Appendix C: Drainage Report

407 TRANSITWAY - KENNEDY ROAD TO BROCK ROAD

MINISTRY OF TRANSPORTATION - CENTRAL REGION

Ontario

Ministry of Transportation

DRAINAGE, HYDROLOGY, STORMWATER MANAGEMENT AND FLOODPLAIN HYDRAULICS REPORT

FOR

407 TRANSITWAY EAST FROM KENNEDY ROAD TO BROCK ROAD

September 14, 2015 (Submission 30%)

January 29, 2016

October 17, 2016

PARSONS

Project No: 602282

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Acronyms and Abbreviations

407 ETR	407 Express Toll Route
407 TWY	Proposed 407 Transitway
CL	Center Line
Diff	Difference
DS INV	Downstream Invert
ESC	Erosion and Sediment Control
EOTL	Edge of Travelled Lane
ES	Enhanced Swale
ESC	Erosion and Sediment Control
Ex Cond	Existing Condition
EPR	Environmental Planning Report
HW	Head Water
IDF	Intensity-Duration-Frequency
Modif	Modified
MOECC	Ministry of the Environment and Climate Change
MNRF	Ministry of Natural Resources and Forestry
MTO	Ministry of Transportation Ontario
OGS	Oil Grit Separator
Prop Cond	Proposed Condition
Prop STM	Proposed Storm Sewer System
PWL	Permanent Pool Water Level
Reg WL	Regional Water Level
ROW	Right of Way

Sta	Station
Std.	Standard
SW	Grassed Swale
SWM	Stormwater Management
SWMF	Stormwater Management Facility
TRCA	Toronto and Region Conservation Authority
TSS	Total Suspended Solids
VH3.0	Visual Otthymo version 3.0
VO2	Visual Otthymo version 2.3.3
WC	Water Crossing
WL	Water Level

1. INTRODUCTION

1.1. Background and Project Description

Parsons was retained by the Ministry of Transportation Ontario (MTO) to undertake a drainage study in support of an Environmental Progress Report for the proposed 407 Transitway between Kennedy Road and Brock Road (407 TWY), a total distance of approximately 20.2km. Five stations are proposed along the study limits at the following locations: Markham Road, Ninth Line, Donald Cousens Parkway, Whites Road and Brock Road.

The proposed Transitway (407TWY) runs parallel to and to the south of the 407 Express Toll Route (407 ETR) from Kennedy Road in the City of Markham to east of Brock Road interchange in the City of Pickering. Refer to Figure 1.1 for Study Area Map. The proposed 407 TWY falls under Toronto and Region Conservation Authority (TRCA) jurisdiction and crosses three watersheds: Rouge River, Petticoat Creek and Duffins Creek. The study area within Rouge River and Petticoat Creek watersheds is predominantly located in an urban environment, however the section located within Duffins Creek is mainly rural, with significant development underway in the upcoming years. The length of the proposed transitway within the study limits is approximately 20.2 km and five (5) stations and additional parking lots are proposed at Markham Road, Ninth Line, Donald Cousens Parkway, Whites Road and Brock Road.

The present study focuses on the development of a drainage and stormwater management plan for the proposed transitway that minimizes impacts on the existing watercourses and drainage patterns. Hydrologic and hydraulic analysis have been undertaken for the proposed water crossings and mitigation measures are recommended where necessary. The proposed transitway crosses forty-nine (49) watercourses, out of which twenty-three (23) are major branches of creeks (such as Lower Rouge, Little Rouge, West Duffins Creek, Brougham Creek and others) and their tributaries. The remaining watercourses were identified as minor conveyance features with small localized tributary areas that the proposed TWY will not impact because of grade difference.

1.2. Objectives and Scope of Work

The objectives of this study are as follows:

- develop a drainage and stormwater management plan for the proposed 407 TWY that minimizes impact on the existing watercourses and drainage system;
- undertake a hydrologic and hydraulic analysis of the proposed water crossings; and
- provide mitigation measures where necessary.

ROUGE RIVER WATERSHED

PROJECT LIMITS

MATCHLINE - STA 4+700

0+000 0+200 0+400 0+600 0+800 1+000 1+200 1+400 1+600 1+800 2+000 2+200 2+400 2+600 2+800 3+000 3+200 3+400 3+600 3+800 4+000 4+200 4+400 4+600

407 ETR

McCOWAN RD.

MAIN STREET MARKHAM S

RIBSTON ST

POND ID R-4

POND ID R-5

POND ID R-6

POND ID 37

POND ID 45

POND ID 46

WC#1 WC#2 WC#3 WC#4 WC#5 WC#6 WC#7 WC#8 WC#9 WC#10 WC#11 WC#12

MARKHAM STATION

SWMF-1

LEGEND

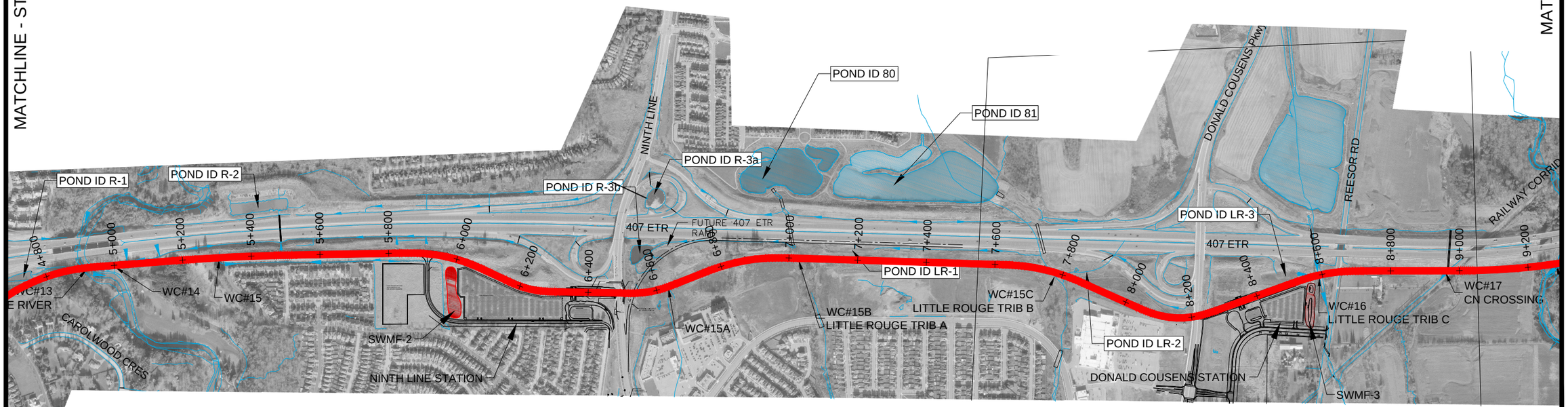
- WATER CROSSING WITH FLOW DIRECTION
- EXISTING CULVERTS
- EXISTING PONDS
- PROPOSED PONDS

	DATE: OCTOBER 2016	Ontario	PARSONS 625 COCHRANE DRIVE, SUITE 500 MARKHAM, ONTARIO L3R 9R9 TEL: 905-943-0500 FAX: 905-943-0400	407 TRANSITWAY FROM KENNEDY RD TO BROCK RD
	SCALE: NTS			FIGURE 1.1 - STUDY AREA MAP (1 of 4)

ROUGE RIVER WATERSHED

MATCHLINE - STA 4+700

MATCHLINE - STA 9+300



LEGEND

- WATER CROSSING WITH FLOW DIRECTION
- EXISTING CULVERTS
- EXISTING PONDS
- PROPOSED PONDS

	DATE: OCTOBER 2016	Ontario	PARSONS 625 COCHRANE DRIVE, SUITE 500 MARKHAM, ONTARIO L3R 9R9 TEL: 905-943-0500 FAX: 905-943-0400	407 TRANSITWAY FROM KENNEDY RD TO BROCK RD
	SCALE: NTS			FIGURE 1.1 - STUDY AREA MAP (2 of 4)

PETTICOAT WATERSHED

CITY OF MARKHAM

CITY OF PICKERING

DUFFINS WATERSHED

MATCHLINE - STA 9+300

MATCHLINE - STA 14+200

YORK DURHAM LINE

SIDELINE 34

11TH CONCESSION

LOCUST HILL LN

CORRIDOR

407 ETR

NORTH RD

N RD

WC#27

WC#28 & 29
WEST DUFFINS CREEK

(WC#28)

WC#26

WC#25

WC#24

WC#23

WC#22

WC#21

WC#20A

WC#20

WC#19

WC#18
LITTLE ROUGE CREEK

WC#31

WC#32

WC#30

WC#33

WC#34

POND ID WD-2

POND ID P-2

POND ID LR-5

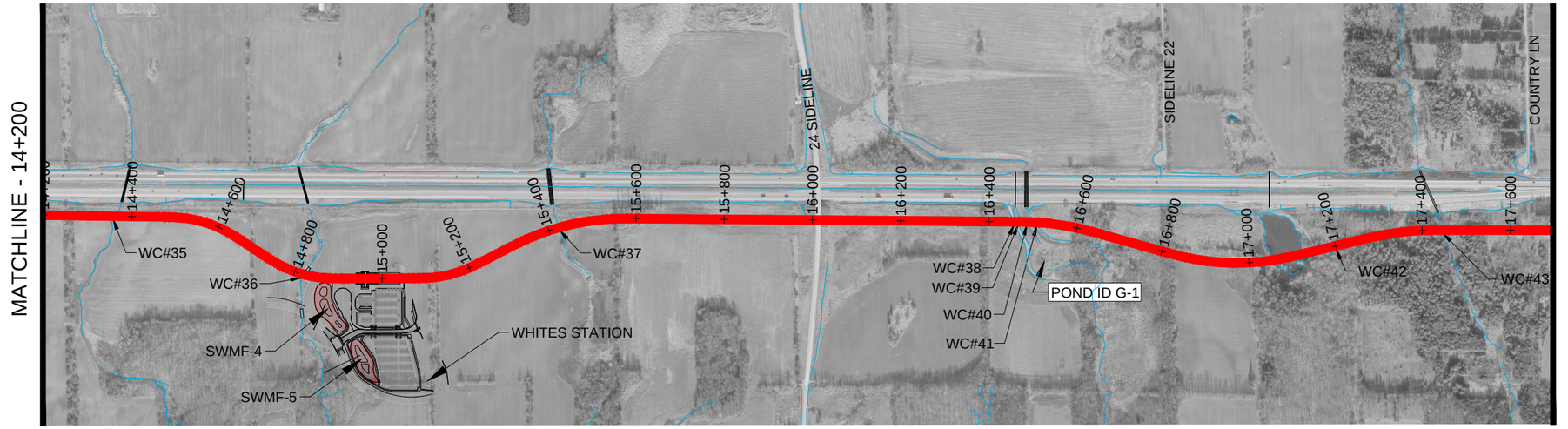
12+200
12+400
12+600
12+800
13+000
13+200
13+400
13+600
13+800
14+000
11+800
11+600
11+400
11+200
11+000
10+800
10+600
10+400
10+200
10+000
9+800
9+600
9+400

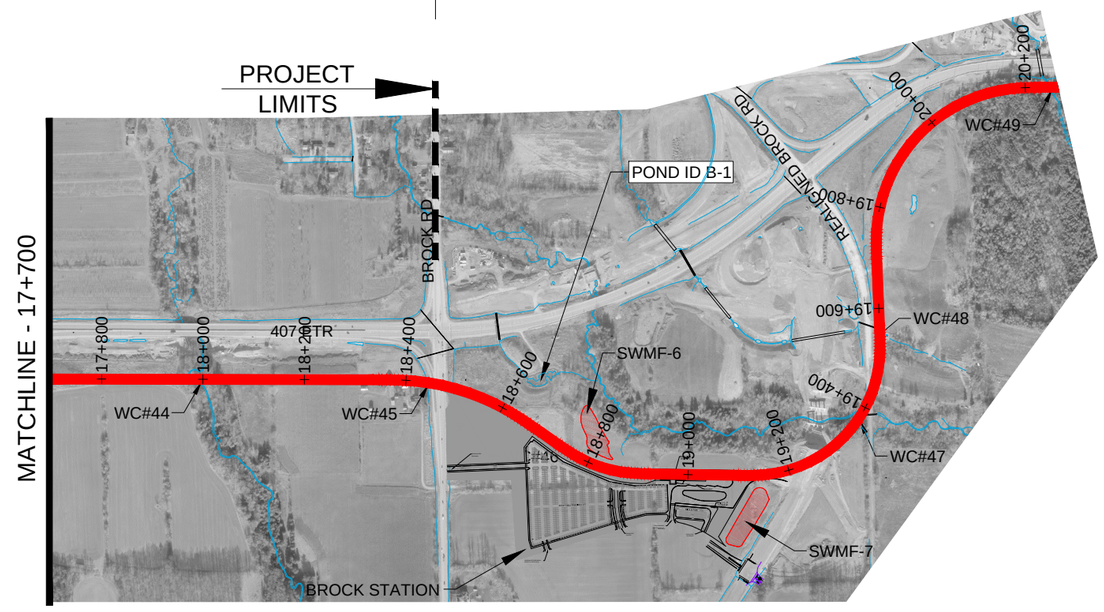
LEGEND

- WATER CROSSING WITH FLOW DIRECTION
- EXISTING CULVERTS
- EXISTING PONDS
- PROPOSED PONDS

	DATE: OCTOBER 2016 SCALE: NTS	Ontario	PARSONS 625 COCHRANE DRIVE, SUITE 500 MARKHAM, ONTARIO L3R 9R9 TEL: 905-943-0500 FAX: 905-943-0400	407 TRANSITWAY FROM KENNEDY RD TO BROCK RD FIGURE 1.1 - STUDY AREA MAP (3 of 4)

DUFFINS WATERSHED





LEGEND

- WATER CROSSING WITH FLOW DIRECTION
- EXISTING CULVERTS
- EXISTING PONDS
- PROPOSED PONDS

	DATE: OCTOBER 2016	Ontario	PARSONS 625 COCHRANE DRIVE, SUITE 500 MARKHAM, ONTARIO L3R 9R9 TEL: 905-943-0500 FAX: 905-943-0400	407 TRANSITWAY FROM KENNEDY RD TO BROCK RD
	SCALE: NTS			FIGURE 1.1 - STUDY AREA MAP (4 of 4)

This study includes the following:

- hydrologic analysis of the proposed transitway to assess any negative impacts on the existing watercourses;
- identifying possible measures to minimize stormwater runoff impacts to fisheries, surface water, groundwater and wetlands;
- design of SWM ponds for each station site to provide quantity and/or quality control;
- updating existing HEC-RAS models provided by TRCA to establish base models that could be used to assess the impact of the proposed 407 TWY;
- created new HEC-RAS models from scratch for water crossings that are not included in the TRCA hydraulic models found within the study area;
- hydraulic analysis of proposed 407 TWY structures;
- review and update of existing floodplain mapping within the study area received from TRCA to include the proposed 407 TWY to ensure no increases in water levels are expected beyond the MTO property.
- create new floodplain maps within the study limits for all creek crossings analyzed.

This report is intended to illustrate how the drainage system is affected by the proposed TWY and to identify possible mitigation measures required to ensure the stormwater management criteria can be met. In addition, a preliminary hydrologic model has been developed to calculate the storage requirements of stormwater management facilities to ensure MOECC's and TRCA's quality and quantity control criteria are achieved for each watershed.

2. EXISTING ENVIRONMENT CHARACTERIZATION

2.1. Water Crossings

The study area crosses three (3) major watersheds governed by the Toronto and Region Conservation Authority (TRCA) - the Rouge River, Petticoat Creek and Duffins Creek. Within the above-mentioned watersheds, 49 (forty nine) water crossings were identified along the proposed 407 TWY corridor. Figure 1.1 shows the location of all water crossings. Refer to Table 2.1 for details.

Table 2.1: Proposed 407 TWY Water Crossings Details

No.	WC ID	TWY Chainage	River Reach	Existing TRCA HEC_RAS Model	Existing FP Map from TRCA	Watercrossing Characteristic	Flow/Thermal Regime	Subwatershed ID (Hydrologic Analysis)	TRCA Tributary Name	Notes
1	WC#1	0+302 & 0+312	Middle Rouge	--	--	Ditch				No analysis required, 407 TWY alignment located above the existing crossing; ex pond
2	WC#2	0+525		--	--	Ditch				No analysis required, 407 TWY alignment located above the existing crossing
3	WC#3	1+131		No HEC-RAS model started from scratch	--	Ditch	R1: Tributary of the Rouge River - Permanent - Warmwater	314	Rouge H	
4	WC#4	1+552		No HEC-RAS model started from scratch	--	Ditch	R3: Tributary of the Rouge River - Permanent - Warmwater			
5	WC#5	1+737		No HEC-RAS model started from scratch	--	Ditch				
6	WC#6	2+058		--	--	Ditch				
7	WC#7	2+101		--	--	Ditch				Structure over McCowan Rd. St 2+053 to St 2+303
8	WC#8	2+250		--	--	Ditch				No analysis required, 407 TWY alignment located above the existing crossings
9	WC#9	2+273		--	--	Ditch				
10	WC#10	2+298		--	--	Ditch				
11	WC#11	2+609		No HEC-RAS model started from scratch	--	Ditch				Conveyance of flows from south side
12	WC#12	3+080		No HEC-RAS model started from scratch	--	Ditch				Conveyance of flows from south side
13	WC#13	4+830 to 5+130	Lower Rouge	HEC-RAS Model: Upper Rouge, Middle Rouge, Lower Rouge, Bruce and Bercy Creeks Geometry File: Jan 17, 2007 River: Main Rouge - Reach Milne-Warden-2	rou_38 MTM NAD 83	River	R4: Rouge River - Permanent - Coolwater	604	Rouge E	**Lower Rouge River**
14	WC#14	5+008		--		Ditch				Conveyance of flows from 407 ETR ditches
15	WC#15	5+306		--		Ditch				Conveyance of flows from 407 ETR ditches
16	WC#15a	6+632		No HEC-RAS model started from scratch		Creek	R5: Tributary of the Rouge River - Permanent - Coolwater	621	Rouge E	
17	WC#15b	7+027	Little Rouge Creek	HEC-RAS Model: Little Rouge TRIB A+D Geometry File: Trib A-Dec 20, 2006 River: Trib A-Reach 1	rou_37 MTM NAD 83	Creek	R6: Tributary of Little Rouge Creek - Permanent - Coolwater	521	Little Rouge C	New watercourse - pond to the north (Pond 80 -Town of Markham); EX twin culv 2x(2.4x1.2) Box Culverts
18	WC#15c	7+766		HEC-RAS Model: Little Rouge TRIB A+D Geometry File: Trib A-Dec 20, 2006 River: Trib D-Reach 1	rou_36 MTM NAD 83	Creek	R7&R7a: Tributary of Little Rouge Creek - Permanent - Warmwater	522	Little Rouge C	New watercourse - pond to the north (Pond 81 -Town of Markham); EX twin culv 2x(3.0x1.8) Box Culverts
19	WC#16	8+591		No HEC-RAS model started from scratch	--	Creek	R8: Tributary of Little Rouge Creek - Permanent - Coolwater	511	Little Rouge C	Conveyance of flows from outlet of pond 85 - Town of Mrkham; 407 ETR structure - (4.6x2.7)
20	WC#17	8+966		--	--	Creek	R9: Tributary of Little Rouge Creek - Permanent - Coolwater			CN Crossing
21	WC#18	9+227 to 9+437		HEC-RAS Model: Little Rouge Geometry File: Little - Oct.2011 River: Little Rouge - Reach 3	rou_24 MTM NAD 83	River	R10: Little Rouge Creek - Permanent - Coldwater	513	Little Rouge C	**Little Rouge River** See Structural GA
22	WC#19	9+824		No HEC-RAS model started from scratch	--	Creek				
23	WC#20	10+019		No HEC-RAS model started from scratch	--	Creek				
24	WC#20a	10+178	Petticoat Creek	No HEC-RAS model started from scratch		Creek	P1: Petticoat Creek - Intermittent - Warmwater	1	--	
25	WC#21	10+761		No HEC-RAS model started from scratch	--	Creek		2	--	

Table 2.1: Proposed 407 TWY Water Crossings Details

No.	WC ID	TWY Chainage	River Reach	Existing TRCA HEC_RAS Model	Existing FP Map from TRCA	Watercrossing Characteristic	Flow/Thermal Regime	Subwatershed ID (Hydrologic Analysis)	TRCA Tributary Name	Notes
26	WC#22	11+064	West Duffins Creek	--	--	Ditch				TWY below
27	WC#23	11+157		--	--	Ditch				TWY below
28	WC#24	11+761		--	--	Ditch				
29	WC#25	11+935		--	--	Ditch				seems to be the inlet of an existing pond no info from 407 ETR
30	WC#26	11+990 & 11+999		--	--	Ditch				ditch
31	WC#27	12+141		--	--	Ditch				
32	WC#28	12+190 to 12+495		HEC-RAS Model: Catchment 11 Geometry: Duffins Creek Catchment 11 River 1, Reach 1	duf_32 MTM NAD 83	Creek	D1: West Duffins Creek - Permanent - Coldwater	7		Green river tributary 1 Structural GA Available for 28&29
33	WC#29			No HEC-RAS model started from scratch	--	Creek	D3: Tributary of West Duffins Creek - Permanent - Coldwater	9	West Duffins Creek - Unnamed Tributary 3	Green river tributary 2
34	WC#30	12+849		No HEC-RAS model started from scratch	--	Creek	D4: Tributary of West Duffins Creek - Permanent - Coldwater	8	West Duffins Creek - Unnamed Tributary 2	
35	WC#31	13+039		--	--	Ditch-Pond WD-2 Outlet				OUTLET OF POND WD-2 (407ETR dwgs)outlet pipe: 0.6m CSP
36	WC#32	13+101		--	--	access rd-407ETR pond;				access rd POND WD-2-407ETR dwgs; no analysis here
37	WC#33	13+152		--	--	Ditch-Pond WD-2 Inlet		8		Inlet of pond WD-2 (407ETR dwgs) 3 pipes (0.750m, 0.625, 0.750m)
38	WC#34	13+496		--	--	Roadside Ditch at N Rd.	D5: Tributary of West Duffins Creek - Ephemeral - Warmwater			TWY below the ditch - one more ditch on the other side of North Rd.
39	WC#35	14+367		No HEC-RAS model started from scratch	--	Creek	D8: Tributary of Whitevale Creek - Permanent - Coldwater	30	Whitevale Creek - Main Branch	
40	WC#36	14+823		No HEC-RAS model started from scratch	--	Creek	D9: Tributary of Whitevale Creek - Intermittent - Warmwater	31	West Duffins creek - Unnamed Tributary 1	
41	WC#37	15+423		No HEC-RAS model started from scratch	--	Creek	D11: Tributary of Ganatsekiagon Creek - Permanent - Coldwater	34	Ganatsekiagon Creek - West Branch	
42	WC#38	16+455	East Duffins Creek	--	--	Ditch				Pond G1-Access Rd.
43	WC#39	16+463		--	--	Ditch				no analysis here
44	WC#40	16+479		--	--	Ditch-Pond G-1 Inlet		35	Ganatsekiagon Creek - East Branch	Inlet of pond G-1 (407 ETR dwgs)
45	WC#41	16+505		No HEC-RAS model started from scratch	--	Creek	D12: Ganatsekiagon Creek - Permanent - Coldwater			creek by-passess the pond (G-1)
46	WC#42	17+210 & 17+264		--	--	Creek	D13: Tributary of Urfe Creek - Permanent - Coldwater	38	Urfe Creek Upper West Branch	
47	WC#43	17+447		No HEC-RAS model started from scratch	--	Creek	D14: Tributary of Urfe Creek - Permanent - Coldwater			
48	WC#44	17+965 to 18+007		No HEC-RAS model started from scratch	--	Creek	D15: Urfe Creek - Permanent - Coldwater	39	Urfe Creek Upper East Branch	
49	WC#45	18+443		--	--	Ditch				

Notes:

1- All the data related to Flow/Thermal Regime has been taken from Fish and Fish Habitat - Impact Assessment Report (LGL April 2016)

2- All data related to Subwatershed ID and and TRCA tributary Names has been taken from the following reports:
Rouge River Watershed, hydrology update, Final Report, TRCA, June 2001
2012 Duffins Creek Hydrology Update, Finla Report, TRCA, February 2013

3 - Cells highlighted in blue represent creeks identified by LGL

2.2. Soils

Review of Ontario Geological Survey maps shows that the study area located within Rouge River mainly falls under till soil group with some sections along major creeks falling in clay, silt, sand, gravel, which may contain organic remains. Also, a section between McCowan Road and Markham Road is located in sand soil groups. Refer to Figure 2.1 in Appendix A.

Study of Ontario Geological Survey maps shows that the study area within the Duffins Creek watershed is located in till soil group except a small part between York Durham Line and North Road situated in clay, silt, sand, gravel, which may contain organic remains. The general slope of the crossing subwatersheds along 407 TWY is northern-southern with an average slope of 4.8%. The review of Duffins Creek hydrology report and Google Maps show the dominate land use in the study area is Agricultural lands. Refer to Figure 2.2 in Appendix A.

2.3. Rainfall Data

The 12-hour AES design storm was selected by TRCA for application in the Rouge River, Petticoat Creek and Duffins Creek watersheds hydrologic modelling. As noted in the documentations received from TRCA for the hydrologic modelling of all watersheds, the AES distribution was selected over both the U.S. Soil Conservation Service (SCS) and Chicago distributions, as it is more suitable for a Southern Ontario study area.

Additionally, the design of storage facilities designed for the purpose of this study considers both storm events, 4hr Chicago and 12hr AES and comparison of modelling results is summarized in several tables in the report. The 12hr AES remains the design storm per TRCA's hydrologic modelling of the watershed and the 4hr Chicago is used to comply with the MTO criteria. The rainfall files were developed in VO2 using the latest IDF curves provided by MTO for 407 ETR and Brock Rd (refer to IDF Curve Look-up, MTO included in Appendix B).

VO2 modelling simulation order is as follows:

- Simulation 1: 2-yr 12hr AES (or Chicago 4-hr)
- Simulation 2: 5-yr 12hr AES (or Chicago 4-hr)
- Simulation 3: 10-yr 12hr AES (or Chicago 4-hr)
- Simulation 4: 25-yr 12hr AES (or Chicago 4-hr)
- Simulation 5: 50-yr 12hr AES (or Chicago 4-hr)
- Simulation 6: 100-yr 12hr AES (or Chicago 4-hr)

2.4. Existing Drainage Infrastructure

Parsons undertook a review of background information received from the 407 ETR and City of Markham. Drawings used as reference in this project are included in Appendix A. Table 2.2 and 2.3 in Appendix A summarize the major creek crossings along 407 ETR within the project limits of the proposed 407 TWY.

There is also number of existing ponds along the existing 407 ETR corridor, on the north and south side of the 407 ETR. A review of available SWM reports was undertaken to determine flows from these ponds that would eventually be conveyed through the 407 TWY ROW. A summary of data reviewed is in included in Table 2.4 in Appendix A. No SWM Pond reports were available for the existing 407 ETR ponds.

3. HYDROLOGIC ANALYSIS – EXISTING CONDITION

Watershed maps for Rouge River, Petticoat Creek and Duffins Creek Watersheds and hydrologic models, as well as rainfall files for each watershed were provided by TRCA for the purpose of this study. Figures 3.1 and 3.2, included in Appendix B show the watersheds digitized in CAD using original maps from TRCA.

The proposed transitway sub-areas were delineated from the larger watershed as shown Figure 3.3 and sketch SK-1 in Appendix B. The transitway sub-areas were delineated assuming a constant width of 19m, using the widest typical road cross-section available for the proposed 407 TWY. The input modelling parameters for each transitway sub-area were set to match the original VO2 input parameters per TRCA. Tables 3.1 to 3.3 in Appendix B show the parameters used in the TRCA model for each watershed. In cases where the larger subwatershed is modelled as a Standhyd, the same command was used for the analysis of the TWY sub-areas; however, the imperviousness was adjusted to 20%. Similarly, where the larger subwatershed is modelled as a NASHYD/WILLHYD, the same command and input parameters were used to define the transitway sub-area, to be conservative.

3.1. Rouge River Watershed

The hydrologic model and watershed map for the Rouge River watershed were provided by TRCA. The relevant subwatersheds for the present study are highlighted in Figure 3.1 in Appendix B.

Hydrologic modeling for the Rouge River was based on three Visual OTTHYMO (VO2) models received from TRCA. Due to the size and complexity of the Rouge River watershed, TRCA has divided the complete regional model into subwatershed or reach models. The proposed transitway crosses the middle reach of Rouge River, as well as Little Rouge Creek; thus, the “Middle Rouge” and “Little Rouge” VO2 models were reviewed under existing conditions. The proposed transitway also crosses the lower reach of the Rouge River, but the TRCA did

not provide a separate model for this segment of the river. To ensure that all components of the river were accounted for in the hydrologic analysis, the Regional VO2 model, which includes the lower reach and all tributaries, was used.

For the existing conditions analysis, each catchment area crossed by the proposed transitway was subdivided to represent areas upstream, downstream, and part of the future transitway right-of-way. The sum of these areas is equal to the total area for each affected catchment area (refer to Figure 3.3 and Table 3.4 in Appendix B).

Updated schematics of Little Rouge, Middle Rouge, and Regional models (existing condition) are shown in Visual OTTHYMO Modelling Schematics 1 and 2 included in Appendix B.

Table 3.5 summarizes the existing condition peak flows generated by each transitway sub-area within Rouge sub-watershed. Visual OTTHYMO Modelling Schematic 3.1 used for the existing condition hydrologic analysis of the 407 TWY sub-areas, as well as model output files are included in Appendix B.

3.2. Petticoat Creek Watershed

The hydrologic model and watershed map for the Petticoat Creek watershed were provided by TRCA. The relevant subwatersheds for the present study as highlighted in Figure 3.2 in Appendix B. Table 3.6 in Appendix B shows the delineation of relevant sub-catchments used for the hydrologic analysis of the 407 TWY sub-areas.

Similar to the analysis undertaken for Rouge sub-watersheds, transitway sub-areas were delineated within Petticoat Watershed. Table 3.7 summarizes the existing condition peak flows generated by each transitway sub-area within Petticoat sub-watershed. Visual OTTHYMO Modelling Schematic 3.1 used for the existing condition hydrologic analysis of the 407 TWY sub-areas, as well as model output files are included in Appendix B.

3.3. Duffins Creek Watershed

Similarly, TRCA provided us with all the data pertinent to the watershed characteristics (model was provided in VH3). The methodology for subcatchment separation was performed as described in the previous section. Refer to Figure 3.3 and Table 3.8 in Appendix B.

Duffins watershed uses unit rates formulas for the determination of allowable peak flows within each sub-watershed. Refer to Table 3.9 for allowable rates.

Table 3.5: Modelling Results - Existing Condition Peak Flows (m^3/s) - 407 TWY Sub-Areas (Rouge River Watershed-12hr AES)

Return Period (12hr-AES)	TWY Sub-Area	318-TWY	314-TWY	312-TWY	614-TWY	604-TWY	620-TWY	521-TWY	522-TWY	511-TWY	513-TWY
	V02 ID	*318*	*314*	*312*	*614*	*604*	*620*	*521*	*522*	*511*	*513*
	A (ha)	*1.79*	*1.62*	*4.14*	*1.37*	*3.34*	*0.94*	*1.12*	*1.52*	*1.60*	*1.82*
	2-yr	0.029	0.027	0.010	0.029	0.068	0.014	0.024	0.013	0.013	0.013
	5-yr	0.045	0.042	0.017	0.046	0.107	0.023	0.037	0.020	0.022	0.021
	10-yr	0.058	0.055	0.022	0.057	0.135	0.029	0.047	0.026	0.028	0.027
	25-yr	0.074	0.070	0.029	0.074	0.172	0.037	0.061	0.034	0.036	0.035
	50-yr	0.087	0.084	0.035	0.087	0.205	0.044	0.071	0.041	0.043	0.041
	100-yr	0.102	0.096	0.040	0.099	0.235	0.051	0.081	0.047	0.050	0.047

Table 3.7: Modelling Results - Existing Condition Peak Flows (m^3/s) - 407 TWY Sub-Areas (Petticoat Creek Watershed-12hr AES)

Return Period (12hr-AES)	TWY Sub-Area	1-TWY	2-TWY
	VO2 ID	*1*	*2*
	A (ha)	*0.96*	*1.02*
	2-yr	0.007	0.006
	5-yr	0.011	0.010
	10-yr	0.014	0.013
	25-yr	0.018	0.018
	50-yr	0.021	0.021
	100-yr	0.025	0.024

Table 3.9: Hydrologic Analysis 407 TWY Sub-Areas - Unit Flow Rates (Duffins Creek Watershed)

Unit Flow Rates 2012 Study, TRCA - Sub-catchment 7 (A = 3.19 ha)

Return Period	Q allowable (L/s/ha)	Q allowable (m^3/s)
2-yr	3.67	0.012
100-yr	13.19	0.042

Unit Flow Rates 2012 Study, TRCA - Sub-catchment 8 (A = 1.41 ha)

Return Period	Q allowable (L/s/ha)	Q allowable (m^3/s)
2-yr	3.67	0.005
100-yr	13.19	0.019

Unit Flow Rates 2012 Study, TRCA - Sub-catchment 30 (A = 2.11 ha)

Return Period	Q allowable (L/s/ha)	Q allowable (m^3/s)
2-yr	2.31	0.005
100-yr	8.24	0.017

Unit Flow Rates 2012 Study, TRCA - Sub-catchment 31 (A = 0.78 ha)

Return Period	Q allowable (L/s/ha)	Q allowable (m^3/s)
2-yr	2.38	0.002
100-yr	8.42	0.007

Unit Flow Rates 2012 Study, TRCA - Sub-catchment 34 (A = 1.35 ha)

Return Period	Q allowable (L/s/ha)	Q allowable (m^3/s)
2-yr	2.86	0.004
100-yr	10.11	0.014

Unit Flow Rates 2012 Study, TRCA - Sub-catchment 35 (A = 2.07 ha)

Return Period	Q allowable (L/s/ha)	Q allowable (m^3/s)
2-yr	2.81	0.006
100-yr	10.12	0.021

Unit Flow Rates 2012 Study, TRCA - Sub-catchment 38 (A = 1.86 ha)

Return Period	Q allowable (L/s/ha)	Q allowable (m^3/s)
2-yr	2.36	0.004
100-yr	8.50	0.016

Unit Flow Rates 2012 Study, TRCA - Sub-catchment 39 (A = 0.73 ha)

Return Period	Q allowable (L/s/ha)	Q allowable (m^3/s)
2-yr	1.86	0.001
100-yr	6.68	0.005

4. HYDROLOGIC ANALYSIS – POST-DEVELOPMENT CONDITION

The proposed 407 TWY crosses several subwatersheds within Rouge, Petticoat and Duffins Creek. As a result of the introduction of the 407 TWY existing drainage patterns are interrupted and conveyance of flow through the proposed 407 TWY ROW has to be provided. As previously discussed and as described in Figure 3.3 in Appendix B the larger subwatersheds were subdivided between upstream areas, TWY sub-areas (areas allocated for the proposed TWY) as well as downstream areas. Figure 4.1 and 4.2 in Appendix D show the TWY sub-areas delineated within each watershed.

4.1. Analysis of Upstream Sub-Catchments

Twenty three (23) water crossings within the study limits are impacted by the proposed 407 TWY. TRCA provided the hydraulic model for five (5) of these water crossings: WC 13, 15b, 15c, 18 and 28 & 29, therefore no hydrologic analysis is required for these. For the remaining eighteen (18), a hydrologic analysis of the drainage areas upstream of the proposed 407 TWY was undertaken. Drainage area maps were delineated for all eighteen (18) water crossings analyzed and maps are included in Figures 4.3 to 4.9 in Appendix C.

The original model parameters from TRCA were maintained in the hydrologic analysis and areas only were adjusted to reflect the drainage boundary at the upstream side of the proposed 407 TWY. Chicago 4-hr distribution using MTO's IDF curves was used in this analysis and peak flows for all upstream areas are summarized in Table 4.1. These flows will further be used in the HEC-RAS analysis of the proposed structures (refer to Section 6 of this report).

Visual OTTHYMO Model Schematic 4.1 and 4.2 in Appendix C show the upstream catchment areas analyzed in VO2. Model output files are included in Appendix C.

Table 4.1: Visual Otthymo Modelling - Watercrossings - Determination of Upstream Flows

ROUGE WATERSHED	WC ID 3	WC ID 4	WC ID 5	WC ID 11	WC ID 12	WC ID 15A	WC ID 16
Return Period	Watershed 314-A	Watershed 314-B	Watershed 314-C	Watershed 312-A	Watershed 312-B	Watershed 621-A	
	VO2 ID 10	VO2 ID 20	VO2 ID 30	VO2 ID 40	VO2 ID 50	VO2 ID 60	VO2 ID 16
	DA= 61.45ha	DA= 54.08ha	DA=30ha	DA= 18.57ha	DA=24.8ha	DA=32.02ha	DA= 184.76ha
	4hr Chicago-MTO	4hr Chicago-MTO	4hr Chicago-MTO	4hr Chicago-MTO	4hr Chicago-MTO	4hr Chicago-MTO	4hr Chicago-MTO
	Q (m^3/s)	Q (m^3/s)	Q (m^3/s)	Q (m^3/s)	Q (m^3/s)	Q (m^3/s)	Q (m^3/s)
2-yr	2.00	1.76	0.98	0.03	0.04	1.50	9.39
5-yr	3.44	3.03	1.68	0.05	0.07	2.39	16.92
10-yr	4.13	3.64	2.02	0.07	0.10	3.47	20.34
25-yr	5.07	4.46	2.48	0.10	0.14	4.26	24.83
50-yr	5.76	5.07	2.81	0.12	0.16	4.84	28.14
100-yr	6.47	5.70	3.16	0.15	0.20	5.43	31.57
Check Flow	8.42	7.41	4.11	0.19	0.25	7.06	41.04
Reg	4.49	3.95	2.19	0.66	0.88	2.99	

PETTICOAT WATERSHED	WC ID 19	WC ID 20	WC ID 20A	WC ID 21
Return Period	Watershed 513-B	Watershed 513-C	Watershed 1-A	Watershed 2-A
	VO2 ID 80	VO2 ID 90	VO2 ID 100	VO2 ID 110
	DA= 6.39 ha	DA= 6.38 ha	DA= 66.51ha	DA= 29.8ha
	4hr Chicago-MTO	4hr Chicago-MTO	4hr Chicago-MTO	4hr Chicago-MTO
	Q (m^3/s)	Q (m^3/s)	Q (m^3/s)	Q (m^3/s)
2-yr	0.03	0.03	0.32	0.13
5-yr	0.06	0.06	0.57	0.23
10-yr	0.08	0.08	0.77	0.32
25-yr	0.10	0.10	1.04	0.43
50-yr	0.12	0.12	1.26	0.52
100-yr	0.15	0.15	1.49	0.62
Check Flow	0.19	0.19	1.94	0.80
Reg	0.47	0.47	5.22	2.25

DUFFINS WATERSHED	WC ID 30	WC ID 35	WC ID 36	WC ID 37	WC ID 41	WC ID 43	WC ID 44
Return Period	Watersheds 8-A	Watersheds 30-A	Watersheds 31-A	Watersheds 34-A	Watersheds 35-A	Watersheds 38-A	Watersheds 39-A
	VO2 ID 478	VO2 ID 487	VO2 ID 493	VO2 ID 499	VO2 ID 503	VO2 ID 514	VO2 ID 520
	DA= 121.77ha	DA= 68.82ha	DA= 102.86ha	DA= 109.71ha	DA= 97.79ha	DA= 207.47ha	DA= 278.48ha
	4hr Chicago	4hr Chicago	4hr Chicago	4hr Chicago	4hr Chicago	4hr Chicago	4hr Chicago
	Q (m^3/s)	Q (m^3/s)	Q (m^3/s)	Q (m^3/s)	Q (m^3/s)	Q (m^3/s)	Q (m^3/s)
2-yr	0.55	0.11	0.18	0.19	0.20	0.43	0.30
5-yr	0.80	0.17	0.27	0.34	0.29	0.62	0.55
10-yr	0.97	0.24	0.36	0.46	0.40	0.75	0.75
25-yr	1.27	0.32	0.49	0.62	0.55	1.00	1.02
50-yr	1.46	0.38	0.59	0.75	0.66	1.21	1.23
100-yr	1.67	0.46	0.70	0.90	0.79	1.44	1.47
Check Flow	2.17	0.59	0.91	1.17	1.03	1.88	1.92
Reg	5.97	2.17	3.27	4.09	3.68	6.84	7.22

4.2. Analysis of Transitway Sub-Areas

The drainage areas along the proposed TWY were delineated based on the high points and low points along the road profile. Drainage Area Maps of TWY areas within Rouge, Petticoat and Duffins watersheds are shown in Figure 4.1 and 4.2 in Appendix D.

The methodology for determining the outlet controlled rates for the TWY sub-areas (refer to SK-2 in Appendix D) was conducted as follows:

- In post-development condition the assumption is that sub-areas are draining from high points to low points, in cases where a sub-area crosses a potential water feature, the strategy was to discharge at such point. If this was the case the area was further subdivided.
- The resulting sub-areas could potentially cross-over two or more larger subwatersheds.
- For Rouge River the release rates are based on the pre-development peak flow for the transitway sub-area within the larger subwatershed where the discharge point is located.
- The release rates are set at each sub-area based on the outlet/low point location using the unit rates for Duffins Creek.

4.2.1. Post-Development Condition Uncontrolled (without SWM)

The post-development condition uncontrolled scenario was run to demonstrate the need of stormwater management facilities within the study limits. Tables 4.2, 4.3 and 4.4 show the difference in peak flows between the existing and post-development condition uncontrolled. Modelling results indicate that an overall significant increase of approximately 6% to 466% is noted within Rouge and Petticoat watersheds. Higher increases of approximately 2000% are noted in Duffins watershed due to more stringent criteria for quality control within this watershed (unit rates). Modelling results indicate that SWM facilities are required to meet the existing/allowable rates within each subwatershed, with the exception of Rouge subwatershed 318 where a decrease in peak flows in noted due to areas being directed to subwatershed 314. Peak flows from areas 318-1 and 318-2 are proposed to be discharged to existing pond ID R-4.

Visual OTTHYMO Model Schematic 4.3 and 4.4 in Appendix D show the uncontrolled scenario for the 407 TWY sub-areas analyzed in VO2. Model output files are included in Appendix D.

Table 4.2: Modelling Results - Proposed Condition without SWM Peak Flows (m^3/s) - 407 TWY Sub-Areas (Rouge River Watershed-12hr AES)

Return Period (12hr-AES)	TWY Sub-Area	318			314			312			614			604		
		$Q_{p\text{-}ex}$	$Q_{p\text{-}unctrl}$	% Increase-Prop Q_{peak}	$Q_{p\text{-}ex}$	$Q_{p\text{-}unctrl}$	% Increase-Prop Q_{peak}	$Q_{p\text{-}ex}$	$Q_{p\text{-}unctrl}$	% Increase-Prop Q_{peak}	$Q_{p\text{-}ex}$	$Q_{p\text{-}unctrl}$	% Increase-Prop Q_{peak}	$Q_{p\text{-}ex}$	$Q_{p\text{-}unctrl}$	% Increase-Prop Q_{peak}
	V02 ID	***318***	***3180***		***314***	***3140***		***312***	***3120***		***614***	***6140***		***604***	***6040***	
	A (ha)=	*1.79*	*0.88*		*1.62*	*3.37*		*4.14*	*1.54*		*1.37*	*3.03*		*3.34*	*3.77*	
	2-yr	0.029	0.025	-13.79%	0.027	0.097	259.26%	0.010	0.045	350.00%	0.029	0.086	196.55%	0.068	0.109	60.29%
	5-yr	0.045	0.034	-24.44%	0.042	0.132	214.29%	0.017	0.062	264.71%	0.046	0.115	150.00%	0.107	0.148	38.32%
	10-yr	0.058	0.040	-31.03%	0.055	0.157	185.45%	0.022	0.073	231.82%	0.057	0.135	136.84%	0.135	0.176	30.37%
	25-yr	0.074	0.048	-35.14%	0.070	0.190	171.43%	0.029	0.089	206.90%	0.074	0.163	120.27%	0.172	0.213	23.84%
	50-yr	0.087	0.055	-36.78%	0.084	0.215	155.95%	0.035	0.100	185.71%	0.087	0.185	112.64%	0.205	0.243	18.54%
	100-yr	0.102	0.061	-40.20%	0.096	0.242	152.08%	0.040	0.113	182.50%	0.099	0.206	108.08%	0.235	0.271	15.32%

Return Period (12hr-AES)	TWY Sub-Area	620			521			522			511			513		
		$Q_{p\text{-}ex}$	$Q_{p\text{-}unctrl}$	% Increase-Prop Q_{peak}	$Q_{p\text{-}ex}$	$Q_{p\text{-}unctrl}$	% Increase-Prop Q_{peak}	$Q_{p\text{-}ex}$	$Q_{p\text{-}unctrl}$	% Increase-Prop Q_{peak}	$Q_{p\text{-}ex}$	$Q_{p\text{-}unctrl}$	% Increase-Prop Q_{peak}	$Q_{p\text{-}ex}$	$Q_{p\text{-}unctrl}$	% Increase-Prop Q_{peak}
	V02 ID	***620***	***6201***		***521***	***5210***		***522***	***5220***		***511***	***5111***		***513***	***5130***	
	A (ha)=	*0.94*	*0.78*		*1.12*	*1.24*		*1.52*	*1.74*		*1.60*	*0.85*		*1.82*	*2.20*	
	2-yr	0.014	0.025	78.57%	0.024	0.035	45.83%	0.013	0.053	307.69%	0.013	0.028	115.38%	0.013	0.066	407.69%
	5-yr	0.023	0.036	56.52%	0.037	0.047	27.03%	0.020	0.073	265.00%	0.022	0.040	81.82%	0.021	0.090	328.57%
	10-yr	0.029	0.043	48.28%	0.047	0.056	19.15%	0.026	0.087	234.62%	0.028	0.048	71.43%	0.027	0.108	300.00%
	25-yr	0.037	0.053	43.24%	0.061	0.068	11.48%	0.034	0.106	211.76%	0.036	0.059	63.89%	0.035	0.131	274.29%
	50-yr	0.044	0.060	36.36%	0.071	0.077	8.45%	0.041	0.121	195.12%	0.043	0.067	55.81%	0.041	0.148	260.98%
	100-yr	0.051	0.068	33.33%	0.081	0.086	6.17%	0.047	0.136	189.36%	0.050	0.076	52.00%	0.047	0.167	255.32%

Table 4.3: Modelling Results - Proposed Condition without SWM Peak Flows (m^3/s) - 407 TWY Sub-Areas (Petticoat Creek Watershed-12hr AES)

Return Period (12hr-AES)	TWY Sub-Area	1			2		
		$Q_{p\text{-}ex}$	$Q_{p\text{-}unctrl}$	% Increase-Prop Q_{peak}	$Q_{p\text{-}ex}$	$Q_{p\text{-}unctrl}$	% Increase-Prop Q_{peak}
	V02 ID	***1***	***11***		***2***	***20***	
	A (ha)=	*0.96*	*1.13*		*1.02*	*1.18*	
	2-yr	0.007	0.031	342.86%	0.006	0.034	466.67%
	5-yr	0.011	0.042	281.82%	0.010	0.046	360.00%
	10-yr	0.014	0.049	250.00%	0.013	0.054	315.38%
	25-yr	0.018	0.059	227.78%	0.018	0.066	266.67%
	50-yr	0.021	0.067	219.05%	0.021	0.076	261.90%
	100-yr	0.025	0.075	200.00%	0.024	0.084	250.00%

Table 4.4: Modelling Results - Proposed Condition without SWM Peak Flows (m^3/s) - 407 TWY Sub-Areas (Duffins Creek Watershed-12hr AES)

Return Period (12hr-AES)	TWY Sub-Area	7			8			30			31			34		
		$Q_{allowable}$	$Q_{p\text{-}unctrl}$	% Increase-Prop Q_{peak}	$Q_{allowable}$	$Q_{p\text{-}unctrl}$	% Increase-Prop Q_{peak}	$Q_{allowable}$	$Q_{p\text{-}unctrl}$	% Increase-Prop Q_{peak}	$Q_{allowable}$	$Q_{p\text{-}unctrl}$	% Increase-Prop Q_{peak}	$Q_{allowable}$	$Q_{p\text{-}unctrl}$	% Increase-Prop Q_{peak}
	V02 ID	-	***70***		-	***80***		-	***300***		-	***311***		-	***311***	
	A (ha)=	*3.19*	*2.75*		*1.41*	*2.48*		*2.11*	*0.78*		*0.78*	*0.40*		*0.78*	*0.40*	
	2-yr	0.012	0.084	600.00%	0.005	0.071	1272.06%	0.005	0.023	371.88%	0.002	0.012	546.41%	0.004	0.038	884.20%
	100-yr	0.042	0.223	430.95%	0.019	0.172	824.84%	0.017	0.061	250.85%	0.007	0.032	387.24%	0.014	0.099	625.35%

Return Period (12hr-AES)	TWY Sub-Area	35			38			39		
		$Q_{allowable}$	$Q_{p\text{-}unctrl}$	% Increase-Prop Q_{peak}	$Q_{allowable}$	$Q_{p\text{-}unctrl}$	% Increase-Prop Q_{peak}	$Q_{allowable}$	$Q_{p\text{-}unctrl}$	% Increase-Prop Q_{peak}
	V02 ID	-	***350***		-	***381***		-	***391***	
	A (ha)=	*2.07*	*2.73*		*1.86*	*1.00*		*0.73*	*1.02*	
	2-yr	0.006	0.077	1183.33%	0.004	0.031	606.21%	0.001	0.029	2035.81%
	100-yr	0.021	0.190	804.76%	0.016	0.085	437.63%	0.005	0.071	1355.99%

4.2.2. Post-Development Condition with SWM

A hydrologic analysis was undertaken for the project to quantify the amount of storage required to achieve the allowable discharges within each subwatershed. This section discusses the post-development condition controlled scenario undertaken for the transitway sub-areas. In addition, five stations are proposed along the study limits and their stormwater management strategy is presented in Section 5 of this report.

The transitway sub-areas delineated along the proposed 407 TWY alignment are shown in Figures 4.1 and 4.2 in Appendix D. The drainage area at each transitway outlet is less than 5 ha, therefore wet ponds are not feasible to be constructed to provide quality and quantity control for the paved area of the runningway. A treatment train approach is implemented consisting of grassed embankments to promote sheet flow, grassed swales on both sides of the transitway and enhanced grassed swales/dry ponds located before each outlet from the transitway. The drainage strategy of the 407 TWY sub-areas within each subwatershed including details related to discharge points of each swale as well as quantity control criteria are presented in Table 4.5 in Appendix D.

4.2.2.1. Proposed Enhanced Swales

Grassed swales are proposed along the entire length of the transitway. Since the swales will follow the slope of the road, which in some instances is steep, segments of enhanced swales are proposed before any stormwater discharge to a watercourse or any other type of outlet. The enhanced swales would cover approximately 50 m length and are designed to have a trapezoidal cross-section, flat bottom (1 m wide), 3:1 side slopes and a depth of 1.5 m. A longitudinal slope of maximum 0.2% is proposed for all swales to provide settlement of sediment and to reduce flow velocities from upstream segment. In order to increase the time of flow in the swales and to promote infiltration at the same time, two cells were designed with a 0.5 m layer of clear stone covered by 0.3 m of topsoil below the invert of the swale. The enhanced swales were designed in a form of dry ponds with a formal outlet control structure to provide quality and quantity control for transitway sub-areas. The outlet is comprised of a 100 mm perforated pipe proposed to be installed at the bottom of each swale that is further connected to a hickenbottom structure equipped with a 75 mm orifice plate. Swale details (plan view, cross-sections and longitudinal profile) are shown in SK-3 in Appendix D. The maximum volume that can be stored in an enhanced swale is calculated to be 412.5 m^3. The controlled discharge rate from the swale was calculated to be 0.015 m^3/s using the orifice equation (75 mm diameter) – refer to Table 4.6 in Appendix D. For modelling purposes, it is considered that the swale volume used is maximized, and the maximum discharge would be 0.015 m^3/s. Modelling results indicate that in some instances the volumes required could be less than the maximum volume provided by the swale; a smaller head would result in less discharge at the outlet as shown in the results. Our approach is conservative since we are using the minimum allowable orifice and providing more storage than required.

Tables 4.7, 4.8 and **4.9** in **Appendix D** show the quantity control strategy for each swale. **Figure 4.1** and **4.2** in **Appendix D** show the location of all swales identified along the transitway. In instances where the volume required exceeds 412.5 m^3, additional swales are proposed to provide the required volume (one example is ES-1 where storage required is 700 m^3; two swales ES-1a and ES-1b are designed to provide 825 m^3 maximum storage).

Flows generated by the 25 mm Chicago 4hr event vary between 0.001 m^3/s and 0.003 m^3/s for each swale as shown in **Table 4.5** in **Appendix D**. Considering the swales have a maximum 0.2% longitudinal slope velocities in the swale are approximately 0.13 m/s which is less than 0.5 m/s as required by TRCA (see Table "25mm 4hr Chicago event" in **Appendix D**).

4.2.2.2. Summary of Modelling Results

Based on the quantity controls identified in **Tables 4.7, 4.8** and **4.9** in **Appendix D**, modelling results for the transitway sub-areas within each subwatershed were summarized in **Tables 4.10, 4.11** and **4.12** to show the results of the hydrologic analysis for all conditions analyzed. The results indicate that no increases are expected within Rouge and Petticoat Watersheds. Increases are noted within Duffins watershed (Subwatershed 8, 31 and 39) due to the extremely low allowable release rates (based on units-rates formulas) and the minimum orifice size of 75 mm at the outlet of the proposed swales, although sufficient volume is provided in the swales. The increases vary between 0.001 m^3/s and 0.004 m^3/s at the outlet of the swales compared to the allowable rates. These increases can be considered small and do not pose significant erosion/scour impacts at the outlets. Velocities could be further mitigated with vegetated outlets or energy dissipaters. Parsons looked at the feasibility of enlarging the footprint of the enhanced swales to lower the hydraulic head of the 75 mm orifice and found that the area of ponding would be larger than the transitway segment itself. During detailed design, it is recommended that a more detailed analysis be carried out to determine an optimum swale cross-section/head-discharge-storage relationship to avoid these increases.

Pumping is required at three locations within (within Rouge sub-watershed 614 and 522 and Petticoat subwatershed 1) where the TWY alignment goes underground. Refer to details in **Figure 5.1** and **5.3** in **Appendix E**. The peak flows at these locations are summarized in **Tables 4.10** and **4.11** in **Appendix D**.

The stormwater management strategy recommends that flows from several enhanced swales be directed to the existing 407 ETR ditches and ultimately to existing ponds. Ponds LR-1, LR-5, WD-2 and G1 were identified as possible outlets. It is recommended that the capacity of existing 407 ponds to be assessed during detailed design to confirm if sufficient capacity exists in the ponds for additional flows.

Visual OTTHYMO Model Schematic 4.5 and 4.6 in Appendix D show the post-development condition with SWM scenario for the 407 TWY sub-areas analyzed in VO2. Model output files are included in Appendix D.

Table 4.10: Modelling Results - Proposed Condition with SWM Peak Flows (m^3/s) - 407 TWY Sub-Areas (Rouge River Watershed-12hr AES)

Return Period (12hr-AES)	TWY Sub-Area	318				314				312				614[1]				604				604[2]
		$Q_{p\text{-}ex}$	$Q_{p\text{-}unctrl}$	$Q_{p\text{-}prop}$	% Increase-Prop Q_{peak}	$Q_{p\text{-}ex}$	$Q_{p\text{-}unctrl}$	$Q_{p\text{-}prop}$	% Increase-Prop Q_{peak}	$Q_{p\text{-}ex}$	$Q_{p\text{-}unctrl}$	$Q_{p\text{-}prop}$	% Increase-Prop Q_{peak}	$Q_{p\text{-}ex}$	$Q_{p\text{-}unctrl}$	Q_{pump}	% Increase-Prop Q_{peak}	$Q_{p\text{-}ex}$	$Q_{p\text{-}unctrl}$	$Q_{p\text{-}prop}$	% Increase-Prop Q_{peak}	Q_{pond}
	V02 ID	*318*	*3180*	*31800*		*314*	*3140*	*31400*		*312*	*3120*	*31200*		*614*	*6140*	*61400*		*604*	*6040*	*60400*		*6043*
	A (ha)=	*1.79*	*0.88*	*0.88*		*1.62*	*3.37*	*3.37*		*4.14*	*1.54*	*1.54*		*1.37*	*3.03*	*3.03*		*3.34*	*3.77*	*2.59*		*1.18*
	2-yr	0.029	0.025	0.025	-13.79%	0.027	0.097	0.014	-48.15%	0.010	0.045	0.009	-10.00%	0.029	0.086	0.011	-62.07%	0.068	0.109	0.010	-85.29%	0.033
	5-yr	0.045	0.034	0.034	-24.44%	0.042	0.132	0.019	-54.76%	0.017	0.062	0.013	-23.53%	0.046	0.115	0.015	-67.39%	0.107	0.148	0.014	-86.92%	0.044
	10-yr	0.058	0.040	0.040	-31.03%	0.055	0.157	0.023	-58.18%	0.022	0.073	0.015	-31.82%	0.057	0.135	0.018	-68.42%	0.135	0.176	0.016	-88.15%	0.052
	25-yr	0.074	0.048	0.048	-35.14%	0.070	0.190	0.028	-60.00%	0.029	0.089	0.018	-37.93%	0.074	0.163	0.022	-70.27%	0.172	0.213	0.020	-88.37%	0.063
	50-yr	0.087	0.055	0.055	-36.78%	0.084	0.215	0.031	-63.10%	0.035	0.100	0.021	-40.00%	0.087	0.185	0.025	-71.26%	0.205	0.243	0.022	-89.27%	0.071
	100-yr	0.102	0.061	0.061	-40.20%	0.096	0.242	0.035	-63.54%	0.040	0.113	0.023	-42.50%	0.099	0.206	0.028	-71.72%	0.235	0.271	0.025	-89.36%	0.079

Return Period (12hr-AES)	TWY Sub-Area	620				521				522				522[3]	511				513			
		$Q_{p\text{-}ex}$	$Q_{p\text{-}unctrl}$	$Q_{p\text{-}prop}$	% Increase-Prop Q_{peak}	$Q_{p\text{-}ex}$	$Q_{p\text{-}unctrl}$	$Q_{p\text{-}prop}$	% Increase-Prop Q_{peak}	$Q_{p\text{-}ex}$	$Q_{p\text{-}unctrl}$	$Q_{p\text{-}prop}$	% Increase-Prop Q_{peak}	Q_{pond}	$Q_{p\text{-}ex}$	$Q_{p\text{-}unctrl}$	$Q_{p\text{-}prop}$	% Increase-Prop Q_{peak}	$Q_{p\text{-}ex}$	$Q_{p\text{-}unctrl}$	$Q_{p\text{-}prop}$	% Increase-Prop Q_{peak}
	V02 ID	*620*	*6201*	*711*		*521*	*5210*	*52100*		*522*	*5221*	*714*		*52200*	*511*	*5111*	*717*		*513*	*5130*	*51300*	
	A (ha)=	*0.94*	*0.78*	*0.78*		*1.12*	*1.24*	*1.24*		*1.52*	*1.74*	*0.18*		*1.56*	*1.60*	*0.85*	*0.85*		*1.82*	*2.20*	*2.20*	
	2-yr	0.014	0.025	0.005	-64.29%	0.024	0.035	0.008	-66.67%	0.013	0.053	0.001	-92.31%	0.046	0.013	0.028	0.006	-53.85%	0.013	0.066	0.011	-15.38%
	5-yr	0.023	0.036	0.007	-69.57%	0.037	0.047	0.011	-70.27%	0.020	0.073	0.002	-90.00%	0.063	0.022	0.040	0.008	-63.64%	0.021	0.090	0.015	-28.57%
	10-yr	0.029	0.043	0.009	-68.97%	0.047	0.056	0.013	-72.34%	0.026	0.087	0.002	-92.31%	0.076	0.028	0.048	0.010	-64.29%	0.027	0.108	0.018	-33.33%
	25-yr	0.037	0.053	0.011	-70.27%	0.061	0.068	0.015	-75.41%	0.034	0.106	0.002	-94.12%	0.093	0.036	0.059	0.012	-66.67%	0.035	0.131	0.021	-40.00%
	50-yr	0.044	0.060	0.012	-72.73%	0.071	0.077	0.017	-76.06%	0.041	0.121	0.003	-92.68%	0.106	0.043	0.067	0.013	-69.77%	0.041	0.148	0.024	-41.46%
	100-yr	0.051	0.068	0.013	-74.51%	0.081	0.086	0.020	-75.31%	0.047	0.136	0.003	-93.62%	0.118	0.050	0.076	0.014	-72.00%	0.047	0.167	0.027	-42.55%

[1] Flows from Areas 614-1, 614-2, and 614-3 are to be pumped to Markham Rd.

[2] Flows from Area 604-3 are accounted for in the Ninth Line SWM Pond analysis.

[3] Flows from Area 522-1 are reported in this table; Areas 522-2 and 522-3 are accounted for in the Donald Cousens SWM Pond analysis (pumping required).

Table 4.11: Modelling Results - Proposed Condition with SWM Peak Flows (m^3/s) - 407 TWY Sub-Areas (Petticoat Creek Watershed-12hr AES)

Return Period (12hr-AES)	TWY Sub-Area	1				2[4]
		$Q_{p\text{-}ex}$	$Q_{p\text{-}unctrl}$	$Q_{p\text{-}prop}$	% Increase-Prop Q_{peak}	Q_{pump}
	V02 ID	*1*	*11*	*722*		*200*
	A (ha)=	*0.96*	*1.13*	*1.13*		*1.18*
	2-yr	0.007	0.031	0.004	-42.86%	0.034
	5-yr	0.011	0.042	0.005	-54.55%	0.046
	10-yr	0.014	0.049	0.007	-50.00%	0.054
	25-yr	0.018	0.059	0.008	-55.56%	0.066
	50-yr	0.021	0.067	0.009	-57.14%	0.076
	100-yr	0.025	0.075	0.010	-60.00%	0.084

[4] Flows from Area 2-1 and 2-2 require pumping.

Table 4.12: Modelling Results - Proposed Condition with SWM Peak Flows (m^3/s) - 407 TWY Sub-Areas (Duffins Creek Watershed-12hr AES)

Return Period (12hr-AES)	TWY Sub-Area	7				8				30				31				34[5]
		$Q_{allowable}$	$Q_{p\text{-}unctrl}$	$Q_{p\text{-}prop}$	% Increase Prop Q_{peak}	$Q_{allowable}$	$Q_{p\text{-}unctrl}$	$Q_{p\text{-}prop}$	% Increase Prop Q_{peak}	$Q_{allowable}$	$Q_{p\text{-}unctrl}$	$Q_{p\text{-}prop}$	% Increase Prop Q_{peak}	$Q_{allowable}$	$Q_{p\text{-}unctrl}$	$Q_{p\text{-}prop}$	% Increase Prop Q_{peak}	Q_{pond}
	V02 ID	*-*	*70*	*700*		*-*	*80*	*800*		*-*	*300*	*3000*		*-*	*311*	*730*		*3400*
	A (ha)=	*3.19*	*2.75*	*2.75*		*1.41*	*2.48*	*2.48*		*2.11*	*0.78*	*0.78*		*0.78*	*0.40*	*0.40*		*1.27*
	2-yr	0.012	0.084	0.009	-25.00%	0.005	0.071	0.008	54.60%	0.005	0.023	0.005	0.00%	0.002	0.012	0.003	61.60%	0.038
	100-yr	0.042	0.223	0.022	-47.62%	0.019	0.172	0.020	7.54%	0.017	0.061	0.012	-30.98%	0.007	0.032	0.006	-8.64%	0.099

Return Period (12hr-AES)	TWY Sub-Area	35				38				39			
		$Q_{allowable}$	$Q_{p\text{-}unctrl}$	$Q_{p\text{-}prop}$	% Increase Prop Q_{peak}	$Q_{allowable}$	$Q_{p\text{-}unctrl}$	$Q_{p\text{-}prop}$	% Increase Prop Q_{peak}	$Q_{allowable}$	$Q_{p\text{-}unctrl}$	$Q_{p\text{-}prop}$	% Increase Prop Q_{peak}
	V02 ID	*-*	*350*	*3500*		*-*	*381*	*734*		*-*	*391*	*735*	
	A (ha)=	*2.07*	*2.73*	*2.73*		*1.86*	*1.00*	*1.00*		*0.73*	*1.02*	*1.02*	
	2-yr	0.006	0.077	0.010	66.67%	0.004	0.031	0.004	-8.88%	0.001	0.029	0.004	194.59%
	100-yr	0.021	0.190	0.025	19.05%	0.016	0.085	0.010	-36.75%	0.005	0.071	0.009	84.56%

[5] Flows from Area 34-1 and 34-2 are accounted for in the Whites SWM Pond analysis.

5. STORMWATER MANAGEMENT

5.1. Stormwater Management Criteria

The TRCA's criteria for stormwater management quantity, quality and erosion control are as follows:

Table 5.0. Stormwater Management Criteria

Quantity Control	Rouge Watershed: match post-development peak flows to pre-development levels for all return periods analyzed (TRCA Stormwater Management Criteria, V 1.0, Aug 2012) Duffins Watershed: post-development peak flows were controlled to levels set by allowable unit flow rates based on the TRCA's Unit Flow Rate (2012 Duffins Creek Hydrology Update, Final Report, Feb 2013)
Quality Control	Enhanced protection (Level-1) criteria to determine the minimum permanent pool size for wet pond facilities Table 3.2 of the Stormwater Management Planning and Design Manual (MOECC, 2003)
Erosion Control	25mm attenuation for 48 hours (Rouge) (TRCA Stormwater Management Criteria, V 1.0, Aug 2012) 25mm attenuation for 120 hours (Duffins) (Duffins Watershed – criteria for developments within Seaton Lands) 5 mm retention for each station area, as per TRCA SWM Criteria (2012)
Thermal Considerations	3m permanent pool depth and others (e.g: cooling trenches) (Guidance for Development Activities in Redside Dace Protected Habitat , MNRF V 1.1 (2014)

5.2. Proposed Stormwater Management Strategy

The proposed strategy is included in Figure 4.1 and 4.2 in Appendix B. For the TWY areas the strategy was to implement enhanced swales and dry ponds because the subareas were less than the 5.0ha requirement of wet ponds.

5.2.1. Transitway Sub-Areas

Quantity control requirements were discussed in Section 4.2.2 of this report. In addition, 80% TSS removal is required for stormwater flows generated by the transitway subareas. As previously noted a treatment train approach is implemented consisting of grassed embankments to promote sheet flow, grassed swales and enhanced grass swales/dry ponds located before each outlet from the transitway.

Grassed swales are proposed along the entire length of the transitway. Since the swales will follow the slope of the road, which in some instances is steep, segments of enhanced swales are proposed before any stormwater discharge to a watercourse or any other type of outlet. The enhanced swales would cover approximately 50m length with a longitudinal slope of 0.2% to provide settlement of sediment and to lessen the flow velocities from upstream segment. In addition, in order to increase the time of flow in the swales and to promote infiltration at the same time, two cells were designed with a 0.5m layer of clear stone covered by 0.3m of topsoil.

To support our use of enhanced swales and to prove the efficiency of the enhanced swales for transitway sub-areas, Parsons undertook a literature review (see reference materials 11 to 14 at the end of this Report). The removal efficiency of grassed swales is noted in a number of reference materials. As noted in Reference 11 (*"Highway Runoff Water Quality Literature Review, MAT-92-13, MTO Research and Development Branch, April 1992"*) and Reference 12 (*"Highway 407 East Phase 2, Stormwater Management Plan Framework, Condition 7, EAB File EA-05-08, October 2013, revised March 2014, Final Draft*) the enhanced grassed swales can achieve between 76% and 90% reduction in total suspended solids generated by highway runoff.

Oil grit-separators (OGS) are well known for their application in urban areas where there is limited space for stormwater management facilities. They are most likely to be used in defined impervious areas where the storm runoff is concentrated and collected in a piped system. However, as also noted in reference 12 (*"Highway 407 East Phase 2, Stormwater Management Plan Framework, Condition 7, EAB File EA-05-08, October 2013, revised March 2014, Final Draft*) MTO has not used OGS along highways primarily due to the initial cost of the units, the relatively small drainage area that can be treated by each units and the on-going maintenance requirements. In addition, the units provide only 50% TSS removal as indicated by the New Jersey Department of Environmental Protection.

Due to the reasons listed above, Parsons recommends the use of treatment train approach consisting of grassed embankments, grassed swales and enhanced grassed swales to provide quality and quantity control of transitway sub-areas.

5.2.2. Proposed 407 TWY Stations

Five stations will be located along the proposed length of the transitway, at the following locations: Markham Road, Ninth Line, Donald Cousens Parkway, Whites Road, and Brock Road. Parsons undertook a preliminary hydrologic analysis to determine volume requirements for stormwater management facilities. The drainage area maps of all stations are included Figures 5.1 to 5.5 in Appendix E.

The VO2 modelling has been undertaken assuming one area that combines all areas shown in each map noted above. The methodology is presented below as follows:

Existing condition

- identified TRCA subwatershed were station will be located
- used the TRCA VO2 input parameters of each specific subwatershed, per Table 3.1 in Appendix B
- if Standhyd is used in the TRCA-existing condition, we used 20% imperviousness since land is currently not developed

Post-Development Condition

- all stations are modelled as Standhyd assuming TIMP= 90% and XIMP=50%
- drainage area will be the total contributing drainage area as shown in Figures 5.1 to 5.5 in App B.
- all the other parameters are per TRCA's VO2 model

Results of existing and post-development condition hydrologic analysis for each station are included in Table 5.1 to Table 5.7 in Appendix E. Modelling Schematics as well as VO2 model output files of each stations are also included in Appendix E.

The proposed stormwater management facilities are shown in Figures 5.1 to 5.5 and the design details are shown in Tables 5.1(a to f) to 5.7(a to f) in Appendix E. The SWM strategy includes wet ponds with controlled structures consisting of multiple orifices and/or weirs. A hydrologic analysis has been undertaken for each site and modelling results show no increase in post-development peak flows compared to existing levels (Rouge) or allowable.

5.2.2.1. Markham Road Station

Markham Road station has a total catchment area of 6.87 ha. Table 5.1g provides a tabular summary of the drainage areas at the station.

Table 5.1g. Summary of Markham Road Station Drainage Areas

Drainage Area ID	Area (Ha)	Post-Development Impervious Area* (Ha)	Notes
A-1	0.76	0.68	Development of this area is outside the scope of the Transitway development; however, a 90% imperviousness was assumed for the post-development condition
A-2	3.62	3.26	
A-3	0.42	0.38	
A-4	0.49	0.44	
A-5	0.28	0.25	
A-6	0.86	0.77	
A-7	0.78	-	
Station Total	7.21	5.78	For an area of 7.21 ha, the 5 mm retention volume (TRCA SWM Criteria, 2012) is 360.5 m^3.

*Assumed 90% imperviousness for developed areas, except A-7 which will remain pervious after development.

Development of the station land significantly increases peak flow rates during storm events, as indicated in Table 5.1h.

Table 5.1h. Comparison of Pre-Development and Post- Development (Uncontrolled) Release Rates at Markham Road Station

12hr AES Return Period	Pre-Development Peak Flow (m^3/s)	Post-Development Peak Flow (Uncontrolled) (m^3/s)	Increase from Allowable (Pre-Development) Peak Flow to Post-Development (Uncontrolled) Peak Flow (%)
2-yr	0.145	0.347	139.31%
5-yr	0.228	0.467	104.82%
10-yr	0.294	0.545	85.37%
25-yr	0.374	0.644	72.19%
50-yr	0.437	0.717	64.07%
100-yr	0.513	0.789	53.80%

Two enhanced swales and a wet pond are proposed to provide quality and quantity control for Markham Road Station. The enhanced swales, each with a total available volume of 412.5 m^3, will control flows from drainage areas A-4 (0.49 ha) and A-7 (0.78 ha), as geographic constraints do not allow for these areas to connect to SWMF-1, which will serve the remaining drainage area of 5.94 ha. SWMF-1 is an extended detention wet pond with a total available volume of 4801 m^3. The permanent pool has an average depth of 1.6 m and a volume of 1336 m^3 for quality control; this volume is larger than that required to meet the 5 mm retention criteria for erosion control. Table 5.1d in Appendix E shows the design parameters of the proposed pond. Details of the outlet structure, as well as the stage-storage, stage-discharge relationships of the pond are included in Table 5.1e in Appendix E. Table 5.1f in Appendix E shows that the orifice size required to attenuate the 25mm in 24hr is 90 mm. Therefore, to provide the erosion control the pond will be equipped with a 90 mm orifice (invert elevation of 179.06 m). To achieve the quantity control requirements one additional orifice is proposed:

- Orifice #2: dia = 440mm, invert elevation = 179.63 m

Storage and discharge characteristics of this facility are summarized in Table 5.1i.

Table 5.1i. Storage and Discharge Characteristics of SWMF-1

12hr AES Return Period	Pre-Development Peak Flows (allowable rates) (m^3/s)	SWMF-1 CHARACTERISTICS		Overall Post Development (Controlled) Peak Flows (m^3/s)	Decrease Post-Development Controlled to Allowable (%)
		Storage Available (m^3)	Release Rate (m^3/s)		
2-yr	0.145	1300	0.113	0.118	-22.88%
5-yr	0.228	1560	0.187	0.184	-23.91%
10-yr	0.294	1748	0.226	0.235	-25.11%
25-yr	0.374	1967	0.304	0.313	-19.49%
50-yr	0.437	2113	0.366	0.378	-15.61%
100-yr	0.513	2257	0.425	0.437	-17.39%

A 975 mm STM outlet pipe is proposed for SWMF-1. It was sized to convey uncontrolled flows from the pond in case of clogging or emergency. The 950 mm weir at the top of the outlet structure (invert elevation of 179.87 m) serves as an emergency overflow spill for the pond. An emergency overflow spillway is also provided on the east side of the pond, so that the pond will not overtop if the outlet pipe is blocked.

The pond is equipped with bottom draw pipe connected to the outlet structure.

5.2.2.2. Ninth Line Station

Table 5.2g provides a tabular summary of the drainage areas at Ninth Line Station.

Table 5.2g. Summary of Ninth Line Station Drainage Areas

Drainage Area ID	Area (Ha)	Post-Development Impervious Area* (Ha)	Notes
A-1	1.69	1.52	Development of this area is outside the scope of the Transitway development. On-site quality and quantity control are to be provided separately when this area is developed.
A-2	0.47	0.42	
A-3	0.68	-	This area will not be developed as part of the Transitway project.
A-4	0.75	0.68	
A-5	5.14	4.63	
A-6	0.40	0.36	
Station Total	9.13	7.61	For an area of 9.13 ha, the 5 mm retention volume (TRCA SWM Criteria, 2012) is 456.5 m^3.

*Assumed 90% imperviousness for developed areas, except for A-3 which will not be developed as part of this project.

Development of the station land significantly increases peak flow rates during storm events, as indicated in Table 5.2h.

Table 5.2h. Comparison of Pre-Development and Post- Development (Uncontrolled) Release Rates at Ninth Line Station

12hr AES Return Period	Pre-Development Peak Flow (m^3/s)	Post-Development Peak Flow (Uncontrolled) (m^3/s)	Increase from Allowable to Post-Development (Uncontrolled) Peak Flow (%)
2-yr	0.146	0.370	153.42%
5-yr	0.230	0.501	117.83%
10-yr	0.297	0.589	98.32%
25-yr	0.378	0.699	84.92%
50-yr	0.442	0.781	76.70%
100-yr	0.519	0.864	66.47%

One enhanced swale and a wet pond are proposed to provide quality and quantity control for Ninth Line Station. The enhanced swale, which has a total available volume of 412.5 m^3, will control flows from drainage area A-2 (0.47 ha) because geographic constraints do not allow for these areas to connect to SWMF-2. SWMF-2 will provide quantity and quality control for drainage areas A-4 through A-6, as well as drainage area 604-3 from the transitway (1.18 ha); a total catchment area of 7.47 ha. SWMF-2 is an extended detention wet pond with a total available volume of 6242 m^3. The permanent pool has an average depth of 2.1 m and a volume of 1681 m^3 for quality control; this volume is also larger than that required to meet the 5 mm retention criteria for erosion control. Table 5.2d in Appendix E shows the design parameters of the proposed pond. Details of the outlet structure, as well as the stage-storage, stage-discharge relationships of the pond are included in Table 5.2e in Appendix E. Table 5.2f in Appendix E shows that the orifice size required to attenuate the 25mm in 24hr is 102 mm. Therefore, to provide the erosion control the pond will be equipped with a 102 mm orifice (invert elevation of 171.62 m). To achieve the quantity control requirements one weir is proposed:

- Weir #1: width = 900 mm, invert elevation = 172.16 m

Storage and discharge characteristics of this facility are summarized in Table 5.2i.

Table 5.2i. Storage and Discharge Characteristics of SWMF-2

12hr AES Return Period	Pre-Development (Allowable) Peak Flow	SWMF-2 CHARACTERISTICS		Overall Post Development (Controlled) Peak Flows	Decrease Post-Development Controlled to Allowable Peak Flow
		Storage Provided	Release Rate		
	(m^3/s)	(m^3)	(m^3/s)	(m^3/s)	(%)
2-yr	0.146	1183	0.071	0.079	-84.81%
5-yr	0.230	2115	0.149	0.162	-41.98%
10-yr	0.297	2330	0.218	0.242	-22.73%
25-yr	0.378	2604	0.313	0.348	-8.62%
50-yr	0.442	2801	0.373	0.417	-6.00%
100-yr	0.519	2992	0.436	0.487	-6.57%

A 975 mm STM outlet pipe is proposed for SWMF-2. It was sized to convey uncontrolled flows from the pond in case of clogging or emergency. The 1900 mm weir at the top of the outlet structure (invert elevation of 172.61 m) serves as an emergency overflow spill for the pond. The pond is equipped with bottom draw pipe connected to the outlet structure.

5.2.2.3. Donald Cousens Parkway Station

Table 5.3g provides a tabular summary of the drainage areas at Donald Cousens Parkway Station.

Table 5.3g. Summary of Donald Cousens Parkway Station Drainage Areas

Drainage Area ID	Area (Ha)	Post-Development Impervious Area* (Ha)	Notes
A-1	0.27	0.24	
A-2	1.84	1.66	
A-3	0.55	0.50	
A-4	0.58	0.52	
A-5	0.19	0.17	
A-6	0.78	0.70	
Station Total	4.21	3.79	For an area of 4.21 ha, the 5 mm retention volume (TRCA SWM Criteria, 2012) is 210.5 m^3.

*Assumed 90% imperviousness for developed areas.

Development of the station land significantly increases peak flow rates during storm events, as indicated in Table 5.3h.

Table 5.3h. Comparison of Pre-Development and Post- Development (Uncontrolled) Release Rates at Donald Cousens Parkway Station

12hr AES Return Period	Pre-Development Peak Flow (m^3/s)	Post-Development Peak Flow (Uncontrolled) (m^3/s)	Increase from Allowable to Post-Development (Uncontrolled) Peak Flow (%)
2-yr	0.047	0.278	491.49%
5-yr	0.078	0.374	379.49%
10-yr	0.100	0.437	337.00%
25-yr	0.131	0.516	293.89%
50-yr	0.155	0.574	270.32%
100-yr	0.179	0.632	253.07%

Two enhanced swales and a wet pond are proposed to provide quality and quantity control for Donald Cousens Parkway Station. The enhanced swales, each with a total available volume of 412.5 m^3, will control flows from drainage areas A-5 (0.19 ha) and A-6 (0.78 ha), as geographic constraints do not allow for these areas to connect to SWMF-3. SWMF-3 will provide quantity and quality control for the rest of the station's drainage areas, as well as drainage areas 522-2 (0.74 ha) and 522-3 (0.82 ha) from the transitway, for a total catchment area of 4.80 ha. SWMF-3 is an extended detention wet pond with a total available volume of 4545 m^3. The permanent pool has an average depth of 1.1 m and a volume of 1080 m^3 for quality control; this volume is also larger than that required to meet the 5 mm retention criteria for erosion control. Table 5.3d in Appendix E shows the design parameters of the proposed pond. Details of the outlet structure, as well as the stage-storage, stage-discharge relationships of the pond are included in Table 5.3e in Appendix E. Table 5.3f in Appendix E shows that the maximum orifice size required to attenuate the 25mm in 24hr is 84 mm. To provide the erosion control and meet the quantity control requirement for the 2-year return period, the pond will be equipped with a 75 mm orifice (invert elevation of 186.58 m). To achieve the remaining quantity control requirements an additional orifice and a weir are proposed:

- Orifice #2: dia = 180 mm, invert elevation = 187.29 m
- Weir #1: width = 800 mm, invert elevation = 187.52 m

Storage and discharge characteristics of this facility are summarized in Table 5.3i.

Table 5.3i. Storage and Discharge Characteristics of SWMF-3

12hr AES Return Period	Pre-Development (Allowable) Peak Flow (m^3/s)	SWMF-3 CHARACTERISTICS		Overall Post-Development (Controlled) Peak Flow (m^3/s)	Decrease Post-Development Controlled to Allowable (%)
		Storage Provided (m^3)	Release Rate (m^3/s)		
2-yr	0.047	1483	0.010	0.018	-161.07%
5-yr	0.078	1809	0.037	0.048	-6.85%
10-yr	0.100	2080	0.046	0.059	-14.94%
25-yr	0.131	2287	0.080	0.095	-5.65%
50-yr	0.155	2438	0.113	0.130	-9.15%
100-yr	0.179	2565	0.147	0.166	-0.56%

A 975 mm STM outlet pipe is proposed for SWMF-3. It was sized to convey uncontrolled flows from the pond in case of clogging or emergency. The 2000 mm overflow weir at the top of the outlet structure (invert elevation of 187.69 m) serves as an emergency overflow spill for the pond. The pond is equipped with bottom draw pipe connected to the outlet structure.

5.2.2.4. Whites Road Station

Two stormwater management facilities are proposed for Whites Road Station. SWMF-4 will provide quality and quantity control for the northern half of the station, including the bus loop, access road, and the station itself, as well as areas 34-1 and 34-2 from the transitway; a total catchment area of 3.97 ha. SWMF-5 will provide quality and quantity control for the southern half of the Station, including the south employment collector and the parking lot south of the access road; a total catchment area of 3.46 ha. The drainage areas for each facility are summarized in Table 5.4g and Table 5.5g respectively.

Table 5.4g. Summary of SWMF-4 Drainage Areas

Drainage Area ID	Area (Ha)	Post-Development Impervious Area* (Ha)	Notes
A-1	0.28	0.25	
A-2	0.53	0.48	
A-4	1.87	1.68	
34-1	0.40	0.36	From Transitway
34-2	0.89	0.80	From Transitway
SWMF-4 Drainage Area Total	3.97	3.57	

Table 5.5g. Summary of SWMF-5 Drainage Areas

Drainage Area ID	Area (Ha)	Post-Development Impervious Area* (Ha)
A-3	0.66	0.59
A-5	2.46	2.21
A-6	0.34	0.31
SWMF-5 Drainage Area Total	3.46	3.11

Development of the station land significantly increases peak flow rates during storm events, as indicated in Table 5.4h and Table 5.5h.

Table 5.4h. Comparison of Allowable and Post- Development (Uncontrolled) Release Rates at Whites Road Station (SWMF-4 Drainage Areas)

12hr AES Return Period	Allowable Release Rate (Unit Rates - Subwatershed 31) (m^3/s)	Post-Development Condition Uncontrolled Peak Flow (m^3/s)	Increase from Allowable to Post-Development (Uncontrolled) Peak Flow (%)
2-yr	0.009	0.449	4888.89%
5-yr	0.015	0.647	4188.74%
10-yr	0.019	0.767	3924.98%
25-yr	0.025	0.916	3627.47%
50-yr	0.029	1.026	3454.86%
100-yr	0.033	1.137	3301.40%

Table 5.5h. Comparison of Allowable and Post- Development (Uncontrolled) Release Rates at Whites Road Station (SWMF-5 Drainage Areas)

12hr AES Return Period	Allowable Release Rates (Unit Rates - SubWatershed 31) (m^3/s)	Post-Development Condition (Uncontrolled) Peak Flow (m^3/s)	Increase from Allowable to Post-Development (Uncontrolled) Peak Flow (%)
2-yr	0.008	0.393	4672.43%
5-yr	0.013	0.566	4204.84%
10-yr	0.017	0.671	3940.22%
25-yr	0.021	0.801	3639.95%
50-yr	0.025	0.897	3466.00%
100-yr	0.029	0.994	3311.91%

SWMF-4 is an extended detention wet pond with a total available volume of 7835 m^3. The permanent pool has an average depth of 3.0 m and a volume of 3590 m^3 for quality control; this volume is also larger than that required to meet the 5 mm retention criteria for erosion control. Table 5.4d in Appendix E shows the design parameters of the proposed pond. Details of the outlet structure, as well as the stage-storage, stage-discharge relationships of the pond are included in Table 5.4e in Appendix E. Table 5.4f in Appendix E shows that the maximum orifice size required to attenuate the 25mm in 120hr is 52 mm; this is smaller than the minimum orifice size requirement of 75mm. To provide erosion control, the pond will be equipped with a 75mm orifice (invert elevation of 213.50 m). The 75 mm diameter orifice provides 57.6 hour detention of the 25 mm event; a shortfall of 62.4 hours.

To achieve the quantity control requirements, one weir is proposed:

- Weir #1: width = 100 mm, invert elevation = 214.26 m

Due to the use of the 75 mm orifice, the 2-year required storage target could not be met by a shortfall of 49 m^3. Storage and discharge characteristics of SWMF-4 are summarized in Table 5.4i.

Table 5.4i. Storage and Discharge Characteristics of SWMF-4

12hr AES Return Period	Allowable Release Rates (Unit Rates – Subwatershed 31)	SWMF-4 CHARACTERISTICS			Decrease Post-Development Controlled to Allowable Peak Flow
		Storage Provided	Storage Required	Release Rate	
	(m^3/s)	(m^3)	(m^3)	(m^3/s)	(%)
2-yr	0.009	1150	1199	0.009	0.00%
5-yr	0.015	1576	1552	0.010	-50.86%
10-yr	0.019	1871	1767	0.011	-73.24%
25-yr	0.025	2174	2052	0.017	-44.55%
50-yr	0.029	2372	2259	0.024	-20.26%
100-yr	0.033	2553	2461	0.031	-7.83%

A 975 mm STM outlet pipe is proposed for SWMF-4. It was sized to convey uncontrolled flows from the pond in case of clogging or emergency. The 700 mm overflow weir at the top of the outlet structure (invert elevation of 214.51 m) serves as an emergency overflow spill for the pond. The pond is equipped with bottom draw pipe connected to the outlet structure.

Whites Road Station – Design Alternatives

Three options were considered for SWMF-5.

- The first option was a 32.5 m by 35 m underground storage tank with a permanent pool and forebay. This option was not pursued due to its limitations with regard to quality control and maintenance requirements.
- The second option was a wet pond to be located to the south of the future collector road. Although this location (i.e.: outside of the proposed station footprint) provided a better opportunity to adjust the size of the facility to meet storage and flow requirements, it was not pursued because it would increase the overall footprint of the station and infringe on environmentally constrained land. Sketches of these options are provided in Appendix E.
- The third option was a wet pond located within the station's original proposed footprint; this option was pursued as SWMF-5.

SWMF-5 is an extended detention wet pond with a total available volume of 4575 m^3. The permanent pool has an average depth of 2.5 m and a volume of 1341 m^3 for quality control; this volume is also larger than that required to meet the 5 mm retention criteria for erosion control. Table 5.5-d in Appendix E shows the design parameters of the proposed pond. Details of the outlet structure, as well as the stage-storage, stage-discharge relationships of the pond are included in Table 5.5e in Appendix E. Table 5.5f in Appendix E shows that the maximum orifice size required to attenuate the 25mm in 120hr is 45 mm; this is smaller than the minimum orifice size requirement of 75mm. To provide erosion control, the pond will be equipped with a 75mm orifice (invert elevation of 211.00 m). The 75 mm diameter orifice provides 44.3 hour detention of the 25 mm event; a shortfall of 75.7 hours. To achieve the quantity control requirements, a weir is proposed:

- Weir #1: width = 200 mm, invert elevation = 212.00 m

Due to the use of the 75 mm orifice, the 2-year required storage target could not be met by a shortfall of 79 m^3, the 2-year required flow target was exceeded by 1 L/s, and the 5-year required storage target could not be met by a shortfall of 16m^3. Storage and discharge characteristics of SWMF-5 are summarized in Table 5.5i.

Table 5.5i. Storage and Discharge Characteristics of SWMF-5

12hr AES Return Period	Allowable Release Rates (Unit Rates – Subwatershed 31)	SWMF-5 CHARACTERISTICS			Decrease Post-Development Controlled to Allowable Peak Flow
		Storage Provided	Storage Required	Release Rate	
	(m^3/s)	(m^3)	(m^3)	(m^3/s)	(%)
2-yr	0.008	966	1045	0.009	8.50%
5-yr	0.013	1337	1353	0.010	-31.48%
10-yr	0.017	1592	1540	0.011	-50.98%
25-yr	0.021	1900	1789	0.013	-64.75%
50-yr	0.025	2083	1969	0.019	-32.39%
100-yr	0.029	2226	2145	0.027	-7.90%

A 975 mm STM outlet pipe is proposed for SWMF-5. It was sized to convey uncontrolled flows from the pond in case of clogging or emergency. The 1200 mm overflow weir at the top of the outlet structure (invert elevation of 212.13 m) serves as an emergency overflow spill for the pond. The pond is equipped with bottom draw pipe connected to the outlet structure.

Neither SWMF-4 nor SWMF-5 meet the 2-year storage requirement or the 120 hour detention criteria due to the minimum 75 mm orifice criteria. During detailed design, the possibility of connecting the two facilities should be assessed as a potential way to meet these criteria within the existing pond footprints.

5.2.2.5. Brock Road Station

Two stormwater management facilities are proposed for this station. SWMF-6 will be constructed to the north of the transitway to provide quality and quantity control for transitway area 37-1 (1.36 ha) and the undeveloped area to the west of the site, in order to maintain the existing drainage pattern as much as possible. The total contributing catchment area for this facility is 4.37 ha; drainage areas are summarized in Table 5.6g.

Table 5.6g. Summary of SWMF-6 Drainage Areas

Drainage Area ID	Area (Ha)	Post-Development Impervious Area* (Ha)	Notes
A-27	0.80	0.72	
A-31	1.83	1.65	
A-32	0.38	0.34	
37-1	1.36	1.22	From transitway
Facility Total	4.37	3.93	

Development of the station land significantly increases peak flow rates during storm events in the areas draining to SWMF-6, as indicated in Table 5.6h.

Table 5.6h. Comparison of Allowable and Post- Development (Uncontrolled) Release Rates for SWMF-6 Drainage Areas

12hr AES Return Period	Allowable Release Rates (Unit Rates - Subwatershed 44) (m^3/s)	Post-Development Condition (Uncontrolled) Peak Flow (m^3/s)	Increase from Allowable to Post-Development (Uncontrolled) Peak Flow (%)
2-yr	0.013	0.203	1461.54%
5-yr	0.021	0.276	1214.29%
10-yr	0.027	0.324	1115.88%
25-yr	0.035	0.384	1008.64%
50-yr	0.041	0.428	946.08%
100-yr	0.048	0.473	885.42%

SWMF-6 is an extended detention wet pond with a total available volume of 4069 m^3. The permanent pool has an average depth of 3 m and a volume of 2976 m^3 for quality control; this volume is also larger than that required to meet the 5 mm retention criteria for erosion control. Table 5.6d in Appendix E shows the design parameters of the proposed pond. Details of the outlet structure, as well as the stage-storage, stage-discharge relationships of the pond are included in Table 5.6e in Appendix E. Table 5.6f in Appendix E shows that the maximum orifice size required to attenuate the 25mm in 120hr is 52 mm; this is smaller than the minimum orifice size requirement of 75mm. To provide erosion control, the pond will be equipped with a 75mm orifice (invert elevation of 182.45 m). The 75 mm diameter orifice provides 57.6 hour detention of the 25 mm event; a shortfall of 62.4 hours. To achieve the quantity control requirements, an additional orifice and a weir are proposed:

- Orifice #2: dia. = 95 mm, invert elevation = 183.02 m
- Weir #1: width = 60 mm, invert elevation = 183.28 m

Storage and discharge characteristics of SWMF-6 are summarized in Table 5.6i.

Table 5.6i. Storage and Discharge Characteristics of SWMF-6

12hr AES Return Period	Allowable Release Rates Unit Rates - Subwatershed 44	SWMF-6 CHARACTERISTICS			Decrease Post-Development Controlled to Allowable Peak Flow
		Storage Provided	Storage Required	Release Rate	
	(m^3/s)	(m^3)	(m^3)	(m^3/s)	(%)
2-yr	0.013	1297	1238	0.009	-44.44%
5-yr	0.021	1702	1598	0.018	-16.67%
10-yr	0.027	1985	1822	0.021	-26.89%
25-yr	0.035	2324	2107	0.029	-19.44%
50-yr	0.041	2562	2318	0.036	-13.65%
100-yr	0.048	2800	2524	0.042	-14.29%

A 975 mm STM outlet pipe is proposed for SWMF-6. It was sized to convey uncontrolled flows from the pond in case of clogging or emergency. The 2060 mm overflow weir at the top of the outlet structure (invert elevation of 183.58 m) serves as an emergency overflow spill for the pond. The pond is equipped with bottom draw pipe connected to the outlet structure.

The existing extended detention wet pond on the east side of the property (SWMF-7) will be regraded to allow for increased flows from the area to the west of the existing parking lot, and the outlet structure will be replaced to meet the allowable discharge rates for the increased catchment area. The drainage areas for this facility are summarized in Table 5.7g.

Table 5.7g. Summary of SWMF-7 Drainage Areas

Drainage Area ID	Area (Ha)	Post-Development Impervious Area* (Ha)
A-22	1.06	0.95
A-23	1.61	1.45
A-25	2.22	2.00
A-26	0.43	0.39
A-28	2.83	2.55
A-29	0.70	0.63
A-30	0.21	0.19
Facility Total	9.06	8.15

Development of the station land significantly increases peak flow rates during storm events in the areas draining to SWMF-7, as indicated in Table 5.7h.

Table 5.7h. Comparison of Allowable and Post- Development (Uncontrolled) Release Rates for SWMF-7 Drainage Areas

12hr AES Return Period	Allowable Release Rate (Unit Rate, Subwatershed 44) (m^3/s)	Post-Development Condition Uncontrolled Peak Flow (m^3/s)	Increase from Allowable to Post-Development Uncontrolled (%)
2-yr	0.027	0.416	1451.22%
5-yr	0.043	0.562	1197.72%
10-yr	0.055	0.661	1101.94%
25-yr	0.071	0.789	1003.75%
50-yr	0.084	0.881	943.35%
100-yr	0.098	0.972	889.71%

The regraded SWMF-7 will have a total available volume of 10771 m^3, and a permanent pool volume of 3090 m^3 for quality control; this volume is also larger than that required to meet the 5 mm retention criteria for erosion control. Table 5.7d in Appendix E shows the design parameters of the proposed pond. Details of the outlet structure, as well as the stage-storage, stage-discharge relationships of the pond are included in Table 5.7e in Appendix E. Table 5.7f in Appendix E shows that the maximum orifice size required to attenuate the 25mm in 120hr is 75 mm. To provide erosion control, the pond will be equipped with a 75mm orifice (invert elevation of 171.16 m). To achieve the quantity control requirements, two additional orifices are proposed:

- Orifice #2: dia = 100 mm, invert elevation = 171.81 m
- Orifice #3: dia = 190 mm, invert elevation = 172.60 m

Due to the presence of a high groundwater table, the target 3 m deep permanent pool is not feasible at SWMF-7, but the existing cooling trench downstream of the pond will be retained to provide additional thermal mitigation before flows from this facility are discharged to Brougham Creek. Storage and discharge characteristics of SWMF-7 are summarized in Table 5.7i.

Table 5.7i. Storage and Discharge Characteristics of SWMF-7

12hr AES Return Period	Allowable Release Rates Unit Rates - Subwatershed 44 (m^3/s)	SWMF-7 CHARACTERISTICS			Decrease Post-Development Controlled to Allowable Peak Flow (%)
		Storage Provided (m^3)	Storage Required (m^3)	Release Rate (m^3/s)	
2-yr	0.027	2642	2555	0.026	-3.14%
5-yr	0.043	3558	3298	0.031	-39.70%
10-yr	0.055	4199	3760	0.034	-61.75%
25-yr	0.071	4796	4349	0.069	-3.60%
50-yr	0.084	5250	4784	0.082	-2.97%
100-yr	0.098	5741	5210	0.093	-5.60%

A 975 mm STM outlet pipe is proposed for SWMF-7. It was sized to convey uncontrolled flows from the pond in case of clogging or emergency. The 2200 mm overflow weir at the top of the outlet structure (invert elevation of 173.02 m) serves as an emergency overflow spill for the pond. The pond is equipped with bottom draw pipe connected to the outlet structure.

Geographic constraints do not allow for drainage area A-24 (0.63 ha) to be connected to either SWMF-6 or SWMF-7; it will be revisited during detailed design to determine what quantity and quality control measures can be provided for this area.

5.2.2.6. Summary of SWM Pond Design for 407 TWY Stations

A summary of stormwater management facilities within the study limits is provided in Table 5.8. For facilities within the Rouge watershed (i.e.: SWMF-1, SWMF-2, and SWMF-3), the pond volume requirement is the sum of the permanent pool size requirement and the 5 mm retention volume. For the facilities in the Duffins watershed, the pond volume requirement is the sum of the permanent pool size requirement and the extended retention unitary rate storage.

Table 5.8. Summary of Stormwater Management Ponds within the Study Limits

Stormwater Management Facility (SWMF)	Location	Total Pond Volume Available (m^3)	Pond Volume Required (m^3)	Quality and Quantity Control
1	Markham Road	4,801	4,604	yes
2	Ninth Line	6,242	4,281	yes
3	Donald Cousens Parkway	4,545	3,645	yes
4	Whites Road (*)	7,835	3,453	yes
5	Whites Road (*)	4,575	2,408	yes
6	Brock Road (*)	7,045	2,638	yes
7	Brock Road	10,771	8,269	yes

(*) oversized pond due to 3.0m permanent pool depth as per MNRF requirements.

The stormwater management facilities in the Rouge watershed (at Markham Road, Ninth Line, and Donald Cousens Parkway Stations) all met the stormwater management criteria identified in Section 5.1. The facilities in the Duffins watersheds met most of the stormwater management criteria, with the following exceptions:

- The criteria for 120 hour retention of the 25 mm event could not be met at SWMF-4 because the orifice diameter required to meet this criteria (52 mm) was smaller than the 75 mm minimum required to prevent clogging. The 75 mm diameter orifice provides 57.6 hour detention of the 25 mm event; a shortfall of 62.4 hours. Due to the use of the 75 mm orifice, the 2-year required storage target could not be met by a shortfall of 49 m^3.

- The criteria for 120 hour retention of the 25 mm event could not be met at SWMF-5 because the orifice diameter required to meet this criteria (45 mm) was smaller than the 75 mm minimum required to prevent clogging. The 75 mm diameter orifice provides 44.3 hour detention of the 25 mm event; a shortfall of 75.7 hours. Due to the use of the 75 mm orifice, the 2-year required storage target could not be met by a shortfall of 79 m^3, the 2-year required flow target was exceeded by 1 L/s, and the 5-year required storage target could not be met by a shortfall of 16m^3.

- The criteria for 120 hour retention of the 25 mm event could not be met at SWMF-6 because the orifice diameter required to meet this criteria (52 mm) was smaller than the 75 mm minimum required to prevent clogging. The 75 mm diameter orifice provides 57.6 hour detention of the 25 mm event; a shortfall of 62.4 hours.

- Parsons looked at the feasibility of enlarging the footprint of the above-mentioned ponds to lower the hydraulic head of the orifice and found that the area of pond would be extremely large and there is no additional land to extend the surface area of the SWM facilities.

- Due to the presence of a high groundwater table, the target 3 m deep permanent pool could not be achieved at SWMF-7, but the existing cooling trench downstream of the pond will be retained to provide additional thermal mitigation before flows from this facility are discharged to Brougham Creek.

  During detailed design, the feasibility of connecting SWMF-4 and SWMF-5 should be assessed in order to achieve the storage and 120 hour detention criteria for Whites Road Station.

6. HYDRAULIC ANALYIS OF PROPOSED WATER CROSSINGS

As previously noted the proposed transitway crosses forty nine (49) watercourses, out of which twenty three (23) are major branches of creeks (such as Lower Rouge, Little Rouge, West Duffins Creek, Brougham Creek and others) and their tributaries. The remaining watercourses were identified as minor conveyance features with small localized tributary areas that the proposed TWY will not impact because of grade difference. Table 2.1 (in Section 2) provides details of all crossings within the study limits and compiles information reviewed from a variety of sources such as TRCA hydrologic modelling documentation for each watershed, impact assessment study for the project, summarizes available HEC-RAS models and floodplain maps received from TRCA. The table identifies each potential water crossing along the proposed 407 TWY.

A HEC-RAS analysis has been undertaken for the twenty three (23) water crossings within the study limits. A HEC-RAS model has been provided from TRCA for five (5) crossings (WC13, WC 15b, WC15C, WC18, WC28-29); refer to existing TRCA's floodplain mapping in Appendix F. For the remaining eighteen (18) water crossings analyzed the HEC-RAS model has been created from scratch using the flows determined in Section 4.1, using 4hr Chicago storm distribution and the MTO IDF curves.

6.1. Methodology

TRCA maintains and updates hydraulic models in digital form as HEC-RAS (River Analysis System) models in the area of this study. Digital floodplain mapping files were also obtained from TRCA to be used in the analysis. Refer to the existing floodplain mappings in Appendix F.

The proposed 407 TWY was overlaid on top of the existing floodplain mapping to determine existing cross-section information that needed to be updated and the location of new cross sections required to add the proposed crossings. Simply updating existing condition cross-sections to a HEC-RAS model can result in changes to the simulated flood levels. The HEC-RAS model was updated with new cross sections from the Civil 3D surface using

updated topography. These cross-sections were located to fit the proposed bridges or culverts as per model requirements. The updated model was used as the base model for the analysis and is called for the purposes of this report "*Modified Existing Model*"

6.2. Hydraulic Design Standards

For the purpose of this study, the following standards will be used from the MTO Drainage Manual (Jan 2008):

Standard WC-1: Design Flows (Bridges and Culverts)

- Road classification – Freeway;
- Design flow to be used as follows:

  For culverts with Total Span less than or equal to 6.0m - use 50-year return period (§ 1.1.1)

  For culverts with Total Span greater than 6.0m - use 100-year return period (§ 1.1.1)
- Check Flow for Scour – 130% of 100-year (§ 1.1.1)

Standard WC-2 – Freeboard and Clearance at Bridge Crossings

- The minimum freeboard is measured vertically from the High Water Level for the Design Flow (50-yr/100-yr WL) to the edge of the travelled lane (§ 3.1.2); the freeboard at bridge crossings shall be greater than or equal to 1m for freeways (§ 3.2.1).
- The clearance is measured vertically from the High Water Level of the Design Flow to the lowest point on the soffit (§ 3.1.3); the clearance for freeways shall be greater than or equal to 1m (§ 3.2.2).
- Zero clearance is required for the regulatory flow (§ 3.2.4).
- The WL generated by the Check Flow shall not exceed the elevation of the edge of the travelled lane (EOTL) (§ 3.2.5).

Standard WC-7 Culverts Crossings on a Watercourse

- Freeboard for the design flow should be at least one (1) m (§ 3.2)

Note: Minimum freeboard is measured vertically from the high water level for the design flow to the edge of the travelled lane (§ 3.1.2)

- Clearance for open footing culverts should be 0.3m (§ 3.4.1)

Note: clearance is measured vertically from the high water level for the design flow to the straight soffit

- Flood depth at culverts can be calculates as follows (§ 3.5):

  For culverts with diameter or rise <3m: HW/D ≤ 1.5

  For culverts with diameter or rise between (3 ÷4.5)m: HW/D ≤ 4.5

  For culverts with diameter or rise >4.5m): HW/D ≤ 1

Where HW represents the flood depth at the US face of the culvert and D is the Diameter/rise of the culvert

- Water Level Generated by the Check Flow (§ 3.6)

  Notes: Water level generated by check flow shall not exceed elevation of edge of travelled lane

Standard WC-8 Minimum Culvert Size

- Minimum Culvert Size for Freeways may be determined as follows (§ 3.1):

  800mm minimum diameter for circular culverts

  900mm minimum rise for box culverts

6.3. HEC-RAS Analysis - Rouge River Watershed

As part of this assignment the TRCA's HEC-RAS models were updated to include the existing 407ETR bridges. The hydraulic analyses of all structures are included in Appendix F. They include HEC-RAS model output files for all return periods (2-yr-to Regional), watercourse cross-sections.

The following summary tables include the proposed structure size, inverts, length and slope. In all cases regrading of the channels is needed and wingwalls are required to improve inlet flow conditions.

Existing 407 ETR structure sizes were estimated based on available data for this study, however sizes need to be confirmed during detailed design.

6.3.1. WC#3

The following results were produced from the HEC-RAS ROUGE model from the file HEC.prj. The geometry file used to model the existing conditions is named "WC3-EX", while the geometry file used to model the proposed conditions is named "WC3-PROP (3 x 1.25)".

The flow data used in HEC-RAS was determined using Visual OTTHYMO. Refer to Table 4.1 in section 4.1 of this report for flow data, and Figure 4.3 in Appendix C for the drainage area map of this crossing.

The existing 407 ETR structure upstream of the proposed transitway is approximately 2.0m in diameter (size available from background data review - to be confirmed during detailed design).

Table 6.3.1: WC#3 – Culvert Design Parameters

Type	Rigid frame open footing
Design flow – Q_{50yr} (m^3/s)	5.76
Sizing (Span x Height) (m)	3 x 1.25
UP INV (m)	178.50
DS INV (m)	178.25
Length (m)	33
Slope	0.8%

Table 6.3.2: WC#3 - HEC-RAS Modeling Results

HEC-RAS Sta	Return Period (4hr Chicago)	Ex Cond WL (m)	Prop Cond WL (m)	Diff in WLs (m)
300	100-yr	181.68	181.60	-0.08
	Regional	181.53	181.45	-0.08
200	100-yr	180.80	179.53	-1.27
	Regional	180.71	179.29	-1.42
150	Proposed 407 TWY Culvert			
100	100-yr	179.81	178.78	-1.03
	Regional	179.68	178.61	-1.07
10	100-yr	177.75	177.76	0.01
	Regional	177.68	177.68	0.00
5	100-yr	176.08	176.08	0.00
	Regional	175.95	175.95	0.00

Figure 6.1 in Appendix F shows the cross sections used for the HEC-RAS analysis and the associated water levels. The proposed Regional floodline is also delineated for this crossing.

6.3.2. WC#4

The following results were produced from the HEC-RAS ROUGE model from the file HEC.prj. The geometry file used to model the existing conditions is named "WC4-EX", while the geometry file used to model the proposed conditions is named "WC4-PROP (3 x 1.25)".

The flow data used in HEC-RAS was determined using Visual OTTHYMO. Refer to Table 4.1 in Section 4.1 of this report for flow data, and Figure 4.3 in Appendix C for the drainage area map of this crossing.

The existing drainage plan on 407 ETR needs to be confirmed during detailed design upstream of WC4. The inlet of the box culvert is observed on site, however the outlet needs to be confirmed.

Table 6.3.3: WC#4 – Culvert Design Parameters

Type	Rigid frame open footing
Design flow – Q_{50yr} (m^3/s)	5.07
Sizing (Span x Height) (m)	3 x 1.25
UP INV (m)	179.20
DS INV (m)	178.92
Length (m)	34
Slope	0.8%

Table 6.3.4: WC#4 - HEC-RAS Modeling results

HEC-RAS Sta	Return Period (4hr Chicago)	Ex Cond WL (m)	Prop Cond WL (m)	Diff in WLs (m)
300	100-yr	181.43	181.15	-0.28
	Regional	181.41	181.04	-0.37
200	100-yr	180.61	180.14	-0.47
	Regional	180.58	179.92	-0.66
150	Proposed 407 TWY Culvert			
100	100-yr	179.37	179.31	-0.06
	Regional	179.30	179.16	-0.14
10	100-yr	178.03	178.03	0.00
	Regional	177.94	177.94	0.00

Figure 6.2 in Appendix F shows the cross sections used for the HEC-RAS analysis and the associated water levels. The proposed Regional floodline is also delineated for this crossing.

6.3.3. WC#5

The following results were produced from the HEC-RAS ROUGE model from the file HEC.prj. The geometry file used to model the existing conditions is named "WC5-EX", while the geometry file used to model the proposed conditions is named "WC5-PROP (3 x 1.25)".

The flow data used in HEC-RAS was determined using Visual OTTHYMO. Refer to Table 4.1 in Section 4.1 of this report for flow data, and Figure 4.3 in Appendix C for the drainage area map of this crossing.

Table 6.3.5: WC#5 – Culvert Design Parameters

Type	Rigid frame open footing
Design flow – Q_{50yr} (m^3/s)	2.81
Sizing (Span x Height) (m)	3 x 1.25
UP INV (m)	179.50
DS INV (m)	179.35
Length (m)	34
Slope	0.4%

Table 6.3.6: WC#5 - HEC-RAS Modeling Results

HEC-RAS Sta	Return Period (4hr Chicago)	Ex Cond WL (m)	Prop Cond WL (m)	Diff in WLs (m)
300	100-yr	181.08	181.05	-0.03
	Regional	181.06	181.03	-0.03
200	100-yr	180.51	180.17	-0.36
	Regional	180.48	180.03	-0.46
150	Proposed 407 TWY Culvert			
100	100-yr	179.98	179.99	0.00
	Regional	179.90	179.89	-0.04
10	100-yr	179.34	179.34	0.00
	Regional	179.27	179.27	0.00

Figure 6.3 in Appendix F shows the cross sections used for the HEC-RAS analysis and the associated water levels. The proposed Regional floodline is also delineated for this crossing.

6.3.4. WC#11

The following results were produced from the HEC-RAS ROUGE model from the file HEC.prj. The geometry file used to model the existing conditions is named "WC11 (EX)", while the geometry file used to model the proposed conditions is named "WC11 (PROP)-OPT4".

The flow data used in HEC-RAS was determined using Visual OTTHYMO. Refer to Table 4.1 in section 4.1 of this report for flow data, and Figure 4.4 in Appendix C for the drainage area map of this cross section.

Table 6.3.7: WC#11 – Culvert Design Parameters

Type	Circular Concrete Pipe
Design flow – Q_{50yr} (m^3/s)	0.12
Sizing (Diameter) (mm)	800
UP INV (m)	180.00
DS INV (m)	179.90
Length (m)	28
Slope	0.4%

Table 6.3.8: WC#11 - HEC-RAS Modeling Results

HEC-RAS Sta	Return Period (4hr Chicago)	Ex Cond WL (m)	Prop Cond WL (m)	Diff in WLs (m)
200	100-yr	184.08	184.07	-0.01
	Regional	184.19	184.19	0.00
100	100-yr	182.19	180.31	-1.88
	Regional	182.24	180.68	-1.56
50	Proposed 407 TWY Culvert			
10	100-yr	180.12	179.96	-0.16
	Regional	180.26	180.22	-0.04

Figure 6.4 in Appendix F shows the cross sections used for the HEC-RAS analysis and the associated water levels. The proposed Regional floodline is also delineated for this crossing.

6.3.5. WC#12

The following results were produced from the HEC-RAS ROUGE model from the file HEC.prj. The geometry file used to model the existing conditions is named "WC12 (EX)", while the geometry file used to model the proposed conditions is named "WC12 (PROP)-OPT6".

The flow data used in HEC-RAS was determined using Visual OTTHYMO. Refer to Table 4.1 in section 4.1 of this report for flow data, and Figure 4.4 in Appendix C for the drainage area map of this crossing.

Table 6.3.9: WC#12 – Culvert Design Parameters

Type	Circular Concrete Pipe
Design flow – Q_{50yr} (m^3/s)	0.16
Sizing (Diameter) (mm)	800
UP INV (m)	176.80
DS INV (m)	176.65
Length (m)	45
Slope	0.3%

Table 6.3.10: WC#12 - HEC-RAS Modeling Results

HEC-RAS Sta	Return Period (4hr Chicago)	Ex Cond WL (m)	Prop Cond WL (m)	Diff in WLs (m)
200	100-yr	179.59	179.07	-0.52
	Regional	179.70	179.20	-0.50
100	100-yr	178.73	177.18	-1.55
	Regional	178.78	177.70	-1.08
50	Proposed 407 TWY Culvert			
10	100-yr	177.14	176.84	-0.30
	Regional	177.18	177.15	-0.03

Figure 6.5 in Appendix F shows the cross sections used for the HEC-RAS analysis and the associated water levels. The proposed Regional floodline is also delineated for this crossing.

6.3.6. WC#13

The following results were produced from the Rouge River model provided by TRCA named Rouge2001.prj. The TRCA model provided was updated to account for the existing 407 ETR Bridge. The geometry file used to model the existing conditions is named “Jan 13, 2016 (Mod EX-Parsons) (407ETR)”, while the geometry file used to model the proposed conditions is named “Jan 13, 2016 (PROP EX-Parsons) (407 ETR)”. The HEC-RAS Stations of interest are found in the geometry data under the MainRouge River and the Milne-Warden2 reach.

The existing bridge on the 407 ETR has a span of ~205m, while the proposed 407 TWY Bridge has a span of 300m.

Table 6.3.11: WC#13 - HEC-RAS Modelling Results

HEC-RAS Sta	Return Period (4hr Chicago)	TRCA Ex Cond WL (m)	Modif Ex Cond WL (m)	Diff in WLs TRCA vs Modif (m)	Prop Cond WL (m)	Diff in WLs Prop Cond vs Modif Ex Cond (m)
5604.21	Regional	162.48	162.39	-0.09	162.44	0.05
	100 yr	160.92	160.62	-0.30	160.63	0.01
5604.20	Regional	162.04	162.34	0.30	162.4	0.06
	100 yr	160.10	160.44	0.34	160.44	0.00
5604.199	Existing 407 ETR Bridge					
5604.198	Regional	-	162.08		162.17	0.09
	100 yr	-	160.23		160.24	0.01
5604.197	Existing 407 ETR Bridge					
5604.196	Regional	-	161.99		162.1	0.11
	100 yr	-	160.05		160.07	0.02
5604.195	Proposed 407 TWY Bridge					
5604.19	Regional	162.06	161.86	-0.20	161.86	0.00
	100 yr	160.03	159.83	-0.20	159.83	0.00
5604.18	Regional	161.96	161.80	-0.16	161.8	0.00
	100 yr	159.87	159.74	-0.13	159.74	0.00
5604.17	Regional	161.81	161.69	-0.12	161.69	0.00
	100 yr	159.68	159.55	-0.13	159.55	0.00
5604.155	Footbridge					
5604.14	Regional	161.50	161.53	0.03	161.53	0.00
	100 yr	159.57	159.49	-0.08	159.49	0.00
5604.13	Regional	161.47	161.55	0.08	161.55	0.00
	100 yr	159.55	159.51	-0.04	159.51	0.00
5604.12	Regional	161.33	161.34	0.01	161.34	0.00
	100 yr	159.38	159.32	-0.06	159.32	0.00

In the proposed conditions the WC#14 ditch needs to be realigned to discharge to WC13 upstream of the TWY

Figure 6.6 in Appendix F shows the cross sections used for the HEC-RAS analysis and the associated water levels. The proposed Regional floodline is also delineated for this crossing.

6.3.7. WC#15A

The following results were produced from the HEC-RAS ROUGE model from the file HEC.prj. The geometry file used to model the existing conditions is named “WC15A-EX”, while the geometry file used to model the proposed conditions is named “WC15A - PROP (6 x 1)”.

The flow data used in HEC-RAS was determined using Visual OTTHYMO. Refer to Table 4.1 in section 4.1 of this report for flow data, and Figure 4.5 in Appendix C for the drainage area map of this cross section.

Findings of our preliminary investigation show that the available survey at the time of this study does not show the two culverts on the 407 ETR (Refer to drawing SWM POND R-3b Plan dwg# 010B revision 5. May 29, 2001). In addition, the TRCA model should be updated to show the new development south of the 407 ETR. This needs to be considered during detailed design.

Due to the flat topography of the area, creek regrading was not feasible to lower proposed water levels; a berm is proposed to be constructed as shown in Figure 6.7 to avoid flooding of the TWY during larger storm events.

Table 6.3.12: WC#15A – Culvert Design Parameters

Type	Rigid frame open footing
Design flow – Q_{50yr} (m^3/s)	4.84
Sizing (Span x Height) (m)	6 x 1
UP INV (m)	180.02
DS INV (m)	179.90
Length (m)	28
Slope	0.4%

Table 6.3.13: WC#15A - HEC-RAS Modeling Results

HEC-RAS Sta	Return Period (4hr Chicago)	Ex Cond WL (m)	Prop Cond WL (m)	Diff in WLs (m)
200	100-yr	180.42	180.86	0.44
	Regional	180.24	180.59	0.35
150	Proposed 407 TWY Culvert			
100	100-yr	180.42	180.80	0.38
	Regional	180.23	180.55	0.32
50	100-yr	180.11	180.11	0.00
	Regional	179.94	179.94	0.00

Figure 6.7 in Appendix F shows the cross sections used for the HEC-RAS analysis and the associated water levels. The proposed Regional floodline is also delineated for this crossing. Future development in the area is recommended to be above 180.9m elevation to avoid flooding during the 100-yr event and larger.

6.3.8. WC#15B

The following results were produced from the Little Rouge A model provided by TRCA named TributaryA.prj. The TRCA model provided was updated to account for the existing 407 ETR culvert and the placement of the proposed 407 TWY. This involved updates to sections 6521.25, 6521.28, 6521.30 to the degree that they may be considered entirely new sections, and the removal of other sections that would cross the proposed transitway.

The geometry file used to model the existing conditions is named "Trib A (Modified EX-Parsons – 407ETR)", while the geometry file used to model the proposed conditions is named "Trib A and Trib D (PROP – 407ETR)". The HEC-RAS Stations of interest are found in the geometry data under the Tributary A river and the Reach 1 reach.

During detailed design the TRCA model should be updated to show new development south of 407ETR by Copper Creek Drive.

Table 6.3.14: WC#15B – Culvert Design Parameters

Crossing	Proposed 407 TWY	Existing 407 ETR*
Type	Rigid frame open footing	Box Culverts
Design flow – Q_{50yr} (m^3/s)	7.73	
Sizing (Span x Height) (m)	6 x 2.5	2 x (3.0 x 1.5)
UP INV (m)	183.50	184.15
DS INV (m)	183.35	184.00
Length (m)	40	93
Slope	0.4%	0.2%

*Preliminary information to be confirmed during detailed design

Table 6.3.15: WC#15B - HEC-RAS Modeling Results

HEC-RAS Sta	Return Period (4hr Chicago)	TRCA Ex Cond WL (m)	Modif Ex Cond WL (m)	Prop Cond WL (m)	Difference in WLs (m)
6521.30	Regional	--	185.86	185.86	0.00
	100 yr	--	185.14	185.14	0.00
6521.285	Existing 407 ETR Culverts				
6521.28	Regional	--	185	184.97	-0.03
	100 yr	--	184.68	184.36	-0.32
6521.255	Proposed 407 TWY				
6521.25	Regional	--	184.33	184.25	-0.08
	100 yr	--	184.21	183.99	-0.22
6521.24	Regional	183.91	183.78	183.78	0.00
	100 yr	183.62	183.54	183.54	0.00

Figure 6.8 in Appendix F shows the cross sections used for the HEC-RAS analysis and the associated water levels. The proposed Regional floodline is also delineated for this crossing.

6.3.9. WC#15C

The following results were produced from the Little Rouge A model provided by TRCA named TributaryA.prj. The TRCA model provided was updated to account for the existing 407 ETR Bridge. The geometry file used to model the existing conditions is named "Trib A (Modified EX-Parsons – 407ETR)", while the geometry file used to model the proposed conditions is named "Trib A and Trib D (PROP – 407ETR)". The HEC-RAS Stations of interest are found in the geometry data under the Tributary D river and the Reach 1 reach.

Table 6.3.16: WC#15C - Culvert Design Parameters

Crossing	Proposed 407 TWY	Existing 407 ETR*
Type	Rigid frame open footing	Box Culverts
Design flow – Q_{50yr} (m^3/s)	2.85	
Sizing (Span x Height) (m)	6 x 2.5	2 x (3.0 x 1.8)
UP INV (m)	184.45	185.38
DS INV (m)	184.33	184.90
Length (m)	47	88
Slope	0.3%	0.5%

*Preliminary information to be confirmed during detailed design

Table 6.3.17: WC#15C - HEC-RAS Modeling Results

HEC-RAS Sta	Return Period (4hr Chicago)	TRCA Ex Cond WL (m)	Modif Ex Cond WL (m)	Diff in WLs TRCA vs Modif (m)	Prop Cond WL (m)	Diff in WLs Prop Cond vs Modif Ex Cond (m)
6523.33	Regional	--	186.66	--	186.66	0.00
	100 yr		186.01	--	186.01	0.00
6523.305	Existing 407 ETR Culverts					
6523.32	Regional	--	185.64	--	185.78	0.14
	100 yr		185.42	--	185.45	0.03
6523.31	Regional	--	185.72	--	185.74	0.02
	100 yr		185.44	--	185.44	0.00
6523.305	Proposed 407 TWY Culvert					
6523.30	Regional	185.69	185.67	-0.02	185.63	-0.04
	100 yr	185.42	185.42	0.00	185.42	0.00
6523.29	Regional	185.60	185.61	0.01	185.61	0.00
	100 yr	185.40	185.40	0.00	185.40	0.00
6523.28	Regional	185.59	185.59	0.00	185.59	0.00
	100 yr	185.40	185.40	0.00	185.40	0.00

Figure 6.9 in Appendix F shows the cross sections used for the HEC-RAS analysis and the associated water levels. The proposed Regional floodline is also delineated for this crossing.

6.3.10. WC#16

The following results were produced from the HEC-RAS ROUGE model from the file HEC.prj. The geometry file used to model the existing conditions is named "WC16 - EX", while the geometry file used to model the proposed conditions is named "WC16 – PROP".

The flow data used in HEC-RAS was determined using Visual OTTHYMO Modelling. Refer to Table 4.1 in in section 4.1 of this report for the flow data of this crossing.

The existing 407 ETR culvert size is (4.6 x 2.7)m based on background data review of Pond 85 received from the City of Markham (Stormwater Management Report Cornell Community – Tributary C, MMM, Revised June 2004, Stormwater Management Cornell Community – Trib C, Revised July 2005). WC#16 is located downstream of the outlet of Pond 85, therefore the flow data was derived using the drainage area of Pond 85 (A=187.76ha). The model parameters were taken from the background report and flows were produced using the 4hr Chicago IDF curves from MTO. To follow a conservative approach, the uncontrolled flows were taken into consideration in the HEC-RAS model, not the controlled flows from SWM Pond 85.

Table 6.3.18: WC#16 – Culvert Design Parameters

Crossing	Culvert 1 - Proposed 407 TWY	Culvert 2 - TWY Driveway	Culvert 3 - Reesor Rd.
Type	Rigid frame open footing	Rigid frame open footing	Rigid frame open footing
Design flow – Q_{50yr} (m^3/s)	28.14	28.14	28.14
Sizing (Span x Height) (m)	6 x 2.5	3 x 0.5	3 x 0.5
UP INV (m)	187.00	186.33	186.13
DS INV (m)	186.90	186.2	186
Length (m)	25.5	20	24
Slope	0.4%	0.7%	0.5%

Table 6.3.19: WC#16 – HEC-RAS Modeling Results (Chicago 4hr – Uncontrolled Flows)

HEC-RAS Sta	Return Period (4hr Chicago)*	Ex Cond WL (m)	Prop Cond WL (m)	Diff in WL (m)
800	100-yr	188.43	188.37	-0.06
	Regional	188.30	188.10	-0.20
750	Culvert 1 - Proposed 407 TWY			
700	100-yr	187.90	187.87	-0.03
	Regional	187.81	187.76	-0.05
600	100-yr	187.75	187.71	-0.04
	Regional	187.62	187.57	-0.05
500	100-yr	187.43	187.47	0.04
	Regional	187.36	187.40	0.04
400	100-yr	187.36	187.45	0.07
	Regional	187.27	187.37	0.10
350	Culvert 2 - TWY Driveway			
300	100-yr	187.37	187.45	0.08
	Regional	187.25	187.36	0.11
200	100-yr	187.35	187.41	0.06
	Regional	187.23	187.32	0.09
150	Culvert 3 - Reesor Rd			
100	100-yr	187.08	187.27	0.19
	Regional	186.94	187.20	0.26

Figure 6.10 in Appendix F shows the cross sections used for the HEC-RAS analysis and the associated water levels. The proposed Regional floodline is also delineated for this crossing. Increases in water levels are noted downstream of the 407 TWY however, it is not feasible to install larger culverts size due to space constraints.

Table 6.3.20: WC#16 – HEC-RAS Modeling Results (Controlled Q from SWM Pond Upstream)

HEC-RAS Sta	Return Period (Trib C-Controlled Q-2005)	Ex Cond WL (m)	Prop Cond WL (m)	Diff in WL (m)
800	10-yr	187.67	187.19	-0.48
	100-yr	187.86	187.49	-0.37
750	Culvert 1 - Proposed 407 TWY			
700	10-yr	187.30	187.12	-0.18
	100-yr	187.51	187.41	-0.10
600	10-yr	187.08	186.91	-0.17
	100-yr	187.27	187.32	0.05
500	10-yr	186.92	186.86	-0.06
	100-yr	187.12	187.30	0.18
400	10-yr	186.76	186.69	-0.07
	100-yr	186.85	187.30	0.45
350	Culvert 2 - TWY Driveway			
300	10-yr	186.53	186.61	0.08
	100-yr	186.77	187.30	0.53
200	10-yr	186.47	186.55	0.08
	100-yr	186.75	186.82	0.07
150	Culvert 3 - Reesor Rd			
100	10-yr	186.31	186.27	-0.04
	100-yr	186.56	186.97	0.41

6.3.11. WC#18

The following results were produced from the LittleRouge.all model provided by TRCA named all40147.prj. The TRCA model provided was updated to account for the existing 407 ETR Bridge. The geometry file used to model the existing conditions is named “Little – Dec.2015 (Mod Ex) (407 ETR)”, while the geometry file used to model the proposed conditions is named “Little – Sep.2016 (PROP) (407 ETR)”. The HEC-RAS Stations of interest are found in the geometry data under the Tributary D River and Reach 1.

The existing 407 ETR Bridge has a span of 190m, while the proposed TWY Bridge has a span of 252m.

Table 6.3.21: WC#18 – HEC-RAS Modeling Results

HEC-RAS Sta	Return Period (4hr Chicago)	TRCA Ex Cond WL (m)	Modif Ex Cond WL (m)	Diff in WLs TRCA vs Modif (m)	Prop Cond WL (m)	Diff in WLs Prop Cond vs Modif Ex Cond (m)
6513.21	Regional	185.04	184.9	-0.14	184.90	0.00
	100 yr	183.10	183.42	0.32	183.42	0.00
6513.205	Railway Bridge					
6513.2	Regional	184.99	184.18	-0.81	184.18	0.00
	100 yr	183.08	182.96	-0.12	182.96	0.00
6513.197	Regional	-	184.22	-	184.21	-0.01
	100 yr	-	182.72	-	182.72	0.00
6513.195	Existing 407 ETR Bridge					
6513.19	Regional	184.15	183.90	-0.25	183.87	-0.03
	100 yr	182.99	182.42	-0.57	182.44	0.02
6513.185	Existing 407 ETR Bridge					
6513.18	Regional	183.87	183.34	-0.53	183.47	0.13
	100 yr	182.60	182.17	-0.43	182.27	0.10
6513.175	Proposed 407 TWY Bridge					
6513.173	Regional	-	183.11	-	183.11	0.00
	100 yr	-	181.88	-	181.87	-0.01
6513.17	Regional	183.37	182.87	-0.51	182.86	0.00
	100 yr	181.90	181.48	-0.42	181.48	0.00
6513.16	Regional	182.15	182.19	0.04	182.19	0.00
	100 yr	181.00	180.85	-0.15	180.85	0.00
6513.15	Regional	181.51	181.06	-0.45	181.06	0.00
	100 yr	180.27	179.81	-0.46	179.81	0.00

Figure 6.11 in **Appendix F** shows the cross sections used for the HEC-RAS analysis and the associated water levels. The proposed Regional floodline is also delineated for this crossing.

6.3.12. Summary of Structures Performance – Rouge Watershed

Table 6.3.22 summarizes the culvert/structure performance and their compliance to the hydraulic design standards. The modeling results show that there are no increases in water levels beyond MTO's ROW and that small increases are limited to areas within MTO's property with the following exceptions:

i. WC#13, shows relatively small increases (5 cm) in Regional WL upstream of the 407 ETR, however the design criteria are met for this structure.

ii. WC#15A shows increase downstream of the transitway due to the flat topography which does not allow creek bottom re-grading; if any development is proposed in the area it is recommended to be above 180.8m elevation (100-yr WL, which is higher than the Regional level). In addition the TRCA model does not show the new development south of the 407 ETR. This needs to be considered during detailed design.

iii. The analysis undertaken for WC#16 assumes uncontrolled flows from Pond 85, which is a conservative approach. WC#16 shows increases in WLs downstream of the proposed Donald Cousens station however it is not feasible to install larger culverts size due to space constraints.

Compliance to the hydraulic design standards from the MTO Drainage Manual (Jan 2008) are met aside from WC#3 and WC#15A. WC#3 has a freeboard of only 0.28m, which is less than the minimum requirement of 1.0m. The freeboard requirements at WC#15A are not met because an underpass is proposed at Ninth Line, and thus a berm is proposed to prevent flooding onto the transitway (see Figure 6.7 in Appendix F). Overall, the proposed 407 TWY structures within Rouge River Watershed have a larger size compared to the existing 407 ETR structures.

Parsons updated the HEC-ARS models received from TRCA to show the 407 ETR existing structures as noted in the above tables. In addition, the TRCA floodlines for the four (4) crossings received from TRCA (WC13, WC 15b, WC15C, WC18) were updated to show the modified existing condition, which differs from TRCA. In all instances the modified existing and proposed floodlines delineated by Parsons are similar.

Table 6.3.22: 407 TWY - Water Crossings (Culverts/Bridges) Rouge River Watershed - Design Parameters and Structure Performance

GENERAL INFO		ROADWAY DATA				EX 407 ETR STR*	Flow Data (4hr Chicago)				PROP 407 TWY STRUCTURE DESIGN PARAMETERS							HYDRAULICS				CULVERT/BRIDGE PERFORMANCE							
WC#	Type	Station	CL Elev. (m)	EOTL Elev (m)	Lowest Point on the Soffit (m)	Size	50-yr (m^3/s)	100-yr (m^3/s)	Check Flow (m^3/s)	Regional Flow (m^3/s)	Inverts		Length	Slope	Span x Rise	Diameter	Material	Computed HW Elevation (m)				Freeboard (STD WC-2) (m)	Clearance (STD WC-2) (m)	HW/D (STD WC-2)	EOTL - Check Flow WL (STD WC-2)	Compliance to Standard			
											Upstr (m)	Downstr (m)	(m)	(%)	(m)	(m)		50-yr	100-yr	Regional	Check Flow					Freeboard >1	Clearance >1	HW/D	Check Flow WL < EOTL
3	Structural Culvert Rigid Frame Open Footing	1+131	180.48	179.73	--	ø2000mm (culvert)	5.76	6.47	8.42	4.49	178.50	178.25	33.00	0.8%	3 x 1.25	--	Conc	179.45	179.53	179.29	179.81	0.28	--	0.32	-0.08	no	--	yes	no
4	Structural Culvert Rigid Frame Open Footing	1+555	181.76	181.01	--	--	5.07	5.70	7.41	3.92	179.20	178.92	34.00	0.8%	3 x 1.25	--	Conc	180.06	180.14	179.92	180.34	0.95	--	0.29	0.67	~	--	yes	yes
5	Structural Culvert Rigid Frame Open Footing	1+737	182.31	181.56	--	--	2.81	3.16	4.11	2.17	179.50	179.35	34.00	0.4%	3 x 1.25	--	Conc	180.12	180.17	180.03	180.28	1.44	--	0.21	1.28	yes	--	yes	yes
11	Circular Concrete Pipe	2+609	182.64	181.89	--	--	0.12	0.15	0.19	0.66	180.00	179.90	28.00	0.4%	--	0.800	Conc	180.27	180.31	180.68	180.34	1.62	--	0.34	1.55	no	--	yes	yes
12	Circular Concrete Pipe	3+080	180.44	179.69	--	--	0.16	0.20	0.25	0.88	176.80	176.65	45.00	0.3%	--	0.800	Conc	177.14	177.18	177.70	177.23	2.55	--	0.42	2.46	yes	--	yes	yes
13	Bridge - Rouge River	4+830 to 5+130	169.65	168.90	168.36	205m (span - bridge)	144.03	166.11	--	662.78	--	--	--	--	300 m span	--	Conc	160.04	160.07	162.10	--	8.83	8.290	--	--	yes	yes	--	--
15a (**)	Structural Culvert Rigid Frame Open Footing	6+632	181.80	181.05	--	--	4.84	5.43	7.06	2.99	180.02	179.90	28.00	0.4%	6 x 1	--	Conc	180.79	180.86	180.59	181.01	0.26	--	0.13	0.04	no	--	yes	yes
15b	Structural Culvert Rigid Frame Open Footing	7+027	188.04	187.29	--	2 x (3.0 x 1.5)m (box culvert)	7.73	8.95	--	20.42	183.50	183.35	40.00	0.4%	6 x 2.5	--	Conc	184.29	184.36	184.97	--	3.00	--	0.13	--	yes	--	yes	--
15c	Structural Culvert Rigid Frame Open Footing	7+766	188.89	188.14	--	2 x (3.0 x 1.8)m (box culvert)	2.85	4.53	--	13.14	184.45	184.33	47.00	0.3%	6 x 2.5	--	Conc	185.35	185.44	185.74	--	2.79	--	0.15	--	yes	--	yes	--
16 (**)	Structural Culvert Rigid Frame Open Footing	8+591	192.74	191.99	--	(4.6 x 2.7)m (box culvert)	28.14	31.57 5.53***	41.04	22.45	187.00	186.90	25.50	0.4%	6 x 2.5	--	Conc	188.25	188.37 187.60***	188.10	188.64	3.74 4.39**	--	0.21 0.10**	3.35	yes	--	yes	yes
18	Bridge - Little Rouge	9+185 to 9+437	199.10	198.35	196.45	190.00 (span - bridge)	49.18	57.95	--	291.33	--	--	--	--	252 m span	--	Conc	182.17	182.27	183.47	--	16.080	14.180	--	--	yes	yes	--	--

(*) Based on background data review (to be confirmed during detailed design)
(**) in these cases the vertical alignment of the corridor slopes to the underground and measures are needed to avoid water entering the underground portion of the corridor
(***) Controlled flow results from SWM Pond Upstream - Refer to report

Note: Culverts/bridges with a total span less than or equal to 6.0m are designed for 50yr storm (MTO Standard WC-1)
Culverts/bridges with a total span greater than 6.0 are design for the 100 yr storm (MTO Standard WC-1)
Freeboard calculated as the difference between the WL generated by the design flow and the EOTR
Clearance calculated as the difference between the lowest point on the soffit and the design flow
Check flow calculated as 1.3 times the design flow
Check flow criteria was assessed for crossing included in the HEC-RAS ROUGE model (HEC.prj) created by Parsons
Check flow criteria for TRCA models assessed in the report

6.4. Hydraulic Analysis – Petticoat Creek Watershed

6.4.1. WC#19

The following results were produced from the HEC-RAS ROUGE model from the file HEC.prj. The geometry file used to model the existing conditions is named "WC19-EX", while the geometry file used to model the proposed conditions is named "WC19-PROP (2.5 x 1.25)".

The flow data used in HEC-RAS was determined using Visual OTTHYMO. Refer to Table 4.1 in Section 4.1 of this report for flow data, and Figure 4.6 in Appendix C for the drainage area map of this crossing.

Table 6.4.1: WC#19 – Culvert Design Parameters

Type	Rigid frame open footing
Design flow – Q_{50yr} (m^3/s)	0.12
Sizing (Span x Height) (m)	2.5 x 1.25
UP INV (m)	194.80
DS INV (m)	194.40
Length (m)	38
Slope	1.1%

Table 6.4.2: WC#19 - HEC-RAS Modeling Results

HEC-RAS Sta	Return Period (4hr Chicago)	Ex Cond WL (m)	Prop cond WL (m)	Diff in WLs (m)
300	100-yr	196.03	196.02	-0.01
	Regional	196.06	196.04	-0.02
200	100-yr	195.04	194.89	-0.15
	Regional	195.10	195.01	-0.09
150	Proposed 407 TWY Culvert			
100	100-yr	194.52	194.45	-0.07
	Regional	194.55	194.55	0.00
10	100-yr	194.25	194.25	0.00
	Regional	194.27	194.27	0.00

Figure 6.12 in Appendix F shows the cross sections used for the HEC-RAS analysis and the associated water levels. The proposed Regional floodline is also delineated for this crossing.

6.4.2. WC#20

The following results were produced from the HEC-RAS ROUGE model from the file HEC.prj. The geometry file used to model the existing conditions is named "WC20-EX (407 ETR)", while the geometry file used to model the proposed conditions is named "WC20-PROP (2.5 x 1.25) (407 ETR)".

The flow data used in HEC-RAS was determined using Visual OTTHYMO. Refer to Table 4.1 in section 4.1 of this report for flow data, and Figure 4.6 in Appendix C for the drainage area map of this crossing

Table 6.4.3: WC#20 – Culvert Design Parameters

Crossing	Proposed 407 TWY	Existing 407 ETR*
Type	Rigid frame open footing	CSP Culvert
Design flow – Q_{50yr} (m^3/s)	0.12	
Sizing (m)	2.5 x 1.25 (Span x Height)	1.65 (Diameter)
UP INV (m)	195.50	196.00
DS INV (m)	195.00	195.75
Length (m)	45	85
Slope	1.1%	0.3%

*Preliminary information to be confirmed during detailed design

Table 6.4.4: WC#20 - HEC-RAS Modeling Results

HEC-RAS Sta	Return Period (4hr Chicago)	Ex Cond WL (m)	Prop Cond WL (m)	Diff in WLs (m)
300	100-yr	196.30	196.30	0.00
	Regional	196.54	196.54	0.00
250	Existing 407 ETR Culvert			
200	100-yr	195.59	195.61	0.02
	Regional	195.71	195.73	0.02
150	Proposed 407 TWY Culvert			
100	100-yr	195.05	195.00	-0.05
	Regional	195.09	195.09	0.00
10	100-yr	194.93	194.72	-0.21
	Regional	194.95	194.75	-0.20

Figure 6.13 in Appendix F shows the cross sections used for the HEC-RAS analysis and the associated water levels. The proposed Regional floodline is also delineated for this crossing.

6.4.3. WC#20a

The following results were produced from the HEC-RAS ROUGE model from the file HEC.prj. The geometry file used to model the existing conditions is named "WC20A-EX (407 ETR)", while the geometry file used to model the proposed conditions is named "WC20A - PROP (407 ETR) (5 x 2.5)".

The flow data used in HEC-RAS was determined using Visual OTTHYMO. Refer to Table 4.1 in Section 4.1 of this report for flow data, and Figure 4.6 in Appendix C for the drainage area map of this crossing

Table 6.4.5: WC#20a - Culvert Design Parameters

Crossing	Proposed 407 TWY	Existing 407 ETR*
Type	Rigid frame open footing	2 x CSP Culvert
Design flow – Q_{50yr} (m^3/s)	1.26	
Sizing (m)	5 x 2.5 (Span x Height)	2.25 (Diameter)
UP INV (m)	196.00	197.00
DS INV (m)	195.50	196.50
Length (m)	36.00	113
Slope	1.4%	0.4%

*Preliminary information to be confirmed during detailed design

Table 6.4.6: WC#20a - HEC-RAS Modeling Results

HEC-RAS Sta	Return Period (4hr Chicago)	Ex Cond WL (m)	Prop Cond WL (m)	Diff in WLs (m)
300	100-yr	197.58	197.58	0.00
	Regional	198.09	198.09	0.00
250	Existing 407 ETR Culvert			
200	100-yr	196.67	196.29	-0.38
	Regional	196.94	196.66	-0.28
150	Proposed 407 TWY Culvert			
100	100-yr	195.74	195.6	-0.14
	Regional	195.87	195.83	-0.04
10	100-yr	195.57	195.06	-0.51
	Regional	195.65	195.16	-0.49

Figure 6.14 in Appendix F shows the cross sections used for the HEC-RAS analysis and the associated water levels. The proposed Regional floodline is also delineated for this crossing.

6.4.4. WC#21

The following results were produced from the HEC-RAS ROUGE model from the file HEC.prj. The geometry file used to model the existing conditions is named "WC21-EX", while the geometry file used to model the proposed conditions is named "WC21-PROP (4.5 x 2)".

The flow data used in HEC-RAS was determined using Visual OTTHYMO. Refer to Table 4.1 in Section 4.1 of this report for flow data, and Figure 4.6 in Appendix C for the drainage area map of this crossing

Table 6.4.7: WC#21 - Culvert Design Parameters

Type	Rigid frame open footing
Design flow – Q_{50yr} (m^3/s)	0.52
Sizing (Span x Height) (m)	4.5 x 2
UP INV (m)	200.47
DS INV (m)	200.00
Length (m)	38
Slope	1.2%

Table 6.4.8: WC#21 - HEC-RAS Modeling Results

HEC-RAS Sta	Return Period (4hr Chicago)	Ex Cond WL (m)	Prop Cond WL (m)	Diff in WLs (m)
300	100-yr	200.87	200.82	-0.05
	Regional	201.08	201.05	-0.03
200	100-yr	200.73	200.63	-0.10
	Regional	200.92	200.85	-0.07
150	Proposed 407 TWY Culvert			
100	100-yr	200.09	199.97	-0.12
	Regional	200.14	200.14	0.00

Figure 6.15 in Appendix F shows the cross sections used for the HEC-RAS analysis and the associated water levels. The proposed Regional floodline is also delineated for this crossing.

6.4.5. Summary of Structures Performance - Petticoat Watershed

Table 6.4.9 summarizes the culvert/structure performance and their compliance to the hydraulic design standards. The modeling results show that there are no increases in water levels beyond MTO's ROW and that small increases are limited to areas within MTO's property. Compliance to the hydraulic design standards from the MTO Drainage Manual (Jan 2008) are met. The proposed structures have a larger size compared to the existing 407 ETR structures.

Table 6.4.9: 407 TWY - Water Crossings (Culverts/Bridges) Petticoat Creek Watershed - Design Parameters and Structure Performance

GENERAL INFO		ROADWAY DATA				EX 407 ETR STR*	Flow Data (4hr Chicago)				PROP 407 TWY STRUCTURE DESIGN PARAMETERS							HYDRAULICS				CULVERT/BRIDGE PERFORMANCE							
WC#	Type	Station	CL Elev. (m)	Edge of Travelled Lane Elev (m)	Lowest Point on the Soffit (m)	Size	50-yr (m^3/s)	100-yr (m^3/s)	Check Flow (m^3/s)	Regional Flow (m^3/s)	Inverts		Length	Slope	Span x Rise	Diameter	Material	Computed HW Elevation (m)				Freeboard STD WC-2 (m)	Clearance STD WC-2 (m)	HW/D STD WC-2	EOTL - Check Flow WL STD WC-2	Compliance to Standard			
											Upstr (m)	Downstr (m)	(m)	(%)	(m)	(m)		50-yr	100-yr	Regional	Check Flow					Freeboard >1	Clearance >1	HW/D	Check Flow WL < EOTL
19	Structural Culvert Rigid Frame Open Footing	9+824	198.88	198.13	--	ø1000mm (culvert)	0.12	0.15	0.19	0.47	194.80	194.40	38.00	1.1%	2.5 x 1.25	--	Conc	194.88	194.89	195.01	194.91	3.25	--	0.03	3.22	yes	--	yes	yes
20	Structural Culvert Rigid Frame Open Footing	10+019	198.88	198.13	--	ø1650mm (culvert)	0.12	0.15	0.19	0.47	195.50	195.00	45.00	1.1%	2.5 x 1.25	--	Conc	195.59	195.61	195.73	195.63	2.54	--	0.04	2.50	yes	--	yes	yes
20a	Structural Culvert Rigid Frame Open Footing	10+178	199.91	199.16	--	2 x ø2250mm (culvert)	1.26	1.49	1.94	5.22	196.00	195.50	36.00	1.4%	5 x 2.5	--	Conc	196.26	196.29	196.66	196.34	2.90	--	0.05	2.82	yes	--	yes	yes
21	Structural Culvert Rigid Frame Open Footing	10+761	203.53	202.78	--	2 x ø2000mm (culvert)	0.52	0.62	0.80	2.25	200.47	200.00	38.00	1.2%	4.5 x 2	--	Conc	200.61	200.63	200.85	200.66	2.17	--	0.03	2.12	yes	--	yes	yes

(*) Based on background data review (to be confirmed during detailed design)

Note: Culverts/bridges with a total span less than or equal to 6.0m are designed for 50yr storm (MTO Standard WC-1)
Culverts/bridges with a total span greater than 6.0 are design for the 100 yr storm (MTO Standard WC-1)
Freeboard calculated as the difference between the WL generated by the design flow and the EOTR
Clearance calculated as the difference between the lowest point on the soffit and the design flow
Check flow calculated as 1.3 times the design flow
Check flow criteria was assessed for crossing included in the HEC-RAS ROUGE model (HEC.prj) created by Parsons
Check flow criteria for TRCA models assessed in the report

6.5. HEC-RAS Analysis – Duffins Creek Watershed

6.5.1. WC#28 & WC#29

The following results were produced from the Duffins Creek Catchment 11 model provided by TRCA named DuffinCreekCatchment11.prj. The TRCA model provided was updated to account for the existing 407 ETR Bridge. The geometry file used to model the existing conditions is named "Duffin Crk Catch 11 (Modif EX) (407ETR)", while the geometry file used to model the proposed conditions is named "Duffin Crk Catch 11 (PROP) (407ETR)".

The existing 407 ETR Bridges have spans of 136m and 42m, while the proposed TWY Bridge has a span of ~300m.

Table 6.5.1: WC#28 & 29 - HEC-RAS Modeling Results

HEC-RAS Sta	Return Period *(4hr Chicago)*	TRCA Ex Cond WL (m)	Modif Ex Cond WL (m)	Diff in WLs TRCA vs Modif (m)	Prop Cond WL (m)	Diff in WLs Prop Cond vs Modif Ex Cond(m)
11.41	100-yr	178.18	178.3	0.12	178.30	0.00
	Regional	180.02	180.06	0.04	180.06	0.00
11.40	100-yr	177.88	178.24	0.36	178.23	-0.01
	Regional	179.86	179.97	0.11	179.97	0.00
11.39	100-yr	177.49	178.13	0.64	178.13	0.00
	Regional	179.02	179.83	0.81	179.83	0.00
11.3895	Existing 407 ETR Bridge					
11.389	100-yr	--	177.81	--	177.78	-0.03
	Regional	--	179.44	--	179.44	0.00
11.3885	Existing 407 ETR Bridge					
11.388	100-yr	--	177.02	--	177.20	0.18
	Regional	--	178.47	--	178.89	0.42
11.385	Proposed 407 TWY Bridge					
11.382	100-yr	--	176.85	--	176.85	0.00
	Regional	--	178.33	--	178.36	0.03
11.38	100-yr	176.54	176.24	-0.30	176.25	0.01
	Regional	177.91	177.98	0.07	178.03	0.05
11.37	100-yr	175.82	175.82	0.00	175.82	0.00
	Regional	177.14	177.15	0.01	177.15	0.00

Figure 6.16 in Appendix F shows the cross sections used for the HEC-RAS analysis and the associated water levels. The proposed Regional floodline is also delineated for this crossing. Minor increases are noted downstream of the 407 TWY (3 to 5cm increase) however the proposed TWY bridge has a span more than

doubled the existing 407 ETR bridge and exceeds the MTO design criteria by far with respect to clearance and freeboard.

6.5.2. WC#30

The following results were produced from the 407TWY-DUFFINS model from the file 407TWY-DUFFINS.prj. The geometry file used to model the existing conditions is named "WC30-EX", while the geometry file used to model the proposed conditions is named "WC30-PROP (6 x 2.5)".

The flow data used in HEC-RAS was determined using Visual OTTHYMO. Refer to Table 4.1 in section 4.1 of this report for flow data, and Figure 4.7 in Appendix C for the drainage area map of this crossing

Table 6.5.2: WC#30 - Culvert Design Parameters

Type	Rigid Frame Open Footing
Design flow – Q_{50yr} (m^3/s)	1.46
Sizing (Span x Height) (m)	(6.0 x 2.5)
UP INV (m)	185.50
DS INV (m)	185.00
Length (m)	48.5
Slope	1.0%

Table 6.5.3: WC #30 - HEC-RAS Modeling Results

HEC-RAS Sta	Return Period (4hr Chicago)	Ex Cond WL (m)	Prop WL (m)	Diff in WLs (m)
300	100-yr	186.40	185.76	-0.64
	Regional	186.60	186.11	-0.49
150	Proposed 407 TWY Culvert			
100	100-yr	185.15	185.20	0.05
	Regional	185.27	185.47	0.20
10	100-yr	184.21	184.23	0.02
	Regional	184.34	184.34	0.00

Figure 6.17 in Appendix F shows the cross sections used for the HEC-RAS analysis and the associated water levels. The proposed Regional floodline is also delineated for this crossing.

6.5.3. WC#35

The following results were produced from the 407TWY-DUFFINS model from the file 407TWY-DUFFINS.prj. The geometry file used to model the existing conditions is named "WC35-EX", while the geometry file used to model the proposed conditions is named "WC35-PROP (6 x 2.5)".

The flow data used in HEC-RAS was determined using Visual OTTHYMO. Refer to Table 4.1 in section 4.1 of this report for flow data, and Figure 4.7 in Appendix C for the drainage area map of this crossing

Table 6.5.4: WC#35 - Culvert Design Parameters

Type	Rigid Frame Open Footing
Design flow – Q_{50yr} (m^3/s)	0.38
Sizing (Span x Height) (m)	(6.0 x 2.5)
UP INV (m)	213
DS INV (m)	212.75
Length (m)	33
Slope	0.8%

Table 6.5.5: WC#35 - HEC-RAS Modeling Results

HEC-RAS Sta	Return Period (4hr Chicago)	Ex Cond WL (m)	Prop Cond WL (m)	Diff in WLs (m)
300	100-yr	213.58	213.52	-0.06
	Regional	213.74	213.55	-0.19
200	100-yr	213.54	213.13	-0.41
	Regional	213.67	213.37	-0.30
150	Proposed 407 TWY Culvert			
100	100-yr	212.66	212.64	-0.02
	Regional	212.79	212.81	0.02
10	100-yr	212.10	212.10	0.00
	Regional	212.21	212.21	0.00

Figure 6.18 in Appendix F shows the cross sections used for the HEC-RAS analysis and the associated water levels. The proposed Regional floodline is also delineated for this crossing.

6.5.4. WC#36

The following results were produced from the 407TWY-DUFFINS model from the file 407TWY-DUFFINS.prj. The geometry file used to model the existing conditions is named "WC36-EX (407 ETR)", while the geometry file used to model the proposed conditions is named "WC36-PROP (6 x 1.75) (407 ETR)".

The flow data used in HEC-RAS was determined using Visual OTTHYMO. Refer to Table 4.1 in Section 4.1 of this report for flow data, and Figure 4.7 in Appendix C for the drainage area map of this crossing

Table 6.5.6: WC#36 - Culvert Design Parameters

Crossing	Existing 407 ETR*	Proposed 407 TWY	Future Collector
Type	CSP	Rigid Frame Open Footing	Rigid Frame Open Footing
Design flow – Q_{50yr} (m^3/s)		0.59	0.59
Sizing (m)	1.35 (Diameter)	(6.0 x 1.75) (Span x Rise)	(6.0 x 2.0) (Span x Rise)
UP INV (m)	217.5	214.32	213.51
DS INV (m)	215	214.1	213.3
Length (m)	84.5	29	41
Slope	3.0%	0.8%	0.5%

*Preliminary information to be confirmed during detailed design

Table 6.5.7: WC#36 - HEC-RAS Modeling Results

HEC-RAS Sta	Return Period (4hr Chicago)	Ex Cond WL (m)	Prop Cond WL (m)	Diff in WLs (m)
500	100-yr	218.00	218.00	0.00
	Regional	218.65	218.65	0.00
450	Existing 407 ETR Culvert			
400	100-yr	215.14	215.14	0.00
	Regional	215.39	215.39	0.00
300	100-yr	214.60	214.59	-0.01
	Regional	214.71	214.86	0.15
200	100-yr	214.58	214.47	-0.11
	Regional	214.67	214.72	0.05
150	Proposed 407 TWY Culvert			
100	100-yr	214.51	214.21	-0.30
	Regional	214.56	214.41	-0.15
10	100-yr	214.04	213.66	-0.38
	Regional	214.14	213.93	-0.21
7	Future Collector Road			
5	100-yr	213.39	213.28	-0.11
	Regional	213.47	213.47	0.00
1	100-yr	212.15	212.15	0.00
	Regional	212.32	212.32	0.00

Figure 6.19 in Appendix F shows the cross sections used for the HEC-RAS analysis and the associated water levels. The proposed Regional floodline is also delineated for this crossing.

6.5.5. WC#37

The following results were produced from the 407TWY-DUFFINS model from the file 407TWY-DUFFINS.prj. The geometry file used to model the existing conditions is named “WC37-EX”, while the geometry file used to model the proposed conditions is named “WC37-PROP (6 x 2)”.

The flow data used in HEC-RAS was determined using Visual OTTHYMO. Refer to Table 4.1 in Section 4.1 of this report for flow data, and Figure 4.8 in Appendix C for the drainage area map of this crossing

Table 6.5.8: WC#37 - Culvert Design Properties

Type	Rigid Frame Open Footing
Design flow – Q_{50yr} (m^3/s)	0.75
Sizing (Span x Height) (m)	(6.0 x 2.0) m
UP INV (m)	218.7
DS INV (m)	218.4
Length (m)	32
Slope	0.9%

Table 6.5.9: WC#37 - HEC-RAS Modeling Results

HEC-RAS Sta	Return Period (4hr Chicago)	Ex Cond WL (m)	Prop Cond WL (m)	Diff in WLs (m)
300	100-yr	219.23	219.14	-0.09
	Regional	219.47	219.41	-0.06
200	100-yr	219.08	218.87	-0.21
	Regional	219.24	219.15	-0.09
150	Proposed 407 TWY Culvert			
100	100-yr	218.60	218.60	0.00
	Regional	218.73	218.83	0.10
10	100-yr	218.05	218.05	0.00
	Regional	218.12	218.12	0.00

Figure 6.20 in Appendix F shows the cross sections used for the HEC-RAS analysis and the associated water levels. The proposed Regional floodline is also delineated for this crossing.

6.5.6. WC#41

The following results were produced from the 407TWY-DUFFINS model from the file 407TWY-DUFFINS.prj. The geometry file used to model the existing conditions is named “WC41-EX”, while the geometry file used to model the proposed conditions is named “WC41-PROP (6x2.5)”.

The flow data used in HEC-RAS was determined using Visual OTTHYMO. Refer to Table 4.1 in section 4.1 of this report for flow data, and Figure 4.8 in Appendix C for the drainage area map of this crossing

Table 6.5.10: WC#41 - Culvert Design Parameters

Type	Rigid Frame Open Footing
Design flow – Q_{50yr} (m^3/s)	0.66
Sizing (Span x Height) (m)	(6.0 x 2.5) m
UP INV (m)	208.48
DS INV (m)	207.97
Length (m)	43
Slope	1.2%

Table 6.5.11: WC#41 - HEC-RAS Modeling Results

HEC-RAS Sta	Return Period (4hr Chicago)	Ex Cond WL (m)	Prop Cond WL (m)	Diff in WLs (m)
300	100-yr	208.76	208.73	-0.03
	Regional	209.05	209.07	0.02
200	100-yr	208.68	208.64	-0.04
	Regional	208.93	208.94	0.01
150	Proposed 407 TWY Culvert			
100	100-yr	208.12	208.12	0.00
	Regional	208.30	208.32	0.02
10	100-yr	207.09	207.09	0.00
	Regional	207.29	207.29	0.00

Figure 6.21 in Appendix F shows the cross sections used for the HEC-RAS analysis and the associated water levels. The proposed Regional floodline is also delineated for this crossing.

6.5.7. WC#43

The following results were produced from the 407TWY-DUFFINS model from the file 407TWY-DUFFINS.prj. The geometry file used to model the existing conditions is named “WC43-EX (407 ETR)”, while the geometry file used to model the proposed conditions is named “WC43-PROP (5 x 2) (407 ETR)”.

The flow data used in HEC-RAS was determined using Visual OTTHYMO. Refer to Table 4.1 in section 4.1 of this report for flow data, and Figure 4.9 in Appendix C for the drainage area map of this crossing.

Table 6.5.12: WC#43 - Culvert Design Parameters

Crossing	Proposed 407 TWY	Existing 407 ETR*
Type	Rigid Frame Open Footing	CSP
Design flow – Q_{50yr} (m^3/s)	1.21	
Sizing (m)	(5.0 x 2.0) (Span x Rise)	3.3 (Diameter)
UP INV (m)	192.00	189.55
DS INV (m)	190.50	188.93
Length (m)	102	64
Slope	1.5%	1.0%

*Preliminary information to be confirmed during detailed design

Table 6.5.13: WC#43 - HEC-RAS Modeling Results

HEC-RAS Sta	Return Period (4hr Chicago)	Ex Cond WL (m)	Prop Cond WL (m)	Diff in WLs (m)
400	100-yr	192.62	192.62	0.00
	Regional	193.36	193.36	0.00
350	Existing 407 ETR Culvert			
300	100-yr	190.56	189.81	-0.75
	Regional	191.05	190.27	-0.78
150	Proposed 407 TWY Culvert			
100	100-yr	189.14	189.15	0.01
	Regional	189.30	189.50	0.20
10	100-yr	188.21	188.21	0.00
	Regional	188.44	188.44	0.00

Figure 6.22 in Appendix F shows the cross sections used for the HEC-RAS analysis and the associated water levels. The proposed Regional floodline is also delineated for this crossing.

6.5.8. WC#44

The following results were produced from the 407TWY-DUFFINS model from the file 407TWY-DUFFINS.prj. The geometry file used to model the existing conditions is named “WC44-EX (407 ETR)”, while the geometry file used to model the proposed conditions is named “WC44-PROP (407 ETR))”.

The flow data used in HEC-RAS was determined using Visual OTTHYMO. Refer to **Table 4.1** in **Section 4.1** of this report for flow data, and **Figure 4.9** in **Appendix C** for the drainage area map of this crossing

The existing 407 ETR Bridge has a span of 42m same as the proposed TWY Bridge.

Table 6.5.14: WC#44 - HEC-RAS Modeling Results

HEC-RAS Sta	Return Period (4hr Chicago)	Ex Cond WL (m)	Prop Cond WL (m)	Diff in WLs (m)
400	100-yr	191.79	191.79	0.00
	Regional	192.13	192.13	0.00
350	Existing 407 ETR Bridge			
300	100-yr	189.71	189.70	-0.01
	Regional	190.00	190.00	0.00
200	100-yr	188.89	189.03	0.14
	Regional	189.08	189.25	0.17
150	Proposed 407 TWY Bridge			
100	100-yr	187.36	187.36	0.00
	Regional	187.68	187.69	0.01
10	100-yr	186.66	186.66	0.00
	Regional	186.93	186.93	0.00

Figure 6.23 in **Appendix F** shows the cross sections used for the HEC-RAS analysis and the associated water levels. The proposed Regional floodline is also delineated for this crossing.

6.5.9. Summary of Structures Performance

Table 6.5.15 summarizes the culvert/structure performance and their compliance to the MTO standards. The modeling results show that there are no increases in water levels beyond MTO's ROW and that small increases are limited to areas within MTO's property with the following exceptions: WC 28&28 shows relatively small increase in WLs downstream of the proposed 407 TWY (5cm increase in WLs for the regional storm); however the proposed TWY bridge has a span more than doubled the existing 407 ETR bridge and exceeds the MTO design criteria by far with respect to clearance and freeboard; and WC#30 shows minimum increase downstream of the transitway (2cm increase for the 100-yr) however the structure meets all MTO hydraulic design criteria.

Compliance to the hydraulic design standards from the MTO Drainage Manual (Jan 2008) are met for all structures.

Table 6.5.15: 407 TWY - Water Crossings (Culverts/Bridges) Duffins Creek Watershed - Design Parameters and Structure Performance

GENERAL INFO		ROADWAY DATA				EX 407 ETR STR*	Flow Data (4hr Chicago)				PROP 407 TWY STRUCTURE DESIGN PARAMETERS							HYDRAULICS				CULVERT/BRIDGE PERFORMANCE							
											Inverts					Diameter		Computed HW Elevation (m)				Freeboard	Clearance	HW/D	EOTL - Check Flow WL	Compliance to Standard			
WC#	Type	CL Station	CL Elev. (m)	Edge of Travelled (m)	Lowest Point on the Soffit (m)	Size	50-yr (m^3/s)	100-yr (m^3/s)	Check Flow (m^3/s)	Regional Flow (m^3/s)	Upstr (m)	Downstr (m)	Length (m)	Slope (%)	Span x Rise (m)	(m)	Material	50-yr	100-yr	Regional	Check Flow	STD WC-2 (m)	STD WC-2 (m)	STD WC-2	STD WC-2	Freeboard >1	Clearance >1	HW/D	Check Flow WL < EOTL
28 & 29	Bridge -West Duffins Creek and Tributary	12+190 to 12+495	186.27	185.52	184.06	136m (span - bridge)	60.10	69.30	N/A	313.10	--	--	--	--	300m span	--	Conc	177.06	177.20	178.89	--	8.32	6.86	--	--	--	yes	--	--
30	Structural Culvert Rigid Frame Open Footing	12+848.55	193.44	192.69	--	3 x ø1800mm (culvert)	1.46	1.67	2.17	1.46	185.50	185.00	48.50	1.0%	6 x 2.5	--	Conc	185.74	185.76	186.11	185.81	6.95	--	0.04	6.88	yes	--	yes	yes
35	Structural Culvert Rigid Frame Open Footing	14+366.71	216.54	215.79	--	2 x ø1500mm (culvert)	0.38	0.46	0.59	2.17	213.00	212.75	33.00	0.8%	6 x 2.5	--	Conc	213.12	213.13	213.37	213.15	2.67	--	0.02	2.64	yes	--	yes	yes
36	Structural Culvert Rigid Frame Open Footing	14+823.43	216.57	215.82	--	2 ø1350mm (culvert)	0.59	0.70	0.91	3.27	214.32	214.10	29.00	0.8%	6 x 1.75	--	Conc	214.45	214.47	214.72	214.49	1.37	--	0.02	1.33	yes	--	yes	yes
37	Structural Culvert Rigid Frame Open Footing	15+423.13	221.70	220.95	--	3 x ø1800mm (culvert)	0.75	0.90	1.17	4.09	218.70	218.40	32.00	0.9%	6 x 2	--	Conc	218.85	218.87	219.15	218.90	2.10	--	0.03	2.05	yes	--	yes	yes
41	Structural Culvert Rigid Frame Open Footing	16+504.9	212.02	211.27	--	3 x ø2250mm (culvert)	0.66	0.79	1.03	3.68	208.48	207.97	43.00	1.2%	6 x 2.5	--	Conc	208.62	208.64	208.94	208.67	2.65	--	0.02	2.60	yes	--	yes	yes
43	Structural Culvert Rigid Frame Open Footing	17+446.77	200.71	199.96	--	ø3300mm (culvert)	1.21	1.44	1.88	6.84	189.55	188.93	64.00	1.0%	5 x 2	--	Conc	189.78	189.81	190.27	189.87	10.18	--	0.05	10.09	yes	--	yes	yes
44	Bridge - Urfe Creek	17+965 to 18+007	195.93	195.18	193.76	42m (span - bridge)	1.23	1.47	1.92	7.22	--	--	--	--	42m span	--	Conc	189.01	189.03	189.25	189.06	6.15	4.73	--	--	--	yes	--	--

(*) Based on background data review (to be confirmed during detailed design)

Note: Culverts/bridges with a total span less than or equal to 6.0m are designed for 50yr storm (MTO Standard WC-1)
Culverts/bridges with a total span greater than 6.0 are design for the 100 yr storm (MTO Standard WC-1)
Freeboard calculated as the difference between the WL generated by the design flow and the EOTR
Clearance calculated as the difference between the lowest point on the soffit and the design flow
Check flow calculated as 1.3 times the design flow
Check flow criteria was assessed for crossing included in the HEC-RAS ROUGE model (HEC.prj) created by Parsons
Check flow criteria for TRCA models assessed in the report

7. IMPACTS OF CLIMATE CHANGE

The impacts of climate change become more and more visible in recent years with increased annual average precipitation, more intense rainfall events, increased flooding, changes in temperature, snow and ice cover. In the last few years a number of extreme rainfall events (e.g: May 12, 2000, July 8, 2013 and others) were recorded that led to extensive flooding, damage to properties and traffic disruptions. Recent records (*Canada in a Changing Climate: Sector Perspectives on Impacts and Adaptation, Government of Canada, Lead Authors Fionna Warren and Donald S.Lemmen, Natural Resources Canada, 2014*) indicate that extreme weather events occur more frequently and the capacity of a system to adapt to a variety of environmental factors become paramount. The study previously noted indicates that the resilience and capacity to adapt are important key factors in designing new infrastructure since there is an emerging need to adapt infrastructure design to a changing climate.

There is additional capacity incorporated in the drainage design for the 407 TWY that makes the system somewhat resilient against the potential for more intense storm events and increased flows arising from climate change in the future.

The key measures to mitigate climate change impacts are:

- increased clearances at all crossings between the high water level and the underside of the bridge,
- increased freeboard for the majority of the structure due to the high road elevations; and
- use of a more conservative “peaky” design storm (Chicago 4-hr) compared to TRCA’s watershed criterion of 12-hr AES.

On the understanding that the 407 TWY is proposed to be built in the next 25 years, it is expected that design criteria will become more stringent as the impacts of climate change are better defined and quantified. However, there is flexibility in the current drainage design, as described above, to convey to some extent, the expected increased flows from climate change, on the assumption that humankind continues to take steps to reduce greenhouse gases and the negative impacts of climate change.

8. EROSION AND SEDIMENT CONTROL DURING CONSTRUCTION

The erosion and sediment control (ESC) practices to be developed during detailed design should follow the latest MTO’s reference documents including the Environmental Reference for Highway Design (MTO, June 2013), the Environmental Guide for Erosion and Sediment Control during Construction of Highway Projects (MTO, September 2015), as well as the Ontario Provincial Standards for Roads and Public Works (OPSS), and the Erosion and Sediment Control Guidelines for Urban Construction (Golden Horseshoe, Dec 2006).

Impacts on the surrounding environment related to highway projects can be mitigated by proper erosion and sediment control measures. MTO

It is recommended that a multi-barrier approach be undertaken during construction using the following measures as a minimum:

- Stabilize exposed soils with vegetation where possible to reduce the amount of sediments that would be conveyed further downstream to existing watercourses;
- Implement construction phasing to limit the duration of soil exposure;
- Install heavy-duty double silt fence at each water crossing;
- Double silt fence to be supported by straw-bale;
- Install rock check dams to reduce high flow velocities in the ditches/swales adjacent to the proposed transitway;
- Erosion and sediment control blankets for the road embankments;
- Dewatering, temporary channel diversions; and
- Use erosion prevention controls and sediment control measures as necessary.

9. CONCLUSIONS AND CONSIDERATIONS FOR DETAILED DESIGN

1. Several ponds could be impacted by the proposed 407 TWY and mitigation measures are recommended as follows:

    - Existing pond ID R-4 at Kennedy Rd: a super-elevated structure is proposed at this location and the piers are located such that no interference with the existing pond is expected.

    - Pond LR-1 upstream of Donald Cousens Parkway Station may be impacted by the proposed 407 TWY; it is recommended that the pond be re-graded to suite proposed transitway profile; retaining walls may be required on the north side of the TWY (refer to Figure 6.1 in Appendix F).

    - Existing 407 ETR pond LR-5, east of WC#18 may require regrading due to proposed embankments of the 407 TWY.

    - Existing 407 ETR Pond WD-2 inlet (east of WC#30) – a new culvert is required across the transitway since inlet of the pond will be cut-off by the proposed TWY.

    - Existing 407 ETR pond G1 inlet (east of WC#40) – a new culvert is required across the transitway since inlet of the pond will be cut-off by the proposed TWY.

    - Existing pond 03West, located north of Brock Road Station – regrading of pond embankment may be required to allow grading of the proposed 407 TWY embankment.

2. The stormwater management strategy recommends that flows from several enhanced swales along the proposed 407 TWY be directed to the existing 407 ETR ditches and ultimately to existing ponds. Ponds LR-1, LR-5, WD-2 and G1 were identified as possible outlets. It is recommended that the capacity of existing 407 ponds to be assessed during detailed design to confirm if sufficient capacity exists for additional flows.

3. Due to the road profile sloping to the underground, pumping may be required at three locations along the proposed 407 TWY: Markham Road, Donald Cousens Parkway and York Durham Line. Peak flows were tabulated and additional details related to pump sizes should be provided during detailed design.

4. A treatment train approach is proposed for the TWY corridor areas consisting of grassed embankments, long grassed swales and enhanced swales in a form of dry ponds with a formal outlet control structure. Quantity control of transitway flows is proposed to be provided through enhanced swales. These were designed as dry ponds with a formal outlet control structure consisting of 100 mm perforated pipe, hickenbottom structure and a 75 mm orifice plate. A typical cross-section was used in the analysis however a more detailed analysis

needs to be undertaken during detailed design to ensure compliance with the latest allowable release rates (unit rates) in Duffins subwatersheds 8, 31, 35 and 39.

5. The increases in peak flows in the post-development condition with SWM compared to the allowable rates vary between 0.001 L/s and 0.004 L/s at the outlet of the swales. These increases can be considered small and do not pose significant erosion/scour impacts at the outlets. Velocities could be further mitigated with vegetated outlets or energy dissipaters. Parsons looked at the feasibility of enlarging the footprint of the enhanced swales to lower the hydraulic head of the 75 mm orifice and found that the area of ponding would be larger than the transitway segment itself.

6. The SWM strategy for the stations include wet ponds with control structures consisting of multiple orifices and/or weirs. Wet ponds were designed for each station site to provide quantity, quality and erosion and sediment control. One facility is recommended at each station in the Rouge watershed, and two facilities are recommended at each station in the Duffins watershed. The stormwater management facilities in the Rouge watershed (at Markham Road, Ninth Line, and Donald Cousens Parkway Stations) all met the stormwater management criteria identified in Section 5.1. The facilities in the Duffins watersheds met most of the stormwater management criteria, with the following exceptions:

    - The criteria for 120 hour retention of the 25 mm event could not be met at SWMF-4, SWMF-5, or SWMF-6 because the orifice diameter required to meet this criteria was smaller than the 75 mm minimum required to prevent clogging. During detailed design, the feasibility of connecting SWMF-4 and SWMF-5 should be assessed in order to achieve the storage and 120-hr detention criteria for Whites Road Station.

    - Parsons looked at the feasibility of enlarging the footprint of the above-mentioned ponds to lower the hydraulic head of the orifice and found that the area of pond would be extremely large and there is no additional land to extend the surface area of the SWM facilities.

    - Due to the presence of a high groundwater table, the target 3 m deep permanent pool could not be achieved at SWMF-7; the existing cooling trench downstream of the pond will be retained to provide additional thermal mitigation before flows from this facility are discharged to Brougham Creek.

7. HEC-RAS analysis

    a. The HEC-RAS analysis was undertaken for 23 crossings within the study limits. Out of the 23 crossings, TRCA provided 5 HEC-RAS models and the rest were started from scratch. The HEC-RAS models from

TRCA were updated to include the 407 ETR existing structures for the majority of the crossings within the study limits. The modified existing levels are different compared to the elevations provided by TRCA.

b. The regional floodline was delineated for all crossings within the study limits.

c. The modeling results show that there are no increases in water levels beyond MTO's ROW and that small increases are limited to areas within MTO's property with the following exceptions

   i. WC#13, shows relatively small increases (5 cm) in Regional WL upstream of the 407 ETR, however the design criteria are met for this structure.

   ii. WC#15A shows increase downstream of the transitway due to the flat topography which does not allow creek bottom re-grading; if any development is proposed in the area it is recommended to be above 180.8m elevation (100-yr WL, which is higher than the Regional level). In addition the TRCA model does not show the new development south of the 407 ETR. This needs to be considered during detailed design.

   iii. The analysis undertaken for WC#16 assumes uncontrolled flows from Pond 85, which is a conservative approach. WC#16 shows increases in WLs downstream of the proposed Donald Cousens station however it is not feasible to install larger culverts size due to space constraints.

   iv. WC 28&28 shows relatively small increase in WLs downstream of the proposed 407 TWY (5cm increase in WLs for the regional storm). However the proposed TWY bridge has a span more than doubled the existing 407 ETR bridge and exceeds the MTO design criteria by far with respect to clearance and freeboard.

   v. WC#30 shows minimum increase downstream of the transitway (2cm increase for the 100-yr) however the structure meets all MTO hydraulic design criteria.

The results presented above are not expected to have negative impacts or damage private properties

d. Compliance to the hydraulic design standards from the MTO Drainage Manual (Jan 2008) are met aside from WC#3 and WC#15A.

e. The freeboard and clearance for most of the structures exceed the required by more than 1m in most instances. Therefore there is flexibility in the future to consider climate change impacts.

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Design of SWM Ponds (Stations):

Tara Bowen
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REFERENCES

The following documents were used in preparation for this report:

11 Contract drawings for 407 ETR received from MTO

12 Hydrologic maps and models and floodline mapping for Rouge River and Duffins Creek watersheds available from TRCA

13 Highway Drainage Design Standards, Ministry of Transportation, January 2008

14 Environmental Reference for Highway Design (MTO, June 2013)

15 Environmental Guide for Erosion and Sediment Control during Construction of Highway Projects (MTO, September 2015)

16 2012 Duffins Creek Hydrology Updates, Final Report, Aquafor Beech Limited, February 11, 2013

17 Rouge River Watershed Hydrology Update, Final Report, MMM, June 2001

18 Petticoat Creek Watershed Hydrology Update Final Report, Greenland Consulting Engineers, October 2006

19 Fish and Fish Habitat - Impact Assessment Report 407 Transitway from Kennedy Road t Brock Road, LGL April 2016

20 Reference Reports for SWM Ponds from City of Markham

- Stormwater Management Cornell Community – Tributary C, MMM, Revised June 2004
- Stormwater Management Cornell Community – Trib C, MMM Revised July 2005

21 Highway Runoff Water Quality Literature Review, MAT-92-13, MTO Research and Development Branch (April 1992)

22 Highway 407 East Phase 2, Stormwater Management Plan Framework, Condition 7, EAB File EA-05-08, October 2013, revised March 2014, Final Draft

23 Performance Assessment of two types of oil grit separator for stormwater management control in parking lot applications, Markham & Toronto, Ontario (a report prepared by Stormwater Assessment Monitoring and performance (SWMP) Program for MOECC, TRCA, Municipal Engineers Association of Ontario and the City of Toronto, July 2004)
http://sustainabletechnologies.ca/wp/wp-content/uploads/2013/03/OGS-ES.pdf

24 Performance Assessment of a Swale and Perforated Pipe Stormwater Infiltration System, Toronto, Ontario (a report prepared by Stormwater Assessment Monitoring and Performance (SWMP) Program for Great Lakes Sustainability Fund of the Government of Canada, Ontario Ministry of Environment and Energy, TRCA, Municipal Engineers Association of Ontario, City of Toronto, May 2002)
http://www.trca.on.ca/dotAsset/26187.pdf

25 Canada in a Changing Climate: Sector Perspectives on Impacts and Adaptation (Government of Canada, Lead Authors: Fionna Warren and Donald S.Lemmen, Natural Resources Canada, 2014)
http://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/earthsciences/pdf/assess/2014/pdf/Full-Report_Eng.pdf

APPENDIX A

EXISTING ENVIRONMENT CHARACTERIZATION

APPENDIX A: Existing Environment Characterization

SOIL MAPS

Figure 2.1: Soil Groups – Rouge River

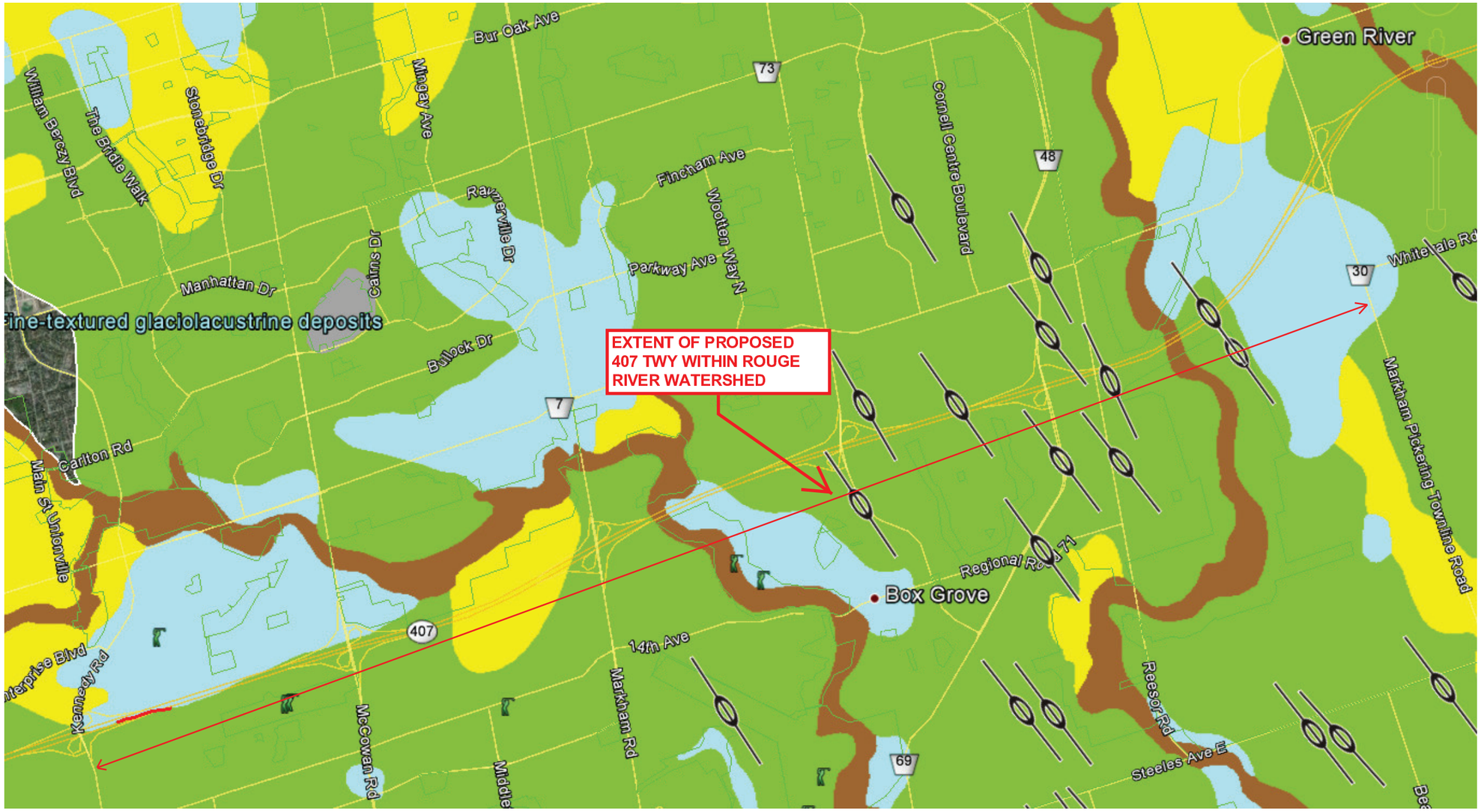
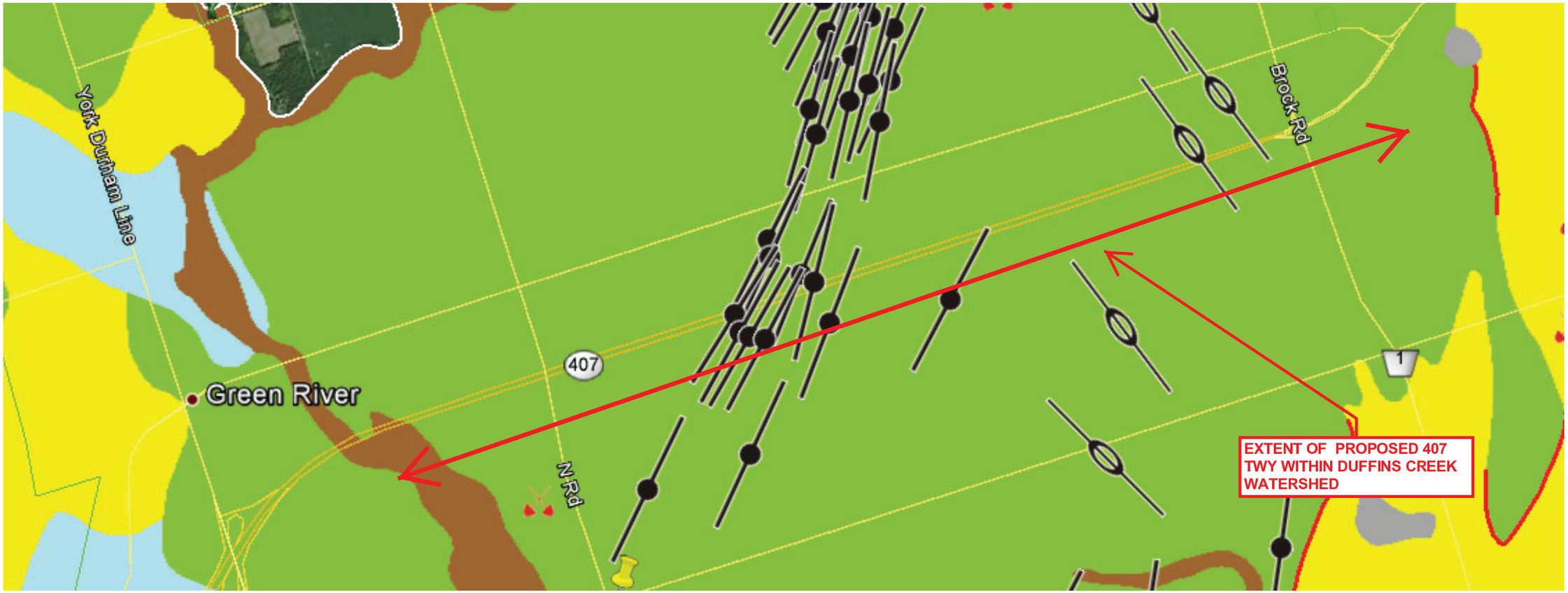


Figure 2.2: Duffins Creek Watershed – Soil Groups



Ontario

Ontario Geological Survey

SURFICIAL GEOLOGY OF

SOUTHERN ONTARIO

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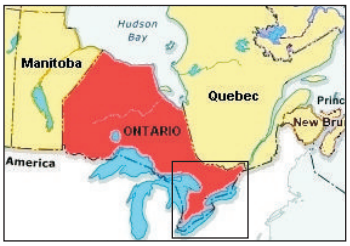


Location Map

SOURCES OF INFORMATION

Base map: Natural Resources and Values Information System (NRVIS)

Projection: NAD 83

CREDITS

Author: The Ontario Geological Survey

Acknowledgements: John Dodge (OGS), Andy Bajc (OGS), George Gao (OGS), Steve van Haaften (OGS), Shannon Evers (OGS), Steve Leney (MNR), John Ernsting (MNR), Scott Christilaw (MNR), Andrew Moore (GSC)

Issued 2003.

Information from this publication may be quoted if credit is given. It is recommended that reference be made in the following form:

The Ontario Geological Survey. 2003. Surficial Geology of Southern Ontario.

LEGEND

- **Fill**
- **Organic Deposits:** peat, muck and marl
- **Silt**
- **Clay**
- **Sand**
- **Gravel**
- **Till (Diamicton)**
- **Sedimentary (Paleozoic) bedrock**
- **Precambrian bedrock**

Correlation Matrix:

Material	Current map units
Fill	21
Organic Materials	20
Silt & Clay	8, 10, 12, 13, 15, 18, 19
Sand & Gravel	6, 7, 9, 11, 12, 14, 16, 18, 19
Sand	6, 7, 9, 11, 12, 14, 16, 17, 18, 19
Till (Diamicton)	5, 5a, 5b, 5c, 5d, 5e
Sedimentary bedrock	3, 4
Precambrian bedrock	1, 2

LEGEND

PHANEROZOIC

CENOZOIC

QUATERNARY

RECENT

21 **Man-made deposits:** fill, sewage lagoon, landfill, urban development

20 **Organic Deposits:** peat, muck, marl

19 **Modern alluvial deposits:** clay, silt, sand, gravel, may contain organic remains

18 **Colluvial deposits:** boulders, scree, talus, undifferentiated landslide materials

17 **Eolian deposits:** fine to very fine sand and silt

16 **Coarse-textured marine deposits:** sand, gravel, minor silt and clay
16a Deltaic deposits
16b Littoral deposits
16c Foreshore and basinal deposits

15 **Fine-textured marine deposits:** silt and clay, minor sand and gravel

14 **Coarse-textured lacustrine deposits:** sand, gravel, minor silt and clay
14a Deltaic deposit
14b Littoral deposits
14c Foreshore and basinal deposits

13 **Fine-textured lacustrine deposits:** silt and clay, minor sand and gravel

PLEISTOCENE

12 **Older alluvial deposits:** clay, silt, sand, gravel, may contain organic remains

11 **Coarse-textured glaciomarine deposits:** sand, gravel, minor silt and clay
11a Deltaic deposits
11b Littoral deposits
11c Foreshore and basinal deposits

10 **Fine-textured glaciomarine deposits:** silt and clay, minor sand and gravel
10a Massive to well laminated
10b Interbedded silt and clay and gritty, pebbly flow till and rainout deposits

9 **Coarse-textured glaciolacustrine deposits:** sand, gravel, minor silt and clay
9a Deltaic deposits
9b Littoral deposits
9c Foreshore and basinal deposits

8 **Fine-textured glaciolacustrine deposits:** silt and clay, minor sand and gravel
8a Massive to well laminated
8b Interbedded silt and clay and gritty, pebbly flow till and rainout deposits

7 **Glaciofluvial deposits:** river deposits and delta topset facies
7a Sandy deposits
7b Gravelly deposits

6 **Ice-contact stratified deposits:** sand and gravel, minor silt, clay and till
6a In moraines, eskers, kames and crevasse fills
6b In subaquatic fans

5a **Till:** Silty sand to sand-textured till on Precambrian terrain
5a Silty sand to sand-textured till on Precambrian terrain

5b 5b Stone-poor, sandy silt to silty sand-textured till on Paleozoic terrain

5c 5c Stony, sandy silt to silty sand-textured till on Paleozoic terrain

5d 5d Clay to silt-textured till (derived from glaciolacustrine deposits or shale)

5e 5e Undifferentiated older tills, may include stratified deposits

PALEOZOIC

4 **Bedrock-drift complex in Paleozoic terrain:**
4a Primarily till cover
4b Primarily stratified drift cover

3 **Paleozoic bedrock**

PRECAMBRIAN

2 **Bedrock-drift complex in Precambrian terrain:**
2a Primarily till cover
2b Primarily stratified drift cover

1 **Precambrian bedrock**

SYMBOLS

- Clay pit (active or inactive)
- Peat and muck pit
- Location of quarry
- Sand or gravel pit;
- Tailings
- Stoss and lee feature; crag and tail
- Delta, glaciolacustrine
- Drumlin or drumlinoid ridges
- Dune
- Glacial fluting
- Fossil locality
- Geotechnical or stratigraphic borehole not reaching bedrock
- Kame
- Solution weathering feature
- Kettle
- Outcrop
- Observed pebble orientation in till
- Reservoir
- Roches moutonee
- Sample site
- Small landslide scar
- Glacial striae; direction of ice movement known
- Glacial striae; direction of ice movement unknown
- Talus
- Area of sand dune
- Area of former lake bed
- Area of ribbed moraine or till ridges transverse to ice flow
- Area of scabland
- Beach ridges and near shore bars
- Shore bluff or scarp
- Crevasse filling
- Crests of large sand dune (eolian)
- Trend of moraine crest
- Bedrock scarp or escarpment
- Esker; direction of flow known
- Esker; direction of flow unknown
- Meltwater channel; inferred direction of flow
- Meltwater channel; direction of flow unknown
- Iceberg keel mark
- Ice-contact slope
- Clint and gryke topography
- Linear feature observed on aerial photograph
- Crest of megaripple
- Meltwater flow; inferred direction of flow
- Meltwater flow; direction of flow unknown
- Minor moraine
- Mapable edge of quarry or pit
- Bedrock pressure release ridge
- Ribbed or rogen moraine
- Edge of a mapable landslide scar
- Slump block, margin
- Abandoned meltwater channel or river channel; terrace escarpment
- Area of landslide scar
- Area of hummocky topography
- Area of moraine with no hummocky topography

Summary of Background Review Data

Table 2.2: Summary of Existing 407 ETR and Proposed 407 Twy Structures

Location	Existing 407 ETR		
	Diameter (m)	Span x Rise (m)	Span (Bridge) (m)
Rouge			
WC3	2.000	-	-
WC4	-	-	-
WC5	-	-	-
WC11	-	-	-
WC12	-	-	-
POND R-1	2 x (1.000)	-	-
WC13	-	-	192 (Westbound)
WC13	-	-	205 (Eastbound)
POND R-2	3 x (1.000)	-	-
WC15B	-	2 x (3.0 x 1.5)	-
WC15C	-	2 x (3.0 x 1.8)	-
WC16	-	(4.6 x 2.7)	-
WC18	-	-	190 (Westbound)
WC18	-	-	190 (Eastbound)
Petticoat			
WC19	1.000	-	-
WC20	1.650	-	-
WC20A	2 x (2.250)	-	-
WC21	3 x (2.000)	-	-
Duffins			
WC28	-	-	136 (Westbound)
WC28	-	-	136 (Eastbound)
WC29	-	-	42 (Westbound)
WC29	-	-	42 (Eastbound)
WC30	3 x (1.800)	-	-
WC35	2 x (1.500)	-	-
WC36	2 x (1.350)	-	-
WC37	3 x (1.800)	-	-
WC 40	0.750	-	-
WC41	3 x (2.250)	-	-
WC43	3.300	-	
WC 44	-	-	212

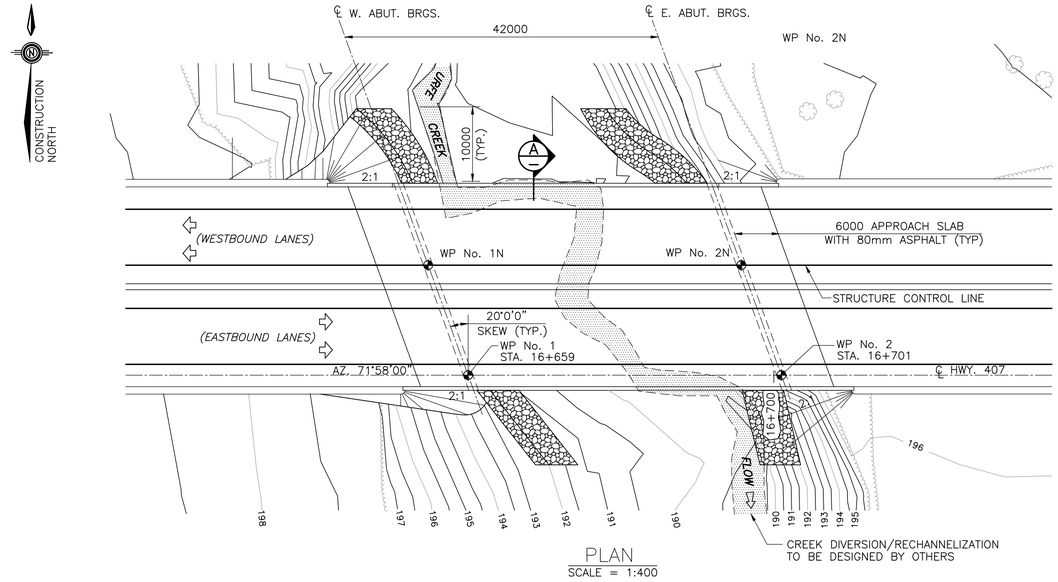
Table 2.3: Existing 407 ETR Structures (Background data)

Creek Name	Dwg No (from 407 ETR)	Crossing Name (from 407 ETR)	WC No (407 TWY Project)	Corresponding Chainage (407 TWY Project)	Existing Structure Span	Existing Structure Height	Deck Elevations (from 407 ETR)		100-yr WL (from 407 ETR)	Regional WL (from 407 ETR)
URFE	1202	EAST AND WEST	45	16+659	42000	4500	197.6	196.5	191.7	GA only states HWL
URFE	1202	EAST AND WEST								
BROUGHAM	1302	EAST AND WEST	48, 49	17+500, 17+700	28000	3200	189.5	188.5	183.8	183.8
BROUGHAM	1302	EAST AND WEST	48, 49	17+500, 17+700						
LITTLE ROUGE	602	EAST	18	29+116.500	189000	11000	202	200.5	182.8	184
LITTLE ROUGE	602	WEST			189000	10500	202.5	201		
DUFFINS CREEK	802	EAST	28	10+971.204	136000	7000	188.5	187	TO BE DETERMINED	TO BE DETERMINED
DUFFINS CREEK	802	WEST		10+964.064	136000	7000	188.5	187	TO BE DETERMINED	TO BE DETERMINED
WEST DUFF TRIB	902	WEST	29	11+172.241	42000	8500	186.9	187	179.7	180.1
WEST DUFF TRIB	902	EAST		11+174.581	42000	8500	186.9	187	179.7	180.1
CPR		EAST	17	28+900	37132	8000	202	202		
CPR		EAST	17	28+900	37132	8000	202	202		

Table 2.4: Existing Ponds from City of Markham - Background Data Collection and Review

POND ID	LOCATION	OUTLET STRUCTURE						Details	Q $_{100\text{-yr uncontrolled}}$ (m^3/s)	DA (ha)	Report/ Table Ref./ Dwg Ref
		Diam (m)	Material	Inv UPS	Inv DS	L (m)	Slope (%)				
37	South of 407, east of Kennedy (North of 14th)	0.6	CONC	182.3	182.09	21	1.00%	Concrete pipe with sharp edge orifice plate	--	14.35	Report - Missing Storm Drainage Areas - Hegerman Estates, Dwg No 201, Jan 1987
45, 46, 49	South of 407, between Kennedy and McCowan (North of 14th)	0.45	CONC				0.50%	Concrete pipe with 90 mm orifice plate	5.8	8.0	SWM Report - Cosburn Patterson Wardman Ltd., Jun 1992 Pond/Drainage Area Drawings - Missing
47, 52, 53	South of 407, between Rouge River and 9th Line (North of 14th)									7	SWM Report - Cosburn Patterson Wardman Ltd., Jan 1994
56	North of 407, east of Markham Rd. (South of Hwy 7)	0.1		160.6			0.8%	Sheet flow from 100 mm orifice plate		9.63	SWM Design Brief - David Schaeffer Engineering Ltd., Oct 1996
60, 61	North of 407, east of Kennedy (South of Hwy 7)										Environmental Master Drainage Plan - Cosburn Patterson Mather Ltd., Apr 1996
80	North of 407, between 9th Line and Reesor Road (Pond "A")	0.6	CONC	184.75	184.60	5.0	1.25%	Pipe leads to twin box culverts 0.6 m pipe has 450 mm orifice plate	8.7	156.96	SWM Design Brief - Greenland Consulting Engineers, Mar 2004
81	North of 407, between 9th Line and Reesor Road (Pond "B")			186.00					11		Stormwater Management Pond "A" Design brief, Lindvest Properties (Cornell) Limited, Town of Markham, Draft Plan 19TM-02001
85	North of 407, west of Reesor Rd.			188.90	187.93			Designed tributary with multilevel weir and 525 mm orifice plate	33.3	187.76	SWM Report - Marshall Macklin Monaghan, Jul 2005 Storm Drainage Areas - Fig 4.2(b)
3	North of 407, east of McCowan (North of 16th Ave)	1.2	CONC	195.20	194.30	41	2.2	Concrete pipe, 179 mm orifice plate (orifice plate invert elev = 196.50 m)		55	SWM Report - Schaeffers Consulting Engineers, Aug 2004

Background Review Drawings



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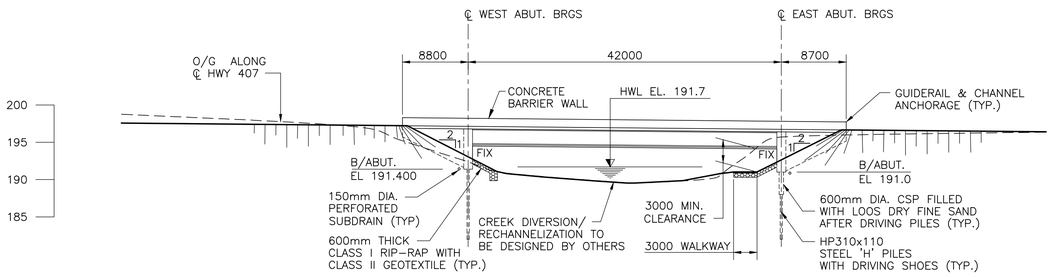

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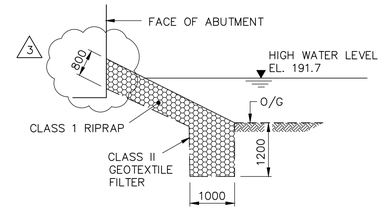
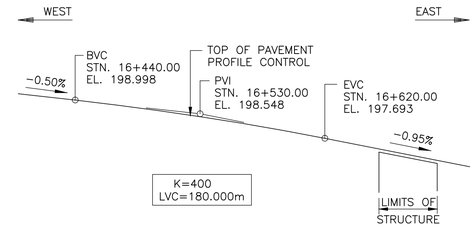
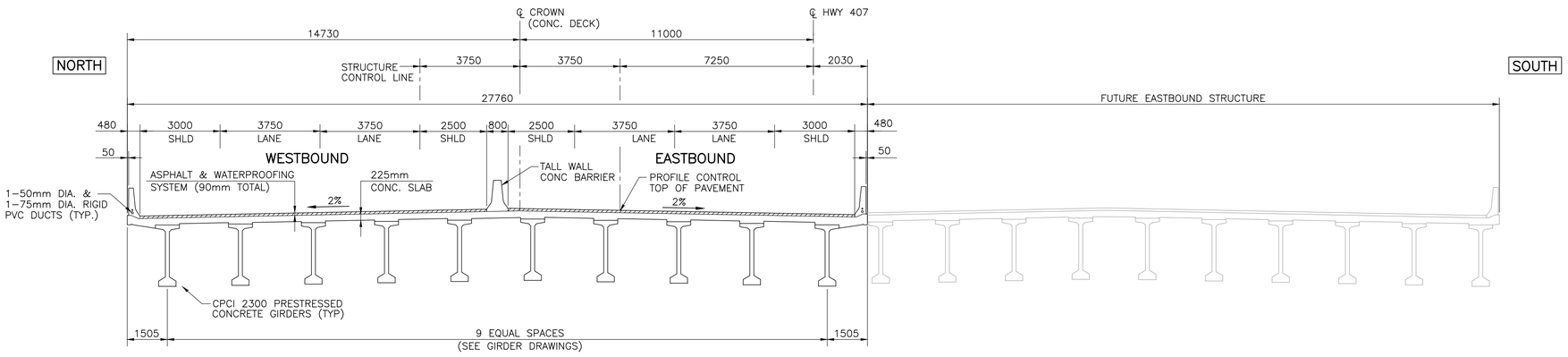


SLOPE PROTECTION
N.T.S.



PROFILE OF HWY 407
N.T.S.



SECTION A
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GENERAL NOTES

1. SPECIFICATIONS:
   - ONTARIO PROVINCIAL STANDARD SPECIFICATIONS
   - ONTARIO HIGHWAY BRIDGE DESIGN CODE, 1991.
2. LIVE LOAD:
   - OHBDC-91 HIGHWAY CLASS 'A'
3. CLASS OF CONCRETE:
   - PRECAST CONCRETE GIRDERS 50 MPa
   - REMAINDER 30 MPa
4. CLEAR COVER TO REINFORCING STEEL:
   - FOOTINGS 100± 25
   - DECK:
     - TOP 70± 20
     - BOTTOM 40± 10
   - REMAINDER: (UNLESS OTHERWISE NOTED) 70± 20
5. REINFORCING STEEL:
   - REINFORCING STEEL SHALL BE GRADE 400 UNLESS OTHERWISE SPECIFIED.
   - BAR MARKS WITH PREFIX 'C' DENOTE COATED BARS.
6. CONTRACTOR SHALL ESTABLISH THE ACTUAL BEARING SEAT ELEVATIONS BY DEDUCTING THE BEARING THICKNESSES FROM THE TOP OF BEARING ELEVATIONS. IF THE ACTUAL BEARING THICKNESSES ARE DIFFERENT FROM THOSE GIVEN BY THE BEARING DESIGN DATA, THE CONTRACTOR SHALL ADJUST THE REINFORCING STEEL.

BENCHMARK DATA				
POINT	BRASS CAP DESCRIPTION	NORTHING	EASTING	ELEVATION
227	107991027	4863536.421	335995.917	199.534
228	107991028	4863692.334	336474.473	193.510

LEGEND

W.P.	DENOTES WORKING POINT
T/P	DENOTES TOP OF PAVEMENT
O/G	DENOTES ORIGINAL GROUND
HWL	DENOTES HIGH WATER LEVEL
F.F	DENOTES FRONT FACE
B.F.	DENOTES BACK FACE

LIST OF DRAWINGS

APPLICABLE STANDARD DRAWINGS

OPSD-3501.00	GRANULAR BACKFILL REQUIREMENTS ABUTMENTS
OPSD-4010.00	GUIDERAIL AND CHANNEL ANCHORAGE

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD DISC.	PROJ. MAN.	SLF DESIGN MAN.	SLF DISC. MAN.
		3	00/07/11	THICKNESS OF RIP RAP REVISED						
		2	00/05/16	GENERAL REVISION						
		1	00/03/16	ISSUED FOR CONSTRUCTION						
		0	00/02/28	ISSUED FOR TENDER						

CONSULTANT				
	DESIGNED	M. ALI		FEB/2000
	DRAWN	D. McDONALD		FEB/2000
	CHECKED	M. ZANGANEH		
	APPROVED LEAD ENG.	M. ALI		
	APPROVED PROJ. MANAGER	S. LIPKUS		
	APPROVED TECHNICAL LEAD	H. JAGASIA		
SLF	REVIEWED			
SCALE	AS SHOWN	NAME (PRINT)	INIT.	DATE

407 ETR Express Toll Route / La route express à péage

SLF Joint Venture

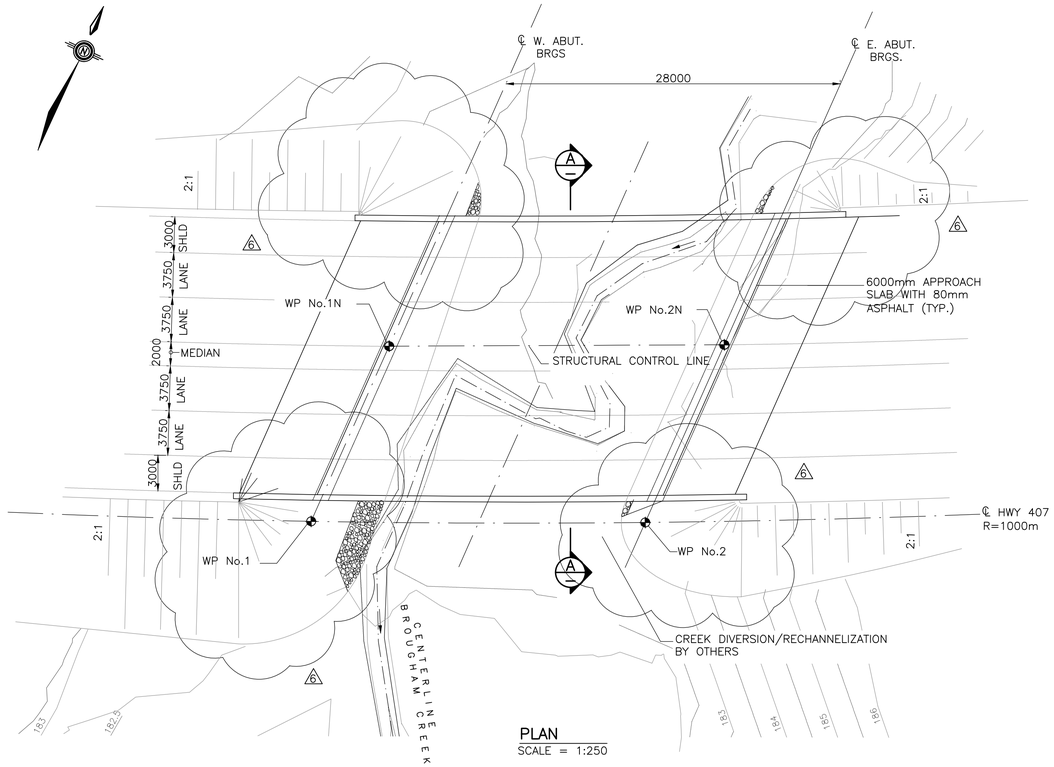
CONSULTANT

UMA Engineering Ltd.
Engineers & Planners
5080 Commerce Blvd.
Mississauga
Ontario, L4W 4P2
Tel. (905) 238-0007
Fax (905) 238-0038

TITLE

HIGHWAY 407 EAST PARTIAL URFE CREEK BRIDGE GENERAL ARRANGEMENT

PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	1ES1	42	DD	1202	3



PLAN
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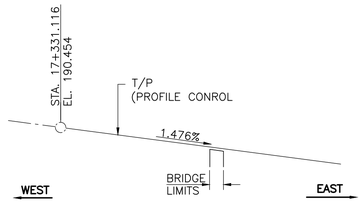
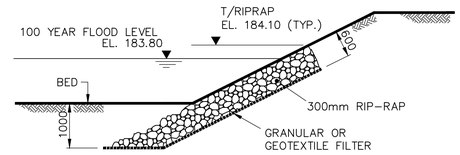
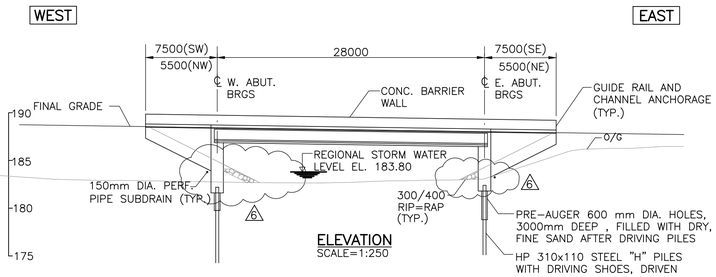
BENCH MARK DATA				
POINT	BRASS CAP DESCRIPTION	NORTHING	EASTING	ELEVATION
228	107991028	4863692.334	336474.473	193.510
229	107991029	4863913.414	336901.946	185.135



PROFILE OF HIGHWAY 407
NOT TO SCALE



SCOUR PROTECTION
N.T.S.



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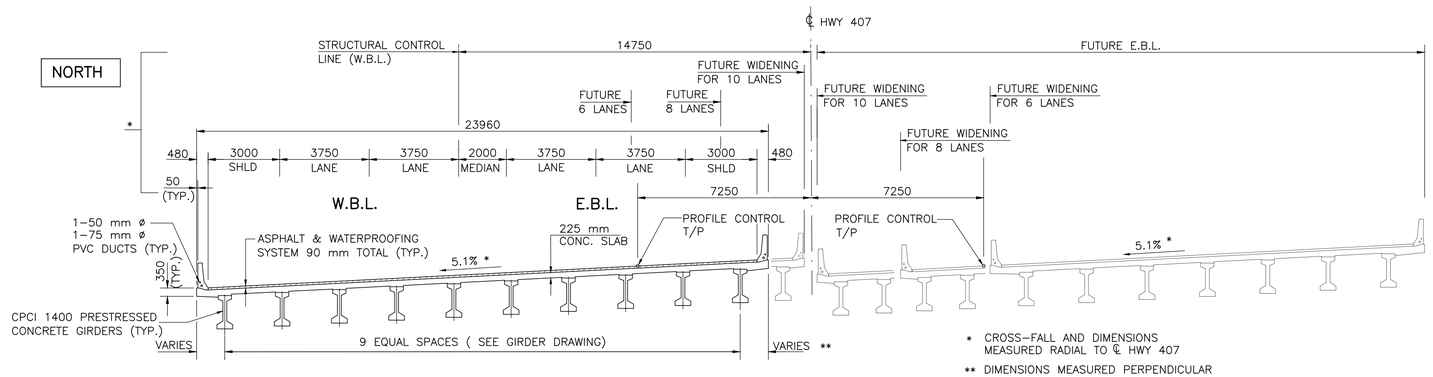


SECTION
SCALE = 1:125 (A)

* CROSS-FALL AND DIMENSIONS MEASURED RADIAL TO ℄ HWY 407

** DIMENSIONS MEASURED PERPENDICULAR TO THE GIRDERS

GENERAL NOTES

1. SPECIFICATIONS:
   - ONTARIO PROVINCIAL STANDARD SPECIFICATIONS
   - ONTARIO HIGHWAY BRIDGE DESIGN CODE, 1991.
2. LIVE LOAD:
   - OHBDC-91 HIGHWAY CLASS 'A'
3. CLASS OF CONCRETE:
   - PRECAST CONCRETE GIRDERS 50 MPa
   - REMAINDER 30 MPa
4. CLEAR COVER TO REINFORCING STEEL:
   - FOOTINGS 100± 25
   - DECK:
     - TOP 70± 20
     - BOTTOM 40± 10
   - REMAINDER: (UNLESS OTHERWISE NOTED) 70± 20
5. REINFORCING STEEL:
   - REINFORCING STEEL SHALL BE GRADE 400 UNLESS OTHERWISE SPECIFIED.
   - BAR MARKS WITH PREFIX 'C' DENOTE COATED BARS.
6. CONTRACTOR SHALL ESTABLISH THE ACTUAL BEARING SEAT ELEVATIONS BY DEDUCTING THE BEARING THICKNESSES FROM THE TOP OF BEARING ELEVATIONS. IF THE ACTUAL BEARING THICKNESSES ARE DIFFERENT FROM THOSE GIVEN BY THE BEARING DESIGN DATA, THE CONTRACTOR SHALL ADJUST THE REINFORCING STEEL.
7. BACKFILL SHALL BE PLACED SIMULTANEOUSLY BEHIND BOTH ABUTMENTS KEEPING THE HEIGHT OF THE BACKFILL APPROXIMATELY THE SAME. AT NO TIME SHALL THE DIFFERENCE IN ELEVATION BE GREATER THAN 500mm.
8. NO BACKFILL SHALL BE PLACED UNTIL DECK CONCRETE HAS REACHED 100% OF ITS SPECIFIED STRENGTH.
9. PROVIDE 20mm CHAMFER AT ALL EXPOSED CONCRETE CORNERS.

LEGEND

W.P.	DENOTES WORKING POINT
T/P	DENOTES TOP OF PAVEMENT
T/F	DENOTES TOP OF FOOTING
O/G	DENOTES ORIGINAL GROUND
W/L	DENOTES WATER LEVEL
I.F	DENOTES INSIDE FACE
O.F	DENOTES OUTSIDE FACE
E.B.L.	DENOTES EAST BOUND LANES
W.B.L.	DENOTES WEST BOUND LANES

LIST OF DRAWINGS

APPLICABLE STANDARD DRAWINGS

OPSD-4010.00	GUIDE RAIL AND CHANNEL ANCHORAGE
OPSD-3501.00	GRANULAR BACKFILL REQUIREMENTS ABUTMENTS

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD DISC.	PROJ. MAN.	SLF DESIGN MAN.	SLF DISC. MAN.
		6	01/07/26	RIP RAP LIMITS REVISED						
		5	01/05/14	GABIONS REMOVED						
		4	00/11/03	BARRIER WALL TRANSITION REVISED						
		3	00/08/11	ABUTMENT HEIGHT REVISED						
		2	00/05/11	HIGHWAY VERTICAL PROFILE REVISED						
		1	00/03/13	ISSUED FOR CONSTRUCTION						
		0	00/02/18	ISSUED FOR TENDER						

LICENCED PROFESSIONAL ENGINEER — M. ZANGANEH — PROVINCE OF ONTARIO

LICENCED PROFESSIONAL ENGINEER — S. E. LIPKUS — PROVINCE OF ONTARIO

CONSULTANT			
	DESIGNED	B.L.LAU/M.Z.	
	DRAWN	STAN BORYS	
	CHECKED	S.B.BISWANGER/S.L.	
	APPROVED LEAD ENG.	MIR ALI	
	APPROVED PROJ. MANAGER	STEPHEN LIPKUS	
	APPROVED TCHNICAL LEAD	HARI JAGASIA	
SLF	REVIEWED		
SCALE	AS SHOWN	NAME (PRINT)	INIT. / DATE

407 ETR — Express Toll Route — La route express à péage

SLF Joint Venture

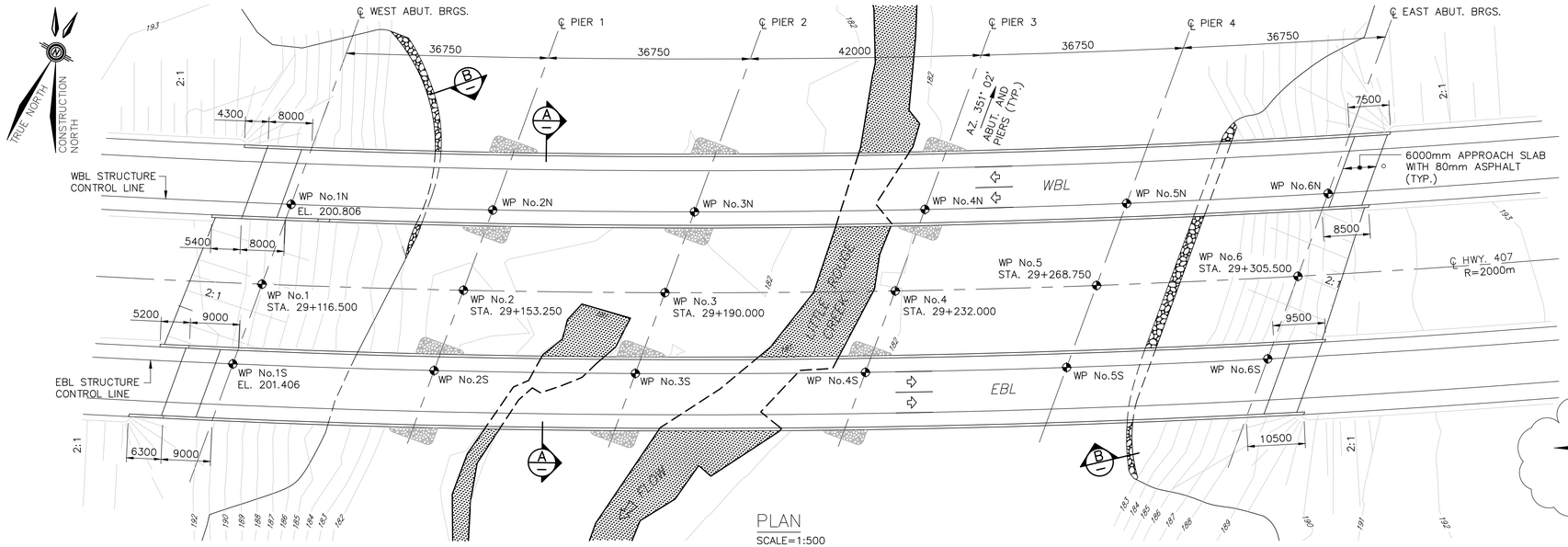
CONSULTANT

UMA Engineering Ltd. — Engineers & Planners
5080 Commerce Blvd. Mississauga Ontario, L4W 4P2
Tel. (905) 238-0007 Fax (905) 238-0038

TITLE

HIGHWAY 407 EAST PARTIAL BROUGHAM CREEK BRIDGE GENERAL ARRANGEMENT

PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	1ES1	42	DD	1302	6



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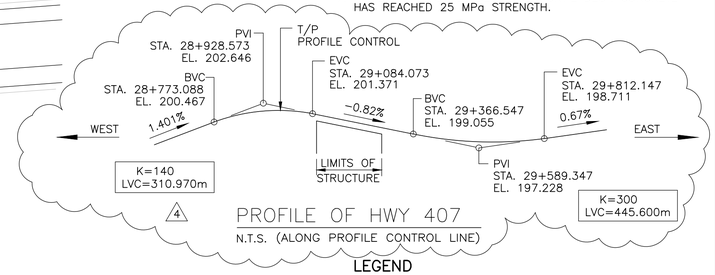
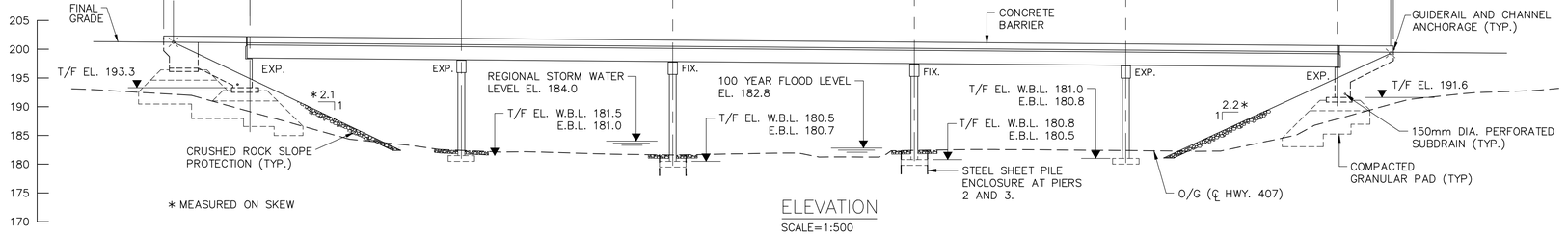


4 PROFILE OF HWY 407
N.T.S. (ALONG PROFILE CONTROL LINE)



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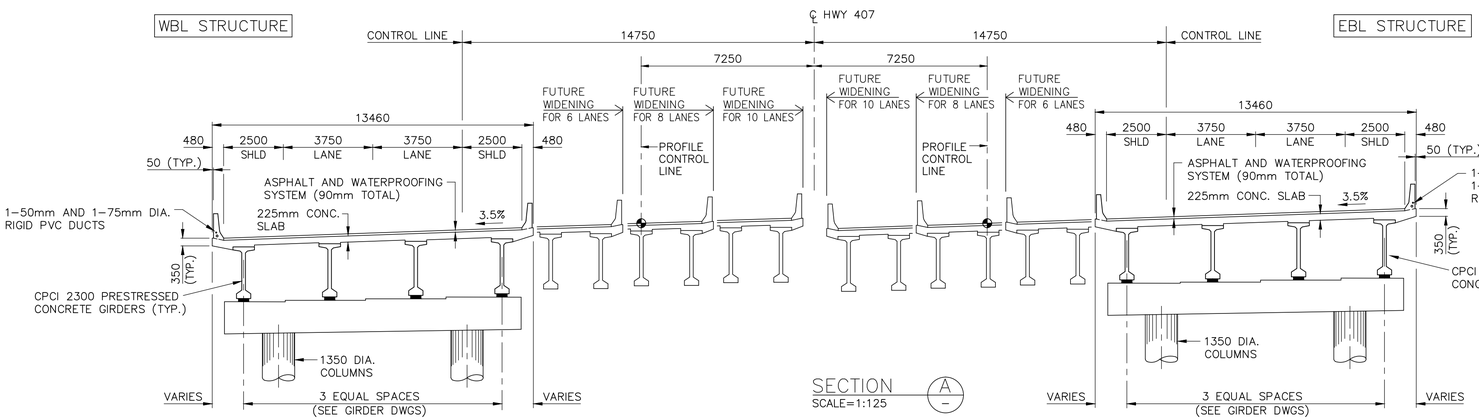

SECTION A
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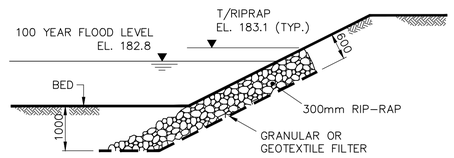


SECTION B
N.T.S.

GENERAL NOTES

1. SPECIFICATIONS:
   - ONTARIO PROVINCIAL STANDARD SPECIFICATIONS
   - ONTARIO HIGHWAY BRIDGE DESIGN CODE, 1991.
2. LIVE LOAD:
   - OHBDC–91 HIGHWAY CLASS 'A'
3. CLASS OF CONCRETE:
   - PRECAST CONCRETE GIRDERS 50/60 MPa
   - REMAINDER 30 MPa
4. CLEAR COVER TO REINFORCING STEEL:
   - FOOTINGS 100± 25
   - DECK: TOP 70± 20
     BOTTOM 40± 10
   - REMAINDER: 70± 20
     (UNLESS OTHERWISE NOTED)
5. REINFORCING STEEL:
   - REINFORCING STEEL SHALL BE GRADE 400 UNLESS OTHERWISE SPECIFIED.
   - BAR MARKS WITH PREFIX 'C' DENOTE COATED BARS.
6. CONTRACTOR SHALL ESTABLISH THE ACTUAL BEARING SEAT ELEVATIONS BY DEDUCTING THE BEARING THICKNESS FROM THE TOP OF BEARING ELEVATIONS. IF THE ACTUAL BEARING THICKNESSES ARE DIFFERENT FROM THOSE GIVEN BY THE DESIGN DATA, THE CONTRACTOR SHALL ADJUST THE REINFORCING STEEL.
7. NO BACKFILL SHALL BE PLACED UNTIL DECK CONCRETE HAS REACHED 25 MPa STRENGTH.

LEGEND

WP	DENOTES WORKING POINT
T/B	DENOTES TOP OF BEARING
T/P	DENOTES TOP OF PAVEMENT
T/F	DENOTES TOP OF FOOTING
O/G	DENOTES ORIGINAL GROUND
I.F	DENOTES INSIDE FACE
O.F	DENOTES OUTSIDE FACE

LIST OF DRAWINGS

APPLICABLE STANDARD DRAWINGS

OPSD–3501.00	GRANULAR BACKFILL REQUIREMENTS ABUTMENTS
OPSD–4010.00	GUIDERAIL AND CHANNEL ANCHORAGE

HORIZONTAL AND VERTICAL CONTROL MONUMENTS

POINT	BRASS CAP DESCRIPTION	NORTHING	EASTING	ELEVATION
210	107991010	4859544.251	328623.334	193.625
211	107991011	4859794.380	329054.233	194.002

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD DISC.	PROJ. MAN.	SLF DESIGN MAN.	SLF DISC. MAN.
		4	00/11/03	HWY 407 PROFILE REVISED						
		3	00/09/07	SCOUR PROTECTION MODIFIED						
		2	00/04/28	EAST ABUTMENT FOOTING ELEVATION REVISION						
		1	00/01/21	ISSUED FOR CONSTRUCTION						
		0	00/01/17	ISSUED FOR TENDER						

CONSULTANT	DESIGNED	DALE SERINK	99/11/19
	DRAWN	COLIN MADDEN	99/11/19
	CHECKED	M. ALI	
	APPROVED LEAD ENG.	M. ALI	
	APPROVED PROJ. MANAGER	STEPHEN LIPKUS	
	APPROVED TECH. LEAD	HARI JAGASIA	
SLF	REVIEWED		
SCALE	AS SHOWN	NAME (PRINT)	INIT. DATE

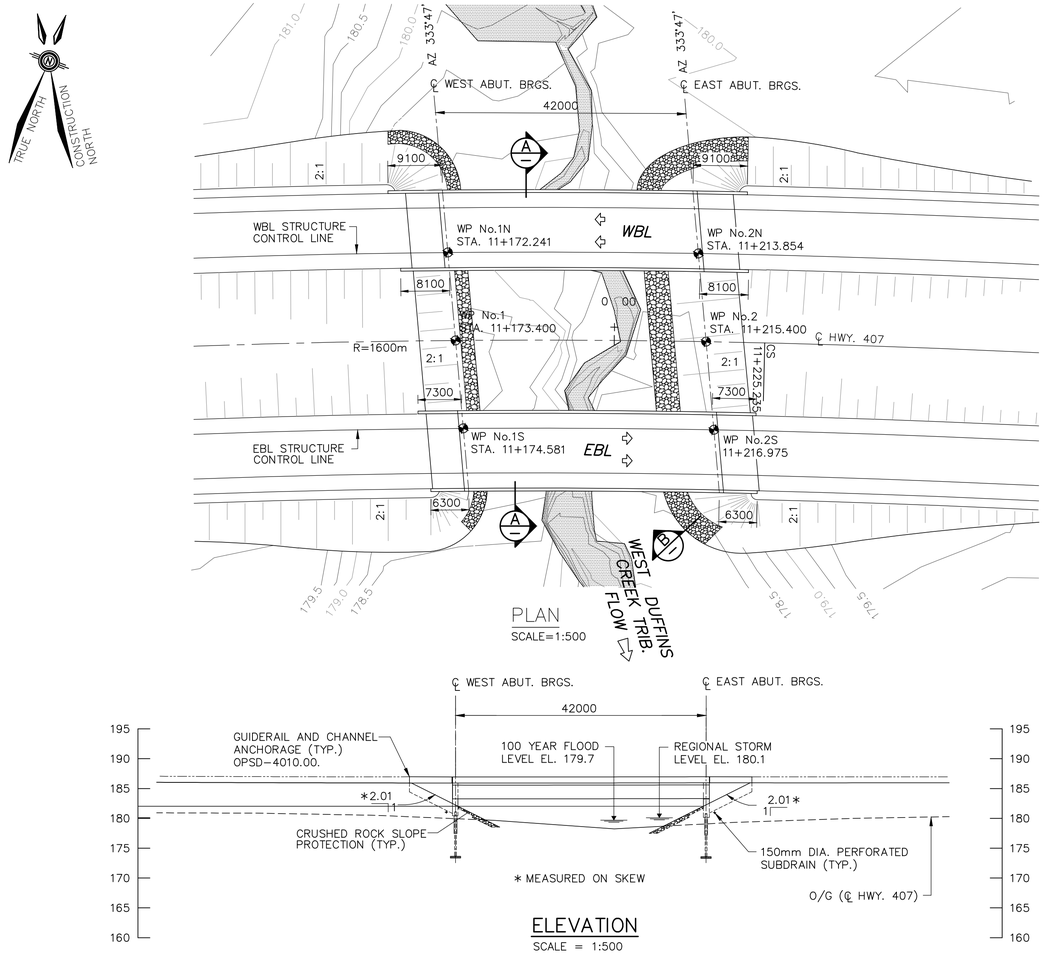
407 ETR Express Toll Route / La route express à péage

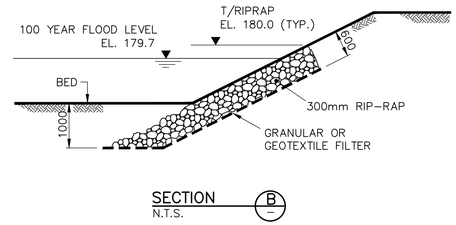
SLF Joint Venture

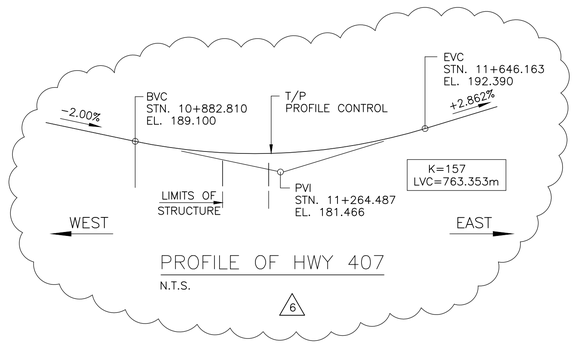
CONSULTANT
UMA Engineering Ltd.
Engineers & Planners
5080 Commerce Blvd.
Mississauga
Ontario, L4W 4P2
Tel. (905) 238–0007
Fax (905) 238–0038

TITLE
HIGHWAY 407 EAST PARTIAL LITTLE ROUGE CREEK BRIDGE GENERAL ARRANGEMENT

PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	1ES1	42	DD	602	4







GENERAL NOTES

1. SPECIFICATIONS:
   - ONTARIO PROVINCIAL STANDARD SPECIFICATIONS
   - ONTARIO HIGHWAY BRIDGE DESIGN CODE, 1991.
2. LIVE LOAD:
   - OHBDC-91 HIGHWAY CLASS 'A'
3. CLASS OF CONCRETE:
   - PRECAST CONCRETE GIRDERS 50 MPa
   - REMAINDER 30 MPa
4. CLEAR COVER TO REINFORCING STEEL:
   - FOOTINGS 100± 25
   - DECK:
     - TOP 70± 20
     - BOTTOM 40± 10
   - REMAINDER: (UNLESS OTHERWISE NOTED) 70± 20
5. REINFORCING STEEL:
   - REINFORCING STEEL SHALL BE GRADE 400 UNLESS OTHERWISE SPECIFIED.
   - BAR MARKS WITH PREFIX 'C' DENOTE COATED BARS.
6. CONTRACTOR SHALL ESTABLISH THE ACTUAL BEARING SEAT ELEVATIONS BY DEDUCTING THE BEARING THICKNESSES FROM THE TOP OF BEARING ELEVATIONS. IF THE ACTUAL BEARING THICKNESSES ARE DIFFERENT FROM THOSE GIVEN BY THE BEARING DESIGN DATA, THE CONTRACTOR SHALL ADJUST THE REINFORCING STEEL.
7. NO BACKFILL SHALL BE PLACED UNTIL DECK CONCRETE HAS REACHED 25 MPa STRENGTH.
8. BACKFILL SHALL BE PLACED SIMULTANEOUSLY BEHIND BOTH ABUTMENTS KEEPING THE HEIGHT OF THE BACKFILL APPROXIMATELY THE SAME. AT NO TIME SHALL THE DIFFERENCE IN ELEVATION BE GREATER THAN 0.5 m.

HORIZONTAL AND VERTICAL CONTROL MONUMENTS

POINT	BRASS CAP DESCRIPTION	NORTHING	EASTING	ELEVATION
215	107991015	4861456.802	330381.863	194.735
216	107991016	4861777.652	330780.564	180.939

LEGEND

WP	DENOTES WORKING POINT
T/B	DENOTES TOP OF BEARING
T/P	DENOTES TOP OF PAVEMENT
T/F	DENOTES TOP OF FOOTING
O/G	DENOTES ORIGINAL GROUND
W/L	DENOTES WATER LEVEL
I.F.	DENOTES INSIDE FACE
O.F.	DENOTES OUTSIDE FACE
C.J.	DENOTES CONSTRUCTION JOINT
EBL	DENOTES EAST BOUND LANE
WBL	DENOTES WEST BOUND LANE

LIST OF DRAWINGS

APPLICABLE STANDARD DRAWINGS

OPSD-3501.00	GRANULAR BACKFILL REQUIREMENTS ABUTMENTS
OPSD-4010.00	GUIDERAIL AND CHANNEL ANCHORAGE

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD DISC.	PROJ. MAN.	SLF DESIGN MAN.	SLF DISC. MAN.
		6	00/11/08	PROFILE REVISED						
		5	00/10/19	SCOUR PROTECTION REVISED						
		4	00/08/25	WATER ELEVATION REVISED						
		3	00/08/23	GEOMETRY REVISED						
		2	00/07/11	RADIUS LOCATION REVISED						
		1	00/02/18	ISSUED FOR CONSTRUCTION						
		0	00/02/15	ISSUED FOR TENDER						

CONSULTANT	DESIGNED	D. SERINK	
	DRAWN	T. WHITFIELD	
	CHECKED	D. OLIVER	
	APPROVED LEAD ENG.	A. WASHUTA	
	APPROVED PROJ. MANAGER	S. LIPKUS	
	APPROVED TECHNICAL LEAD	H. JAGASIA	
SLF	REVIEWED		
SCALE	AS SHOWN	NAME (PRINT)	INIT. / DATE

407 ETR Express Toll Route / La route express à péage

SLF Joint Venture

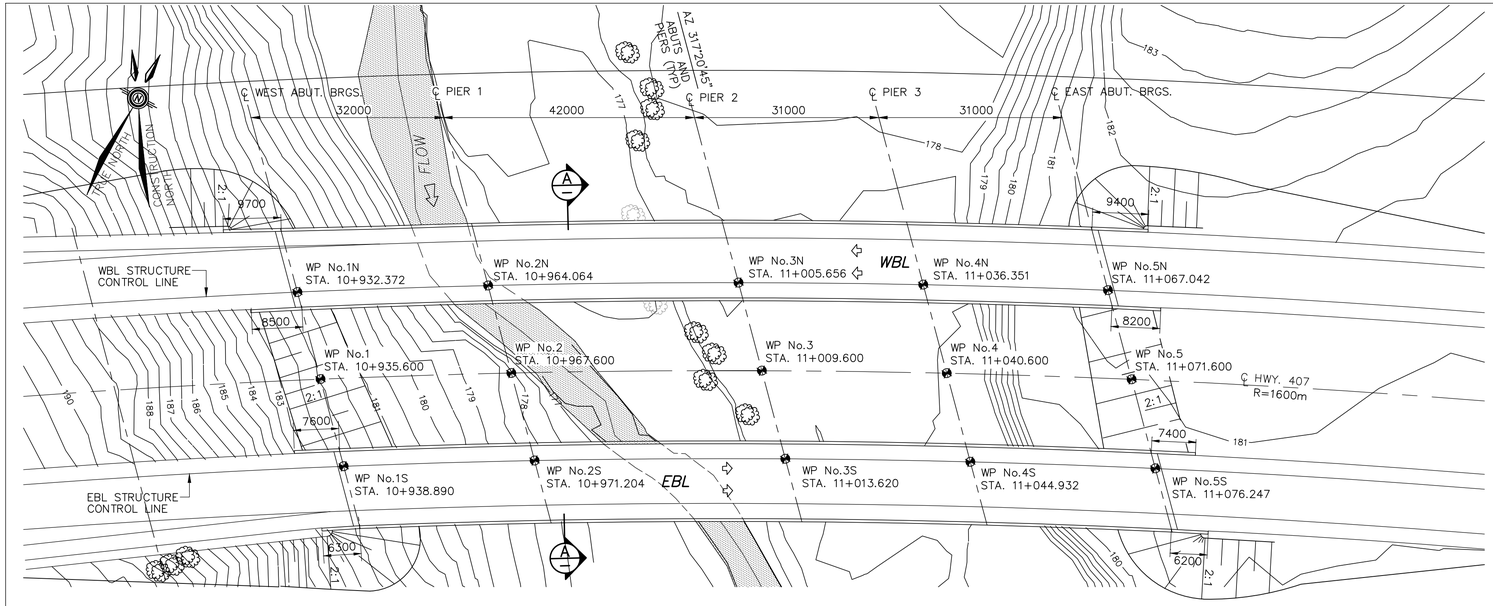
CONSULTANT

UMA Engineering Ltd.
Engineers & Planners
5080 Commerce Blvd.
Mississauga
Ontario, L4W 4P2
Tel. (905) 238-0007
Fax (905) 238-0038

TITLE

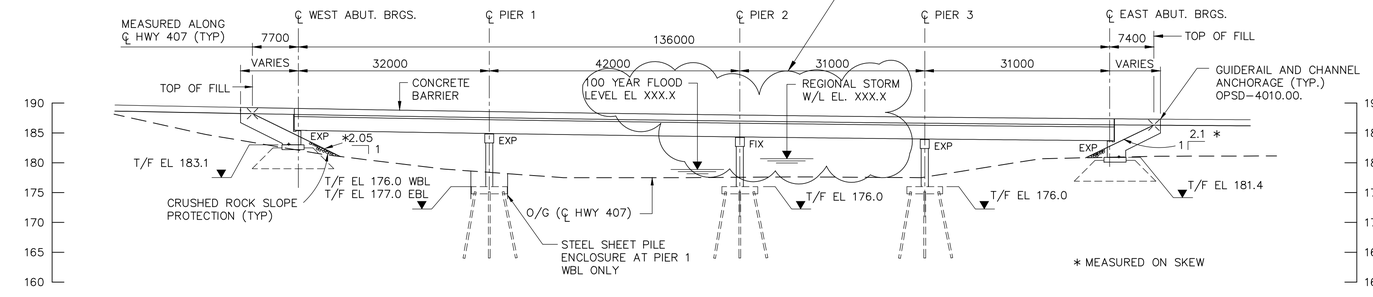
HIGHWAY 407 EAST PARTIAL
WEST DUFFINS CREEK TRIBUTARY BRIDGE
GENERAL ARRANGEMENT

PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	1ES1	42	DD	902	6



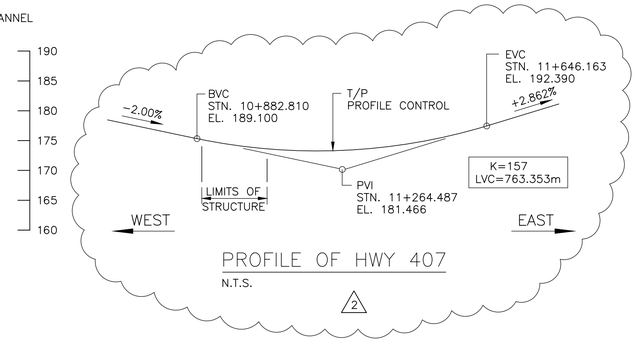
PLAN
SCALE=1:500

TO BE DETERMINED



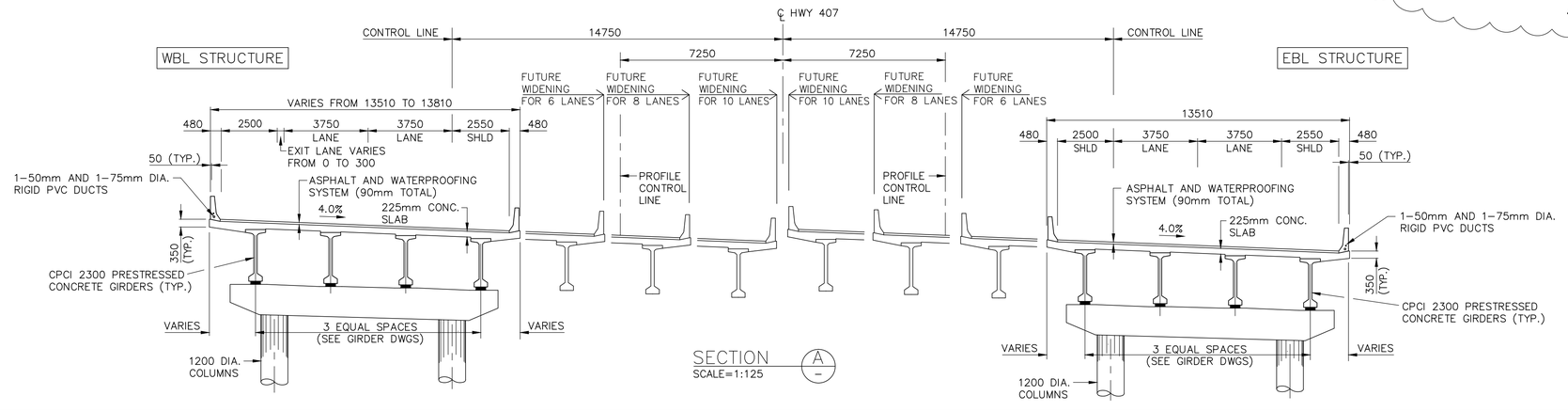
* MEASURED ON SKEW

ELEVATION
SCALE=1:500



PROFILE OF HWY 407
N.T.S.

2



SECTION
SCALE=1:125

A

GENERAL NOTES

1. SPECIFICATIONS:
   - ONTARIO PROVINCIAL STANDARD SPECIFICATIONS
   - ONTARIO HIGHWAY BRIDGE DESIGN CODE, 1991.
2. LIVE LOAD:
   - OHBDC-91 HIGHWAY CLASS 'A'
3. CLASS OF CONCRETE:
   - PRECAST CONCRETE GIRDERS 50/60 MPa
   - REMAINDER 30 MPa
4. CLEAR COVER TO REINFORCING STEEL:
   - FOOTINGS 100± 25
   - DECK: TOP 70± 20
     BOTTOM 40± 10
   - REMAINDER: 70± 20
     (UNLESS OTHERWISE NOTED)
5. REINFORCING STEEL:
   - REINFORCING STEEL SHALL BE GRADE 400 UNLESS OTHERWISE SPECIFIED.
   - BAR MARKS WITH PREFIX 'C' DENOTE COATED BARS.
6. CONTRACTOR SHALL ESTABLISH THE ACTUAL BEARING SEAT ELEVATIONS BY DEDUCTING THE BEARING THICKNESS FROM THE TOP OF BEARING ELEVATIONS. IF THE ACTUAL BEARING THICKNESSES ARE DIFFERENT FROM THOSE GIVEN BY THE DESIGN DATA, THE CONTRACTOR SHALL ADJUST THE REINFORCING STEEL.
7. NO BACKFILL SHALL BE PLACED UNTIL DECK CONCRETE HAS REACHED 25 MPa STRENGTH.
8. STATIONING SHOWN IS BASED ON CENTRELINE CHAINAGE.

HORIZONTAL AND VERTICAL CONTROL MONUMENTS				
POINT	BRASS CAP DESCRIPTION	NORTHING	EASTING	ELEVATION
215	107991015	4861456.802	330381.863	194.735
216	107991016	4861777.652	330780.564	180.939

LEGEND

WP	DENOTES WORKING POINT
T/B	DENOTES TOP OF BEARING
T/P	DENOTES TOP OF PAVEMENT
T/F	DENOTES TOP OF FOOTING
O/G	DENOTES ORIGINAL GROUND
W/L	DENOTES WATER LEVEL
I.F.	DENOTES INSIDE FACE
O.F.	DENOTES OUTSIDE FACE
C.J.	DENOTES CONSTRUCTION JOINT
EBL	DENOTES EAST BOUND LANE
WBL	DENOTES WEST BOUND LANE

LIST OF DRAWINGS

APPLICABLE STANDARD DRAWINGS

OPSD-3501.00	GRANULAR BACKFILL REQUIREMENTS ABUTMENTS
OPSD-4010.00	GUIDERAIL AND CHANNEL ANCHORAGE

NO.	DATE	REVISIONS	BY	CHK	LEAD DISC.	PROJ. MAN.	SLF DESIGN MAN.	SLF DISC. MAN.
2	03/11/00	HWY 407 PROFILE REVISED						
1	05/04/00	ISSUED FOR CONSTRUCTION						
0	11/02/00	ISSUED FOR TENDER						

DWG. NO. | REFERENCES

CONSULTANT	DESIGNED	DALE SERINK	APR.2000
	DRAWN	TIM WHITFIELD	APR.04.2000
	CHECKED	M. ZANGANEH	APR.04.2000
	APPROVED LEAD ENG.	M. ALI	
	APPROVED PROJ. MANAGER	S. LIPKUS	
	APPROVED TECH. LEAD	H. JAGASIA	
SLF	REVIEWED		
SCALE	AS SHOWN	NAME (PRINT)	INIT. / DATE

407 ETR Express Toll Route / La route express à péage

SLF Joint Venture

CONSULTANT

UMA Engineering Ltd.
Engineers & Planners
5080 Commerce Blvd.
Mississauga
Ontario, L4W 4P2
Tel. (905) 238-0007
Fax (905) 238-0038

TITLE

HIGHWAY 407 EAST PARTIAL WEST DUFFINS CREEK BRIDGE GENERAL ARRANGEMENT

PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	1ES1	42	DD	802	2

THE REGIONAL MUNICIPALITY OF YORK

KEY PLAN

CANADIAN HIGHWAYS INTERNATIONAL CONSTRUCTORS

CONSTRUCTION
DETENTION POND R-4

ONTARIO TRANSPORTATION CAPITAL CORP.

DRAWING NUMBER					REV. NO.
9401	17	570	22	0224	0000

totten sims hubicki associates
ENGINEERS ARCHITECTS AND PLANNERS

SHT. NO. 203

METRIC

RECORD DWG.

NOTES :
1. ALL BUILDINGS WITHIN THE HWY. 407 R.O.W. TO BE REMOVED BY O.R.C.

ISSUED FOR CONSTRUCTION

SCALE 5 m 0 10 m

D. R. WOODS
REGISTERED PROFESSIONAL ENGINEER
PROVINCE OF ONTARIO
MAY 97

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THE REGIONAL MUNICIPALITY OF YORK

KEY PLAN

CANADIAN HIGHWAYS INTERNATIONAL CONSTRUCTORS

CONSTRUCTION
DETENTION POND R-5

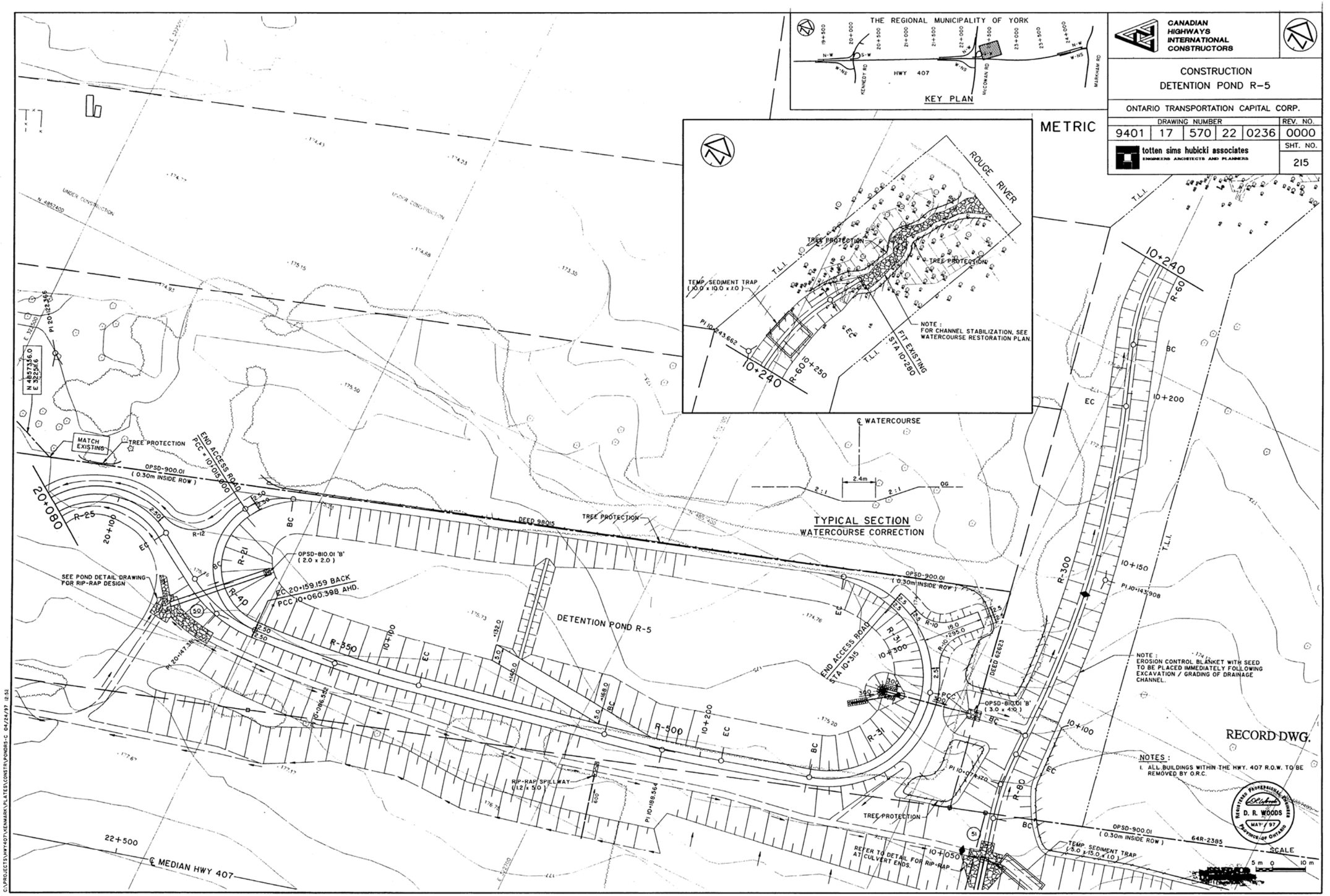
ONTARIO TRANSPORTATION CAPITAL CORP.

DRAWING NUMBER					REV. NO.
9401	17	570	22	0236	0000

SHT. NO. 215

totten sims hubicki associates
ENGINEERS ARCHITECTS AND PLANNERS

METRIC



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THE REGIONAL MUNICIPALITY OF YORK

KEY PLAN

CANADIAN HIGHWAYS INTERNATIONAL CONSTRUCTORS

CONSTRUCTION
STA 23+050 TO STA 23+400

ONTARIO TRANSPORTATION CAPITAL CORP.

DRAWING NUMBER					REV. NO.
9401	17	570	22	0239	00

totten sims hubicki associates
ENGINEERS ARCHITECTS AND PLANNERS

SHT. NO. 218

METRIC

RECORD DWG.

NOTES :
1. ALL BUILDINGS WITHIN THE HWY. 407 R.O.W. TO BE REMOVED BY O.R.C.

SCALE 5 m 0 10 m

ISSUED FOR CONSTRUCTION

ISSUED FOR CONSTRUCTION

D. R. WOODS MAY / 97

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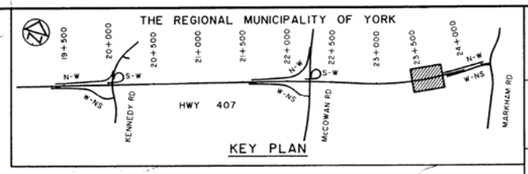
THE REGIONAL MUNICIPALITY OF YORK



KEY PLAN

CANADIAN HIGHWAYS INTERNATIONAL CONSTRUCTORS

CONSTRUCTION
STA 23+400 TO STA 23+750

ONTARIO TRANSPORTATION CAPITAL CORP.

DRAWING NUMBER					REV. NO.
9401	17	570	22	0240	00

totten sims hubicki associates
ENGINEERS ARCHITECTS AND PLANNERS

SHT. NO. 219

METRIC

N 4857617.3
E 323446.5

OPSD-900.01

REFER TO DETAIL FOR RIP-RAP AT CULVERT ENDS

N 4857604.3
E 323496.0

R-2924

N 4857696.5
E 323668.5

SEE POND DETAIL DRAWING FOR RIP-RAP DESIGN

DETENTION POND R-6

OPSD-810.01 'B' (2.0 x 2.0)

RIP-RAP SPILLWAY (12 x 10.0)

RIP-RAP SPILLWAY (12 x 11.0)

HOC 23+460.000 HWY 407, 23+250 LT
HOT 10+199.617 R-6 ACCESS ROAD

OPSD-917.01 'A'
OPSD-951.01
OPSD-951.20

23+400
23+500
23+600
23+700
23+750

OPSD-810.02 'B'

393
394

℄ WBL
℄ MEDIAN HWY 407
℄ EBL

10+000
10+100

R-3076

N 4857565.0
E 323744.6

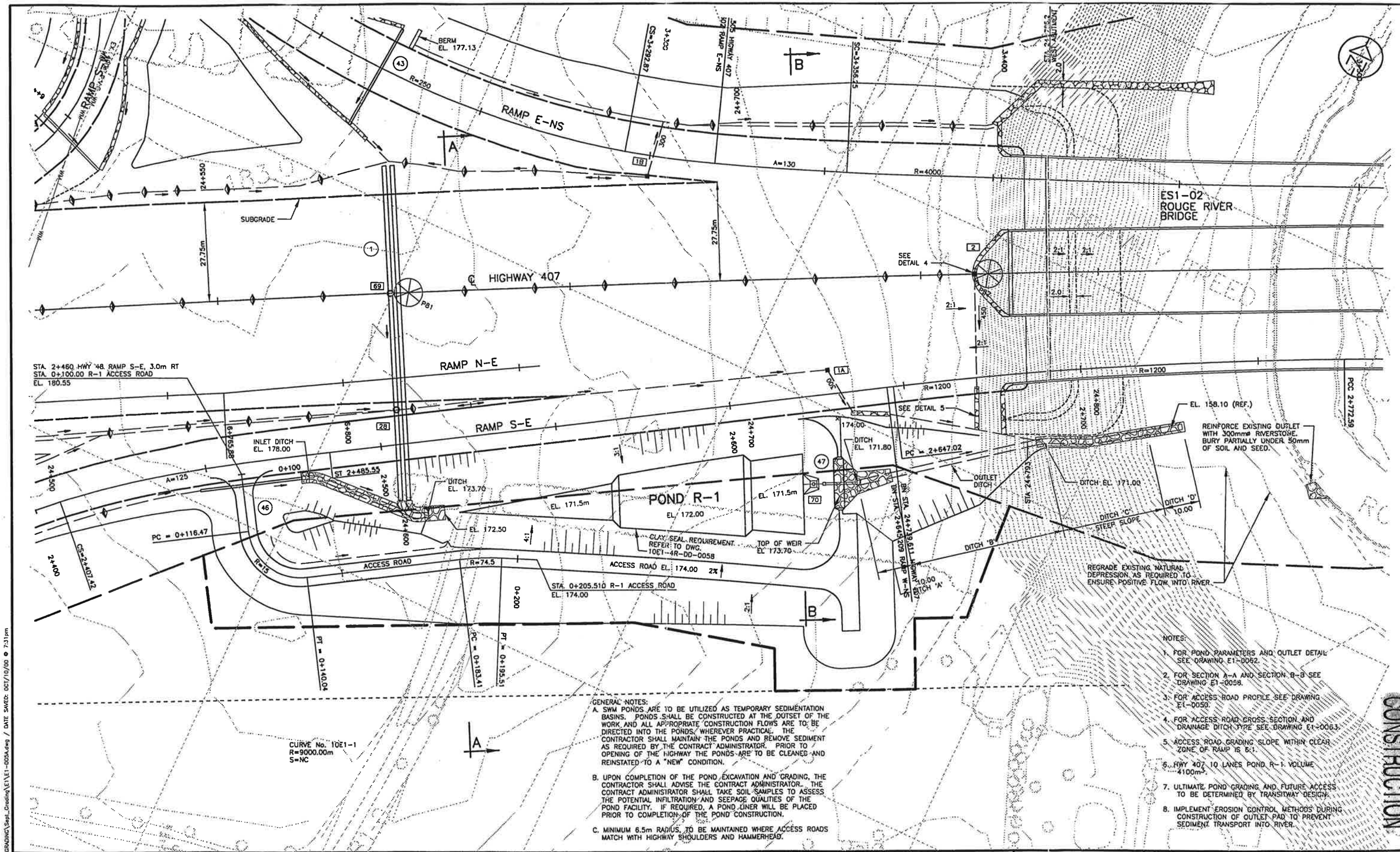
RECORD DWG.

NOTES:
1. ALL BUILDINGS WITHIN THE HWY. 407 R.O.W. TO BE REMOVED BY O.R.C.

REGISTERED PROFESSIONAL ENGINEER
D. R. WOODS
MAY 7/97
PROVINCE OF ONTARIO

SCALE
5 m 0 10 m

C:\PROJECTS\HWY407\KENMARK\PLATES\CONSTR\C2375O-C 04/24/97 14:00



GENERAL NOTES:

A. SWM PONDS ARE TO BE UTILIZED AS TEMPORARY SEDIMENTATION BASINS. PONDS SHALL BE CONSTRUCTED AT THE OUTSET OF THE WORK AND ALL APPROPRIATE CONSTRUCTION FLOWS ARE TO BE DIRECTED INTO THE PONDS WHEREVER PRACTICAL. THE CONTRACTOR SHALL MAINTAIN THE PONDS AND REMOVE SEDIMENT AS REQUIRED BY THE CONTRACT ADMINISTRATOR. PRIOR TO OPENING OF THE HIGHWAY THE PONDS ARE TO BE CLEANED AND REINSTATED TO A "NEW" CONDITION.

B. UPON COMPLETION OF THE POND EXCAVATION AND GRADING, THE CONTRACTOR SHALL ADVISE THE CONTRACT ADMINISTRATOR. THE CONTRACT ADMINISTRATOR SHALL TAKE SOIL SAMPLES TO ASSESS THE POTENTIAL INFILTRATION AND SEEPAGE QUALITIES OF THE POND FACILITY. IF REQUIRED, A POND LINER WILL BE PLACED PRIOR TO COMPLETION OF THE POND CONSTRUCTION.

C. MINIMUM 6.5m RADIUS TO BE MAINTAINED WHERE ACCESS ROADS MATCH WITH HIGHWAY SHOULDERS AND HAMMERHEAD.

NOTES:

1. FOR POND PARAMETERS AND OUTLET DETAIL SEE DRAWING E1-0052.
2. FOR SECTION A-A AND SECTION B-B SEE DRAWING E1-0058.
3. FOR ACCESS ROAD PROFILE SEE DRAWING E1-0050.
4. FOR ACCESS ROAD CROSS SECTION AND DRAINAGE DITCH TYPE SEE DRAWING E1-0063.
5. ACCESS ROAD GRADING SLOPE WITHIN CLEAR ZONE OF RAMP IS 6:1.
6. HWY 407 10 LANES POND R-1 VOLUME 4100m³.
7. ULTIMATE POND GRADING AND FUTURE ACCESS TO BE DETERMINED BY TRANSITWAY DESIGN.
8. IMPLEMENT EROSION CONTROL METHODS DURING CONSTRUCTION OF OUTLET PAD TO PREVENT SEDIMENT TRANSPORT INTO RIVER.

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD DISC.	PROJ. MAN.	DESIGN MGR.	SLF DISC. MGR.
		3	09/25/00	REVISED AS PER SLF FIELD INPUT / IA COMMENTS	KC	AS	AA	CG		
		2	05/26/00	MISCELLANEOUS REVISIONS / IA COMMENTS	KC	AS	AA	CG		
		1	04/07/00	ISSUED FOR CONSTRUCTION	CH	AS	AA	CG		
		0	03/24/00	FOR INFORMATION ONLY	CH	AS	AA	CG		

SCALE : 5m 0 10m HORIZONTAL

L. C. ADHIKARY 100147 PROVINCE OF ONTARIO

CONSULTANT				
DESIGNED	A. SZALAMIN	AS	03/01/00
DRAWN	C. HOPKINS	CBH	03/02/00
CHECKED	A. ADHIKARY	AA	03/03/00
APPROVED LEAD DISC.	A. ADHIKARY	AA	03/06/00
APPROVED PROJ. MANAGER	C. GAUER	CBG	03/07/00
SLF REVIEWED			
SCALE	NAME (PRINT)	INIT.	DATE

407 ETR Express Toll Route / La route express à péage

SLF Joint Venture

CONSULTANT: Marshall Macklin Monaghan — CONSULTING ENGINEERS • SURVEYORS • PLANNERS

TITLE

HIGHWAY 407 EAST PARTIAL STORMWATER MANAGEMENT POND POND R-1 PLAN

PROJECT NO.		SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
3	30	10E1	4R	DD	005A	3

Format "A1" Sheet Size

5922

R:\407PROJECT\SUBMISSION\HWY_GRADING\Sept_Grading\E1\E1-005A.dwg / DATE SAVED: OCT/10/00 @ 7:31pm

GENERAL NOTES:

A. SWM PONDS ARE TO BE UTILIZED AS TEMPORARY SEDIMENTATION BASINS. PONDS SHALL BE CONSTRUCTED AT THE OUTSET OF THE WORK AND ALL APPROPRIATE CONSTRUCTION FLOWS ARE TO BE DIRECTED INTO THE PONDS, WHEREVER PRACTICAL. THE CONTRACTOR SHALL MAINTAIN THE PONDS AND REMOVE SEDIMENT AS REQUIRED BY THE CONTRACT ADMINISTRATOR. PRIOR TO OPENING OF THE HIGHWAY THE PONDS ARE TO BE CLEANED AND REINSTATED TO A 'NEW' CONDITION.

B. UPON COMPLETION OF THE POND EXCAVATION AND GRADING, THE CONTRACTOR SHALL ADVISE THE CONTRACT ADMINISTRATOR. THE CONTRACT ADMINISTRATOR SHALL TAKE SOIL SAMPLES TO ASSESS THE POTENTIAL INFILTRATION AND SEEPAGE QUALITIES OF THE POND FACILITY. IF REQUIRED, A POND LINER WILL BE PLACED PRIOR TO COMPLETION OF THE POND CONSTRUCTION.

C. MINIMUM 6.5m RADIUS, TO BE MAINTAINED WHERE ACCESS ROADS MATCH WITH HIGHWAY SHOULDERS AND HAMMERHEAD.

NOTES:

1. FOR POND PARAMETERS AND OUTLET DETAIL SEE DRAWING E1-0057.
2. FOR SECTION C-C SEE DRAWING E1-0058.
3. FOR ACCESS ROAD PROFILE SEE DRAWING E1-0056.
4. FOR ACCESS ROAD CROSS SECTION AND DRAINAGE DITCH TYPE SEE DRAWING E1-0063.
5. ACCESS ROAD GRADING SLOPE WITHIN CLEAR ZONE OF HWY 407 IS 6:1.
6. HWY 407 10 LANES POND R-2 VOLUME = 9750m³.

ROUGE RIVER

0+000 0+100 0+200

SA

C

TOP OF POND GRADING (ULTIMATE)

MATCH EXISTING GROUND

PC = 0+182.083

2:1

SANITARY TRUNK SEWER

2%

4:1

ACCESS ROAD EL. 165.80

R=1197m

PT = 0+293.766

POND R-2

EL. 164.00

EL. 163.50

EL. 163.50

72

TOP OF BERM EL. 166.70

SEE DETAIL 5

25+355.2

4:1

DITCH EL. 165.50

BERM EL. 166.10

BERM EL. 166.10

49

STA. 0+234.66 R-2 ACCESS ROAD EL. 165.80

PI = 0+313.632

25+240.6

SUBGRADE

SEE DETAIL 5

SEE DETAIL 5

48

27.75m

450 450 450

27.75m

0+200

STA. 25+487 HWY 407, 28.75 LT
STA. 0+200.00 R-2 ACCESS ROAD
EL. 167.85

4 5 6

SEE DETAIL 4 (NOTE 1)

SEE DETAIL 4 (NOTE 1)

SEE DETAIL 4 (NOTE 1)

℄ HIGHWAY 407 MEDIAN

2

27.75m

27.75m

25+200

25+289.8

25+300

SUBGRADE

CURVE No. 10E1-1
R=9000.00m
S=NC

25+400

C

25+515

CONSTRUCTION

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD DISC.	PROJ. MGR.	DESIGN MGR.	DISC. MGR.
		2	05/26/00	MISCELLANEOUS REVISIONS / IA COMMENTS	KC	AS	AA	CG		
		1	04/07/00	ISSUED FOR CONSTRUCTION	CH	AS	AA	CG		
		0	03/24/00	FOR INFORMATION ONLY	CH	AS	AA	CG		

SCALE :
5m 0 10m
HORIZONTAL

LICENCED PROFESSIONAL ENGINEER
A. C. ADHIKARY
PROVINCE OF ONTARIO

DESIGNED	A. SZALAMIN	AS	03/01/00
DRAWN	C. HOPKINS	CBH	03/02/00
CHECKED	A. ADHIKARY	AA	03/03/00
APPROVED LEAD DISC.	A. ADHIKARY	AA	03/08/00
APPROVED PROJ. MANAGER	C. GAUER	CBG	03/07/00
REVIEWED			
SCALE	NAME (PRINT)	INT.	DATE

CONSULTANT

407 ETR Express Toll Route / La route express à péage

SLF Joint Venture

Marshall Macklin Monaghan
CONSULTING ENGINEERS • SURVEYORS • PLANNERS

TITLE

HIGHWAY 407 EAST PARTIAL STORMWATER MANAGEMENT POND POND R-2 PLAN

PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	10E1	4R	DD	007A	2

Format 'A1' Sheet Size

W93.0

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POND R-3a
EL. 179.50
EL. 180.10
INLET EL. 180.00
EL. 179.00
INLET EL. 181.70
TOP OF BENCH/BERM EL. 182.00 (TYP.)
EXISTING DITCH
EXISTING NINTH LINE
RAMP N-W
RAMP N-E
RAMP E-NS
RAMP N-W
℄ NINTH LINE
℄ HIGHWAY 407 MEDIAN
ES1-03 NINTH LINE OVERPASS
SUBGRADE
INLET DITCH
DITCH EL. 182.08
SUBDRAIN STA. 26+570 EL. 180.14 O/S 40.0m LT
SUBDRAIN STA. 26+570 EL. 180.02 O/S 0.0m
SUBDRAIN STA. 26+460 EL. 179.66 O/S 0.0m
SUBDRAIN STA. 26+467 EL. 179.81 O/S 47.46m LT
STA. 26+521 HWY 407 OFFSET 25.25 LT. STA. 0+300 R-3a ACCESS ROAD EL. 181.43
STA. 0+347.78 R-3a ACCESS ROAD EL. 182.00
ACCESS ROAD
POC STA. 26+441.308 HWY 407 =HOT STA. 10+000 NINTH LINE
BN STA. 26+388.208 HWY 407 STA. 8+497.067 RAMP N-E
EX. 400ø P.V.C. WM
BERM EL. 183.80
SEE DETAIL 4
SEE DETAIL 5
SEE TYPICAL DETAIL No. 14
FOR POND R-3b AND NOTES SEE E1-010B
450ø SEWER
100mm ø SUBDRAIN
CONSTRUCTION

GENERAL NOTES:

A. SWM PONDS ARE TO BE UTILIZED AS TEMPORARY SEDIMENTATION BASINS. PONDS SHALL BE CONSTRUCTED AT THE OUTSET OF THE WORK AND ALL APPROPRIATE CONSTRUCTION FLOWS ARE TO BE DIRECTED INTO THE PONDS, WHEREVER PRACTICAL. THE CONTRACTOR SHALL MAINTAIN THE PONDS AND REMOVE SEDIMENT AS REQUIRED BY THE CONTRACT ADMINISTRATOR. PRIOR TO OPENING OF THE HIGHWAY THE PONDS ARE TO BE CLEANED AND REINSTATED TO A "NEW" CONDITION.

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C. MINIMUM 6.5m RADIUS, TO BE MAINTAINED WHERE ACCESS ROADS MATCH WITH HIGHWAY SHOULDERS AND HAMMERHEAD.

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD DISC.	PROJ MGR.	DESIGN MGR.	DISC. MGR.
		3	11/07/00	GENERAL REVISION / IA COMMENTS	KC	AS	AA	CG		
		2	05/26/00	MISCELLANEOUS REVISIONS / IA COMMENTS	KC	AS	AA	CG		
		1	04/07/00	ISSUED FOR CONSTRUCTION	CH	AS	AA	CG		
		0	03/24/00	FOR INFORMATION ONLY	CH	AS	AA	CG		

SCALE : 5m 0 10m HORIZONTAL

LICENCED PROFESSIONAL ENGINEER A. C. ADHIKARY PROVINCE OF ONTARIO

CONSULTANT				
DESIGNED	A. SZALAMIN	AS	03/01/00
DRAWN	C. HOPKINS	CBH	03/02/00
CHECKED	A. ADHIKARY	AA	03/03/00
APPROVED LEAD DISC.	A. ADHIKARY	AA	03/08/00
APPROVED PROJ. MANAGER	C. GAUER	CBG	03/07/00
REVIEWED			
SLF SCALE	NAME (PRINT)	INT.	DATE

407 ETR Express Toll Route / La route express à péage

SLF Joint Venture

CONSULTANT Marshall Macklin Monaghan CONSULTING ENGINEERS • SURVEYORS • PLANNERS

TITLE
HIGHWAY 407 EAST PARTIAL STORMWATER MANAGEMENT POND POND R-3a PLAN

PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	10E1	4R	DD	010A	3

Format 'A1' Sheet Size

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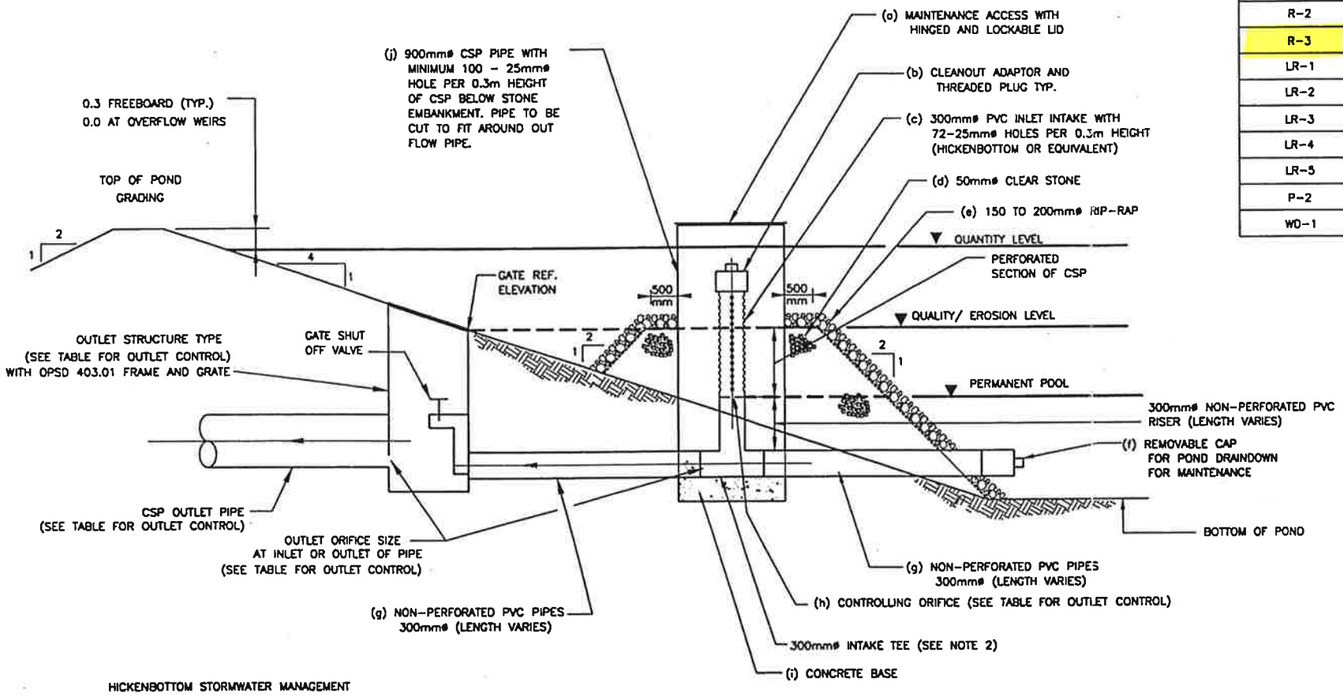
W94-10

TABLE FOR POND WATER LEVELS AND VOLUMES

POND NUMBER	PERMANENT		QUALITY		QUANTITY	
	LEVEL (m)	VOLUME (m^3)	LEVEL (m)	VOLUME (m^3)	LEVEL (m)	VOLUME (m^3)
R-1	172.5	1100	172.9	790	173.7	2210
R-2	164.5	3250	165.0	2650	165.5	3850
R-3	180.0	1900	180.74	3880	181.7	4220
LR-1	N/A	N/A	N/A	N/A	185.5	1480
LR-2	N/A	N/A	N/A	N/A	185.7	1550
LR-3	N/A	N/A	N/A	N/A	190.0	2020
LR-4	N/A	N/A	N/A	N/A	189.0	780
LR-5	N/A	N/A	N/A	N/A	192.2	890
P-2	N/A	N/A	N/A	N/A	200.7	1270
WD-1	188.1	2630	188.7	2905	189.7	5985

TABLE FOR OULET CONTROL

POND NUMBER	CONTROLLING ORIFICE SIZE (mm)	OUTLET ORIFICE SIZE (mm)	OUTLET STRUCTURE (OPSD TYPE)	OUTLET PIPE SIZE (mm)
R-1	77	193	705.030	450
R-2	139	397	702.040 TYPE A	800
R-3	N/A	169	N/A	300
LR-1	N/A	88	N/A	300
LR-2	N/A	100	N/A	300
LR-3	N/A	82	N/A	300
LR-4	N/A	78	N/A	300
LR-5	N/A	75	N/A	300
P-2	N/A	85	N/A	300
WD-1	134	739	702.040 TYPE A	900



HICKENBOTTOM STORMWATER MANAGEMENT POND OUTLET INCLUDES a), b), c), d), e) f), g), h), i), j), COMPLETE OUTLET PIPE DICB WITH FRAME AND GRATE NOT INCLUDED

TYPICAL DETAIL 6 – POND OUTLET STRUCTURE

N.T.S.

NOTES :

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. FOR PONDS LR-1 THRU LR-5 AND P-2, THE 300mm INTAKE TEE SHALL BE PERFORATED AS PER SPECIFICATION NOTED IN (C)-75-25mm HOLES PER 0.3m HEIGHT.
3. FOR PONDS LR-1 THRU LR-5 AND P-2 OUTLET ORFICE SHALL BE PLACED AT DOWNSTREAM CONNECTION OF 300mm INTAKE TEE TO PVC PIPE.

CONSTRUCTION

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD DISC.	PROJ. MGR.	CLIENT APPR.	DISC. APP.
		6	07/20/01	ADDED NOTE 2 AND NOTE 3	KC	CG	CG	CG		
		5	04/04/01	REVISED OUTLET CONTROL TEXT	KJ	AA	AA	CG		
		4	10/30/00	GENERAL REVISION	KJ	AA	AA	CG		
		3	08/15/00	REVISED .DATA	MW	AA	AA	CG		
		2	05/26/00	MISCELLANEOUS REVISIONS / IA COMMENTS	KC	AA	AA	CG		
		1	04/07/00	ISSUED FOR CONSTRUCTION	CH	AS	AA	CG		

SCALE : N.T.S.

PROFESSIONAL ENGINEER — G.M.D. GAUER — PROVINCE OF ONTARIO

CONSULTANT				
	DESIGNED	J.PAYNE	JP	07/26/99
	DRAWN	K. CHENG	KC	07/26/99
	CHECKED	A. ADHIKARY	AA	07/26/99
	APPROVED LEAD DISC.	A. ADHIKARI	AA	07/26/99
	APPROVED PROJ. MANAGER	C. GAUER	CG	07/26/99
	REVISED			
SLF				
SCALE		NAME (PRINT)	INIT.	DATE

407 ETR Express Toll Route / La route express à péage

SLF Joint Venture

CONSULTANT: Marshall Macklin Monaghan — CONSULTING ENGINEERS • SURVEYORS • PLANNERS

TITLE: HIGHWAY 407 EAST PARTIAL
TYPICAL DETAILS
FOR POND OUTLET

PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	10E1	4R	DD	0062	6

Format 'A1' Sheet Size

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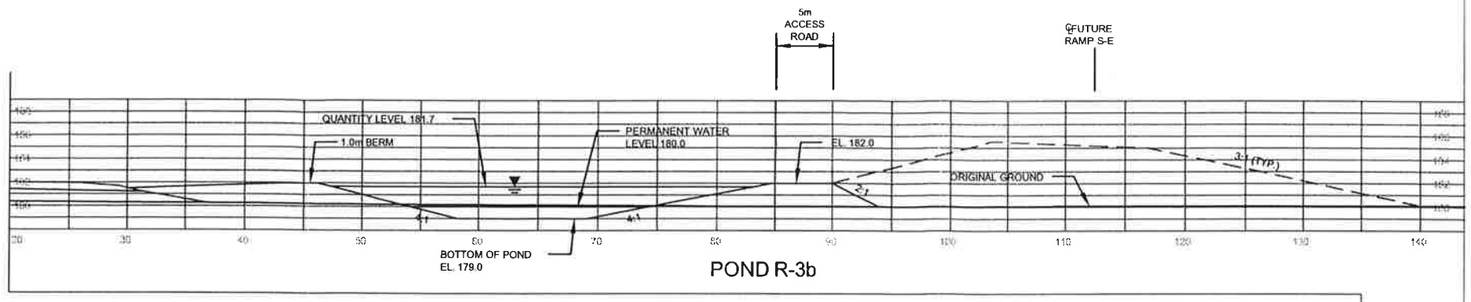
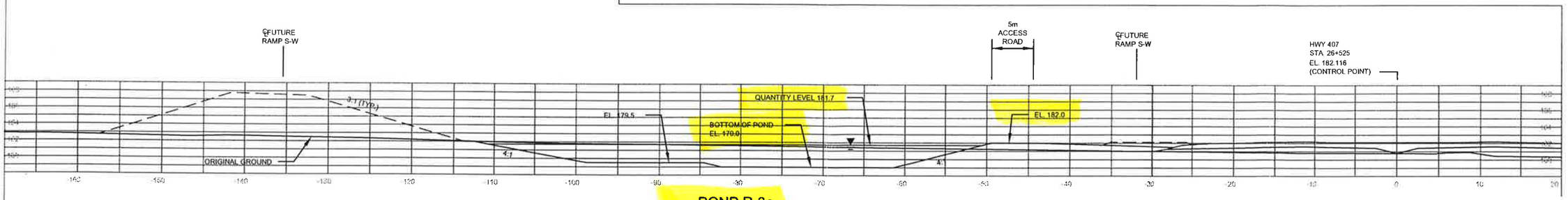
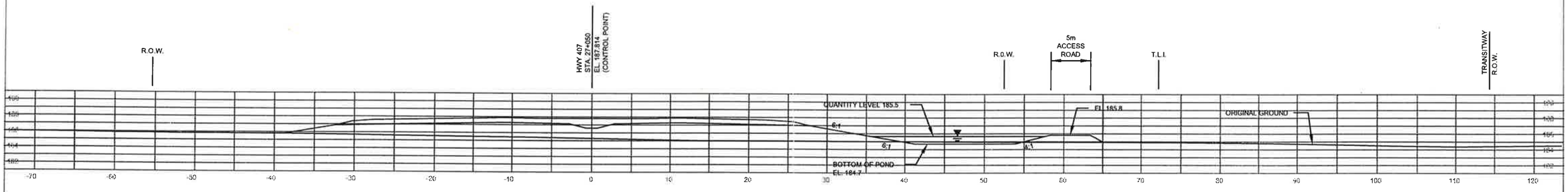


POND R-3b

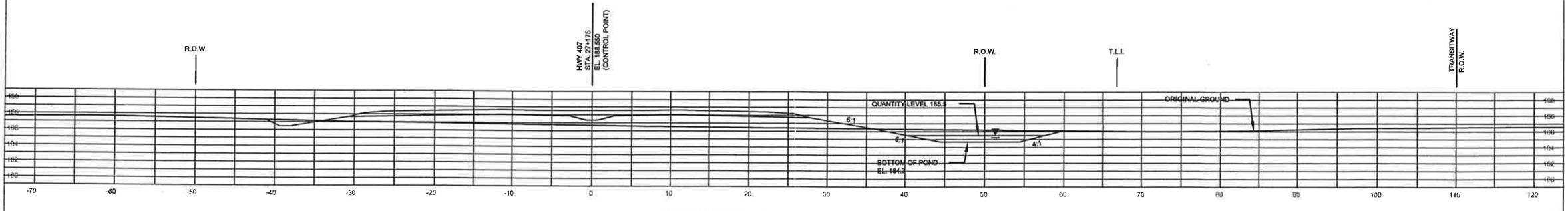


POND R-3a

SECTION D-D STA. 26+525 HWY 407



SECTION E-E POND LR-1
STA. 27+050 HWY 407



SECTION F-F POND LR-1
STA. 27+175 HWY 407

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD ENG.	PROJ. ENG.	DESIGN APPR.	DOC. APPR.
		2	09/26/00	REVISED AS PER IA COMMENTS	CH	AS	AA	CG		
		1	04/07/00	ISSUED FOR CONSTRUCTION	CH	AS	AA	CG		
		0	03/24/00	ISSUED FOR INFORMATION ONLY	CH	AS	AA	CG		

SCALE : 2.5m 0 5m

LICENSED PROFESSIONAL ENGINEER
A. C. ADHIKARY
PROVINCE OF ONTARIO

CONSULTANT				
	DESIGNED	A. SZALAMIN	AS	03/06/00
	DRAWN	C. HOPKINS	CBH	03/07/00
	CHECKED	A. ADHIKARY	AA	03/08/00
	APPROVED LEAD ENG.	A. ADHIKARY	AA	03/09/00
	APPROVED PROJ. MANAGER	C. GAUER	CBG	03/10/00
SLF	REVIEWED			
SCALE		NAME (PRINT)	INIT.	DATE

407 ETR Express Toll Route / Le route express à péage

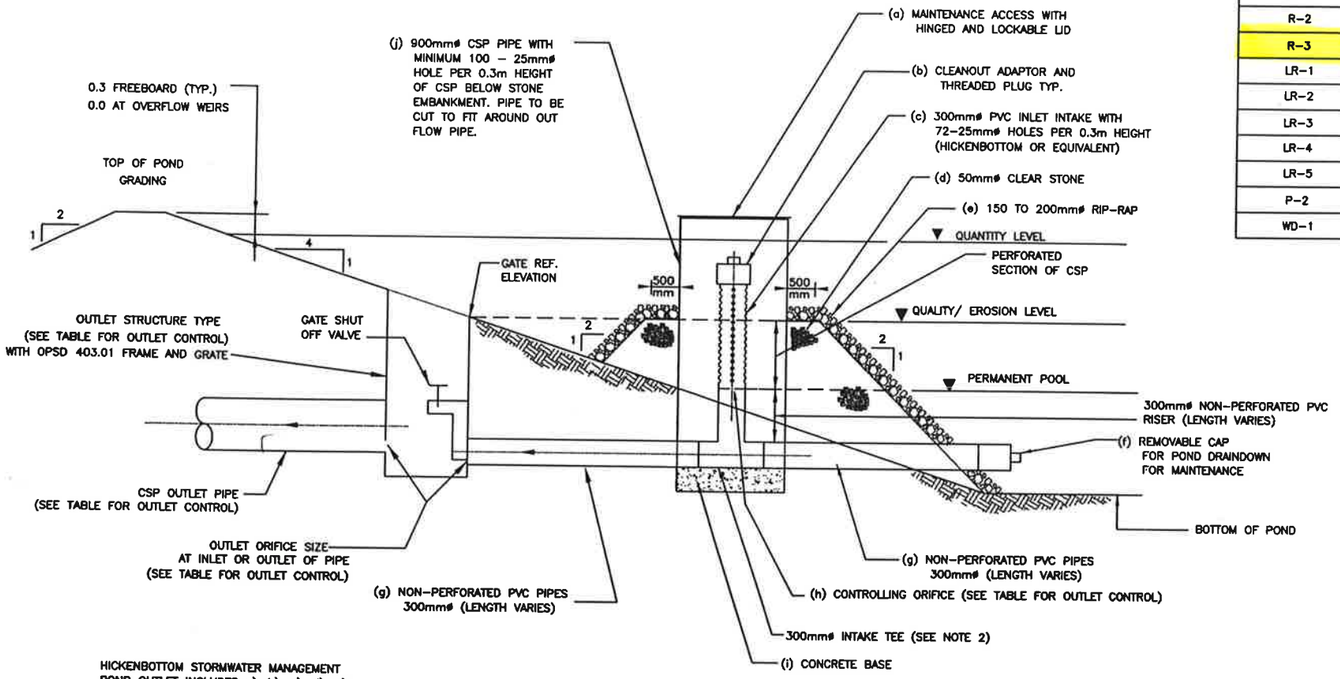
SLF Joint Venture

CONSULTANT: Marshall Macklin Monaghan — CONSULTING ENGINEERS • SURVEYORS • PLANNERS

TITLE

HIGHWAY 407 EAST PARTIAL TYPICAL CROSS SECTIONS SECTION E1 PONDS

PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	10E1	4R	DD	0059	2



HICKENBOTTOM STORMWATER MANAGEMENT POND OUTLET INCLUDES a), b), c), d), e) f), g), h), i), j), COMPLETE OUTLET PIPE DICB WITH FRAME AND GRATE NOT INCLUDED

TABLE FOR POND WATER LEVELS AND VOLUMES

POND NUMBER	PERMANENT		QUALITY		QUANTITY	
	LEVEL (m)	VOLUME (m^3)	LEVEL (m)	VOLUME (m^3)	LEVEL (m)	VOLUME (m^3)
R–1	172.5	1100	172.9	790	173.7	2210
R–2	164.5	3250	165.0	2650	165.5	3850
R–3	180.0	1900	180.74	3880	181.7	4220
LR–1	N/A	N/A	N/A	N/A	185.5	1480
LR–2	N/A	N/A	N/A	N/A	185.7	1550
LR–3	N/A	N/A	N/A	N/A	190.0	2020
LR–4	N/A	N/A	N/A	N/A	189.0	780
LR–5	N/A	N/A	N/A	N/A	192.2	890
P–2	N/A	N/A	N/A	N/A	200.7	1270
WD–1	188.1	2630	188.7	2905	189.7	5985

TABLE FOR OULET CONTROL

POND NUMBER	CONTROLLING ORIFICE SIZE (mm)	OUTLET ORIFICE SIZE (mm)	OUTLET STRUCTURE (OPSD TYPE)	OUTLET PIPE SIZE (mm)
R–1	77	193	705.030	450
R–2	139	397	702.040 TYPE A	800
R–3	N/A	169	N/A	300
LR–1	N/A	88	N/A	300
LR–2	N/A	100	N/A	300
LR–3	N/A	82	N/A	300
LR–4	N/A	78	N/A	300
LR–5	N/A	75	N/A	300
P–2	N/A	85	N/A	300
WD–1	134	739	702.040 TYPE A	900

TYPICAL DETAIL 6 – POND OUTLET STRUCTURE

N.T.S.

NOTES :

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. FOR PONDS LR–1 THRU LR–5 AND P–2 THE 300mm INTAKE TEE SHALL BE PERFORATED AS PER SPECIFICATION NOTED IN (C)–75–25mm HOLES PER 0.3m HEIGHT.
3. FOR PONDS LR–1 THRU LR–5 AND P–2 OUTLET ORFICE SHALL BE PLACED AT DOWNSTREAM CONNECTION OF 300mm INTAKE TEE TO PVC PIPE.

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD DISC.	PROJ. MAN.	SLF DESIGN MAN.	SLF DISC. MAN.
		6	07/20/01	ADDED NOTE 2 AND NOTE 3	KJ	AA	AA	CG		
		5	04/04/01	REVISED OUTLET CONTROL TEXT	KJ	AA	AA	CG		
		4	10/30/00	GENERAL REVISION	MW	AA	AA	CG		
		3	06/15/00	REVISED DATA	KC	AA	AA	CG		
		2	05/26/00	MISCELLANEOUS REVISIONS / IA COMMENTS	CH	AS	AA	CG		
		1	04/07/00	ISSUED FOR CONSTRUCTION	CH	AS	AA	CG		

SCALE : N.T.S.

LICENCED PROFESSIONAL ENGINEER — A. C. ADHIKARY — PROVINCE OF ONTARIO

CONSULTANT				
	DESIGNED	J.PAYNE	JP	07/26/99
	DRAWN	K. CHENG	KC	07/26/99
	CHECKED	A. ADHIKARY	AA	07/26/99
	APPROVED LEAD ENG.	A. ADHIKARI	AA	07/26/99
	APPROVED PROJ. MANAGER	C. GAUER	CG	07/26/99
SLF	REVIEWED			
	SCALE	NAME (PRINT)	SIG.	DATE

407 ETR — Express Toll Route / La route express à péage

SLF Joint Venture

CONSULTANT: Marshall Macklin Monaghen — CONSULTING ENGINEERS • SURVEYORS • PLANNERS

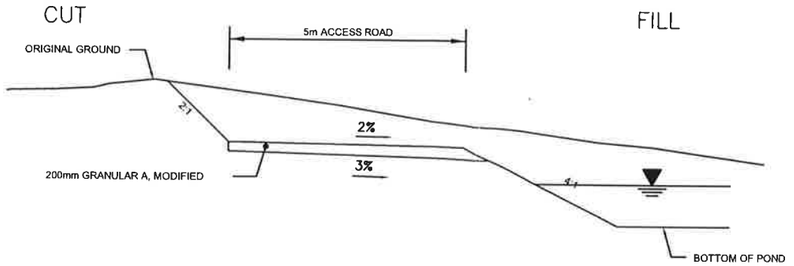
TITLE: HIGHWAY 407 EAST PARTIAL
TYPICAL DETAILS
FOR POND OUTLET

PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	10E1	4R	DD	0062	6

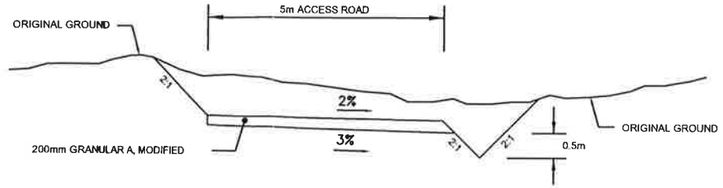
TABLE FOR POND DITCHES AND WEIRS

POND	DITCHES	TYPE	SLOPE (%)	BASE WIDTH (m)	MIN. DEPTH (m)	TREATMENT (GRASS OR RIP RAP)
R–1	INLET		8.8	1.0	0.5	300mmØ
	OVERFLOW WEIR		0.0	14.0	0.3	300mmØ
	OUTLET	A	1.5	1.5	0.6	300mmØ
		B	1.5	1.5	0.6	GRASS
		C	42	1.5	0.4	800mmØ
		D	0.0	1.5	0.25	800mmØ WITH 50mm SOIL AND SEED
R–2	OVERFLOW/OUTLET	A	0.3	1.5	0.9	GRASS
		B	7.1	1.5	0.45	500mmØ
		C	3.4	1.5	0.6	500mmØ
		D	3.4	1.5	0.8	GRASS
R–3a	INLET		2.7	0	0.5	GRASS
R–3b	INLET		1.7	0	0.6	GRASS
	OUTLET		EXISTING DITCH			300mmØ
	OVERFLOW DITCH	A	0.0	7.0	PAD	300mmØ
LR–1	INLET		6.3	1.5	0.5	300mmØ
	OVERFLOW WEIR		0.0	8.0	0.3	300mmØ
	OUTLET	A	1.3	3.0	0.5	300mmØ
		B	1.3	3.0	0.5	GRASS
LR–2	INLET		1.0	1.5	0.6	GRASS
	OVERFLOW WEIR		0.0	7.0	0.3	300mmØ
	OUTLET	A	0.0	7.0	PAD	300mmØ
LR–3	INLET		3.4	1.0	0.4	GRASS
	OVERFLOW WEIR		0.0	4.0	0.3	300mmØ
	OUTLET	A	2.1	1.0	0.35	300mmØ
		B	2.1	1.0	0.35	GRASS
LR–4	INLET		MAINLINE DITCH			
	OVERFLOW WEIR		0.0	5.5	0.3	300mmØ
LR–5	INLET		MAINLINE DITCH			
	OVERFLOW WEIR		0.0	10.0	0.3	300mmØ
	OUTLET	A	11.1	1.0	0.35	300mmØ
		B	40.0	1.0	0.35	800mmØ
		C	0.0	1.5	0.45	800mmØ WITH 50mm SOIL AND SEED
P–2	INLET		0.7	1.5	0.7	GRASS
	OVERFLOW WEIR		0.0	12.0	0.3	300mmØ
	OUTLET		0.0	4.0	PAD	300mmØ
WD–1	INLET		1.25	3.0	1.06	300mmØ
	OVERFLOW WEIR		0.0	25.0	0.3	300mmØ
	OUTLET	A	1.3	2.0	0.9	300mmØ
		B	17.0	2.0	0.5	800mmØ
		C	0.0	2.0	0.4	800mmØ WITH 100mm SOIL AND SEED

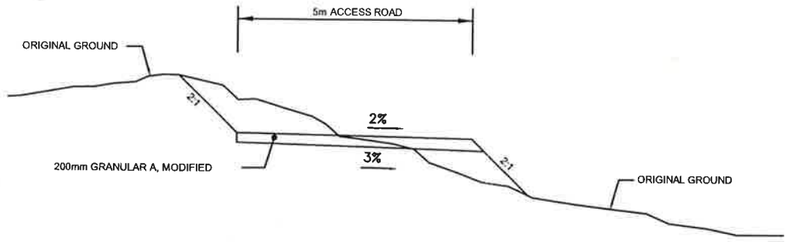
NOTE: ALL RIP RAP TO BE PROVIDED IN TWO LAYERS



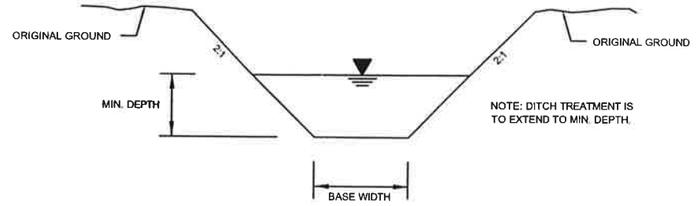
TYPICAL SECTION OF ACCESS ROAD – AROUND POND



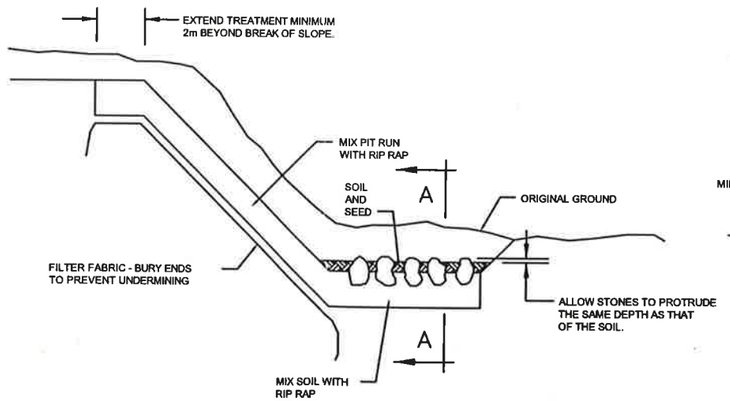
TYPICAL SECTION OF ACCESS ROAD – APPROACH
CUT SECTION



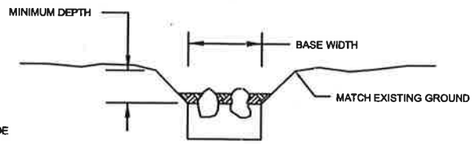
TYPICAL SECTION OF ACCESS ROAD – APPROACH
FILL SECTION



TYPICAL SECTION OF SURFACE DITCHES
(INCLUDING OVERFLOW WEIRS)



DETAIL OF OUTLET FOR PONDS
R–1, LR–5 AND WD–1



SECTION A–A
AT BOTTOM END

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD DISC.	PROJ. ENGR.	SLF DESIGN APPR.	SLF DISC. APPR.
		6	04/02/01	REVISED R–2 OUTLET RIP RAP SIZE	KC	AA	AA	CG		
		5	02/12/01	REVISED R–2 OUTLET RIP RAP SIZE	KC	AA	AA	CG		
		4	06/15/00	REVISED DATA	MW	AS	AA	CG		
		3	05/26/00	MISCELLANEOUS REVISIONS / MA COMMENTS	CH	AS	AA	CG		
		2	05/10/00	REVISED AS PER ENVIRONMENTAL INPUT	CH	AS	AA	CG		
		1	04/07/00	ISSUED FOR CONSTRUCTION	CH	AS	AA	CG		

SCALE : N.T.S.

LICENSED PROFESSIONAL ENGINEER — A. C. ADHIKARY — PROVINCE OF ONTARIO

CONSULTANT				
	DESIGNED	A. SZALAMIH	AS	02/16/00
	DRAWN	C. HOPKINS	CBH	02/17/00
	CHECKED	A. ADHIKARY	AA	02/18/00
	APPROVED LEAD ENG.	A. ADHIKARY	AA	02/21/00
	APPROVED PROJ. MANAGER	C. GAUER	CBG	02/21/00
SLF	REVIEWED DESIGN MANAGER			
	REVIEWED DISC. MANAGER			
	SCALE	NAME (PRINT)	INT.	DATE

407 ETR — Express Toll Route / La route express à péage

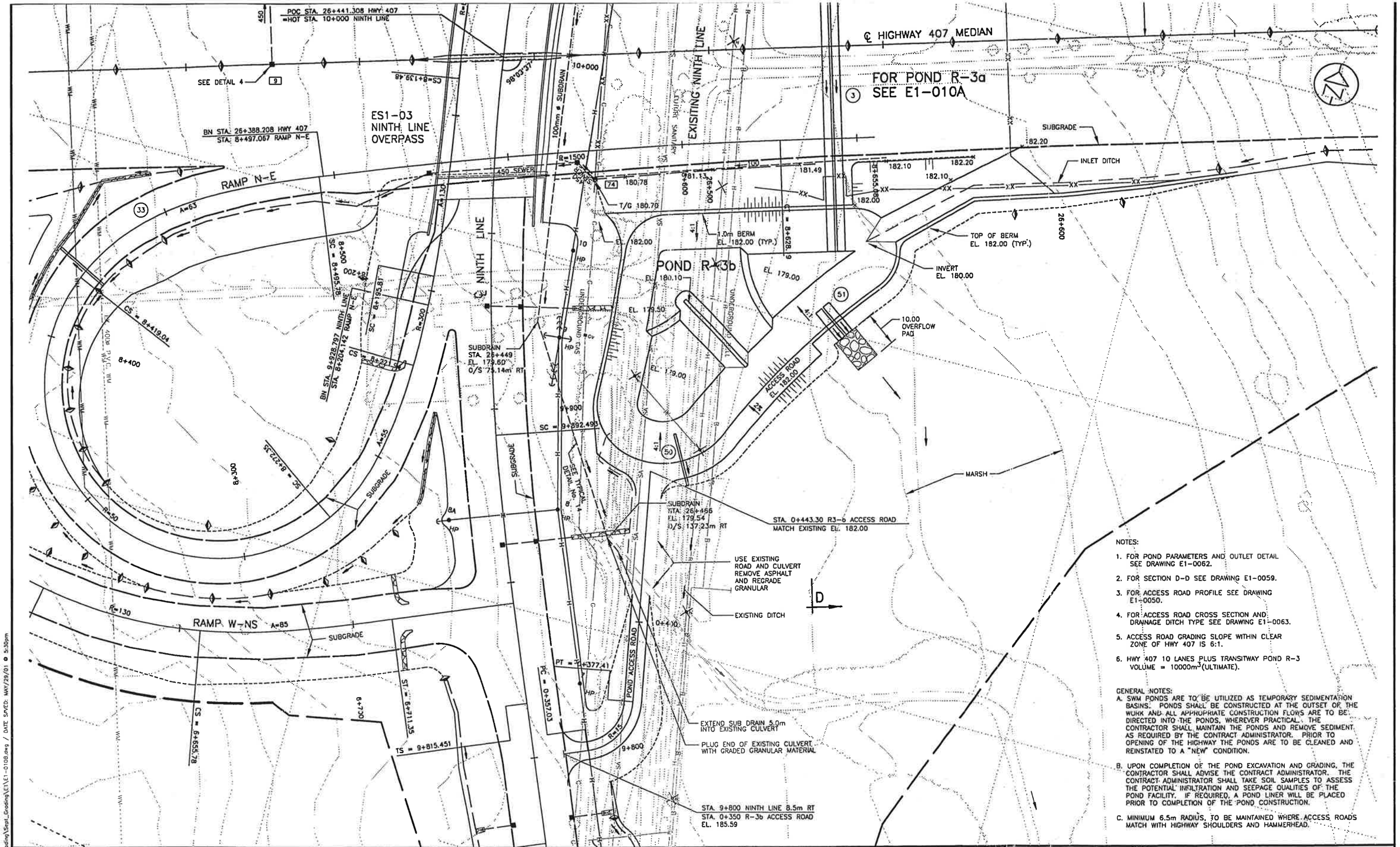
SLF Joint Venture

CONSULTANT: Marshall Macklin Monaghan — CONSULTING ENGINEERS • SURVEYORS • PLANNERS

TITLE: HIGHWAY 407 EAST PARTIAL
TYPICAL POND ACCESS RD. X–SECT.
AND DRAINAGE DITCH DETAILS

PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	10E1	4R	DD	0063	6

CONSTRUCTION



DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD DES.	PROJ. MAN.	SLF DESIGN MGR.	SLF DISC. LEAD
		5	05/29/01	RELOCATED SUBDRAIN AT EAST OF NINTH LINE AS PER SLF	KC	CG	CG	CG		
		4	11/07/00	GENERAL REVISION / IA COMMENTS	KC	AS	AA	CG		
		3	07/17/00	REVISED CULVERT No. 50	CH	AS	AA	CG		
		2	05/26/00	MISCELLANEOUS REVISIONS / IA COMMENTS	KC	AS	AA	CG		
		1	04/07/00	ISSUED FOR CONSTRUCTION	CH	AS	AA	CG		
		0	03/24/00	FOR INFORMATION ONLY	CH	AS	AA	CG		

SCALE :
5m 0 10m
HORIZONTAL

REGISTERED PROFESSIONAL ENGINEER
C. B. GAUER
PROVINCE OF ONTARIO
JUNE 5/01

CONSULTANT			
DESIGNED	A. SZALAMIN	AS	03/01/00
DRAWN	C. HOPKINS	CBH	03/02/00
CHECKED	A. ADHIKARY	AA	03/03/00
APPROVED LEAD ENG.	A. ADHIKARY	AA	03/06/00
APPROVED PROJ. MANAGER	C. GAUER	CBG	03/07/00
SLF REVIEWER			
SCALE	NAME (PRINT)	INIT.	DATE

407 ETR Express Toll Route / La route express à péage

SLF Joint Venture

CONSULTANT
Marshall Macklin Monaghan
CONSULTING ENGINEERS • SURVEYORS • PLANNERS

TITLE
HIGHWAY 407 EAST PARTIAL STORMWATER MANAGEMENT POND POND R-3b PLAN

PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	10E1	4R	DD	010B	5

Format 'A1' Sheet Size

E940

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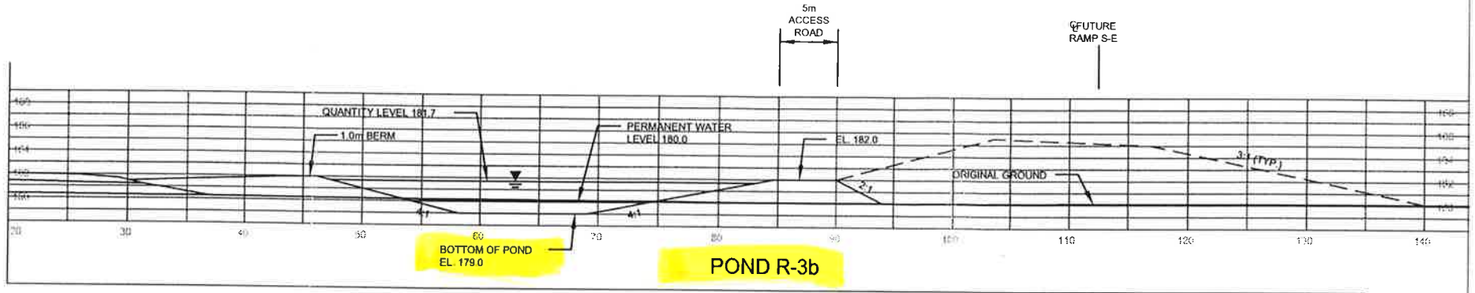
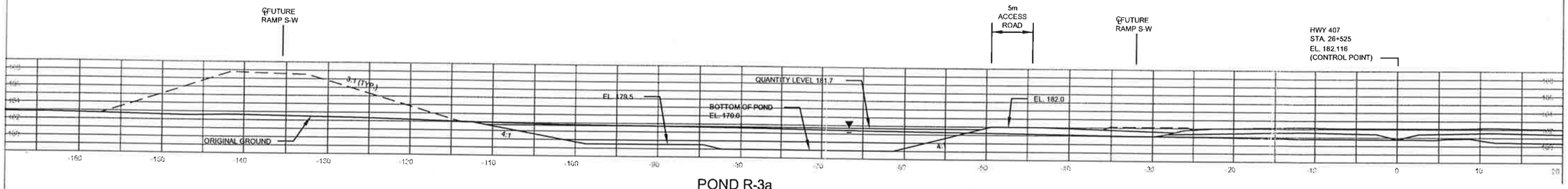
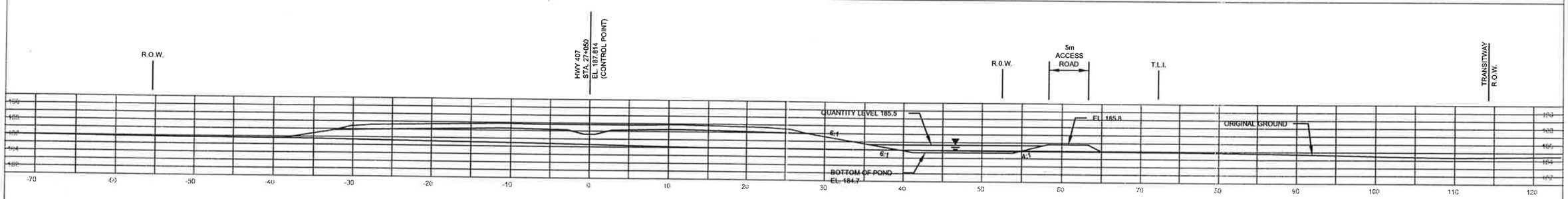


POND R-3b

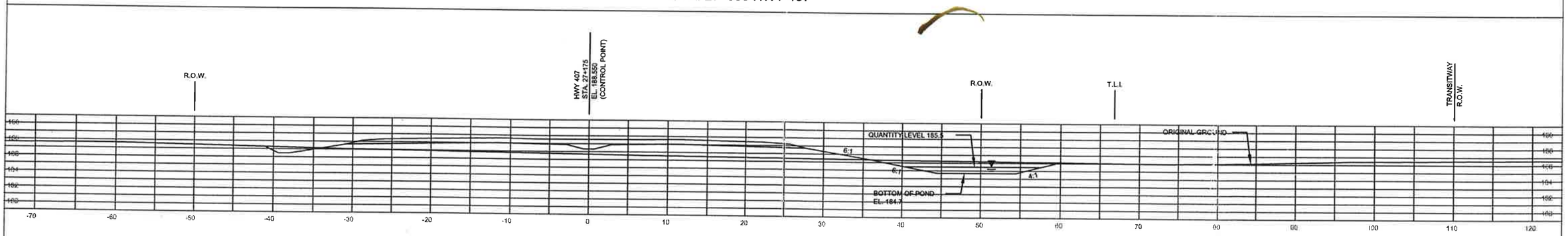


POND R-3a

SECTION D-D STA. 26+525 HWY 407



SECTION E-E POND LR-1
STA. 27+050 HWY 407



SECTION F-F POND LR-1
STA. 27+175 HWY 407

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD DISC.	PROJ. ENG.	DESIGN MGR.	DISC. MGR.
		2	09/26/00	REVISED AS PER IA COMMENTS	CH	AS	AA	CG		
		1	04/07/00	ISSUED FOR CONSTRUCTION	CH	AS	AA	CG		
		0	03/24/00	ISSUED FOR INFORMATION ONLY	CH	AS	AA	CG		

SCALE : 2.5m 0 5m

LICENSED PROFESSIONAL ENGINEER A. C. ADHIKARY PROVINCE OF ONTARIO

CONSULTANT				
	DESIGNED	A. SZALAMIN	AS	03/06/00
	DRAWN	C. HOPKINS	CBH	03/07/00
	CHECKED	A. ADHIKARY	AA	03/08/00
	APPROVED LEAD ENG.	A. ADHIKARY	AA	03/09/00
	APPROVED PROJ. MANAGER	C. GAUER	CBG	03/10/00
SLF	REVISED			
SCALE		NAME (PRINT)	INIT.	DATE

407 ETR Express Toll Route / La route express à péage

SLF Joint Venture

CONSULTANT: Marshall Macklin Monaghan — CONSULTING ENGINEERS • SURVEYORS • PLANNERS

TITLE

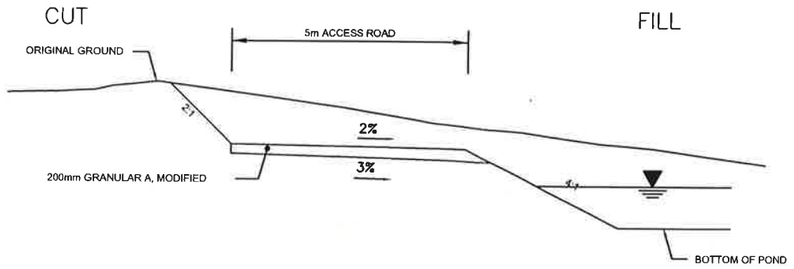
HIGHWAY 407 EAST PARTIAL TYPICAL CROSS SECTIONS SECTION E1 PONDS

PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	10E1	4R	DD	0059	2

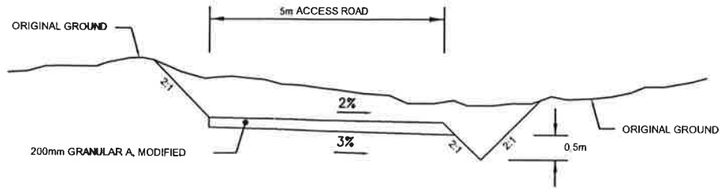
TABLE FOR POND DITCHES AND WEIRS

POND	DITCHES	TYPE	SLOPE (%)	BASE WIDTH (m)	MIN. DEPTH (m)	TREATMENT (GRASS OR RIP RAP)
R-1	INLET		8.8	1.0	0.5	300mmØ
	OVERFLOW WEIR		0.0	14.0	0.3	300mmØ
	OUTLET	A	1.5	1.5	0.6	300mmØ
		B	1.5	1.5	0.6	GRASS
		C	42	1.5	0.4	800mmØ
		D	0.0	1.5	0.25	800mmØ WITH 50mm SOIL AND SEED
R-2	OVERFLOW/OUTLET	A	0.3	1.5	0.9	GRASS
		B	7.1	1.5	0.45	500mmØ
		C	3.4	1.5	0.6	500mmØ
		D	3.4	1.5	0.8	GRASS
R-3a	INLET		2.7	0	0.5	GRASS
R-3b	INLET		1.7	0	0.6	GRASS
	OUTLET		EXISTING DITCH			300mmØ
	OVERFLOW DITCH	A	0.0	7.0	PAD	300mmØ
LR-1	INLET		6.3	1.5	0.5	300mmØ
	OVERFLOW WEIR		0.0	8.0	0.3	300mmØ
	OUTLET	A	1.3	3.0	0.5	300mmØ
		B	1.3	3.0	0.5	GRASS
LR-2	INLET		1.0	1.5	0.6	GRASS
	OVERFLOW WEIR		0.0	7.0	0.3	300mmØ
	OUTLET	A	0.0	7.0	PAD	300mmØ
LR-3	INLET		3.4	1.0	0.4	GRASS
	OVERFLOW WEIR		0.0	4.0	0.3	300mmØ
	OUTLET	A	2.1	1.0	0.35	300mmØ
		B	2.1	1.0	0.35	GRASS
LR-4	INLET		MAINLINE DITCH			
	OVERFLOW WEIR		0.0	5.5	0.3	300mmØ
LR-5	INLET		MAINLINE DITCH			
	OVERFLOW WEIR		0.0	10.0	0.3	300mmØ
	OUTLET	A	11.1	1.0	0.35	300mmØ
		B	40.0	1.0	0.35	800mmØ
		C	0.0	1.5	0.45	800mmØ WITH 50mm SOIL AND SEED
P-2	INLET		0.7	1.5	0.7	GRASS
	OVERFLOW WEIR		0.0	12.0	0.3	300mmØ
	OUTLET		0.0	4.0	PAD	300mmØ
WD-1	INLET		1.25	3.0	1.06	300mmØ
	OVERFLOW WEIR		0.0	25.0	0.3	300mmØ
	OUTLET	A	1.3	2.0	0.9	300mmØ
		B	17.0	2.0	0.5	800mmØ
		C	0.0	2.0	0.4	800mmØ WITH 100mm SOIL AND SEED

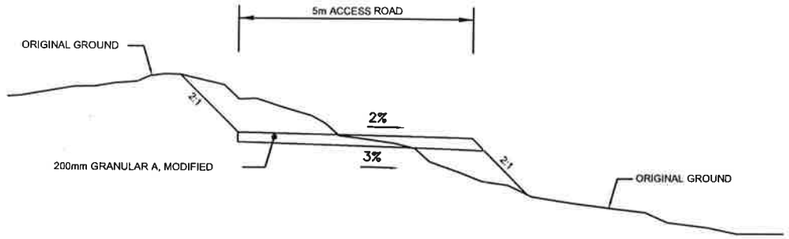
NOTE: ALL RIP RAP TO BE PROVIDED IN TWO LAYERS



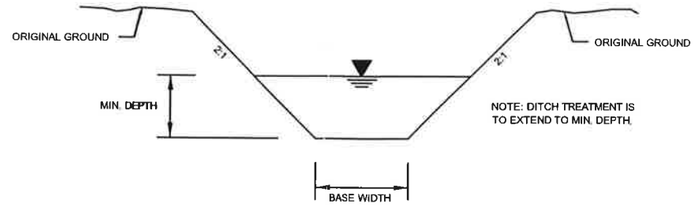
TYPICAL SECTION OF ACCESS ROAD – AROUND POND



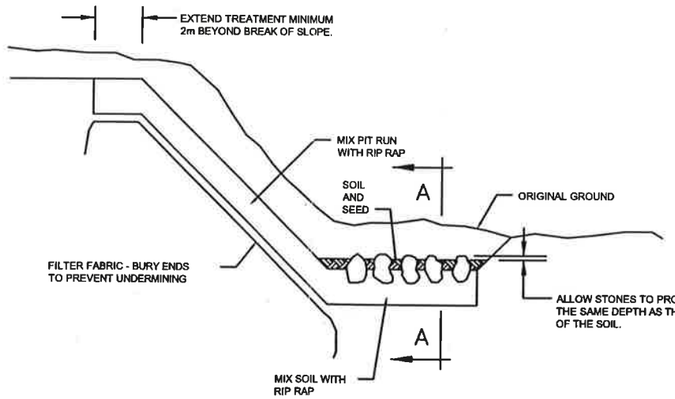
TYPICAL SECTION OF ACCESS ROAD – APPROACH
CUT SECTION



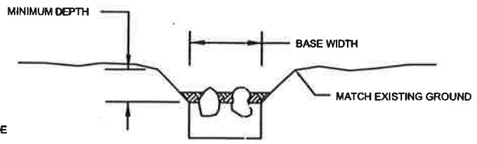
TYPICAL SECTION OF ACCESS ROAD – APPROACH
FILL SECTION



TYPICAL SECTION OF SURFACE DITCHES
(INCLUDING OVERFLOW WEIRS)



DETAIL OF OUTLET FOR PONDS
R-1, LR-5 AND WD-1



SECTION A-A
AT BOTTOM END

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD DISC.	PROJ. MGR.	SLF DESIGN DATE	SLF DISC. MGR.
		6	04/02/01	REVISED R-2 OUTLET RIP RAP SIZE	KC	AA	AA	CG		
		5	02/12/01	REVISED R-2 OUTLET RIP RAP SIZE	KC	AA	AA	CG		
		4	06/15/00	REVISED DATA	MW	AS	AA	CG		
		3	05/26/00	MISCELLANEOUS REVISIONS / MA COMMENTS	CH	AS	AA	CG		
		2	05/10/00	REVISED AS PER ENVIRONMENTAL INPUT	CH	AS	AA	CG		
		1	04/07/00	ISSUED FOR CONSTRUCTION	CH	AS	AA	CG		

SCALE : N.T.S.

LICENSED PROFESSIONAL ENGINEER — A. C. ADHIKARY — PROVINCE OF ONTARIO

CONSULTANT				
DESIGNED	A. SZALAMIN	AS	02/16/00
DRAWN	C. HOPKINS	CBH	02/17/00
CHECKED	A. ADHIKARY	AA	02/18/00
APPROVED LEAD DISC.	A. ADHIKARY	AA	02/21/00
APPROVED PROJ. MANAGER	C. GAUER	CBG	02/21/00
REVIEWED DESIGN MANAGER			
REVIEWED DISC. MANAGER			
SLF SCALE	NAME (PRINT)	INT.	DATE

407 ETR — Express Toll Route / La route express à péage

SLF Joint Venture

CONSULTANT: Marshall Macklin Monaghan — CONSULTING ENGINEERS • SURVEYORS • PLANNERS

TITLE: HIGHWAY 407 EAST PARTIAL
TYPICAL POND ACCESS RD. X-SECT.
AND DRAINAGE DITCH DETAILS

PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	10E1	4R	DD	0063	6

POND NOTES:

1. FOR POND PARAMETERS AND OUTLET DETAIL SEE DRAWING E1-0062.
2. FOR SECTION E-E SEE DRAWING E1-0059.
3. FOR SECTION F-F SEE DRAWING E1-0059.
4. FOR ACCESS ROAD PROFILE SEE DRAWING E1-0051.
5. FOR ACCESS ROAD CROSS SECTION AND DRAINAGE DITCH TYPE SEE DRAWING E1-0063.
6. ACCESS ROAD GRADING SLOPE WITHIN CLEAR ZONE OF HWY 407 IS 6:1.
7. HWY 407 10 LANES POND LR-1 VOLUME = 1480m³.

BCE = 7+232.05
7+200
7+100
7+000
1.5m WIDE ENHANCED SWALE SEE DETAIL 9
SUBGRADE
RAMP E-NS
R=5000
SEE DETAIL 4
41
℄ HIGHWAY 407 MEDIAN
1.5m WIDE ENHANCED SWALE SEE DETAIL 9
450
STA. 27+035 HWY 407 25.25m LT
STA. 0+400 LR-1 ACCESS ROAD
EL 187.38
TEMPORARY DIVERSION TYP. DETAIL 1
0+400
SUBGRADE
INLET DITCH
DITCH EL. 185.83
1.5m WIDE ENHANCED SWALE SEE DETAIL 9
DITCH EL. 184.37
TOP OF WEIR EL. 185.50
12%
6:1
52
POND LR-1 EL. 184.70
4:1
27+300
MATCH ELEV. 184.000
TOP OF POND GRADING (ULTIMATE)
27+000
27+200
27+100
STA. 0+364.46 LR-1 ACCESS ROAD
EL 185.80
DITCH 'B'
DITCH 'A'
10.00
PERMANENT DIVERSION TYP. DETAIL 2
0+058.52
TRIBUTARY A
MATCH EXISTING ELEV. 183.75
E
F

GENERAL NOTES:

A. SWM PONDS ARE TO BE UTILIZED AS TEMPORARY SEDIMENTATION BASINS. PONDS SHALL BE CONSTRUCTED AT THE OUTSET OF THE WORK AND ALL APPROPRIATE CONSTRUCTION FLOWS ARE TO BE DIRECTED INTO THE PONDS, WHEREVER PRACTICAL. THE CONTRACTOR SHALL MAINTAIN THE PONDS AND REMOVE SEDIMENT AS REQUIRED BY THE CONTRACT ADMINISTRATOR. PRIOR TO OPENING OF THE HIGHWAY THE PONDS ARE TO BE CLEANED AND REINSTATED TO A "NEW" CONDITION.

B. UPON COMPLETION OF THE POND EXCAVATION AND GRADING, THE CONTRACTOR SHALL ADVISE THE CONTRACT ADMINISTRATOR. THE CONTRACT ADMINISTRATOR SHALL TAKE SOIL SAMPLES TO ASSESS THE POTENTIAL INFILTRATION AND SEEPAGE QUALITIES OF THE POND FACILITY. IF REQUIRED, A POND LINER WILL BE PLACED PRIOR TO COMPLETION OF THE POND CONSTRUCTION.

C. MINIMUM 6.5m RADIUS, TO BE MAINTAINED WHERE ACCESS ROAD MATCH WITH HIGHWAY SHOULDERS AND HAMMERHEAD.

CONSTRUCTION

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD DISC.	PROJ. MNGR.	DESIGN APPR.	DISC. APPR.
		3	10/30/00	GENERAL REVISION / RESPONSE TO IA COMMENTS	KC	AS	AA	CG		
		2	05/26/00	MISCELLANEOUS REVISIONS / IA COMMENTS	KC	AS	AA	CG		
		1	04/07/00	ISSUED FOR CONSTRUCTION	CH	AS	AA	CG		
		0	03/24/00	FOR INFORMATION ONLY	CH	AS	AA	CG		

SCALE : 5m 0 10m HORIZONTAL

L. LICENSED PROFESSIONAL ENGINEER A. C. ADHIKARY NOV. 8 PROVINCE OF ONTARIO

DESIGNED	A. SZALAMIN	AS	03/01/00
DRAWN	C. HOPKINS	CBH	03/02/00
CHECKED	A. ADHIKARY	AA	03/03/00
APPROVED LEAD ENG.	A. ADHIKARY	AA	03/06/00
APPROVED PROJ. MANAGER	C. GAUER	CBG	03/07/00
REVIEWED			
SCALE	NAME (PRINT)	INIT.	DATE

CONSULTANT

407 ETR Express Toll Route / La route express à péage

SLF Joint Venture

CONSULTANT

Marshall Macklin Monaghan
CONSULTING ENGINEERS • SURVEYORS • PLANNERS

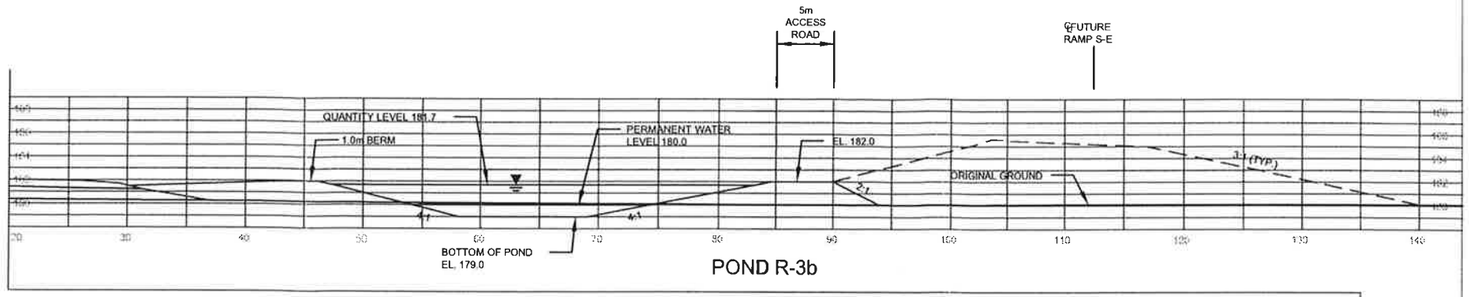
TITLE

HIGHWAY 407 EAST PARTIAL STORMWATER MANAGEMENT POND POND LR-1 PLAN

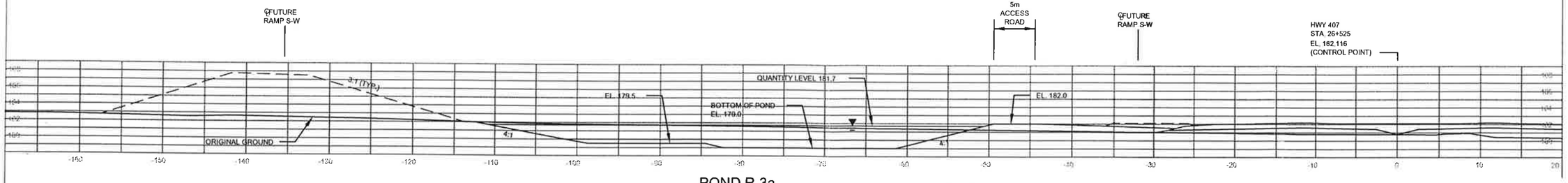
PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	10E1	4R	DD	012A	3

Format 'A1' Sheet Size

R:\407PROJECT\SUBMISSION\HWY_GRADING\Sept_Grading\E1\E1-012A.dwg / DATE SAVED: OCT/10/00 @ 7:39pm

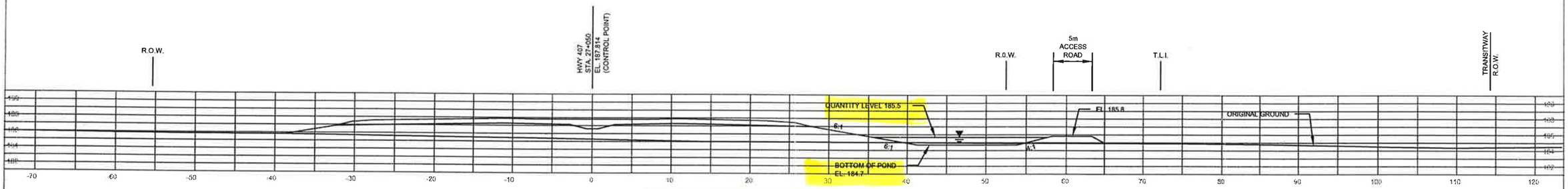


POND R-3b

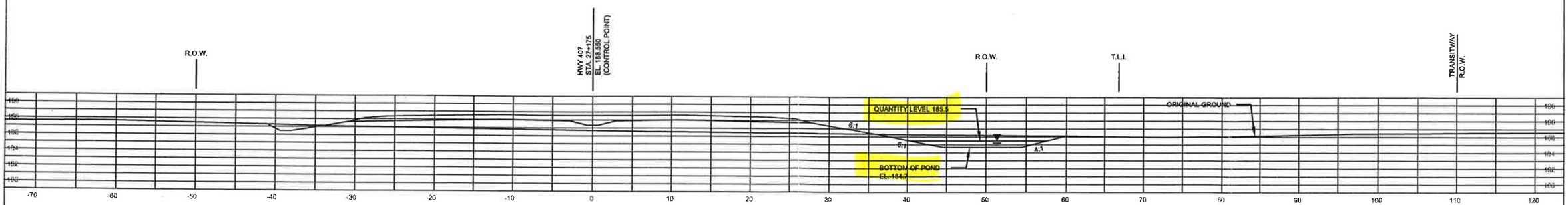


POND R-3a

SECTION D-D STA. 26+525 HWY 407



SECTION E-E POND LR-1
STA. 27+050 HWY 407



SECTION F-F POND LR-1
STA. 27+175 HWY 407

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD DISC.	PROJ. MGR.	DESIGN WORK	DISC. WORK
		2	09/26/00	REVISED AS PER IA COMMENTS	CH	AS	AA	CG		
		1	04/07/00	ISSUED FOR CONSTRUCTION	CH	AS	AA	CG		
		0	03/24/00	ISSUED FOR INFORMATION ONLY	CH	AS	AA	CG		

SCALE :

2.5m 0 5m

LICENSED PROFESSIONAL ENGINEER
A. C. ADHIKARY
PROVINCE OF ONTARIO

CONSULTANT		NAME (PRINT)	INIT.	DATE
	DESIGNED	A. SZALAMIN	AS	03/06/00
	DRAWN	C. HOPKINS	CBH	03/07/00
	CHECKED	A. ADHIKARY	AA	03/08/00
	APPROVED LEAD ENG.	A. ADHIKARY	AA	03/09/00
	APPROVED PROJ. MANAGER	C. GAUER	CBG	03/10/00
SLF	REVISED			
SCALE				

407 ETR Express Toll Route / La route express à péage

SLF Joint Venture

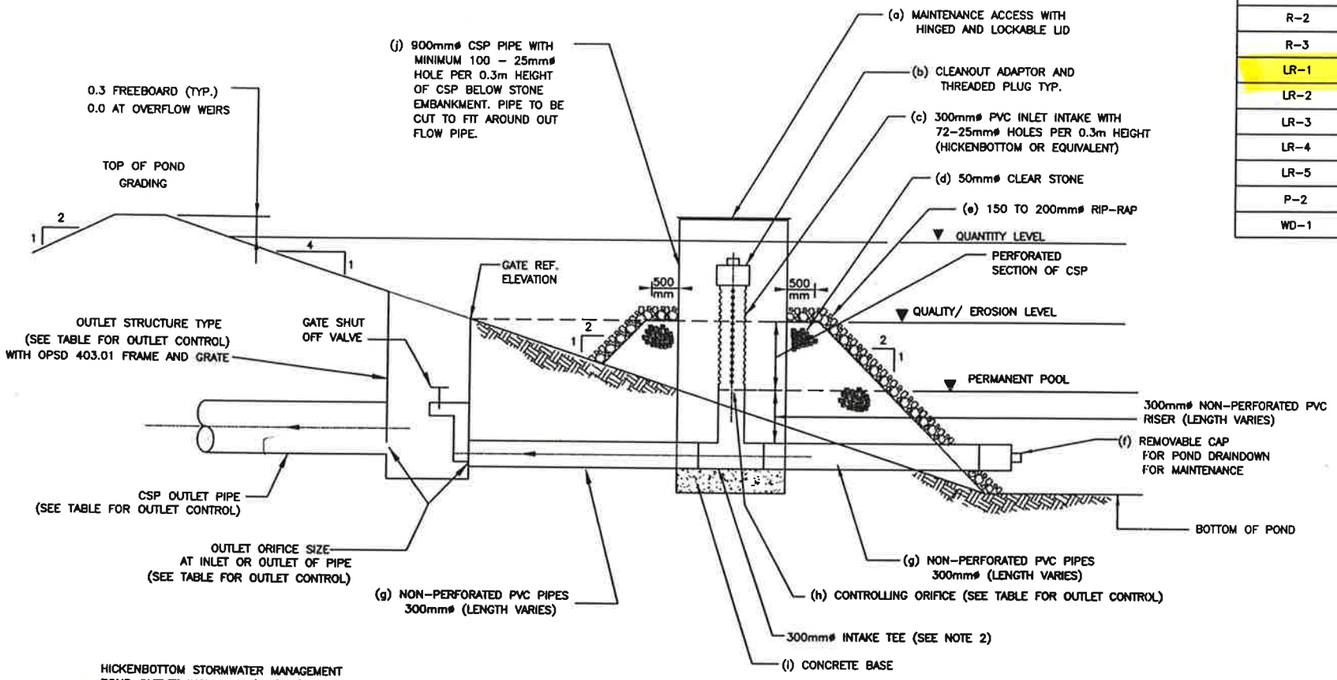
CONSULTANT

Marshall Macklin Monaghan
CONSULTING ENGINEERS • SURVEYORS • PLANNERS

TITLE

HIGHWAY 407 EAST PARTIAL TYPICAL CROSS SECTIONS SECTION E1 PONDS

PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	10E1	4R	DD	0059	2



HICKENBOTTOM STORMWATER MANAGEMENT POND OUTLET INCLUDES a), b), c), d), e) f), g), h), i), j), COMPLETE OUTLET PIPE DICB WITH FRAME AND GRATE NOT INCLUDED

TABLE FOR POND WATER LEVELS AND VOLUMES

POND NUMBER	PERMANENT		QUALITY		QUANTITY	
	LEVEL (m)	VOLUME (m^3)	LEVEL (m)	VOLUME (m^3)	LEVEL (m)	VOLUME (m^3)
R–1	172.5	1100	172.9	790	173.7	2210
R–2	164.5	3250	165.0	2650	165.5	3850
R–3	180.0	1900	180.74	3880	181.7	4220
LR–1	N/A	N/A	N/A	N/A	185.5	1480
LR–2	N/A	N/A	N/A	N/A	185.7	1550
LR–3	N/A	N/A	N/A	N/A	190.0	2020
LR–4	N/A	N/A	N/A	N/A	189.0	780
LR–5	N/A	N/A	N/A	N/A	192.2	890
P–2	N/A	N/A	N/A	N/A	200.7	1270
WD–1	188.1	2630	188.7	2905	189.7	5985

TABLE FOR OULET CONTROL

POND NUMBER	CONTROLLING ORIFICE SIZE (mm)	OUTLET ORIFICE SIZE (mm)	OUTLET STRUCTURE (OPSD TYPE)	OUTLET PIPE SIZE (mm)
R–1	77	193	705.030	450
R–2	139	397	702.040 TYPE A	800
R–3	N/A	169	N/A	300
LR–1	N/A	88	N/A	300
LR–2	N/A	100	N/A	300
LR–3	N/A	82	N/A	300
LR–4	N/A	78	N/A	300
LR–5	N/A	75	N/A	300
P–2	N/A	85	N/A	300
WD–1	134	739	702.040 TYPE A	900

TYPICAL DETAIL 6 – POND OUTLET STRUCTURE

N.T.S.

NOTES :

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. FOR PONDS LR–1 THRU LR–5 AND P–2 THE 300mm INTAKE TEE SHALL BE PERFORATED AS PER SPECIFICATION NOTED IN (C)–75–25mm HOLES PER 0.3m HEIGHT.
3. FOR PONDS LR–1 THRU LR–5 AND P–2 OUTLET ORFICE SHALL BE PLACED AT DOWNSTREAM CONNECTION OF 300mm INTAKE TEE TO PVC PIPE.

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD DISC.	PROJ. ENG.			
		6	07/20/01	ADDED NOTE 2 AND NOTE 3	KJ	AA	AA	CG			
		5	04/04/01	REVISED OUTLET CONTROL TEXT	KJ	AA	AA	CG			
		4	10/30/00	GENERAL REVISION	MW	AA	AA	CG			
		3	08/15/00	REVISED DATA	KC	AA	AA	CG			
		2	05/26/00	MISCELLANEOUS REVISIONS / IA COMMENTS	CH	AS	AA	CG			
		1	04/07/00	ISSUED FOR CONSTRUCTION	CH	AS	AA	CG			

SCALE : N.T.S.

A. C. ADHIKARY — LICENSED PROFESSIONAL ENGINEER — PROVINCE OF ONTARIO

CONSULTANT				
	DESIGNED	J.PAYNE	JP	07/26/99
	DRAWN	K. CHENG	KC	07/26/99
	CHECKED	A. ADHIKARY	AA	07/20/99
	APPROVED LEAD ENG.	A. ADHIKARI	AA	07/26/99
	APPROVED PROJ. MANAGER	C. GAUER	CG	07/26/99
SLF	REVIEWED			
SCALE		NAME (PRINT)	INIT.	DATE

407 ETR Express Toll Route / La route express à péage

SLF Joint Venture

CONSULTANT: Marshall Macklin Monaghan — CONSULTING ENGINEERS • SURVEYORS • PLANNERS

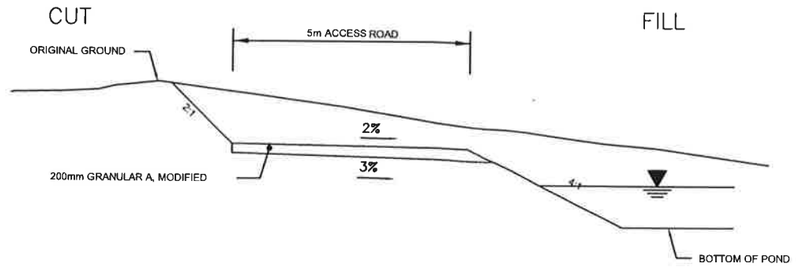
TITLE: HIGHWAY 407 EAST PARTIAL
TYPICAL DETAILS
FOR POND OUTLET

PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	10E1	4R	DD	0062	6

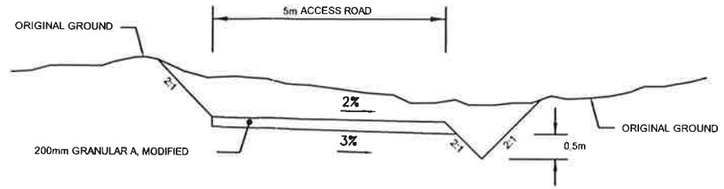
TABLE FOR POND DITCHES AND WEIRS

POND	DITCHES	TYPE	SLOPE (%)	BASE WIDTH (m)	MIN. DEPTH (m)	TREATMENT (GRASS OR RIP RAP)
R–1	INLET		8.6	1.0	0.5	300mmØ
	OVERFLOW WEIR		0.0	14.0	0.3	300mmØ
	OUTLET	A	1.5	1.5	0.6	300mmØ
		B	1.5	1.5	0.6	GRASS
		C	42	1.5	0.4	800mmØ
		D	0.0	1.5	0.25	800mmØ WITH 50mm SOIL AND SEED
R–2	OVERFLOW/OUTLET	A	0.3	1.5	0.9	GRASS
		B	7.1	1.5	0.45	500mmØ
		C	3.4	1.5	0.6	500mmØ
		D	3.4	1.5	0.8	GRASS
R–3a	INLET		2.7	0	0.5	GRASS
R–3b	INLET		1.7	0	0.6	GRASS
	OUTLET		EXISTING DITCH			300mmØ
	OVERFLOW DITCH	A	0.0	7.0	PAD	300mmØ
LR–1	INLET		6.3	1.5	0.5	300mmØ
	OVERFLOW WEIR		0.0	8.0	0.3	300mmØ
	OUTLET	A	1.3	3.0	0.5	300mmØ
		B	1.3	3.0	0.5	GRASS
LR–2	INLET		1.0	1.5	0.6	GRASS
	OVERFLOW WEIR		0.0	7.0	0.3	300mmØ
	OUTLET	A	0.0	7.0	PAD	300mmØ
LR–3	INLET		3.4	1.0	0.4	GRASS
	OVERFLOW WEIR		0.0	4.0	0.3	300mmØ
	OUTLET	A	2.1	1.0	0.35	300mmØ
		B	2.1	1.0	0.35	GRASS
LR–4	INLET		MAINLINE DITCH			
	OVERFLOW WEIR		0.0	5.5	0.3	300mmØ
LR–5	INLET		MAINLINE DITCH			
	OVERFLOW WEIR		0.0	10.0	0.3	300mmØ
	OUTLET	A	11.1	1.0	0.35	300mmØ
		B	40.0	1.0	0.35	800mmØ
		C	0.0	1.5	0.45	800mmØ WITH 50mm SOIL AND SEED
P–2	INLET		0.7	1.5	0.7	GRASS
	OVERFLOW WEIR		0.0	12.0	0.3	300mmØ
	OUTLET		0.0	4.0	PAD	300mmØ
WD–1	INLET		1.25	3.0	1.06	300mmØ
	OVERFLOW WEIR		0.0	25.0	0.3	300mmØ
	OUTLET	A	1.3	2.0	0.9	300mmØ
		B	17.0	2.0	0.5	800mmØ
		C	0.0	2.0	0.4	800mmØ WITH 100mm SOIL AND SEED

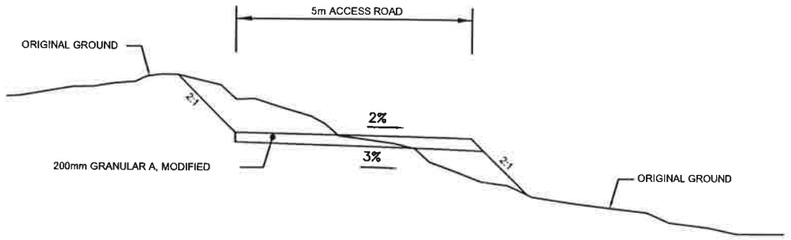
NOTE: ALL RIP RAP TO BE PROVIDED IN TWO LAYERS



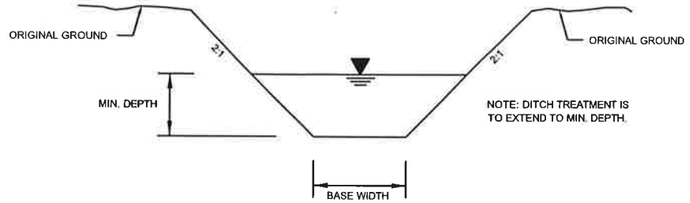
TYPICAL SECTION OF ACCESS ROAD – AROUND POND



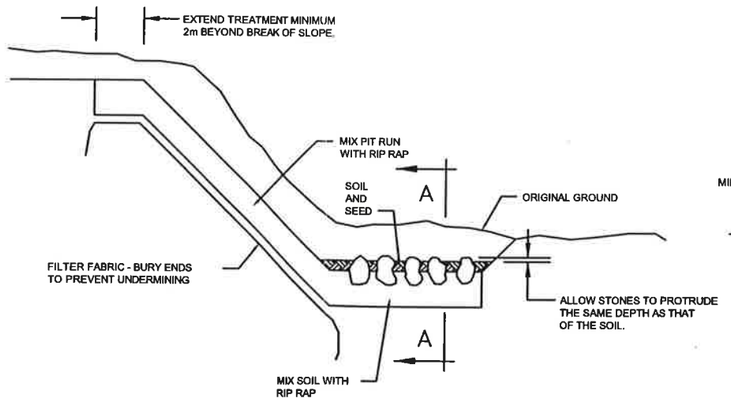
TYPICAL SECTION OF ACCESS ROAD – APPROACH
CUT SECTION



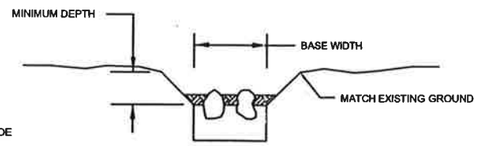
TYPICAL SECTION OF ACCESS ROAD – APPROACH
FILL SECTION



TYPICAL SECTION OF SURFACE DITCHES
(INCLUDING OVERFLOW WEIRS)



DETAIL OF OUTLET FOR PONDS
R–1, LR–5 AND WD–1



SECTION A–A
AT BOTTOM END

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHD	LEAD DISC.	PROJ. MGR.	SLF DESIGN MGR.	SLF DISC. MGR.
		6	04/02/01	REVISED R–2 OUTLET RIP RAP SIZE	KC	AA	AA	CG		
		5	02/12/01	REVISED R–2 OUTLET RIP RAP SIZE	KC	AA	AA	CG		
		4	06/15/00	REVISED DATA	MW	AS	AA	CG		
		3	05/26/00	MISCELLANEOUS REVISIONS / IA COMMENTS	CH	AS	AA	CG		
		2	05/10/00	REVISED AS PER ENVIRONMENTAL INPUT	CH	AS	AA	CG		
		1	04/07/00	ISSUED FOR CONSTRUCTION	CH	AS	AA	CG		

SCALE : N.T.S.

LICENCED PROFESSIONAL ENGINEER A. C. ADHIKARY PROVINCE OF ONTARIO

CONSULTANT				
	DESIGNED	A. SZALAMIN	AS	02/16/00
	DRAWN	C. HOPKINS	CBH	02/17/00
	CHECKED	A. ADHIKARY	AA	02/16/00
	APPROVED LEAD ENG.	A. ADHIKARY	AA	02/21/00
	APPROVED PROJ. MANAGER	C. GAUER	CBG	02/21/00
SLF	REVIEWED DESIGN MANAGER			
	REVIEWED DISC. MANAGER			
	SCALE	NAME (PRINT)	INT.	DATE

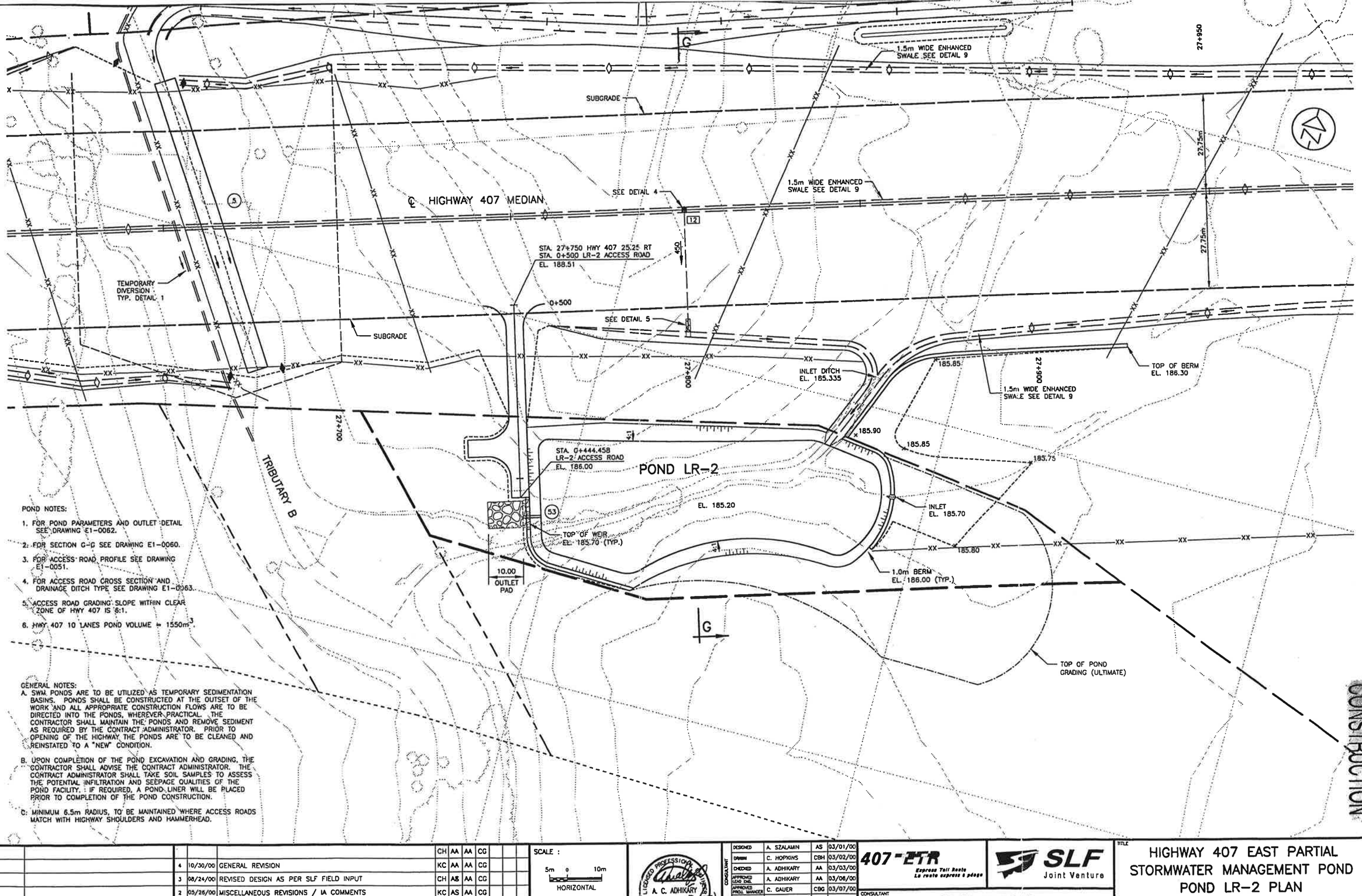
407 ETR Express Toll Route / La route express à péage

SLF Joint Venture

CONSULTANT: Marshall Macklin Monaghan — CONSULTING ENGINEERS • SURVEYORS • PLANNERS

TITLE: HIGHWAY 407 EAST PARTIAL
TYPICAL POND ACCESS RD. X–SECT.
AND DRAINAGE DITCH DETAILS

PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	10E1	4R	DD	0063	6



POND NOTES:

1. FOR POND PARAMETERS AND OUTLET DETAIL SEE DRAWING E1-0062.
2. FOR SECTION G-G SEE DRAWING E1-0060.
3. FOR ACCESS ROAD PROFILE SEE DRAWING E1-0051.
4. FOR ACCESS ROAD CROSS SECTION AND DRAINAGE DITCH TYPE SEE DRAWING E1-0063.
5. ACCESS ROAD GRADING SLOPE WITHIN CLEAR ZONE OF HWY 407 IS 6:1.
6. HWY 407 10 LANES POND VOLUME = 1550m^3.

GENERAL NOTES:

A. SWM PONDS ARE TO BE UTILIZED AS TEMPORARY SEDIMENTATION BASINS. PONDS SHALL BE CONSTRUCTED AT THE OUTSET OF THE WORK AND ALL APPROPRIATE CONSTRUCTION FLOWS ARE TO BE DIRECTED INTO THE PONDS, WHEREVER PRACTICAL. THE CONTRACTOR SHALL MAINTAIN THE PONDS AND REMOVE SEDIMENT AS REQUIRED BY THE CONTRACT ADMINISTRATOR. PRIOR TO OPENING OF THE HIGHWAY THE PONDS ARE TO BE CLEANED AND REINSTATED TO A "NEW" CONDITION.

B. UPON COMPLETION OF THE POND EXCAVATION AND GRADING, THE CONTRACTOR SHALL ADVISE THE CONTRACT ADMINISTRATOR. THE CONTRACT ADMINISTRATOR SHALL TAKE SOIL SAMPLES TO ASSESS THE POTENTIAL INFILTRATION AND SEEPAGE QUALITIES OF THE POND FACILITY. IF REQUIRED, A POND LINER WILL BE PLACED PRIOR TO COMPLETION OF THE POND CONSTRUCTION.

C. MINIMUM 6.5m RADIUS, TO BE MAINTAINED WHERE ACCESS ROADS MATCH WITH HIGHWAY SHOULDERS AND HAMMERHEAD.

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD DISC.	PROJ. MGR.	DESIGN MGR.	DISC. MGR.
		4	10/30/00	GENERAL REVISION	KC	AA	AA	CG		
		3	08/24/00	REVISED DESIGN AS PER SLF FIELD INPUT	CH	AS	AA	CG		
		2	05/26/00	MISCELLANEOUS REVISIONS / IA COMMENTS	KC	AS	AA	CG		
		1	04/07/00	ISSUED FOR CONSTRUCTION	CH	AS	AA	CG		
		0	03/24/00	FOR INFORMATION ONLY	CH	AS	AA	CG		

SCALE : 5m 0 10m HORIZONTAL

LICENCED PROFESSIONAL ENGINEER A. C. ADHIKARY PROVINCE OF ONTARIO NOV. 15

CONSULTANT				
DESIGNED	A. SZALAMIN	AS	03/01/00
DRAWN	C. HOPKINS	CBH	03/02/00
CHECKED	A. ADHIKARY	AA	03/03/00
APPROVED LEAD DISC.	A. ADHIKARY	AA	03/08/00
APPROVED PROJ. MANAGER	C. GAUER	CBG	03/07/00
SLF REVIEWED			
SCALE	NAME (PRINT)	INIT.	DATE

407 ETR Express Toll Route / La route express à péage

SLF Joint Venture

CONSULTANT Marshall Macklin Monaghan CONSULTING ENGINEERS • SURVEYORS • PLANNERS

TITLE

HIGHWAY 407 EAST PARTIAL STORMWATER MANAGEMENT POND POND LR-2 PLAN

PROJECT NO.	SUBMISSION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	10E1	4R	DD	014A	4

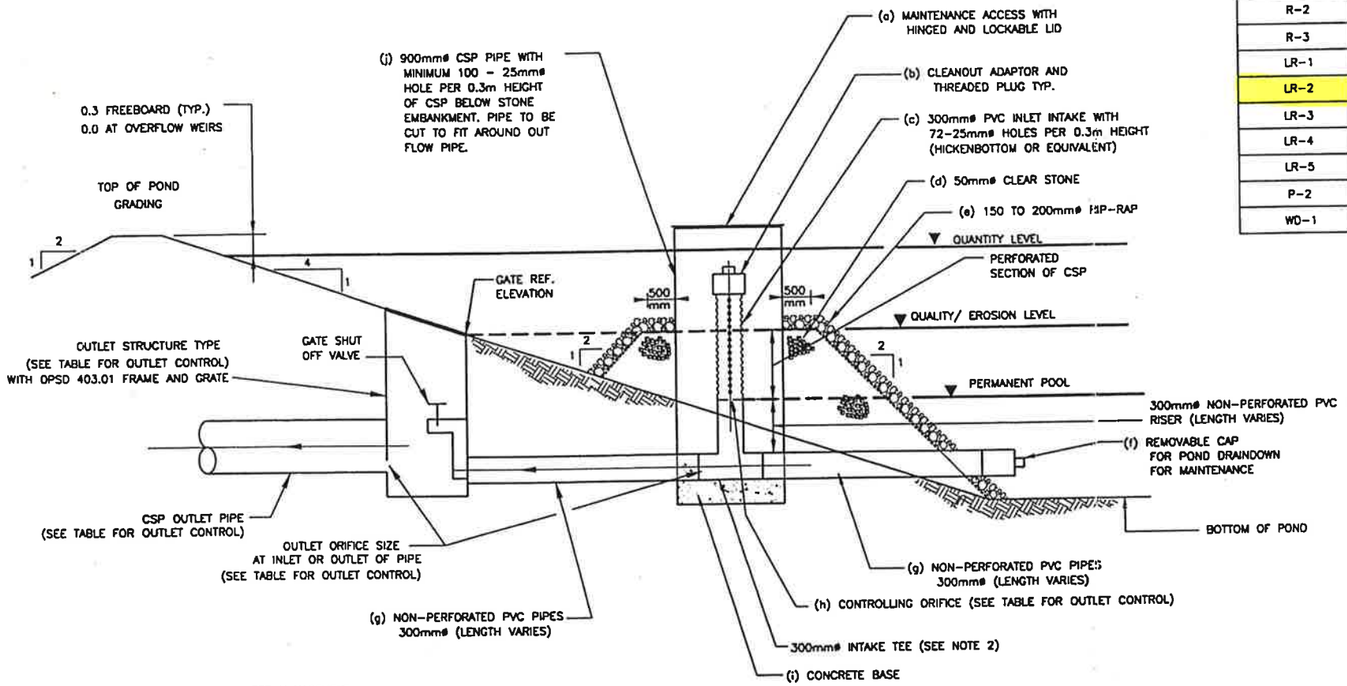
Format 'A1' Sheet Size

CONSTRUCTION

E95.0

R:\407PROJECTS\SUBMISSION\HWY_GRADING\Septl_Grading\E1\E1-014A.dwg / DATE SAVED: OCT/18/00 @ 7:40pm

E95.0



HICKENBOTTOM STORMWATER MANAGEMENT POND OUTLET INCLUDES a), b), c), d), e) f), g), h), i), j), COMPLETE OUTLET PIPE DICB WITH FRAME AND GRATE NOT INCLUDED

TYPICAL DETAIL 6 – POND OUTLET STRUCTURE

N.T.S.

TABLE FOR POND WATER LEVELS AND VOLUMES

POND NUMBER	PERMANENT		QUALITY		QUANTITY	
	LEVEL (m)	VOLUME (m^3)	LEVEL (m)	VOLUME (m^3)	LEVEL (m)	VOLUME (m^3)
R-1	172.5	1100	172.9	790	173.7	2210
R-2	164.5	3250	165.0	2650	165.5	3850
R-3	180.0	1900	180.74	3880	181.7	4220
LR-1	N/A	N/A	N/A	N/A	185.5	1480
LR-2	N/A	N/A	N/A	N/A	185.7	1550
LR-3	N/A	N/A	N/A	N/A	190.0	2020
LR-4	N/A	N/A	N/A	N/A	189.0	780
LR-5	N/A	N/A	N/A	N/A	192.2	890
P-2	N/A	N/A	N/A	N/A	200.7	1270
WD-1	188.1	2630	188.7	2905	189.7	5985

TABLE FOR OULET CONTROL

POND NUMBER	CONTROLLING ORIFICE SIZE (mm)	OUTLET ORIFICE SIZE (mm)	OUTLET STRUCTURE (OPSD TYPE)	OUTLET PIPE SIZE (mm)
R-1	77	193	705.030	450
R-2	139	397	702.040 TYPE A	800
R-3	N/A	169	N/A	300
LR-1	N/A	88	N/A	300
LR-2	N/A	100	N/A	300
LR-3	N/A	82	N/A	300
LR-4	N/A	78	N/A	300
LR-5	N/A	75	N/A	300
P-2	N/A	85	N/A	300
WD-1	134	739	702.040 TYPE A	900

NOTES :

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. FOR PONDS LR-1 THRU LR-5 AND P-2, THE 300mm INTAKE TEE SHALL BE PERFORATED AS PER SPECIFICATION NOTED IN (C)-75-25mm HOLES PER 0.3m HEIGHT.
3. FOR PONDS LR-1 THRU LR-5 AND P-2 OUTLET ORFICE SHALL BE PLACED AT DOWNSTREAM CONNECTION OF 300mm INTAKE TEE TO PVC PIPE.

CONSTRUCTION

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD DISC	PROJ. MGR.	DESIGN SPV.	DISC. MGR.
		6	07/20/01	ADDED NOTE 2 AND NOTE 3	KC	CG	CG	CG		
		5	04/04/01	REVISED OUTLET CONTROL TEXT	KJ	AA	AA	CG		
		4	10/30/00	GENERAL REVISION	KJ	AA	AA	CG		
		3	08/15/00	REVISED ,DATA	MW	AA	AA	CG		
		2	05/25/00	MISCELLANEOUS REVISIONS / IA COMMENTS	KC	AA	AA	CG		
		1	04/07/00	ISSUED FOR CONSTRUCTION	CH	AS	AA	CG		

SCALE : N.T.S.

REGISTERED PROFESSIONAL ENGINEER G. G. GAUER PROVINCE OF ONTARIO

CONSULTANT				
	DESIGNED	J.PAYNE	JP	07/26/99
	DRAWN	K. CHENG	KC	07/26/99
	CHECKED	A. ADHIKARY	AA	07/26/99
	APPROVED LEAD DISC.	A. ADHIKARI	AA	07/26/99
	APPROVED PROJ. MANAGER	C. GAUER	CG	07/26/99
SLF	REVIEWED			
SCALE		NAME (PRINT)	INIT.	DATE

407-ETR Express Toll Route / La route express à péage

SLF Joint Venture

CONSULTANT: Marshall Macklin Monaghan — CONSULTING ENGINEERS • SURVEYORS • PLANNERS

TITLE: HIGHWAY 407 EAST PARTIAL TYPICAL DETAILS FOR POND OUTLET

PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	10E1	4R	DD	0062	6

Format 'A1' Sheet Size

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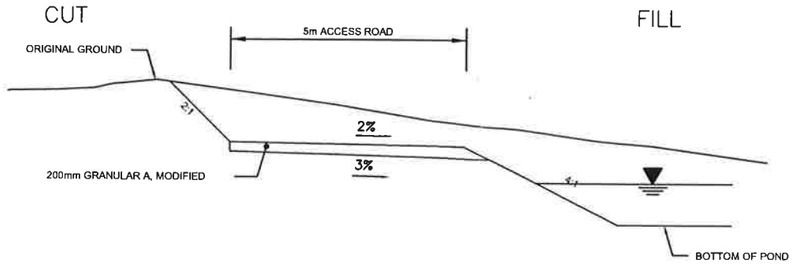
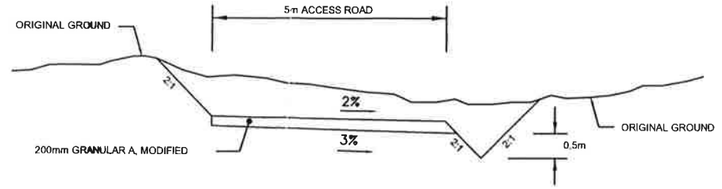
TABLE FOR POND DITCHES AND WEIRS

POND	DITCHES	TYPE	SLOPE (%)	BASE WIDTH (m)	MIN. DEPTH (m)	TREATMENT (GRASS OR RIP RAP)
R–1	INLET		8.8	1.0	0.5	300mmØ
	OVERFLOW WEIR		0.0	14.0	0.3	300mmØ
	OUTLET	A	1.5	1.5	0.6	300mmØ
		B	1.5	1.5	0.6	GRASS
		C	42	1.5	0.4	600mmØ
		D	0.0	1.5	0.25	800mmØ WITH 50mm SOIL AND SEED
R–2	OVERFLOW/OUTLET	A	0.3	1.5	0.9	GRASS
		B	7.1	1.5	0.45	500mmØ
		C	3.4	1.5	0.6	500mmØ
		D	3.4	1.5	0.8	GRASS
R–3a	INLET		2.7	0	0.5	GRASS
R–3b	INLET		1.7	0	0.6	GRASS
	OUTLET		EXISTING DITCH			300mmØ
	OVERFLOW DITCH	A	0.0	7.0	PAD	300mmØ
LR–1	INLET		6.3	1.5	0.5	300mmØ
	OVERFLOW WEIR		0.0	8.0	0.3	300mmØ
	OUTLET	A	1.3	3.0	0.5	300mmØ
		B	1.3	3.0	0.5	GRASS
LR–2	INLET		1.0	1.5	0.6	GRASS
	OVERFLOW WEIR		0.0	7.0	0.3	300mmØ
	OUTLET	A	0.0	7.0	PAD	300mmØ
LR–3	INLET		3.4	1.0	0.4	GRASS
	OVERFLOW WEIR		0.0	4.0	0.3	300mmØ
	OUTLET	A	2.1	1.0	0.35	300mmØ
		B	2.1	1.0	0.35	GRASS
LR–4	INLET		MAINLINE DITCH			
	OVERFLOW WEIR		0.0	5.5	0.3	300mmØ
LR–5	INLET		MAINLINE DITCH			
	OVERFLOW WEIR		0.0	10.0	0.3	300mmØ
	OUTLET	A	11.1	1.0	0.35	300mmØ
		B	40.0	1.0	0.35	800mmØ
		C	0.0	1.5	0.45	800mmØ WITH 50mm SOIL AND SEED
P–2	INLET		0.7	1.5	0.7	GRASS
	OVERFLOW WEIR		0.0	12.0	0.3	300mmØ
	OUTLET		0.0	4.0	PAD	300mmØ
WD–1	INLET		1.25	3.0	1.06	300mmØ
	OVERFLOW WEIR		0.0	25.0	0.3	300mmØ
	OUTLET	A	1.3	2.0	0.9	300mmØ
		B	17.0	2.0	0.5	800mmØ
		C	0.0	2.0	0.4	800mmØ WITH 100mm SOIL AND SEED

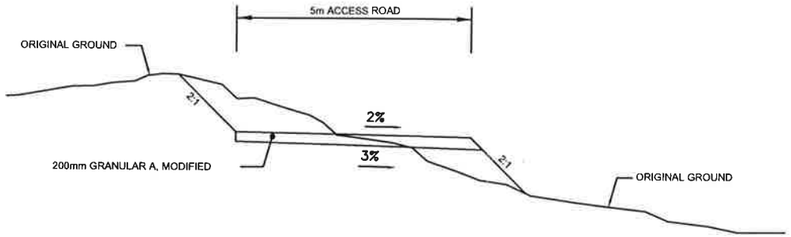
NOTE: ALL RIP RAP TO BE PROVIDED IN TWO LAYERS



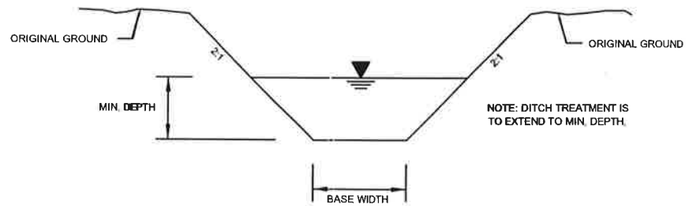
TYPICAL SECTION OF ACCESS ROAD – AROUND POND



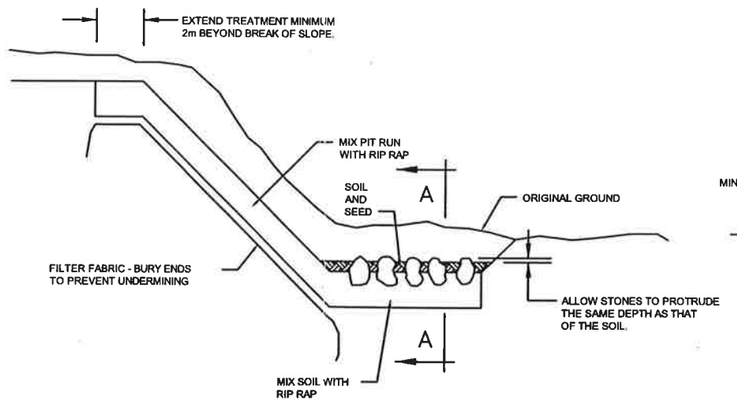
TYPICAL SECTION OF ACCESS ROAD – APPROACH
CUT SECTION



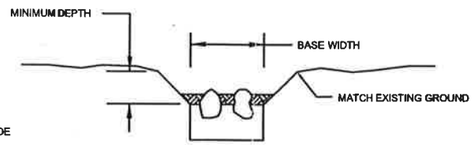
TYPICAL SECTION OF ACCESS ROAD – APPROACH
FILL SECTION



TYPICAL SECTION OF SURFACE DITCHES
(INCLUDING OVERFLOW WEIRS)



DETAIL OF OUTLET FOR PONDS
R–1, LR–5 AND WD–1



SECTION A–A
AT BOTTOM END

NO.	DATE	REVISIONS	BY	CHK	LEAD DISC.	PROJ. MAN.	DESIGN MGR.	DISC. MGR.
6	04/02/01	REVISED R–2 OUTLET RIP RAP SIZE	KC	AA	AA	CG		
5	02/12/01	REVISED R–2 OUTLET RIP RAP SIZE	KC	AA	AA	CG		
4	06/15/00	REVISED DATA	MW	AS	AA	CG		
3	05/26/00	MISCELLANEOUS REVISIONS / IA COMMENTS	CH	AS	AA	CG		
2	05/10/00	REVISED AS PER ENVIRONMENTAL INPUT	CH	AS	AA	CG		
1	04/07/00	ISSUED FOR CONSTRUCTION	CH	AS	AA	CG		

ORIG. NO. | REFERENCES

SCALE : N.T.S.

LICENSED PROFESSIONAL ENGINEER — A. C. ADHIKARY — PROVINCE OF ONTARIO

CONSULTANT				
DESIGNED	A. SZALAMIN	AS	02/16/00
DRAWN	C. HOPKINS	CBH	02/17/00
CHECKED	A. ADHIKARY	AA	02/18/00
APPROVED LEAD ENG.	A. ADHIKARY	AA	02/21/00
APPROVED PROJ. MANAGER	C. GAUER	CBG	02/21/00
SLF REVIEWED DESIGN MANAGER			
SLF REVIEWED DISC. MANAGER			
SCALE	NAME (PRINT)	INT.	DATE

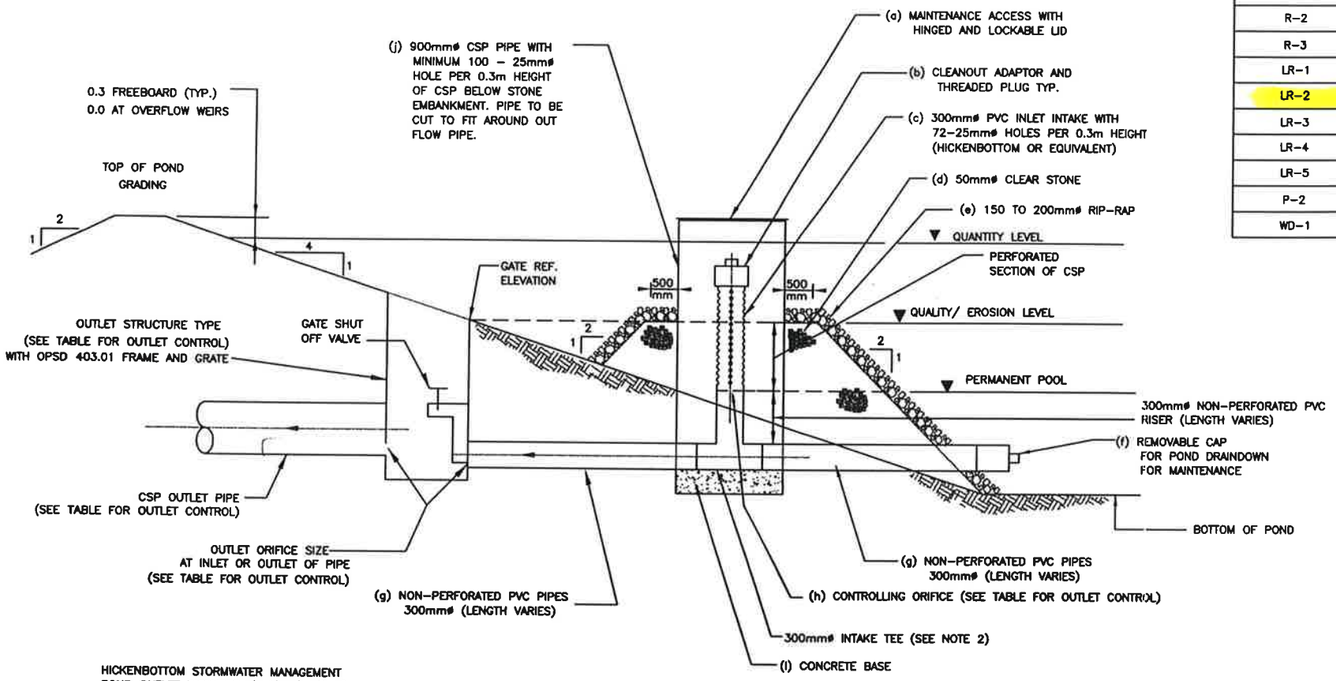
407 ETR Express Toll Route — La route express à péage

SLF Joint Venture

CONSULTANT: Marshall Macklin Monaghan — CONSULTING ENGINEERS • SURVEYORS • PLANNERS

TITLE: HIGHWAY 407 EAST PARTIAL
TYPICAL POND ACCESS RD. X–SECT.
AND DRAINAGE DITCH DETAILS

PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	10E1	4R	DD	0063	6



HICKENBOTTOM STORMWATER MANAGEMENT POND OUTLET INCLUDES a), b), c), d), e) f), g), h), i), j), COMPLETE OUTLET PIPE DICB WITH FRAME AND GRATE NOT INCLUDED

TYPICAL DETAIL 6 – POND OUTLET STRUCTURE

N.T.S.

TABLE FOR POND WATER LEVELS AND VOLUMES

POND NUMBER	PERMANENT		QUALITY		QUANTITY	
	LEVEL (m)	VOLUME (m^3)	LEVEL (m)	VOLUME (m^3)	LEVEL (m)	VOLUME (m^3)
R–1	172.5	1100	172.9	790	173.7	2210
R–2	164.5	3250	165.0	2650	165.5	3850
R–3	180.0	1900	180.74	3880	181.7	4220
LR–1	N/A	N/A	N/A	N/A	185.5	1480
LR–2	N/A	N/A	N/A	N/A	185.7	1550
LR–3	N/A	N/A	N/A	N/A	190.0	2020
LR–4	N/A	N/A	N/A	N/A	189.0	780
LR–5	N/A	N/A	N/A	N/A	192.2	890
P–2	N/A	N/A	N/A	N/A	200.7	1270
WD–1	188.1	2630	188.7	2905	189.7	5985

TABLE FOR OULET CONTROL

POND NUMBER	CONTROLLING ORIFICE SIZE (mm)	OUTLET ORIFICE SIZE (mm)	OUTLET STRUCTURE (OPSD TYPE)	OUTLET PIPE SIZE (mm)
R–1	77	193	705.030	450
R–2	139	397	702.040 TYPE A	800
R–3	N/A	169	N/A	300
LR–1	N/A	88	N/A	300
LR–2	N/A	100	N/A	300
LR–3	N/A	82	N/A	300
LR–4	N/A	78	N/A	300
LR–5	N/A	75	N/A	300
P–2	N/A	85	N/A	300
WD–1	134	739	702.040 TYPE A	900

NOTES :

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. FOR PONDS LR–1 THRU LR–5 AND P–2 THE 300mm INTAKE TEE SHALL BE PERFORATED AS PER SPECIFICATION NOTED IN (C)–75–25mm HOLES PER 0.3m HEIGHT.
3. FOR PONDS LR–1 THRU LR–5 AND P–2 OUTLET ORFICE SHALL BE PLACED AT DOWNSTREAM CONNECTION OF 300mm INTAKE TEE TO PVC PIPE.

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	ENGR MGR.	PROJ. MGR.	DESIGN MGR.	DISC. MGR.
		6	07/20/01	ADDED NOTE 2 AND NOTE 3	KJ	AA	AA	CG		
		5	04/04/01	REVISED OUTLET CONTROL TEXT	KJ	AA	AA	CG		
		4	10/30/00	GENERAL REVISION	MW	AA	AA	CG		
		3	06/13/00	REVISED DATA	KC	AA	AA	CG		
		2	05/26/00	MISCELLANEOUS REVISIONS / IA COMMENTS	CH	AS	AA	CG		
		1	04/07/00	ISSUED FOR CONSTRUCTION	CH	AS	AA	CG		

SCALE : N.T.S.

LICENCED PROFESSIONAL ENGINEER A. C. ADHIKARY PROVINCE OF ONTARIO

CONSULTANT				
	DESIGNED	J.PAYNE	JP	07/26/99
	DRAWN	K. CHENG	KC	07/26/99
	CHECKED	A. ADHIKARY	AA	07/26/99
	APPROVED LEAD ENG.	A. ADHIKARI	AA	07/26/99
	APPROVED PROJ. MANAGER	C. GAUER	CG	07/26/99
SLF	REVIEWED			
SCALE		NAME (PRINT)	INIT.	DATE

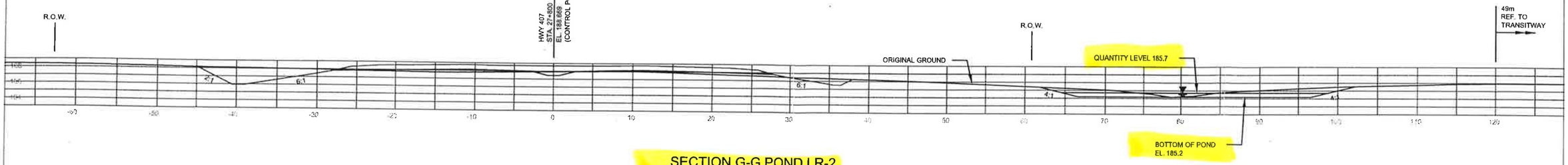
407 ETR Express Toll Route / La route express à péage

SLF Joint Venture

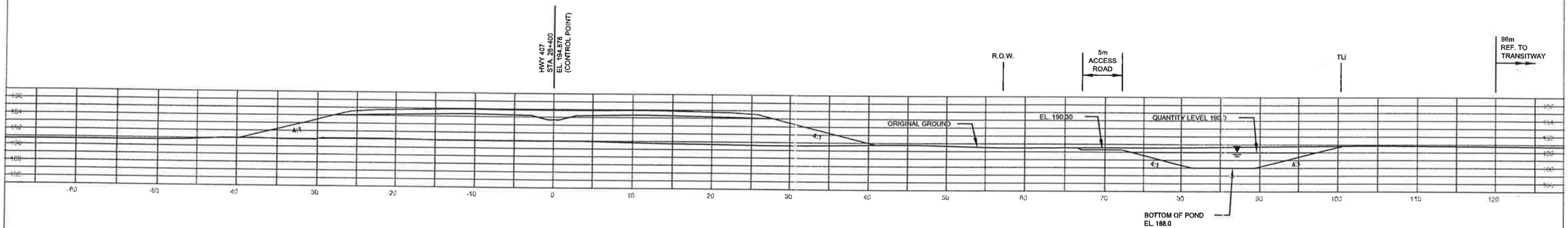
CONSULTANT Marshall Macklin Monaghan CONSULTING ENGINEERS • SURVEYORS • PLANNERS

TITLE: HIGHWAY 407 EAST PARTIAL TYPICAL DETAILS FOR POND OUTLET

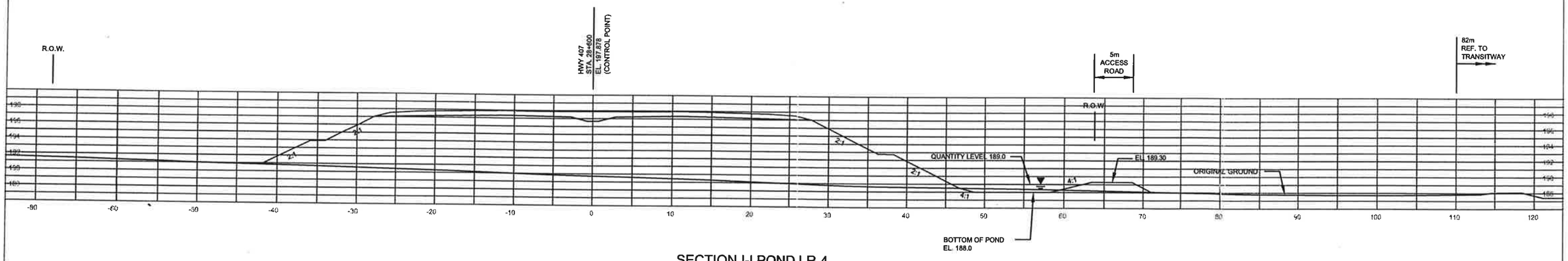
PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	10E1	4R	DD	0062	6



SECTION G-G POND LR-2
STA. 27+800 HWY 407



SECTION H-H POND LR-3
STA. 28+400 HWY 407



SECTION I-I POND LR-4
STA. 28+600 HWY 407

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD DISC.	PROJ. MGR.	DESIGN APPR.	DISC. APPR.
		1	04/07/00	ISSUED FOR CONSTRUCTION	CH	AS	AA	CG		
		0	03/24/00	ISSUED FOR INFORMATION ONLY	CH	AS	AA	CG		

SCALE : 2.5m 0 5m

A. C. ADHIKARY — LICENCED PROFESSIONAL ENGINEER — PROVINCE OF ONTARIO

CONSULTANT				
	DESIGNED	A. SZALAMIN	AS	03/06/00
	DRAWN	C. HOPKINS	CBH	03/07/00
	CHECKED	A. ADHIKARY	AA	03/08/00
	APPROVED LEAD ENG.	A. ADHIKARY	AA	03/09/00
	APPROVED PROJ. MANAGER	C. GAUER	CBG	03/10/00
SLF	REVIEWED			
SCALE		NAME (PRINT)	INIT.	DATE

407 ETR — Express Toll Route — La route express à péage

SLF Joint Venture

CONSULTANT: Marshall Macklin Monaghan — CONSULTING ENGINEERS • SURVEYORS • PLANNERS

TITLE

HIGHWAY 407 EAST PARTIAL TYPICAL CROSS SECTIONS SECTION E1 PONDS

PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	10E1	4R	DD	0060	1

POND NOTES:

1. FOR POND PARAMETERS AND OUTLET DETAIL SEE DRAWING E1-0062.
2. FOR SECTION H-H SEE DRAWING E1-0060.
3. FOR SECTION I-I SEE DRAWING E1-0060.
4. FOR ACCESS ROAD PROFILE SEE DRAWING E1-0051.
5. FOR ACCESS ROAD CROSS SECTION AND DRAINAGE DITCH TYPE SEE DRAWING E1-0063.
6. ACCESS ROAD GRADING SLOPE WITHIN CLEAR ZONE OF HWY 407 IS 6:1.
7. HWY 407 10 LANES POND LR-3 VOLUME = 2020m³.
8. HWY 407 10 LANES POND LR-4 VOLUME = 780m³.

H

I

1.5m WIDE ENHANCED SWALE SEE DETAIL 9

SANDBAG BARRIER OPSD 219.150

UNDERGROUND BELL

AERIAL BELL

ES1-04 2 TENTH LINE OVERPASS

SUBGRADE

SEE DETAIL 4

℄ HIGHWAY 407 MEDIAN

HOT STA. 28+538.331 HWY 407 = HOT STA. 10+000 TENTH LINE

1.5m WIDE ENHANCED SWALE SEE DETAIL 9

STA. 28+356 HWY 407 25.25m RT. LR-3 ACCESS ROAD

TEMPORARY DIVERSION TYP. DETAIL 1

SEE DETAIL 4

SEE DETAIL 5

0+600

PT = 0+593.50

PC = 0+546.66

DITCH EL. 190.32

ACCESS ROAD

SUBGRADE

DITCH EL. 188.32

SEE DETAIL 5

TOP OF BERM EL. 189.0 (TYP.)

TOP OF BENCH EL. 189.30 (TYP.)

DITCH EL. 188.02

LR-4 ACCESS ROAD STA. 0+546.96 EL. 190.35

1.5m WIDE ENHANCED SWALE SEE DETAIL 9

INLET DITCH

PT = 0+559.66

PC = 0+555.96

ACCESS ROAD EL. 190.30

TOP OF WEIR EL. 190.0

DITCH EL. 187.90

POND LR-3 EL. 188.00

POND LR-4 EL. 188.00

TOP OF WEIR EL. 189.0

ACCESS ROAD EL. 189.30

EL. 187.58

EL. 187.90

STA. 9+934 TENTH LINE 3.50m RT. LR-4 ACCESS ROAD STA. 0+700 EL. 189.47

LR-4 ACCESS ROAD STA. 0+783.94 EL. 189.30

TOP OF BERM EL. 190.30 (TYP.)

DITCH 'A' 10.0m

DITCH 'B'

TOP OF POND GRADING (ULTIMATE)

TOP OF POND GRADING (ULTIMATE)

LITTLE ROUGE RIVER (TRIBUTARY 'C')

℄ TENTH LINE

GENERAL NOTES:

A. SWM PONDS ARE TO BE UTILIZED AS TEMPORARY SEDIMENTATION BASINS. PONDS SHALL BE CONSTRUCTED AT THE OUTSET OF THE WORK AND ALL APPROPRIATE CONSTRUCTION FLOWS ARE TO BE DIRECTED INTO THE PONDS, WHEREVER PRACTICAL. THE CONTRACTOR SHALL MAINTAIN THE PONDS AND REMOVE SEDIMENT AS REQUIRED BY THE CONTRACT ADMINISTRATOR. PRIOR TO OPENING OF THE HIGHWAY THE PONDS ARE TO BE CLEANED AND REINSTATED TO A "NEW" CONDITION.

B. UPON COMPLETION OF THE POND EXCAVATION AND GRADING, THE CONTRACTOR SHALL ADVISE THE CONTRACT ADMINISTRATOR. THE CONTRACT ADMINISTRATOR SHALL TAKE SOIL SAMPLES TO ASSESS THE POTENTIAL INFILTRATION AND SEEPAGE QUALITIES OF THE POND FACILITY. IF REQUIRED, A POND LINER WILL BE PLACED PRIOR TO COMPLETION OF THE POND CONSTRUCTION.

C. MINIMUM 6.5m RADIUS, TO BE MAINTAINED WHERE ACCESS ROADS MATCH WITH HIGHWAY SHOULDERS AND HAMMERHEAD.

CONSTRUCTION

E95.8

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD DISC.	PROJ MGR.	RESP. DISC.	QUAL. MGR.
		4	11/07/00	GENERAL REVISION / IA COMMENTS	KC	AS	AA	CG		
		3	08/24/00	REVISED DESIGN AS PER SLF FIELD INPUT	CH	AS	AA	CG		
		2	05/26/00	MISCELLANEOUS REVISIONS / IA COMMENTS	KC	AS	AA	CG		
		1	04/07/00	ISSUED FOR CONSTRUCTION	CH	AS	AA	CG		
		0	03/24/00	FOR INFORMATION ONLY	CH	AS	AA	CG		

SCALE : 5m 0 10m HORIZONTAL

LICENSED PROFESSIONAL ENGINEER A. C. ADHIKARY PROVINCE OF ONTARIO

CONSULTANT		NAME (PRINT)	INT.	DATE
	DESIGNED	A. SZALAMIN	AS	03/01/00
	DRAWN	C. HOPKINS	CBH	03/02/00
	CHECKED	A. ADHIKARY	AA	03/03/00
	APPROVED DESIGN ENG.	A. ADHIKARY	AA	03/06/00
	APPROVED PROJ. MANAGER	C.CAUER	CBG	07/07/00
SLF	REVIEWED			

407 ETR Express Toll Route / La route express à péage

SLF Joint Venture

CONSULTANT Marshall Macklin Monaghan CONSULTING ENGINEERS • SURVEYORS • PLANNERS

TITLE

HIGHWAY 407 EAST PARTIAL STORMWATER MANAGEMENT POND POND LR-3 & 4 PLAN

PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	10E1	4R	DD	016A	4

Format 'A1' Sheet Size

R:\407PROJECT\SUBMISSION\WM_GRADING\Sept_Grading\E1\E1-016A.dwg / DATE SAVED: OCT/11/00 @ 08:31am

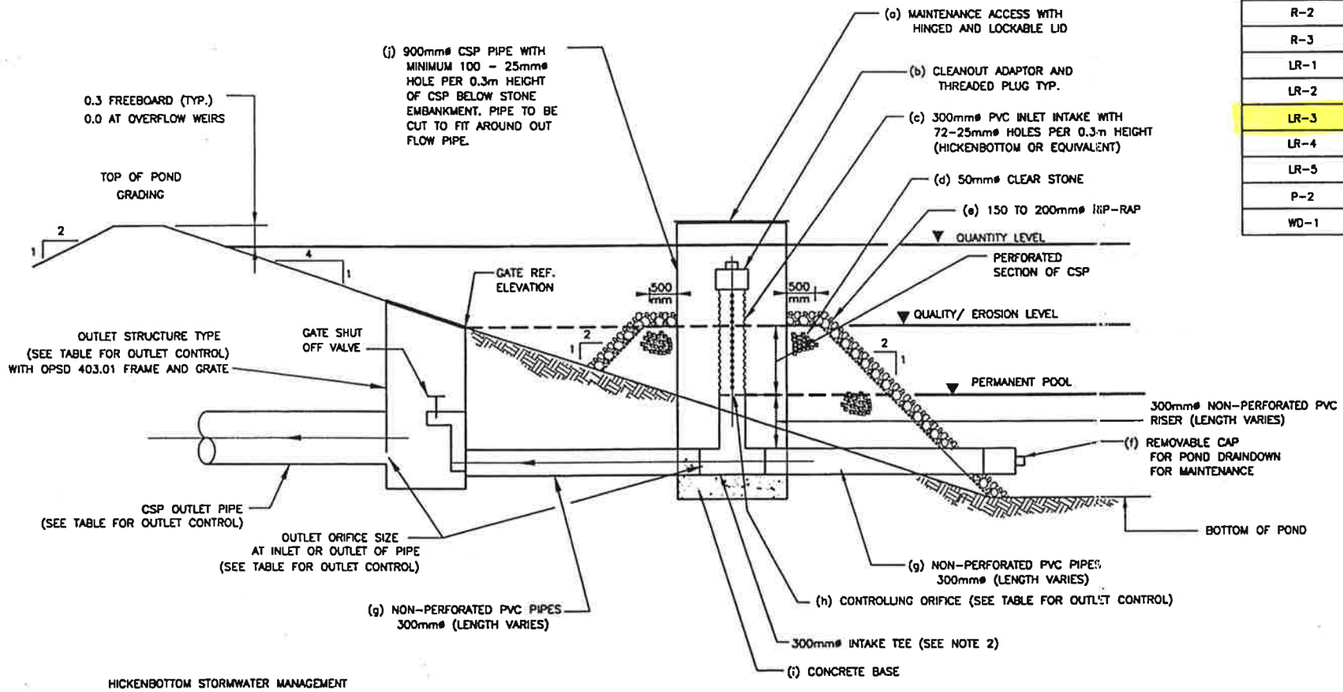
E95.8

TABLE FOR POND WATER LEVELS AND VOLUMES

POND NUMBER	PERMANENT		QUALITY		QUANTITY	
	LEVEL (m)	VOLUME (m^3)	LEVEL (m)	VOLUME (m^3)	LEVEL (m)	VOLUME (m^3)
R-1	172.5	1100	172.9	790	173.7	2210
R-2	164.5	3250	165.0	2650	165.5	3850
R-3	180.0	1900	180.74	3880	181.7	4220
LR-1	N/A	N/A	N/A	N/A	185.5	1480
LR-2	N/A	N/A	N/A	N/A	185.7	1550
LR-3	N/A	N/A	N/A	N/A	190.0	2020
LR-4	N/A	N/A	N/A	N/A	189.0	780
LR-5	N/A	N/A	N/A	N/A	192.2	890
P-2	N/A	N/A	N/A	N/A	200.7	1270
WD-1	188.1	2630	188.7	2905	189.7	5985

TABLE FOR OULET CONTROL

POND NUMBER	CONTROLLING ORIFICE SIZE (mm)	OUTLET ORIFICE SIZE (mm)	OUTLET STRUCTURE (OPSD TYPE)	OUTLET PIPE SIZE (mm)
R-1	77	193	705.030	450
R-2	139	397	702.040 TYPE A	800
R-3	N/A	169	N/A	300
LR-1	N/A	88	N/A	300
LR-2	N/A	100	N/A	300
LR-3	N/A	82	N/A	300
LR-4	N/A	78	N/A	300
LR-5	N/A	75	N/A	300
P-2	N/A	85	N/A	300
WD-1	134	739	702.040 TYPE A	900



HICKENBOTTOM STORMWATER MANAGEMENT POND OUTLET INCLUDES a), b), c), d), e) f), g), h), i), j). COMPLETE OUTLET PIPE DICB WITH FRAME AND GRATE NOT INCLUDED

TYPICAL DETAIL 6 – POND OUTLET STRUCTURE

N.T.S.

NOTES :

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. FOR PONDS LR-1 THRU LR-5 AND P-2, THE 300mm INTAKE TEE SHALL BE PERFORATED AS PER SPECIFICATION NOTED IN (C)-75-25mm HOLES PER 0.3m HEIGHT.
3. FOR PONDS LR-1 THRU LR-5 AND P-2 OUTLET ORFICE SHALL BE PLACED AT DOWNSTREAM CONNECTION OF 300mm INTAKE TEE TO PVC PIPE.

CONSTRUCTION

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD DISC.	PROJ MNGR.	ESCRP APP.	DISC APP.
		6	07/20/01	ADDED NOTE 2 AND NOTE 3	KC	CG	CG	CG		
		5	04/04/01	REVISED OUTLET CONTROL TEXT	KJ	AA	AA	CG		
		4	10/30/00	GENERAL REVISION	KJ	AA	AA	CG		
		3	08/15/00	REVISED ,DATA	MW	AA	AA	CG		
		2	05/26/00	MISCELLANEOUS REVISIONS / MA COMMENTS	KC	AA	AA	CG		
		1	04/07/00	ISSUED FOR CONSTRUCTION	CH	AS	AA	CG		

SCALE : N.T.S.

REGISTERED PROFESSIONAL ENGINEER G.D. GAUER PROVINCE OF ONTARIO
07/20/01

CONSULTANT				
	DESIGNED	J.PAYNE	JP	07/26/99
	DRAWN	K. CHENG	KC	07/26/99
	CHECKED	A. ADHIKARY	AA	07/26/99
	APPROVED (LEAD DISC.)	A. ADHIKARI	AA	07/26/99
	APPROVED (PROJ. MANAGER)	C. GAUER	CG	07/26/99
SLF	REVISED			
SCALE	NAME (PRINT)		INT.	DATE

407-ETR Express Toll Route / La route express à péage

SLF Joint Venture

CONSULTANT: Marshall Macklin Monaghan — CONSULTING ENGINEERS • SURVEYORS • PLANNERS

TITLE: HIGHWAY 407 EAST PARTIAL
TYPICAL DETAILS
FOR POND OUTLET

PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	10E1	4R	DD	0062	6

Format 'A1' Sheet Size

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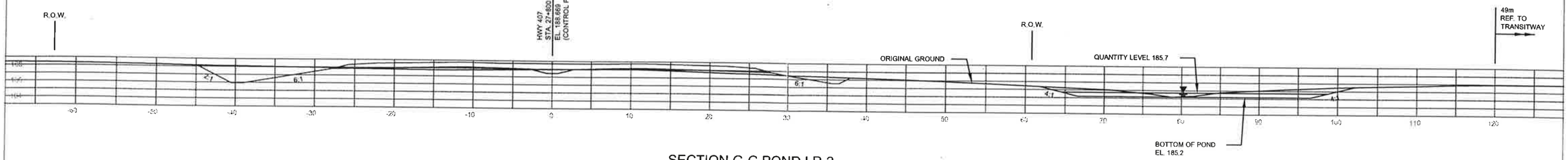
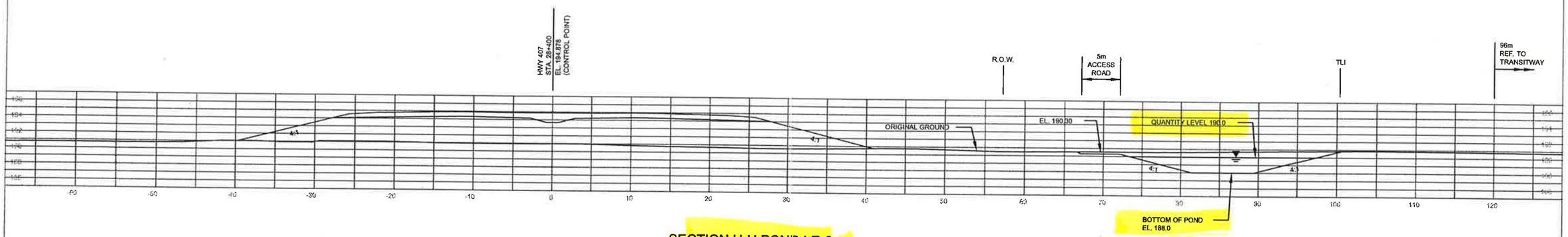
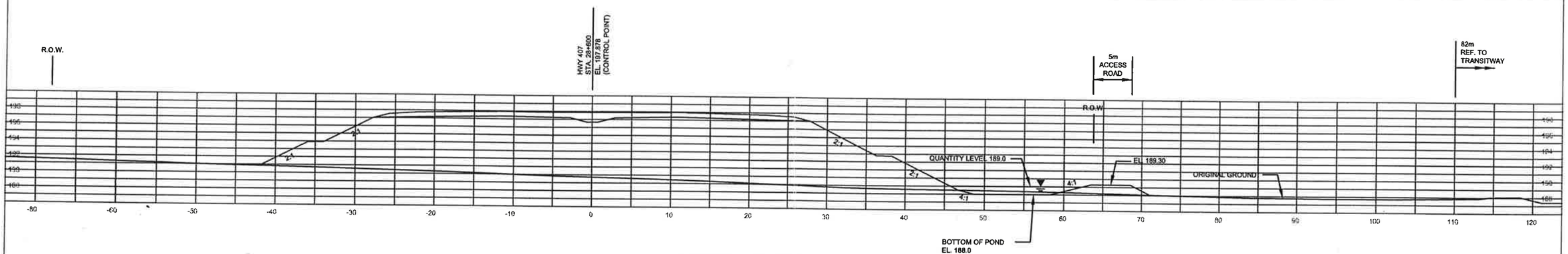


SECTION G-G POND LR-2
STA. 27+800 HWY 407



SECTION H-H POND LR-3
STA. 28+400 HWY 407



SECTION I-I POND LR-4
STA. 28+600 HWY 407

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD DISC.	PROJ. MGR.	SLF DESIGN APVL	SLF DISC. APVL
		1	04/07/00	ISSUED FOR CONSTRUCTION	CH	AS	AA	CG		
		0	03/24/00	ISSUED FOR INFORMATION ONLY	CH	AS	AA	CG		

SCALE : 2.5m 0 5m

LICENSED PROFESSIONAL ENGINEER
A. C. ADHIKARY
PROVINCE OF ONTARIO

CONSULTANT				
	DESIGNED	A. SZALAMIH	AS	03/06/00
	DRAWN	C. HOPKINS	CBH	03/07/00
	CHECKED	A. ADHIKARY	AA	03/08/00
	APPROVED LEAD DISC.	A. ADHIKARY	AA	03/09/00
	APPROVED PROJ. MANAGER	C. GAUER	CBG	03/10/00
SLF	FINISHED			
	SCALE	NAME (PRINT)	INIT.	DATE

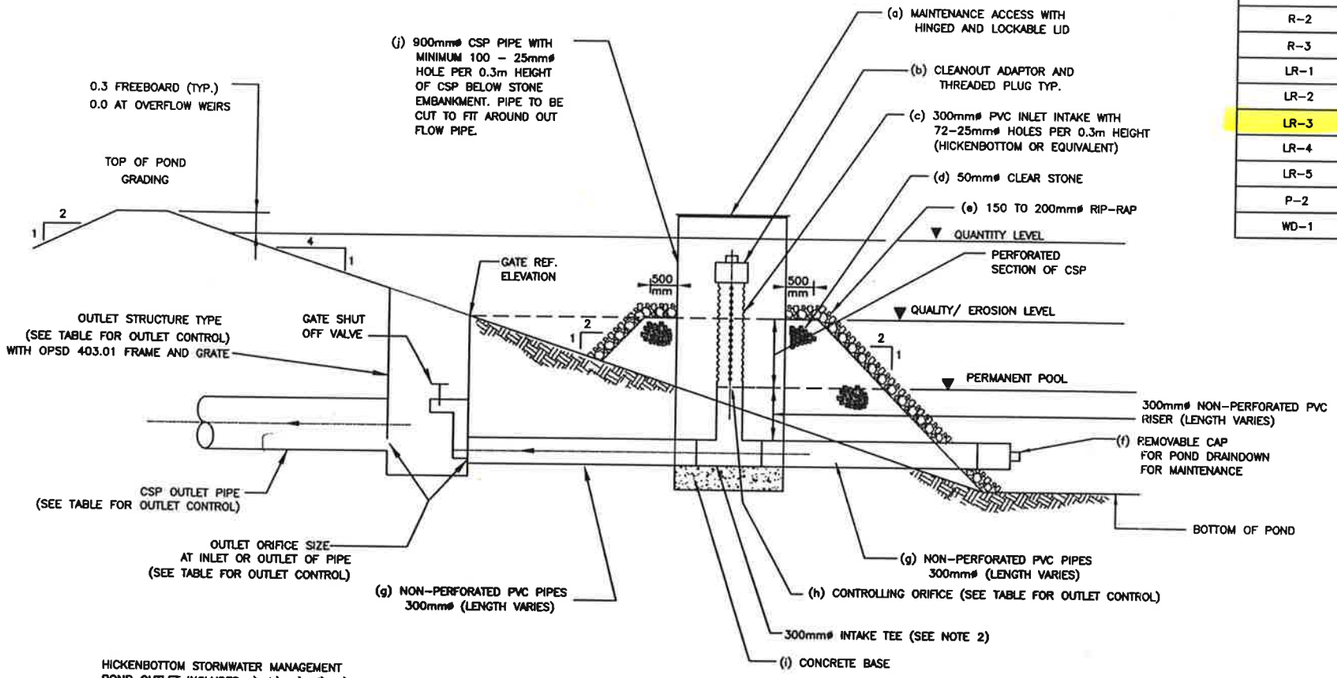
407 ETR
Express Toll Route
La route express à péage

SLF
Joint Venture

CONSULTANT
Marshall Macklin Monaghan
CONSULTING ENGINEERS • SURVEYORS • PLANNERS

TITLE
HIGHWAY 407 EAST PARTIAL
TYPICAL CROSS SECTIONS
SECTION E1 PONDS

PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	10E1	4R	DD	0060	1



HICKENBOTTOM STORMWATER MANAGEMENT POND OUTLET INCLUDES a), b), c), d), e) f), g), h), i), j), COMPLETE OUTLET PIPE DICB WITH FRAME AND GRATE NOT INCLUDED

TYPICAL DETAIL 6 – POND OUTLET STRUCTURE

N.T.S.

TABLE FOR POND WATER LEVELS AND VOLUMES

POND NUMBER	PERMANENT		QUALITY		QUANTITY	
	LEVEL (m)	VOLUME (m^3)	LEVEL (m)	VOLUME (m^3)	LEVEL (m)	VOLUME (m^3)
R–1	172.5	1100	172.9	790	173.7	2210
R–2	164.5	3250	165.0	2650	165.5	3850
R–3	180.0	1900	180.74	3880	181.7	4220
LR–1	N/A	N/A	N/A	N/A	185.5	1480
LR–2	N/A	N/A	N/A	N/A	185.7	1550
LR–3	N/A	N/A	N/A	N/A	190.0	2020
LR–4	N/A	N/A	N/A	N/A	189.0	780
LR–5	N/A	N/A	N/A	N/A	192.2	890
P–2	N/A	N/A	N/A	N/A	200.7	1270
WD–1	188.1	2630	188.7	2905	189.7	5985

TABLE FOR OULET CONTROL

POND NUMBER	CONTROLLING ORIFICE SIZE (mm)	OUTLET ORIFICE SIZE (mm)	OUTLET STRUCTURE (OPSD TYPE)	OUTLET PIPE SIZE (mm)
R–1	77	193	705.030	450
R–2	139	397	702.040 TYPE A	600
R–3	N/A	169	N/A	300
LR–1	N/A	88	N/A	300
LR–2	N/A	100	N/A	300
LR–3	N/A	82	N/A	300
LR–4	N/A	78	N/A	300
LR–5	N/A	75	N/A	300
P–2	N/A	85	N/A	300
WD–1	134	739	702.040 TYPE A	900

NOTES :

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. FOR PONDS LR–1 THRU LR–5 AND P–2 THE 300mm INTAKE TEE SHALL BE PERFORATED AS PER SPECIFICATION NOTED IN (C)–75–25mm HOLES PER 0.3m HEIGHT.
3. FOR PONDS LR–1 THRU LR–5 AND P–2 OUTLET ORFICE SHALL BE PLACED AT DOWNSTREAM CONNECTION OF 300mm INTAKE TEE TO PVC PIPE.

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD DISC.	PROJ. MGR.	DESIGN LEVEL	DISC. LEVEL
		6	07/20/01	ADDED NOTE 2 AND NOTE 3	KJ	AA	AA	CG		
		5	04/04/01	REVISED OUTLET CONTROL TEXT	KJ	AA	AA	CG		
		4	10/30/00	GENERAL REVISION	MW	AA	AA	CG		
		3	06/15/00	REVISED DATA	KC	AA	AA	CG		
		2	05/28/00	MISCELLANEOUS REVISIONS / IA COMMENTS	CH	AS	AA	CG		
		1	04/07/00	ISSUED FOR CONSTRUCTION	CH	AS	AA	CG		

SCALE : N.T.S.

LICENCED PROFESSIONAL ENGINEER A. C. ADHIKARY PROVINCE OF ONTARIO

CONSULTANT				
	DESIGNED	J.PAYNE	JP	07/26/99
	DRAWN	K. CHENG	KC	07/26/99
	CHECKED	A. ADHIKARY	AA	07/26/99
	APPROVED LEAD ENG.	A. ADHIKARI	AA	07/26/99
	APPROVED PROJ. MANAGER	C. GAUER	CG	07/26/99
SLF	REVIEWED			
	SCALE	NAME (PRINT)	INIT.	DATE

407 ETR Express Toll Route / La route express à péage

SLF Joint Venture

CONSULTANT Marshall Macklin Monaghan CONSULTING ENGINEERS • SURVEYORS • PLANNERS

TITLE

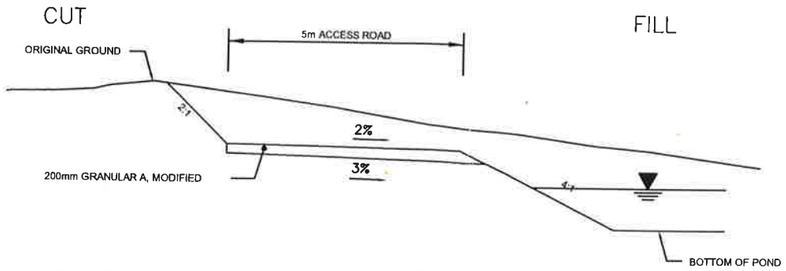
HIGHWAY 407 EAST PARTIAL
TYPICAL DETAILS FOR POND OUTLET

PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	10E1	4R	DD	0062	6

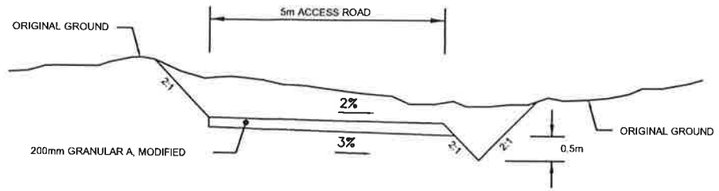
TABLE FOR POND DITCHES AND WEIRS

POND	DITCHES	TYPE	SLOPE (%)	BASE WIDTH (m)	MIN. DEPTH (m)	TREATMENT (GRASS OR RIP RAP)
R-1	INLET		8.8	1.0	0.5	300mmØ
	OVERFLOW WEIR		0.0	14.0	0.3	300mmØ
	OUTLET	A	1.5	1.5	0.6	300mmØ
		B	1.5	1.5	0.6	GRASS
		C	42	1.5	0.4	800mmØ
		D	0.0	1.5	0.25	800mmØ WITH 50mm SOIL AND SEED
R-2	OVERFLOW/OUTLET	A	0.3	1.5	0.9	GRASS
		B	7.1	1.5	0.45	500mmØ
		C	3.4	1.5	0.6	500mmØ
		D	3.4	1.5	0.8	GRASS
R-3a	INLET		2.7	0	0.5	GRASS
R-3b	INLET		1.7	0	0.6	GRASS
	OUTLET		EXISTING DITCH			300mmØ
	OVERFLOW DITCH	A	0.0	7.0	PAD	300mmØ
LR-1	INLET		6.3	1.5	0.5	300mmØ
	OVERFLOW WEIR		0.0	8.0	0.3	300mmØ
	OUTLET	A	1.3	3.0	0.5	300mmØ
		B	1.3	3.0	0.5	GRASS
LR-2	INLET		1.0	1.5	0.6	GRASS
	OVERFLOW WEIR		0.0	7.0	0.3	300mmØ
	OUTLET	A	0.0	7.0	PAD	300mmØ
LR-3	INLET		3.4	1.0	0.4	GRASS
	OVERFLOW WEIR		0.0	4.0	0.3	300mmØ
	OUTLET	A	2.1	1.0	0.35	300mmØ
		B	2.1	1.0	0.35	GRASS
LR-4	INLET		MAINLINE DITCH			
	OVERFLOW WEIR		0.0	5.5	0.3	300mmØ
LR-5	INLET		MAINLINE DITCH			
	OVERFLOW WEIR		0.0	10.0	0.3	300mmØ
	OUTLET	A	11.1	1.0	0.35	300mmØ
		B	40.0	1.0	0.35	800mmØ
		C	0.0	1.5	0.45	800mmØ WITH 50mm SOIL AND SEED
P-2	INLET		0.7	1.5	0.7	GRASS
	OVERFLOW WEIR		0.0	12.0	0.3	300mmØ
	OUTLET		0.0	4.0	PAD	300mmØ
WD-1	INLET		1.25	3.0	1.06	300mmØ
	OVERFLOW WEIR		0.0	25.0	0.3	300mmØ
	OUTLET	A	1.3	2.0	0.9	300mmØ
		B	17.0	2.0	0.5	800mmØ
		C	0.0	2.0	0.4	800mmØ WITH 100mm SOIL AND SEED

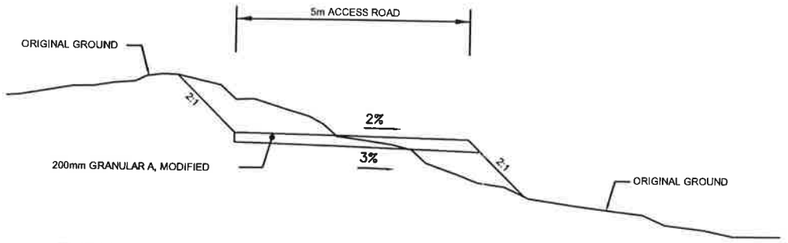
NOTE: ALL RIP RAP TO BE PROVIDED IN TWO LAYERS



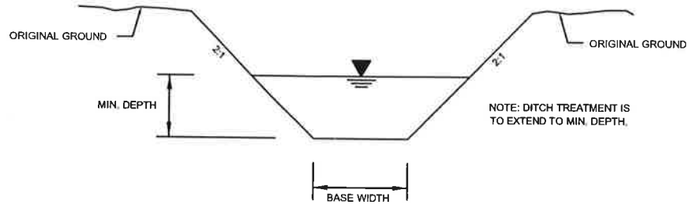
TYPICAL SECTION OF ACCESS ROAD – AROUND POND



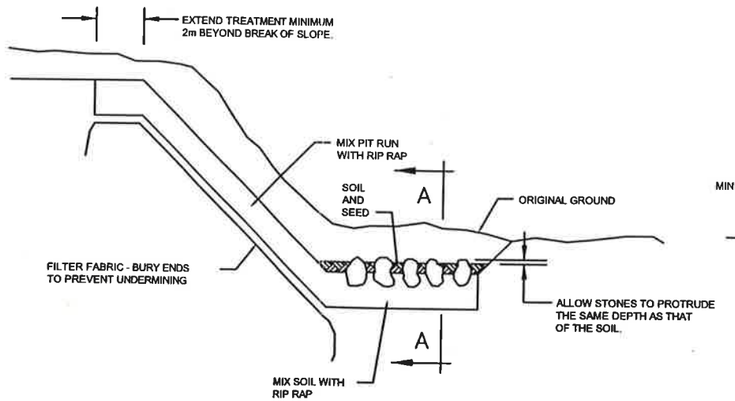
TYPICAL SECTION OF ACCESS ROAD – APPROACH
CUT SECTION



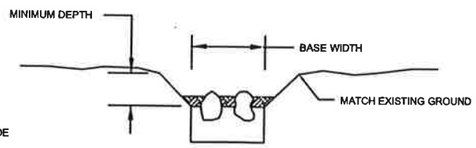
TYPICAL SECTION OF ACCESS ROAD – APPROACH
FILL SECTION



TYPICAL SECTION OF SURFACE DITCHES
(INCLUDING OVERFLOW WEIRS)



DETAIL OF OUTLET FOR PONDS
R-1, LR-5 AND WD-1



SECTION A–A
AT BOTTOM END

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD DISC.	FINAL SIGN.	DESIGN LEVEL	DISC. LEVEL
		6	04/02/01	REVISED R-2 OUTLET RIP RAP SIZE	KC	AA	AA	CG		
		5	02/12/01	REVISED R-2 OUTLET RIP RAP SIZE	KC	AA	AA	CG		
		4	06/15/00	REVISED DATA	MW	AS	AA	CG		
		3	05/26/00	MISCELLANEOUS REVISIONS / IA COMMENTS	CH	AS	AA	CG		
		2	05/10/00	REVISED AS PER ENVIRONMENTAL INPUT	CH	AS	AA	CG		
		1	04/07/00	ISSUED FOR CONSTRUCTION	CH	AS	AA	CG		

SCALE : N.T.S.

LICENSED PROFESSIONAL ENGINEER — A. C. ADHIKARY — PROVINCE OF ONTARIO

CONSULTANT				
	DESIGNED	A. SZALAMIN	AS	02/16/00
	DRAWN	C. HOPKINS	CBH	02/17/00
	CHECKED	A. ADHIKARY	AA	02/18/00
	APPROVED LEAD ENG.	A. ADHIKARY	AA	02/21/00
	APPROVED PROJ. MANAGER	C. GAUER	CBG	02/21/00
SLF	REVIEWED DESIGN MANAGER			
	REVIEWED DISC. MANAGER			
	SCALE	NAME (PRINT)	INIT.	DATE

407 ETR — Express Toll Route / La route express à péage

SLF Joint Venture

CONSULTANT: Marshall Macklin Monaghan — CONSULTING ENGINEERS • SURVEYORS • PLANNERS

TITLE: HIGHWAY 407 EAST PARTIAL
TYPICAL POND ACCESS RD. X-SECT.
AND DRAINAGE DITCH DETAILS

PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	10E1	4R	DD	0063	6

GENERAL NOTES:

A. SWM PONDS ARE TO BE UTILIZED AS TEMPORARY SEDIMENTATION BASINS. PONDS SHALL BE CONSTRUCTED AT THE OUTSET OF THE WORK AND ALL APPROPRIATE CONSTRUCTION FLOWS ARE TO BE DIRECTED INTO THE PONDS, WHEREVER PRACTICAL. THE CONTRACTOR SHALL MAINTAIN THE PONDS AND REMOVE SEDIMENT AS REQUIRED BY THE CONTRACT ADMINISTRATOR. PRIOR TO OPENING OF THE HIGHWAY THE PONDS ARE TO BE CLEANED AND REINSTATED TO A "NEW" CONDITION.

B. UPON COMPLETION OF THE POND EXCAVATION AND GRADING, THE CONTRACTOR SHALL ADVISE THE CONTRACT ADMINISTRATOR. THE CONTRACT ADMINISTRATOR SHALL TAKE SOIL SAMPLES TO ASSESS THE POTENTIAL INFILTRATION AND SEEPAGE QUALITIES OF THE POND FACILITY. IF REQUIRED, A POND LINER WILL BE PLACED PRIOR TO COMPLETION OF THE POND CONSTRUCTION.

C. MINIMUM 6.5m RADIUS, TO BE MAINTAINED WHERE ACCESS ROADS MATCH WITH HIGHWAY SHOULDERS AND HAMMERHEAD.

NOTES:

1. FOR POND PARAMETERS AND OUTLET DETAIL SEE DRAWING E1-0062.
2. FOR SECTION J-J SEE DRAWING E1-0061.
3. FOR ACCESS ROAD PROFILE SEE DRAWING E1-0052.
4. FOR ACCESS ROAD CROSS SECTION AND DRAINAGE DITCH TYPE SEE DRAWING E1-0063.
5. ACCESS ROAD GRADING SLOPE WITHIN CLEAR ZONE OF HWY 407 IS 6:1.
6. HWY 407 10 LANES POND LR-5 VOLUME = 890m³.

ES1-06
LITTLE ROUGE
CREEK BRIDGE

1.5m WIDE ENHANCED SWALE SEE DETAIL 9

SUBGRADE

1.5m WIDE ENHANCED SWALE SEE DETAIL 9

℄ HIGHWAY 407

DITCH
EL. 186.50

SUBGRADE

DITCH
EL. 190.90

TOP OF WEIR
EL. 192.20

HWY 407 STA. 29+550
℄ OFFSET 25.75 RT EL. 198.549
POND ACCESS ROAD STA. 0+800

EL. 182.50
(REF.)

EXIST. NATURAL
DRAINAGE SWALE

POND LR-5

EL. 191.00

PT = 0+779.076
PCC = 0+733.570

BERM TO
EL. 193.00

DITCH "C"
10.0m

DITCH
29+900

OUTLET DITCH 'A'

ACCESS ROAD EL. 192.50

29+800

29+700

1.0m BERM
EL. 192.20 (REF.)

ACCESS ROAD STA. 0+621.433
EL. 192.50

PC = 0+621.433

TOP OF POND
GRADING (ULTIMATE)

0+700

R=15

CURVE No. 10E1-2
R=2000.00m
S=0.035

CONSTRUCTION

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD DISC.	PROJ. MGR.	DESIGN MGR.	SLF DISC. MGR.
		3	09/25/00	RESPONSE TO IA COMMENTS	KC	AS	AA	CG		
		2	05/26/00	MISCELLANEOUS REVISIONS / IA COMMENTS	KC	AS	AA	CG		
		1	04/07/00	ISSUED FOR CONSTRUCTION	CH	AS	AA	CG		
		0	03/24/00	FOR INFORMATION ONLY	CH	AS	AA	CG		

SCALE :
5m 0 10m
HORIZONTAL

LICENSED PROFESSIONAL ENGINEER
A. C. ADHIKARY
NOV. 14
PROVINCE OF ONTARIO

CONSULTANT				
	DESIGNED	A. SZALAMIN	AS	03/01/00
	DRAWN	C. HOPKINS	CBH	03/02/00
	CHECKED	A. ADHIKARY	AA	03/03/00
	APPROVED LEAD ENG.	A. ADHIKARY	AA	03/06/00
	APPROVED PROJ. MANAGER	C. GAUER	CBG	03/07/00
SLF	REVIEWED			
SCALE		NAME (PRINT)	INIT.	DATE

407 ETR
Express Toll Route
La route express à péage

SLF
Joint Venture

CONSULTANT
Marshall Macklin Monaghan
CONSULTING ENGINEERS • SURVEYORS • PLANNERS

TITLE
HIGHWAY 407 EAST PARTIAL STORMWATER MANAGEMENT POND POND LR-5 PLAN

PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	10E1	4R	DD	019A	3

Format 'A1' Sheet Size

E96.80

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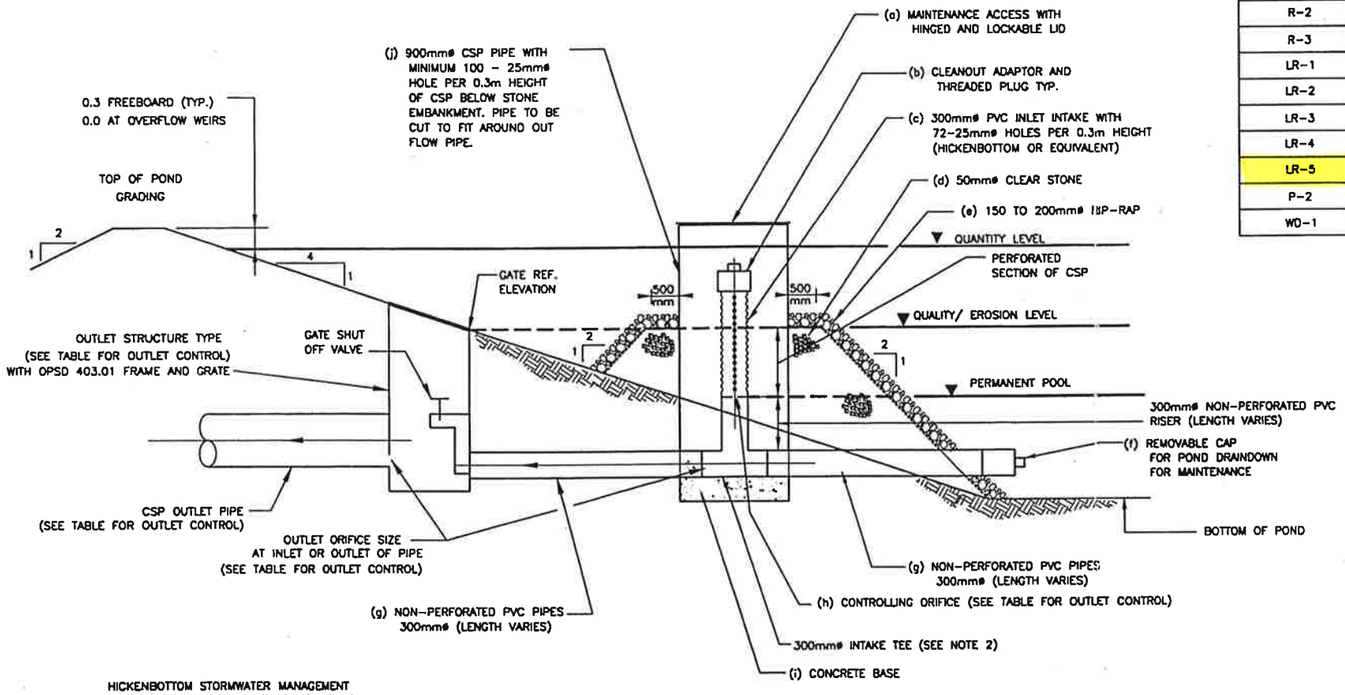
E96.8



HICKENBOTTOM STORMWATER MANAGEMENT POND OUTLET INCLUDES a), b), c), d), e) f), g), h), i), j), COMPLETE OUTLET PIPE DICB WITH FRAME AND GRATE NOT INCLUDED

TYPICAL DETAIL 6 – POND OUTLET STRUCTURE

N.T.S.

TABLE FOR POND WATER LEVELS AND VOLUMES

POND NUMBER	PERMANENT		QUALITY		QUANTITY	
	LEVEL (m)	VOLUME (m^3)	LEVEL (m)	VOLUME (m^3)	LEVEL (m)	VOLUME (m^3)
R-1	172.5	1100	172.9	790	173.7	2210
R-2	164.5	3250	165.0	2650	165.5	3850
R-3	180.0	1900	180.74	3880	181.7	4220
LR-1	N/A	N/A	N/A	N/A	185.5	1480
LR-2	N/A	N/A	N/A	N/A	185.7	1550
LR-3	N/A	N/A	N/A	N/A	190.0	2020
LR-4	N/A	N/A	N/A	N/A	189.0	780
LR-5	N/A	N/A	N/A	N/A	192.2	890
P-2	N/A	N/A	N/A	N/A	200.7	1270
WD-1	188.1	2630	188.7	2905	189.7	5985

TABLE FOR OULET CONTROL

POND NUMBER	CONTROLLING ORIFICE SIZE (mm)	OUTLET ORIFICE SIZE (mm)	OUTLET STRUCTURE (OPSD TYPE)	OUTLET PIPE SIZE (mm)
R-1	77	193	705.030	450
R-2	139	397	702.040 TYPE A	800
R-3	N/A	169	N/A	300
LR-1	N/A	88	N/A	300
LR-2	N/A	100	N/A	300
LR-3	N/A	82	N/A	300
LR-4	N/A	78	N/A	300
LR-5	N/A	75	N/A	300
P-2	N/A	85	N/A	300
WD-1	134	739	702.040 TYPE A	900

NOTES :

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. FOR PONDS LR-1 THRU LR-5 AND P-2, THE 300mm INTAKE TEE SHALL BE PERFORATED AS PER SPECIFICATION NOTED IN (C)-75-25mm HOLES PER 0.3m HEIGHT.
3. FOR PONDS LR-1 THRU LR-5 AND P-2 OUTLET ORFICE SHALL BE PLACED AT DOWNSTREAM CONNECTION OF 300mm INTAKE TEE TO PVC PIPE.

CONSTRUCTION

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD DISC.	PROJ. MNGR.	CONST. INSP.	PROC. INSP.
		6	07/20/01	ADDED NOTE 2 AND NOTE 3	KC	CG	CG	CG		
		5	04/04/01	REVISED OUTLET CONTROL TEXT	KJ	AA	AA	CG		
		4	10/30/00	GENERAL REVISION	KJ	AA	AA	CG		
		3	08/15/00	REVISED .DATA	MW	AA	AA	CG		
		2	05/26/00	MISCELLANEOUS REVISIONS / IA COMMENTS	KC	AA	AA	CG		
		1	04/07/00	ISSUED FOR CONSTRUCTION	CH	AS	AA	CG		

SCALE : N.T.S.

REGISTERED PROFESSIONAL ENGINEER C.G. GAUER PROVINCE OF ONTARIO

CONSULTANT			
DESIGNED	J.PAYNE	JP	07/26/99
DRAWN	K. CHENG	KC	07/26/99
CHECKED	A. ADHIKARY	AA	07/26/99
APPROVED LEAD DISC.	A. ADHIKARI	AA	07/26/99
APPROVED PROJ. MANAGER	C. GAUER	CG	07/26/99
REVIEWED			
SCALE	NAME (PRINT)	INT.	DATE

407 ETR Express Toll Route / La route express à péage

SLF Joint Venture

CONSULTANT Marshall Macklin Monaghan CONSULTING ENGINEERS • SURVEYORS • PLANNERS

TITLE: HIGHWAY 407 EAST PARTIAL TYPICAL DETAILS FOR POND OUTLET

PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	10E1	4R	DD	0062	6

Format "A1" Sheet Size

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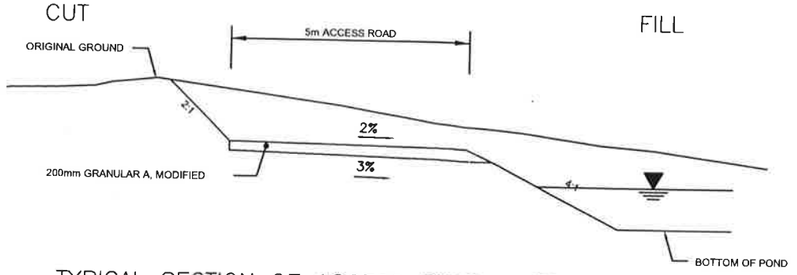
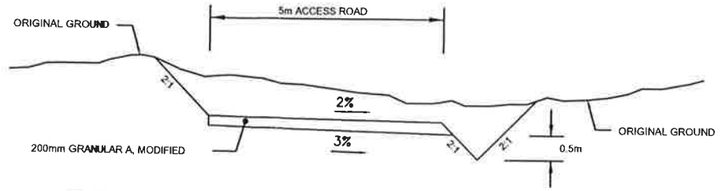
TABLE FOR POND DITCHES AND WEIRS

POND	DITCHES	TYPE	SLOPE (%)	BASE WIDTH (m)	MIN. DEPTH (m)	TREATMENT (GRASS OR RIP RAP)
R–1	INLET		8.8	1.0	0.5	300mmØ
	OVERFLOW WEIR		0.0	14.0	0.3	300mmØ
	OUTLET	A	1.5	1.5	0.6	300mmØ
		B	1.5	1.5	0.6	GRASS
		C	42	1.5	0.4	800mmØ
		D	0.0	1.5	0.25	800mmØ WITH 50mm SOIL AND SEED
R–2	OVERFLOW/OUTLET	A	0.3	1.5	0.9	GRASS
		B	7.1	1.5	0.45	500mmØ
		C	3.4	1.5	0.6	500mmØ
		D	3.4	1.5	0.8	GRASS
R–3a	INLET		2.7	0	0.5	GRASS
R–3b	INLET		1.7	0	0.6	GRASS
	OUTLET		EXISTING DITCH			300mmØ
	OVERFLOW DITCH	A	0.0	7.0	PAD	300mmØ
LR–1	INLET		6.3	1.5	0.5	300mmØ
	OVERFLOW WEIR		0.0	8.0	0.3	300mmØ
	OUTLET	A	1.3	3.0	0.5	300mmØ
		B	1.3	3.0	0.5	GRASS
LR–2	INLET		1.0	1.5	0.6	GRASS
	OVERFLOW WEIR		0.0	7.0	0.3	300mmØ
	OUTLET	A	0.0	7.0	PAD	300mmØ
LR–3	INLET		3.4	1.0	0.4	GRASS
	OVERFLOW WEIR		0.0	4.0	0.3	300mmØ
	OUTLET	A	2.1	1.0	0.35	300mmØ
		B	2.1	1.0	0.35	GRASS
LR–4	INLET		MAINLINE DITCH			
	OVERFLOW WEIR		0.0	5.5	0.3	300mmØ
LR–5	INLET		MAINLINE DITCH			
	OVERFLOW WEIR		0.0	10.0	0.3	300mmØ
	OUTLET	A	11.1	1.0	0.35	300mmØ
		B	40.0	1.0	0.35	800mmØ
		C	0.0	1.5	0.45	800mmØ WITH 50mm SOIL AND SEED
P–2	INLET		0.7	1.5	0.7	GRASS
	OVERFLOW WEIR		0.0	12.0	0.3	300mmØ
	OUTLET		0.0	4.0	PAD	300mmØ
WD–1	INLET		1.25	3.0	1.06	300mmØ
	OVERFLOW WEIR		0.0	25.0	0.3	300mmØ
	OUTLET	A	1.3	2.0	0.9	300mmØ
		B	17.0	2.0	0.5	800mmØ
		C	0.0	2.0	0.4	800mmØ WITH 100mm SOIL AND SEED

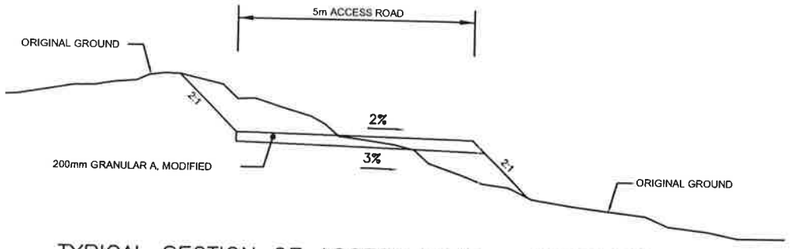
NOTE: ALL RIP RAP TO BE PROVIDED IN TWO LAYERS



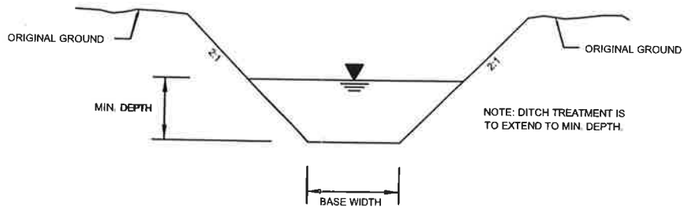
TYPICAL SECTION OF ACCESS ROAD – AROUND POND



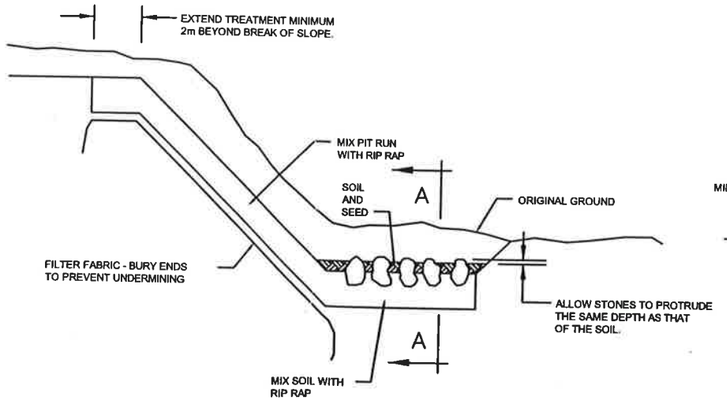
TYPICAL SECTION OF ACCESS ROAD – APPROACH
CUT SECTION



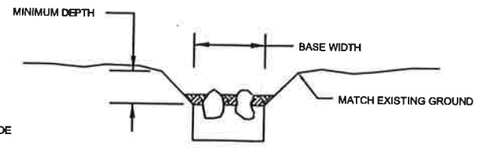
TYPICAL SECTION OF ACCESS ROAD – APPROACH
FILL SECTION



TYPICAL SECTION OF SURFACE DITCHES
(INCLUDING OVERFLOW WEIRS)



DETAIL OF OUTLET FOR PONDS
R–1, LR–5 AND WD–1



SECTION A–A
AT BOTTOM END

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD DISC.	PROJ. MAN.	DESIGN MAN.	DISC. MAN.
		6	04/02/01	REVISED R–2 OUTLET RIP RAP SIZE	KC	AA	AA	CG		
		5	02/12/01	REVISED R–2 OUTLET RIP RAP SIZE	KC	AA	AA	CG		
		4	06/15/00	REVISED DATA	MW	AS	AA	CG		
		3	05/26/00	MISCELLANEOUS REVISIONS / IA COMMENTS	CH	AS	AA	CG		
		2	05/10/00	REVISED AS PER ENVIRONMENTAL INPUT	CH	AS	AA	CG		
		1	04/07/00	ISSUED FOR CONSTRUCTION	CH	AS	AA	CG		

SCALE : N.T.S.

LICENSED PROFESSIONAL ENGINEER — A. C. ADHIKARY — PROVINCE OF ONTARIO

CONSULTANT				
	DESIGNED	A. SZALAMIN	AS	02/16/00
	DRAWN	C. HOPKINS	CBH	02/17/00
	CHECKED	A. ADHIKARY	AA	02/18/00
	APPROVED LEAD ENG.	A. ADHIKARY	AA	02/21/00
	APPROVED PROJ. MANAGER	C. GAUER	CBG	02/21/00
SLF	REVIEWED DESIGN MANAGER			
	REVIEWED DISC. MANAGER			
SCALE		NAME (PRINT)	INIT.	DATE

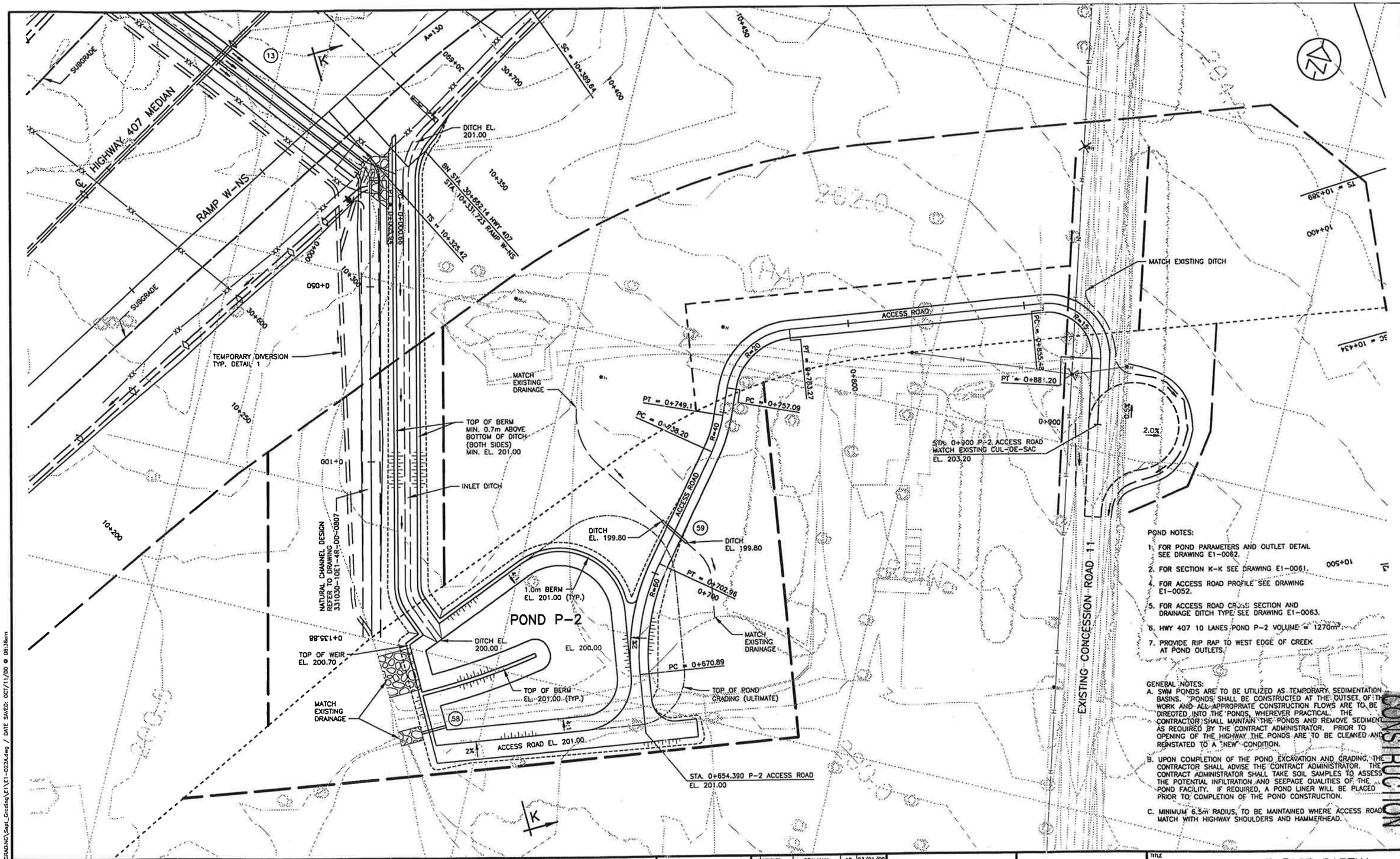
407 ETR — Express Toll Route / La route express à péage

SLF Joint Venture

CONSULTANT: Marshall Macklin Monaghan — CONSULTING ENGINEERS • SURVEYORS • PLANNERS

TITLE: HIGHWAY 407 EAST PARTIAL
TYPICAL POND ACCESS RD. X–SECT.
AND DRAINAGE DITCH DETAILS

PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	10E1	4R	DD	0063	6



POND NOTES:

1. FOR POND PARAMETERS AND OUTLET DETAIL SEE DRAWING E1-0062.
2. FOR SECTION K-K SEE DRAWING E1-0061.
4. FOR ACCESS ROAD PROFILE SEE DRAWING E1-0052.
5. FOR ACCESS ROAD CROSS SECTION AND DRAINAGE DITCH TYPE SEE DRAWING E1-0063.
6. HWY 407 10 LANES POND P-2 VOLUME = 1270m³.
7. PROVIDE RIP RAP TO WEST EDGE OF CREEK AT POND OUTLETS.

GENERAL NOTES:

A. SWM PONDS ARE TO BE UTILIZED AS TEMPORARY SEDIMENTATION BASINS. PONDS SHALL BE CONSTRUCTED AT THE OUTSET OF THE WORK AND ALL APPROPRIATE CONSTRUCTION FLOWS ARE TO BE DIRECTED INTO THE PONDS, WHEREVER PRACTICAL. THE CONTRACTOR SHALL MAINTAIN THE PONDS AND REMOVE SEDIMENT AS REQUIRED BY THE CONTRACT ADMINISTRATOR. PRIOR TO OPENING OF THE HIGHWAY THE PONDS ARE TO BE CLEANED AND REINSTATED TO A "NEW" CONDITION.

B. UPON COMPLETION OF THE POND EXCAVATION AND GRADING, THE CONTRACTOR SHALL ADVISE THE CONTRACT ADMINISTRATOR. THE CONTRACT ADMINISTRATOR SHALL TAKE SOIL SAMPLES TO ASSESS THE POTENTIAL INFILTRATION AND SEEPAGE QUALITIES OF THE POND FACILITY. IF REQUIRED, A POND LINER WILL BE PLACED PRIOR TO COMPLETION OF THE POND CONSTRUCTION.

C. MINIMUM 6.5m RADIUS, TO BE MAINTAINED WHERE ACCESS ROAD MATCH WITH HIGHWAY SHOULDERS AND HAMMERHEAD.

CONSTRUCTION

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD DISC.	PROJ. MNG.	SLF DESIGN MNG.	SLF DISC. MNG.
		3	10/30/00	GENERAL REVISION / IA COMMENTS	KC	AS	AA	CG		
		2	05/26/00	MISCELLANEOUS REVISIONS / IA COMMENTS	KC	AS	AA	CG		
		1	04/07/00	ISSUED FOR CONSTRUCTION	CH	AS	AA	CG		
		0	03/24/00	FOR INFORMATION ONLY	CH	AS	AA	CG		

SCALE : 5m 0 10m HORIZONTAL

LICENCED PROFESSIONAL ENGINEER A. C. ADHIKARY PROVINCE OF ONTARIO

CONSULTANT				
DESIGNED	A. SZALAMIN	AS	03/01/00
DRAWN	C. HOPKINS	CBH	03/02/00
CHECKED	A. ADHIKARY	AA	03/03/00
APPROVED LEAD DISC.	A. ADHIKARY	AA	03/06/00
APPROVED PROJ. MANAGER	C. GAUER	CBG	03/07/00
REVIEWED			
SLF SCALE	NAME (PRINT)	INIT.	DATE

407 ETR Express Toll Route / La route express à péage

SLF Joint Venture

CONSULTANT: Marshall Macklin Monaghan — CONSULTING ENGINEERS • SURVEYORS • PLANNERS

TITLE

HIGHWAY 407 EAST PARTIAL STORMWATER MANAGEMENT POND POND P-2 PLAN

PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	10E1	4R	DD	022A	3

Format 'A1' Sheet Size

E98.2

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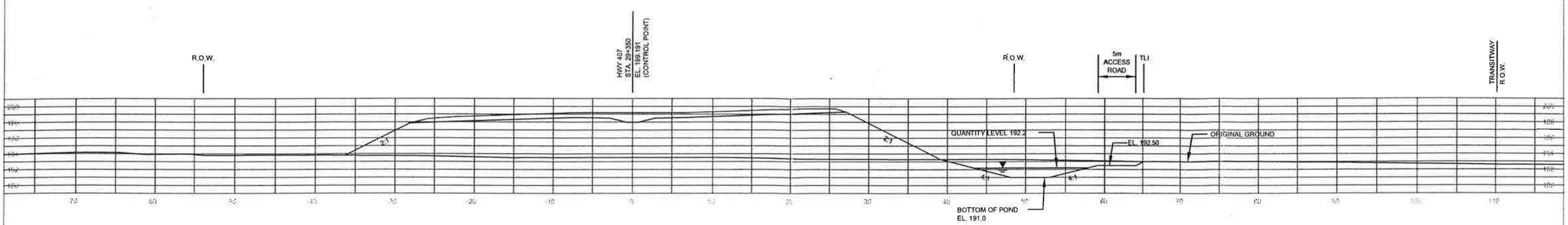
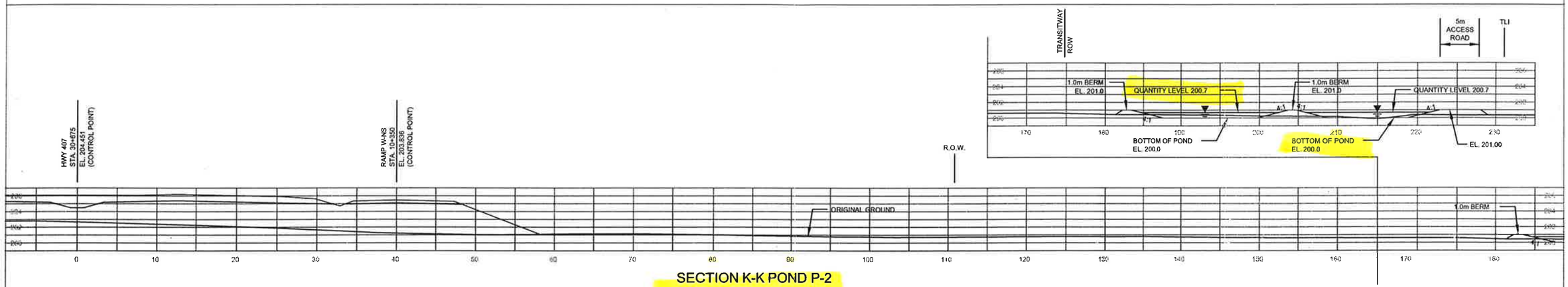
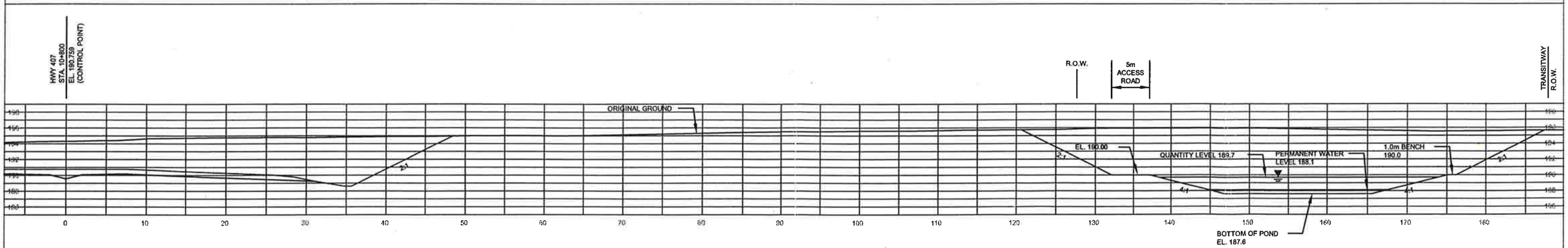


SECTION J-J POND LR-5
STA. 29+350 HWY 407



SECTION K-K POND P-2
STA. 30+675 HWY 407



SECTION L-L POND WD-1
STA. 29+350 HWY 407

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD SURV.	PROJ. ENG.	DESIGN APPR.	DISC. APPR.
		1	04/07/00	ISSUED FOR CONSTRUCTION	CH	AS	AA	CG		
		0	03/24/00	ISSUED FOR INFORMATION ONLY	CH	AS	AA	CG		

SCALE : 2.5m 0 5m

L'ICENSED PROFESSIONAL ENGINEER
A. C. ADHIKARY
PROVINCE OF ONTARIO

CONSULTANT DESIGNED	A. SZALAMIH	AS	03/06/00
CONSULTANT DRAWN	C. HOPKINS	CBH	03/07/00
CONSULTANT CHECKED	A. ADHIKARY	AA	03/06/00
CONSULTANT APPROVED (LEAD DISC.)	A. ADHIKARY	AA	03/09/00
CONSULTANT APPROVED (PROJ. MANAGER)	C. GAUER	CBC	03/10/00
SLF REVIEWED			
SLF SCALE			
	NAME (PRINT)	INIT.	DATE

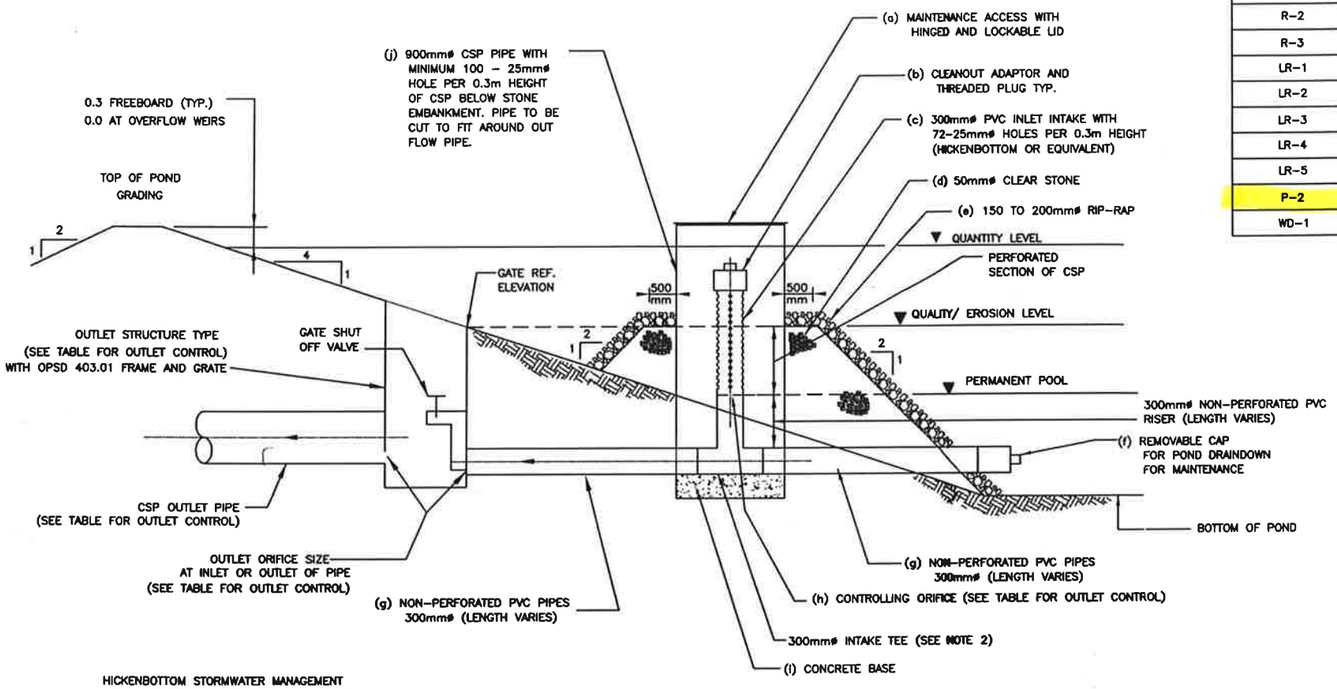
407 ETR Express Toll Route / La route express à péage

SLF Joint Venture

CONSULTANT Marshall Macklin Monaghan — CONSULTING ENGINEERS • SURVEYORS • PLANNERS

TITLE
HIGHWAY 407 EAST PARTIAL TYPICAL CROSS SECTIONS SECTION E1 PONDS

PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	10E1	4R	DD	0061	1



HICKENBOTTOM STORMWATER MANAGEMENT
POND OUTLET INCLUDES a), b), c), d), e)
f), g), h), i), j), COMPLETE OUTLET PIPE
DICB WITH FRAME AND GRATE NOT INCLUDED

TYPICAL DETAIL 6 – POND OUTLET STRUCTURE

N.T.S.

TABLE FOR POND WATER LEVELS AND VOLUMES

POND NUMBER	PERMANENT		QUALITY		QUANTITY	
	LEVEL (m)	VOLUME (m^3)	LEVEL (m)	VOLUME (m^3)	LEVEL (m)	VOLUME (m^3)
R-1	172.5	1100	172.9	790	173.7	2210
R-2	164.5	3250	165.0	2650	165.5	3850
R-3	180.0	1900	180.74	3880	181.7	4220
LR-1	N/A	N/A	N/A	N/A	185.5	1480
LR-2	N/A	N/A	N/A	N/A	185.7	1550
LR-3	N/A	N/A	N/A	N/A	190.0	2020
LR-4	N/A	N/A	N/A	N/A	189.0	780
LR-5	N/A	N/A	N/A	N/A	192.2	890
P-2	N/A	N/A	N/A	N/A	200.7	1270
WD-1	188.1	2630	188.7	2905	189.7	5985

TABLE FOR OULET CONTROL

POND NUMBER	CONTROLLING ORIFICE SIZE (mm)	OUTLET ORIFICE SIZE (mm)	OUTLET STRUCTURE (OPSD TYPE)	OUTLET PIPE SIZE (mm)
R-1	77	193	705.030	450
R-2	139	397	702.040 TYPE A	800
R-3	N/A	169	N/A	300
LR-1	N/A	88	N/A	300
LR-2	N/A	100	N/A	300
LR-3	N/A	82	N/A	300
LR-4	N/A	78	N/A	300
LR-5	N/A	75	N/A	300
P-2	N/A	85	N/A	300
WD-1	134	739	702.040 TYPE A	900

NOTES :

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. FOR PONDS LR-1 THRU LR-5 AND P-2 THE 300mm INTAKE TEE SHALL BE PERFORATED AS PER SPECIFICATION NOTED IN (C)-75-25mm HOLES PER 0.3m HEIGHT.
3. FOR PONDS LR-1 THRU LR-5 AND P-2 OUTLET ORFICE SHALL BE PLACED AT DOWNSTREAM CONNECTION OF 300mm INTAKE TEE TO PVC PIPE.

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD DISC.	PROJ. MNGR.	DESIGN APPR.	DISC. MNGR.
		6	07/20/01	ADDED NOTE 2 AND NOTE 3	KJ	AA	AA	CG		
		5	04/04/01	REVISED OUTLET CONTROL TEXT	KJ	AA	AA	CG		
		4	10/30/00	GENERAL REVISION	MW	AA	AA	CG		
		3	06/15/00	REVISED DATA	KC	AA	AA	CG		
		2	05/26/00	MISCELLANEOUS REVISIONS / IA COMMENTS	CH	AS	AA	CG		
		1	04/07/00	ISSUED FOR CONSTRUCTION	CH	AS	AA	CG		

SCALE : N.T.S.

LICENCED PROFESSIONAL ENGINEER A. C. ADHIKARY PROVINCE OF ONTARIO

CONSULTANT	DESIGNED	J.PAYNE	JP 07/26/99
	DRAWN	K. CHENG	KC 07/26/99
	CHECKED	A. ADHIKARY	AA 07/26/99
	APPROVED LEAD DISC.	A. ADHIKARI	AA 07/26/99
	APPROVED PROJ. MANAGER	C. GAUER	CG 07/26/99
SLF	REVISED		
SCALE		SIGNATURE (PRINT)	INIT. DATE

407 ETR Express Toll Route / La route express à péage

SLF Joint Venture

CONSULTANT Marshall Macklin Monaghan CONSULTING ENGINEERS • SURVEYORS • PLANNERS

TITLE

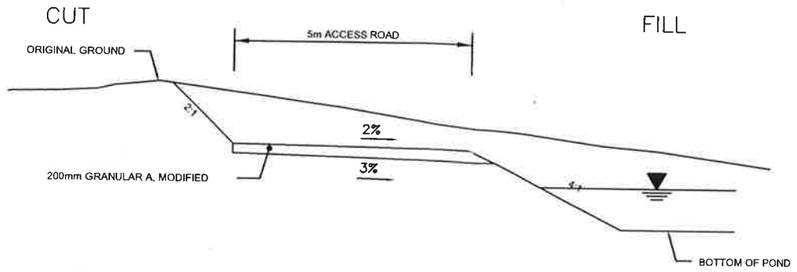
HIGHWAY 407 EAST PARTIAL
TYPICAL DETAILS FOR POND OUTLET

PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	10E1	4R	DD	0062	6

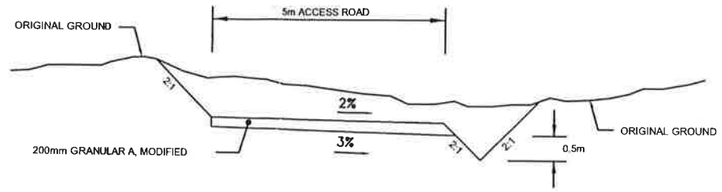
TABLE FOR POND DITCHES AND WEIRS

POND	DITCHES	TYPE	SLOPE (%)	BASE WIDTH (m)	MIN. DEPTH (m)	TREATMENT (GRASS OR RIP RAP)
R-1	INLET		8.8	1.0	0.5	300mmØ
	OVERFLOW WEIR		0.0	14.0	0.3	300mmØ
	OUTLET	A	1.5	1.5	0.6	300mmØ
		B	1.5	1.5	0.6	GRASS
		C	42	1.5	0.4	800mmØ
		D	0.0	1.5	0.25	800mmØ WITH 50mm SOIL AND SEED
R-2	OVERFLOW/OUTLET	A	0.3	1.5	0.9	GRASS
		B	7.1	1.5	0.45	500mmØ
		C	3.4	1.5	0.6	500mmØ
		D	3.4	1.5	0.8	GRASS
R-3a	INLET		2.7	0	0.5	GRASS
R-3b	INLET		1.7	0	0.6	GRASS
	OUTLET		EXISTING DITCH			300mmØ
	OVERFLOW DITCH	A	0.0	7.0	PAD	300mmØ
LR-1	INLET		6.3	1.5	0.5	300mmØ
	OVERFLOW WEIR		0.0	8.0	0.3	300mmØ
	OUTLET	A	1.3	3.0	0.5	300mmØ
		B	1.3	3.0	0.5	GRASS
LR-2	INLET		1.0	1.5	0.6	GRASS
	OVERFLOW WEIR		0.0	7.0	0.3	300mmØ
	OUTLET	A	0.0	7.0	PAD	300mmØ
LR-3	INLET		3.4	1.0	0.4	GRASS
	OVERFLOW WEIR		0.0	4.0	0.3	300mmØ
	OUTLET	A	2.1	1.0	0.35	300mmØ
		B	2.1	1.0	0.35	GRASS
LR-4	INLET		MAINLINE DITCH			
	OVERFLOW WEIR		0.0	5.5	0.3	300mmØ
LR-5	INLET		MAINLINE DITCH			
	OVERFLOW WEIR		0.0	10.0	0.3	300mmØ
	OUTLET	A	11.1	1.0	0.35	300mmØ
		B	40.0	1.0	0.35	800mmØ
		C	0.0	1.5	0.45	800mmØ WITH 50mm SOIL AND SEED
P-2	INLET		0.7	1.5	0.7	GRASS
	OVERFLOW WEIR		0.0	12.0	0.3	300mmØ
	OUTLET		0.0	4.0	PAD	300mmØ
WD-1	INLET		1.25	3.0	1.06	300mmØ
	OVERFLOW WEIR		0.0	25.0	0.3	300mmØ
	OUTLET	A	1.3	2.0	0.9	300mmØ
		B	17.0	2.0	0.5	800mmØ
		C	0.0	2.0	0.4	800mmØ WITH 100mm SOIL AND SEED

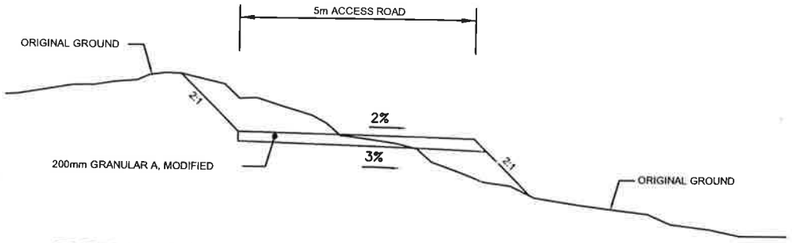
NOTE: ALL RIP RAP TO BE PROVIDED IN TWO LAYERS



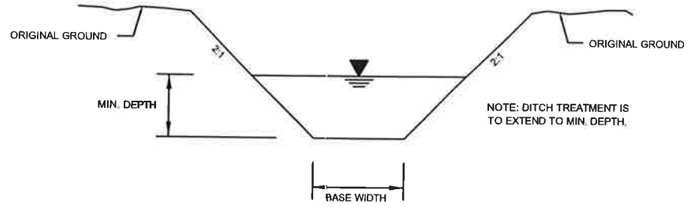
TYPICAL SECTION OF ACCESS ROAD – AROUND POND



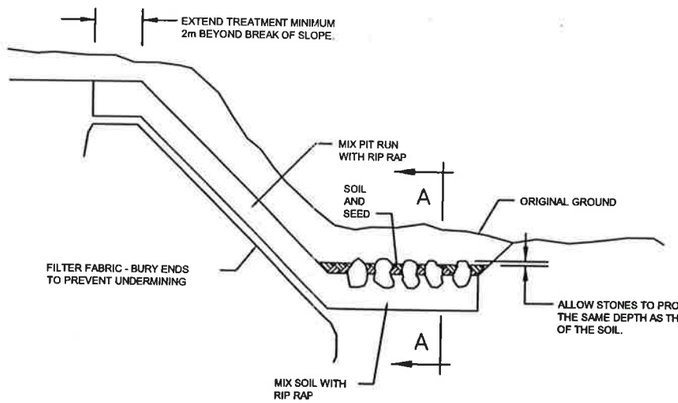
TYPICAL SECTION OF ACCESS ROAD – APPROACH
CUT SECTION



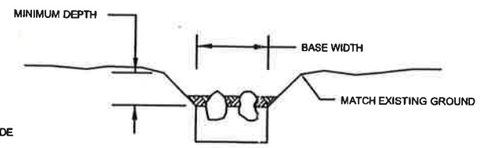
TYPICAL SECTION OF ACCESS ROAD – APPROACH
FILL SECTION



TYPICAL SECTION OF SURFACE DITCHES
(INCLUDING OVERFLOW WEIRS)



DETAIL OF OUTLET FOR PONDS
R-1, LR-5 AND WD-1



SECTION A–A
AT BOTTOM END

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK.	LEAD DISC.	PROJ. MAN.	SLF DESIGN MAN.	SLF DISC. MAN.
		6	04/02/01	REVISED R-2 OUTLET RIP RAP SIZE	KC	AA	AA	CG		
		5	02/12/01	REVISED R-2 OUTLET RIP RAP SIZE	KC	AA	AA	CG		
		4	06/15/00	REVISED DATA	MW	AS	AA	CG		
		3	05/26/00	MISCELLANEOUS REVISIONS / IA COMMENTS	CH	AS	AA	CG		
		2	05/10/00	REVISED AS PER ENVIRONMENTAL INPUT	CH	AS	AA	CG		
		1	04/07/00	ISSUED FOR CONSTRUCTION	CH	AS	AA	CG		

SCALE : N.T.S.

LICENSED PROFESSIONAL ENGINEER A. C. ADHIKARY PROVINCE OF ONTARIO

CONSULTANT			
	DESIGNED	A. SZALAMIH	AS 02/16/00
	DRAWN	C. HOPKINS	CBH 02/17/00
	CHECKED	A. ADHIKARY	AA 02/18/00
	APPROVED LEAD DISC.	A. ADHIKARY	AA 02/21/00
	APPROVED PROJ. MANAGER	C. GAUER	CBG 02/21/00
SLF	REVIEWED DESIGN MANAGER		
	REVIEWED DISC. MANAGER		
	SCALE	NAME (PRINT)	INIT. DATE

407 ETR Express Toll Route / La route express à péage

SLF Joint Venture

CONSULTANT: Marshall Macklin Monaghan — CONSULTING ENGINEERS • SURVEYORS • PLANNERS

TITLE: HIGHWAY 407 EAST PARTIAL
TYPICAL POND ACCESS RD. X-SECT.
AND DRAINAGE DITCH DETAILS

PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	10E1	4R	DD	0063	6

STA. 11+750

STA. 12+100

HWY 407 STA. 11+875
OFFSET: 25.25 RT, EL. 198.613
POND ACCESS ROAD STA. 0+700

DITCH EL. 195.00

DITCH "C"

OUTLET DITCH

DITCH "B"

DITCH "A"

DITCH EL. 195.90

TOP OF WEIR EL. 198.60

SEE DETAIL 4

℄ HIGHWAY 407 MEDIAN

SUBGRADE

SEE DETAIL 5

DITCH EL. 198.00

INLET DITCH

ACCESS ROAD

PT = 0+686.23

PC = 0+671.71

PT = 0+640.65

PC = 0+626.12

ACCESS ROAD STA. 0+607.08
EL. 198.90

EL. 198.90

ACCESS ROAD

R=6.5

R=80

EL. 197.0

EL. 195.90

EL. 196.40

EL. 195.90

DITCH EL. 196.90

POND WD-2

EL. 197.0

TOP OF BERM
EL. 198.90 (TYP.)

TOP OF POND
GRADING (ULTIMATE)

4:1

2:1

POND NOTES:

1. FOR POND PARAMETERS AND OUTLET DETAIL SEE DRAWING E2-0051.
2. FOR SECTION A-A SEE DRAWING E2-0056.
3. FOR POND ACCESS ROAD PROFILE SEE DRAWING E2-0046.
4. FOR ACCESS ROAD CROSS SECTION AND DRAINAGE DITCH TYPE SEE DRAWING E2-0057.
5. ACCESS ROAD GRADING SLOPE WITHIN CLEAR ZONE OF HWY 407 IS 6:1.
6. HIGHWAY 407 10-LANES POND WD-2 VOLUME : 8440m

GENERAL NOTES :

A. SWM PONDS ARE TO BE UTILIZED AS TEMPORARY SEDIMENTATION BASIN. POND SHALL BE CONSTRUCTED AT THE OUTSET OF THE WORK AND ALL APPROPRIATE CONSTRUCTION FLOWS ARE TO BE DIRECTED INTO THE PONDS WHEREVER PRACTICAL. THE CONTRACTOR SHALL MAINTAIN THE PONDS AND REMOVE SEDIMENT AS REQUIRED BY THE CONTRACT ADMINISTRATOR. PRIOR TO OPENING OF THE HIGHWAY THE PONDS ARE TO BE CLEANED AND REINSTATED TO A "NEW" CONDITION.

B. UPON COMPLETION OF THE POND EXCAVATION AND GRADING, THE CONTRACTOR SHALL ADVISE THE CONTRACT ADMINISTRATOR. THE CONTRACT ADMINISTRATOR SHALL TAKE SOIL SAMPLES TO ASSESS THE POTENTIAL INFILTRATION AND SEEPAGE QUALITIES OF THE POND FACILITY. IF REQUIRED, A POND LINER WILL BE PLACED PRIOR TO COMPLETION OF THE POND CONSTRUCTION.

C. MINIMUM 6.5m RADIUS TO BE MAINTAINED WHERE ACCESS ROADS MATCH HIGHWAY SHOULDERS AND HAMMERHEAD.

CONSTRUCTION

E100.3

R:\407Project\Submission\Hwy_Grading\Sept_Grading\E2\E2-007A.dwg / DATE SAVED: 001/25/00 @ 1054am

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD DISC.	PROJ. MAN.	DESIGN MGR.	DRAC MGR.
		5	10/15/00	REVISED DESIGN AS PER SLF PROFILE	KC	AA	AA	CG		
		4	05/26/00	MISCELLANEOUS REVISION / IA COMMENTS	KC	AA	AA	CG		
		3	05/10/00	REVISED AS PER ENVIRONMENTAL INPUT	KC	AS	AA	CG		
		2	04/18/00	COMPOSITE GRADING PACKAGE	KC	AA	AA	CG		
		1	02/18/00	ISSUED FOR CONSTRUCTION	KC	AA	AA	CG		

SCALE :
5m 0 10m
HORIZONTAL

LICENCED PROFESSIONAL ENGINEER
K.C. ADHIKARY
PROVINCE OF ONTARIO

CONSULTANT DESIGNED	A. SZALAMIN	AS	02/17/00
DRAWN	K.CHENG	KC	02/17/00
CHECKED	A. ADHIKARI	AA	02/18/00
APPROVED LEAD ENG.	A. ADHIKARI	AA	02/18/00
APPROVED PROJ. MANAGER	C.GAUER	CG	02/21/00
SLF REVIEWED			
SCALE	NAME (PRINT)	INT.	DATE

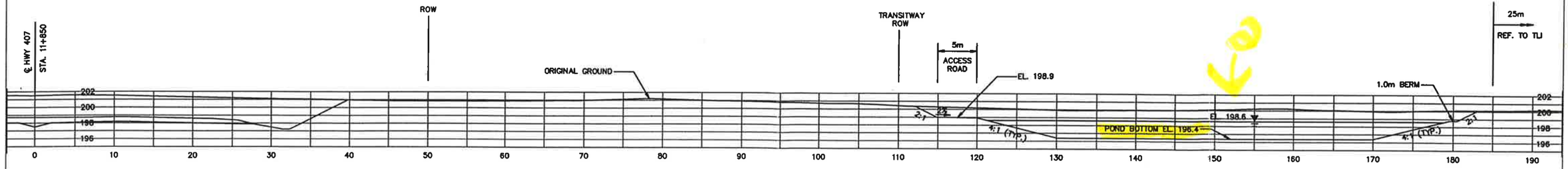
407-ETR Express Toll Route / La route express à péage

SLF Joint Venture

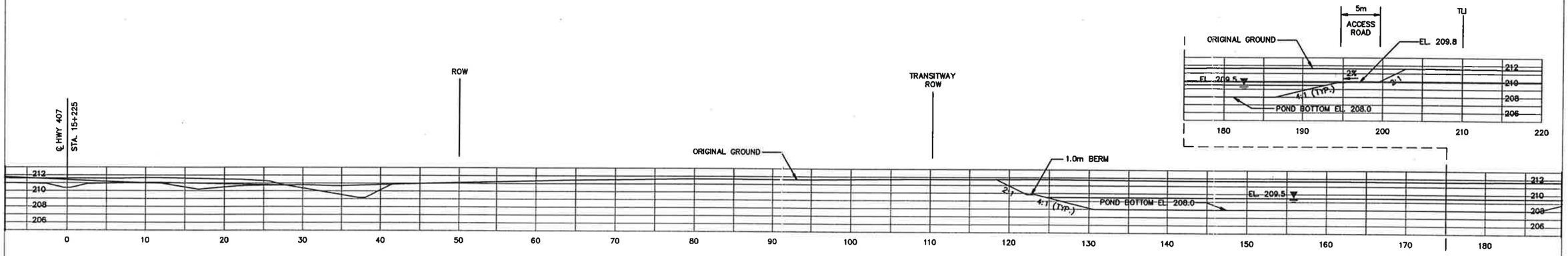
CONSULTANT: Marshall Macklin Monaghan — CONSULTING ENGINEERS • SURVEYORS • PLANNERS

TITLE: HIGHWAY 407 EAST PARTIAL STORMWATER MANAGEMENT POND POND WD-2 PLAN

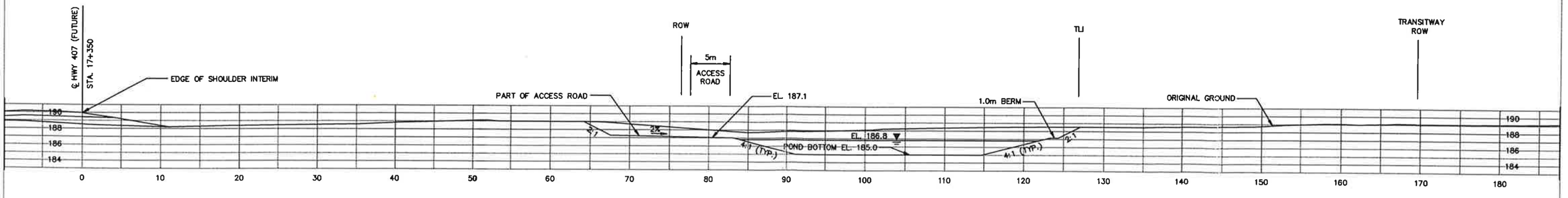
PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	10E2	4R	DD	007A	5



SECTION A–A (POND WD–2)



SECTION B–B (POND G–1)



SECTION C–C (POND B–1)

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD DISC.	PROJ. MAN.	DESIGN MAN.	DISC. MAN.
		2	04/18/00	COMPOSITE GRADING PACKAGE	KC	AA	AA	CG		
		1	02/21/00	ISSUED FOR CONSTRUCTION	KJ	AS	AA	CG		

SCALE : N.T.S.

LICENSED PROFESSIONAL ENGINEER — A. C. ADHIKARY — PROVINCE OF ONTARIO

CONSULTANT				
DESIGNED	A. SZALAMIN	AS	02/17/00
DRAWN	K. JAMSHEDJI	KJ	02/17/00
CHECKED	A. ADHIKARY	AA	02/18/00
APPROVED LEAD ENG.	A. ADHIKARY	AA	02/18/00
APPROVED PROJ. MANAGER	C. GAUER	CBG	02/21/00
SLF REVISED			
SCALE	NAME (PRINT)	INIT.	DATE

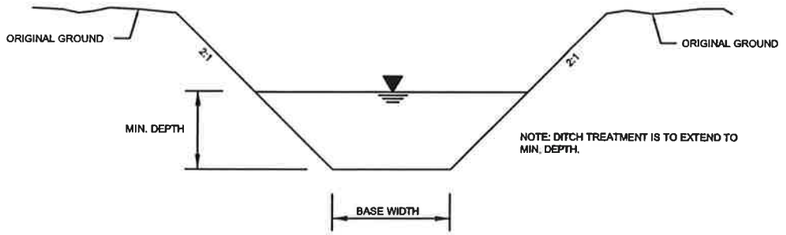
407 ETR Express Toll Route / La route express à péage

SLF Joint Venture

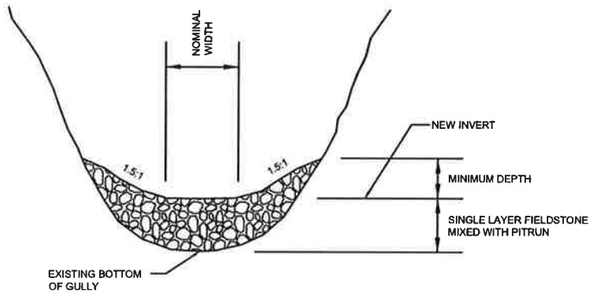
CONSULTANT: Marshall Macklin Monaghan — CONSULTING ENGINEERS • SURVEYORS • PLANNERS

TITLE: HIGHWAY 407 EAST PARTIAL CROSS SECTIONS E2 PONDS

PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	10E2	4R	DD	0056	2



TYPICAL SECTION OF SURFACE DITCHES
(INCLUDING OVERFLOW WEIRS)



B–1 POND OUTLET

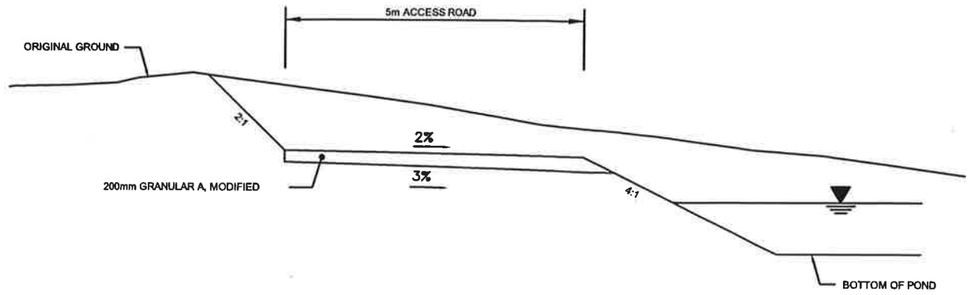
TABLE FOR POND DITCHES AND WIERS

POND	DITCHES	TYPE	SLOPE (%)	BASE WIDTH (m)	MIN. DEPTH (m)	TREATMENT (GRASS OR RIP RAP)
WD–2	INLET		1.3	2.0	1.1	300mmØ
	OUTLET	A	1.3	2.0	0.8	300mmØ
		B	1.3	2.0	0.8	GRASS
	MAINLINE RIGHT	C	0.8	2.0	0.9	GRASS
		D	8.7	2.0	0.5	700mmØ
		E	3.8	2.0	0.6	500mmØ
	OVERFLOW WEIR		0.0	27.0	0.3	300mmØ
G–1	INLET		1.3	1.0	0.45	GRASS
	OUTLET	A	3.4	0.5	0.4	300mmØ
		B	3.4	0.5	0.4	GRASS
B–1	INLET		2.8	1.0	0.65	300mmØ
	OUTLET CHANNEL (NOTE 2)	A	6.7	2.0	0.25	300mmØ
		B	9.1	0.8	0.4	300mmØ FIELDSTONE
		C	6.2	1.0	0.35	250mmØ FIELDSTONE
	OVERFLOW WEIR		0.0	10.0	0.3	300mmØ

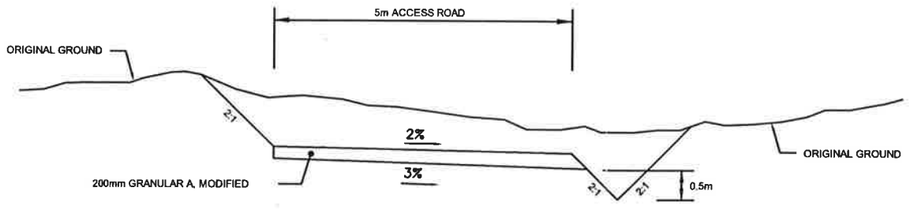
NOTES:

1. ALL RIP RAP PROVIDE IN TWO LAYERS, UNLESS OTHERWISE SPECIFIED.
2. SEE DETAIL ABOVE FOR B-1 OUTLET.

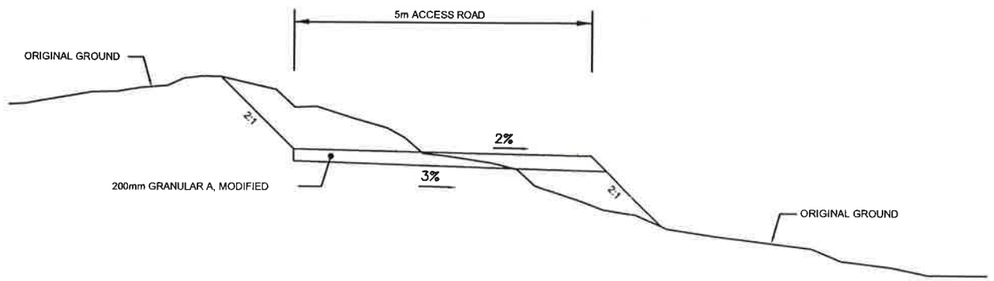
CUT FILL



TYPICAL SECTION OF ACCESS ROAD – AROUND POND



TYPICAL SECTION OF ACCESS ROAD – APPROACH
CUT SECTION



TYPICAL SECTION OF ACCESS ROAD – APPROACH
FILL SECTION

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD DISC	PROJ. MAN.	SLF DESIGN MAN.	SLF DISC. MAN.
		4	05/26/00	MISCELLANEOUS REVISIONS / IA COMMENTS	CH	AA	AA	CG		
		3	05/10/00	REVISED AS PER ENVIRONMENTAL INPUT	CH	AA	AA	CG		
		2	04/18/00	COMPOSITE GRADING PACKAGE	CH	AA	AA	CG		
		1	02/21/00	ISSUED FOR TENDER	CH	AA	AA	CG		

SCALE : N.T.S.

LICENSED PROFESSIONAL ENGINEER A. C. ADHIKARY PROVINCE OF ONTARIO

CONSULTANT	DESIGNED	A. SZALAMIN	AS	02/16/00
	DRAWN	C. HOPKINS	CBH	02/17/00
	CHECKED	A. ADHIKARY	AA	02/18/00
	APPROVED LEAD ENG.	A. ADHIKARY	AA	02/21/00
	APPROVED PROJ. MANAGER	C. GAUER	CBG	02/21/00
SLF	REVIEWED DESIGN MANAGER			
	REVIEWED DISC. MANAGER			
	SCALE	NAME (PRINT)	INIT.	DATE

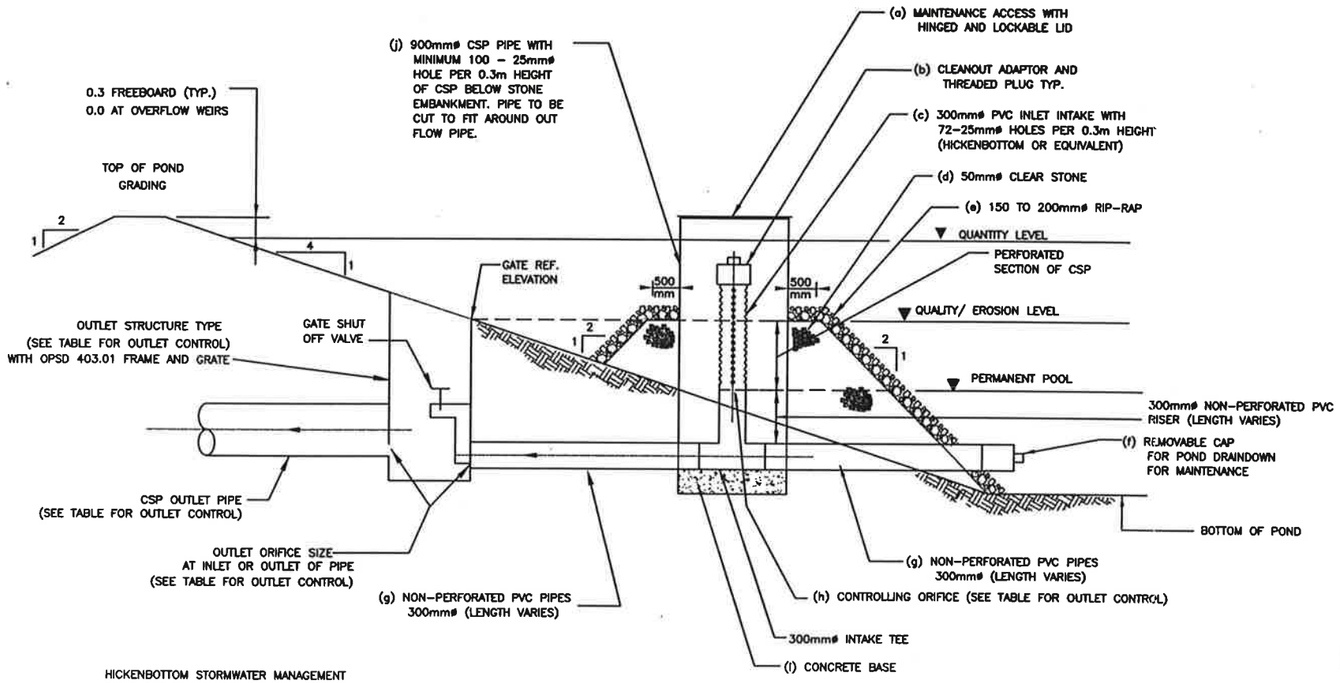
407 ETR Express Toll Route / La route express à péage

SLF Joint Venture

CONSULTANT Marshall Macklin Monaghan — CONSULTING ENGINEERS • SURVEYORS • PLANNERS

TITLE
HIGHWAY 407 EAST PARTIAL
TYPICAL POND ACCESS ROAD X–SEC.
AND DRAINAGE DITCH DETAILS

PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	10E2	4R	DD	0057	4



HICKENBOTTOM STORMWATER MANAGEMENT POND OUTLET INCLUDES a), b), c), d), e) f), g), h), i), j), COMPLETE OUTLET PIPE DICB WITH FRAME AND GRATE NOT INCLUDED

TYPICAL DETAIL 6 – POND OUTLET STRUCTURE

N.T.S.

NOTES:

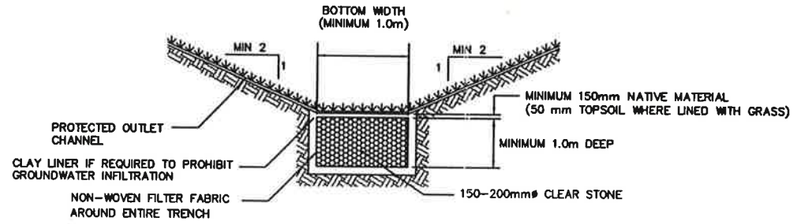
1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.

TABLE FOR POND WATER LEVELS AND VOLUMES

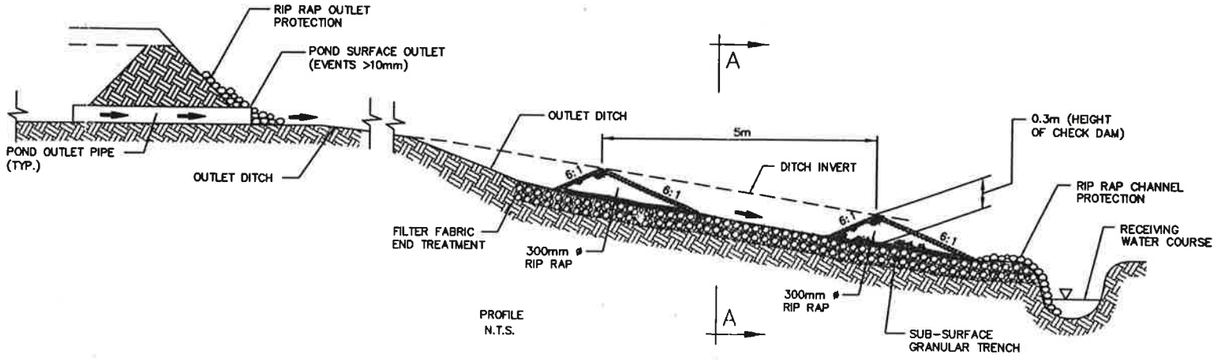
POND NUMBER	PERMANENT		QUALITY		QUANTITY	
	LEVEL (m)	VOLUME (m^3)	LEVEL (m)	VOLUME (m^3)	LEVEL (m)	VOLUME (m^3)
WD–2	196.9	705	197.5	3200	198.6	8440
C–1	N/A	N/A	N/A	N/A	209.5	3770
B–1	185.5	355	186.1	850	186.8	1200

TABLE FOR OULET CONTROL

POND NUMBER	CONTROLLING ORIFICE SIZE (mm)	OUTLET ORIFICE SIZE (mm)	OUTLET PIPE SIZE (mm)
WD–2	200	544	600
C–1	N/A	120	300
B–1	75	560	600



CROSS SECTION A–A
N.T.S.



TYPICAL DETAIL 7 – SUB–SURFACE POND OUTLET

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD DISC.	PROJ. MGR.	SLF DESIGN	SLF DISC.
		5	04/02/01	ADDED ORIFICE CONTROL TEXT	KC	AA	AA	CG		
		4	06/15/00	REVISED DATA	MW	AA	AA	CG		
		3	05/26/00	MISCELLANEOUS REVISIONS / IA COMMENTS	AS	AA	AA	CG		
		2	04/18/00	COMPOSITE GRADING PACKAGE	AS	AA	AA	CG		
		1	02/21/00	ISSUED FOR CONSTRUCTION	KC	AA	AA	CG		

SCALE : N.T.S.

A. C. ADHIKARY — LICENSED PROFESSIONAL ENGINEER — PROVINCE OF ONTARIO

CONSULTANT	DESIGNED	J.PAYNE	JP 07/26/99
	DRAWN	K. CHENG	KC 07/26/99
	CHECKED	A. ADHIKARY	AA 07/26/99
	APPROVED LEAD DISC.	A. ADHIKARI	AA 07/26/99
	APPROVED PROJ. MANAGER	C. GAUER	CG 07/26/99
SLF	REVISED		
SCALE			

407 ETR Express Toll Route / La route express à péage

SLF Joint Venture

CONSULTANT Marshall Macklin Monaghan

TITLE

HIGHWAY 407 EAST PARTIAL
TYPICAL DETAILS

PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
771070	1050	4B	DD	3054	5

GANATSEKIAGON CREEK TRIBUTARY

1.0m WIDE ENHANCED SWALE SEE DETAIL 9

HWY 407 STA. 15+158
OFFSET 25.25 RT. EL. 211.89
POND ACCESS ROAD STA. 0+800

MATCH EXISTING STREAM ELEV.

SANDBAG BARRIER OPSD 219.150

SEE DETAIL 4

B

℄ HIGHWAY 407 MEDIAN

SUBGRADE

1.0m WIDE ENHANCED SWALE SEE DETAIL 9

R=6.5 R=6.5

PT = 0+779.99

SEE DETAIL 5

STA. 0+000
MATCH EL. 208.50m

DITCH EL. 209.20

TEMPORARY DIVERSION TYP. DETAIL

1.5m WIDE ENHANCED SWALE SEE DETAIL 9

15+100 15+300 15+400

ACCESS ROAD

PC = 0+766.76

PT = 0+744.12

PT = 0+680.72

PC = 0+717.08

R=50

INLET DITCH

PT = 0+714.08

PC = 0+691.11

R=30

PC = 0+680.72

PT = 0+092.73

0+100

PC = 0+196.47

PT = 0+127.95

PC = 0+184.24

PT = 0+189.18

0+193.60

EXISTING RAIL FENCE

MATCH EXISTING

EXISTING CHANNEL

ACCESS ROAD STA. 0+666.97
EL. 209.80

POND G-1

EL. 208.0

TOP OF BERM
EL. 209.80 (TYP.)

2:1

2%

4:1

TOP OF POND GRADING (ULTIMATE)

OUTLET DITCH

DITCH EL. 207.9

MATCH EXISTING DRAINAGE

DITCH 'A'
10.00

DITCH 'B'

DITCH 'C'
20.00

SUB-SURFACE POND OUTLET
SEE DETAIL 7 DRAWING E2-0051

EL. 209.8

B

CONSTRUCTION

POND NOTES:

1. FOR POND PARAMETERS AND OUTLET DETAIL SEE DRAWING E2-0051.
2. FOR SECTION B-B SEE DRAWING E2-0056.
3. FOR POND ACCESS ROAD PROFILE SEE DRAWING E2-0046.
4. FOR ACCESS ROAD CROSS SECTION AND DRAINAGE DITCH TYPE SEE DRAWING E2-0057.
5. ACCESS ROAD GRADING SLOPE WITHIN CLEAR ZONE OF HWY 407 IS 6:1.
6. HIGHWAY 407 10-LANES POND G-1 VOLUME : 3770m³

GENERAL NOTES :

A. SWM PONDS ARE TO BE UTILIZED AS TEMPORARY SEDIMENTATION BASIN. POND SHALL BE CONSTRUCTED AT THE OUTSET OF THE WORK AND ALL APPROPRIATE CONSTRUCTION FLOWS ARE TO BE DIRECTED INTO THE PONDS WHEREVER PRACTICAL. THE CONTRACTOR SHALL MAINTAIN THE PONDS AND REMOVE SEDIMENT AS REQUIRED BY THE CONTRACT ADMINISTRATOR. PRIOR TO OPENING OF THE HIGHWAY THE PONDS ARE TO BE CLEANED AND REINSTATED TO A 'NEW' CONDITION.

B. UPON COMPLETION OF THE POND EXCAVATION AND GRADING, THE CONTRACTOR SHALL ADVISE THE CONTRACT ADMINISTRATOR. THE CONTRACT ADMINISTRATOR SHALL TAKE SOIL SAMPLES TO ASSESS THE POTENTIAL INFILTRATION AND SEEPAGE QUALITIES OF THE POND FACILITY. IF REQUIRED, A POND LINER WILL BE PLACED PRIOR TO COMPLETION OF THE POND CONSTRUCTION.

C. MINIMUM 6.5m RADIUS TO BE MAINTAINED WHERE ACCESS ROADS MATCH HIGHWAY SHOULDERS AND HAMMERHEAD.

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD DISC.	PROJ. MNG.	DESIGN MNG.	DISC. MNG.
		5	10/13/00	REVISED DESIGN AS PER SLF PROFILE	KC	AA	AA	CG		
		4	05/26/00	MISCELLANEOUS REVISION / IA COMMENTS	KC	AA	AA	CG		
		3	05/10/00	REVISED AS PER ENVIRONMENTAL INPUT	KC	AS	AA	CG		
		2	04/18/00	COMPOSITE GRADING PACKAGE	KC	AA	AA	CG		
		1	02/18/00	ISSUED FOR CONSTRUCTION	KC	AA	AA	CG		

SCALE :
5m 0 10m
HORIZONTAL

LICENCED PROFESSIONAL ENGINEER
A. C. ADHIKARY
PROVINCE OF ONTARIO

CONSULTANT			
DESIGNED	A. SZALAMIN	AS	02/17/00
DRAWN	K.CHENG	KC	02/17/00
CHECKED	A. ADHIKARY	AA	02/18/00
APPROVED LEAD ENG.	A. ADHIKARY	AA	02/18/00
APPROVED PROJ. MANAGER	C.GAUER	CBG	02/21/00
SLF REVIEWED			
SCALE	NAME (PRINT)	INIT.	DATE

407 ETR
Express Toll Route
La route express à péage

SLF Joint Venture

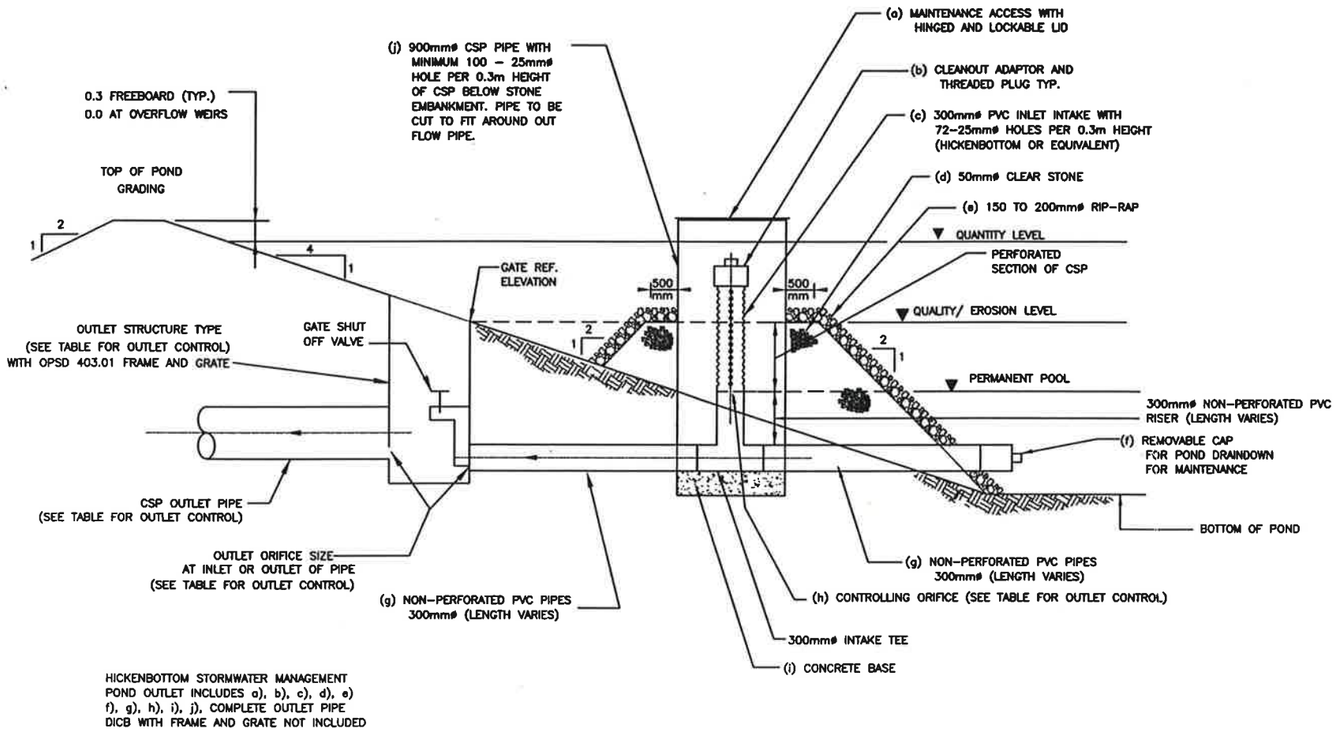
CONSULTANT
Marshall Macklin Monaghan
CONSULTING ENGINEERS • SURVEYORS • PLANNERS

TITLE
HIGHWAY 407 EAST PARTIAL STORMWATER MANAGEMENT POND POND G-1 PLAN

PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	10E2	4R	DD	016A	5

E10316

I:\407Project\Submission\Very_Grading\Sept_Grading\E2\E2-016A.dwg / DATE SAVED: 06/23/00 @ 10:58am



HICKENBOTTOM STORMWATER MANAGEMENT POND OUTLET INCLUDES a), b), c), d), e) f), g), h), i), j), COMPLETE OUTLET PIPE DICB WITH FRAME AND GRATE NOT INCLUDED

TYPICAL DETAIL 6 – POND OUTLET STRUCTURE

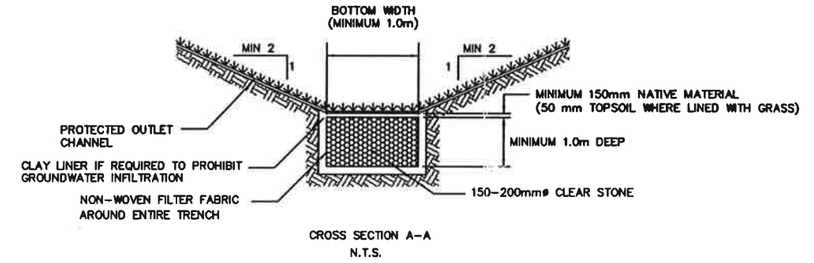
N.T.S.

TABLE FOR POND WATER LEVELS AND VOLUMES

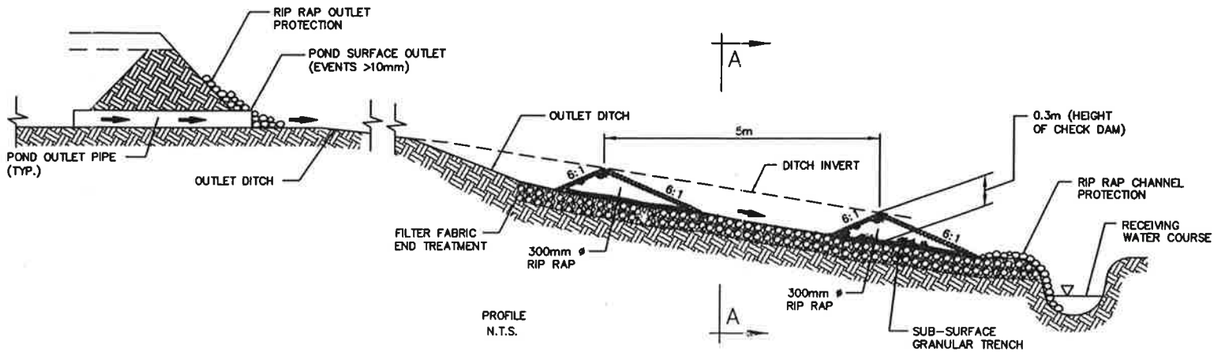
POND NUMBER	PERMANENT		QUALITY		QUANTITY	
	LEVEL (m)	VOLUME (m^3)	LEVEL (m)	VOLUME (m^3)	LEVEL (m)	VOLUME (m^3)
WD–2	196.9	705	197.5	3200	198.6	8440
C–1	N/A	N/A	N/A	N/A	209.5	3770
B–1	185.5	355	186.1	850	186.8	1200

TABLE FOR OULET CONTROL

POND NUMBER	CONTROLLING ORIFICE SIZE (mm)	OUTLET ORIFICE SIZE (mm)	OUTLET PIPE SIZE (mm)
WD–2	200	544	600
C–1	N/A	120	300
B–1	75	560	600



CROSS SECTION A–A
N.T.S.



PROFILE
N.T.S.

TYPICAL DETAIL 7 – SUB–SURFACE POND OUTLET

NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD DISC.	PROJ. MAN.	SLF DESIGN MAN.	SLF DISC. MAN.
		5	04/02/01	ADDED ORIFICE CONTROL TEXT	KC	AA	AA	CG		
		4	00/15/00	REVISED DATA	MW	AA	AA	CG		
		3	03/28/00	MISCELLANEOUS REVISIONS / IA COMMENTS	AS	AA	AA	CG		
		2	04/18/00	COMPOSITE GRADING PACKAGE	AS	AA	AA	CG		
		1	02/21/00	ISSUED FOR CONSTRUCTION	KC	AA	AA	CG		

SCALE : N.T.S.

A. C. ADHIKARY — LICENSED PROFESSIONAL ENGINEER — PROVINCE OF ONTARIO

CONSULTANT				
	DESIGNED	J.PAYNE	JP	07/26/99
	DRAWN	K. CHENG	KC	07/26/99
	CHECKED	A. ADHIKARY	AA	07/26/99
	APPROVED 100 ENG.	A. ADHIKARI	AA	07/26/99
	APPROVED PROJ. MANAGER	C. GAUER	CG	07/26/99
SLF	REVIEWED			
SCALE		NAME (PRINT)	INIT.	DATE

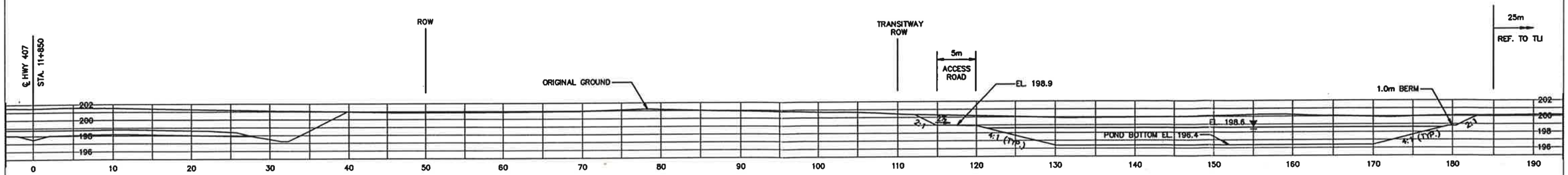
407 ETR — Express Toll Route — La route express à péage

SLF Joint Venture

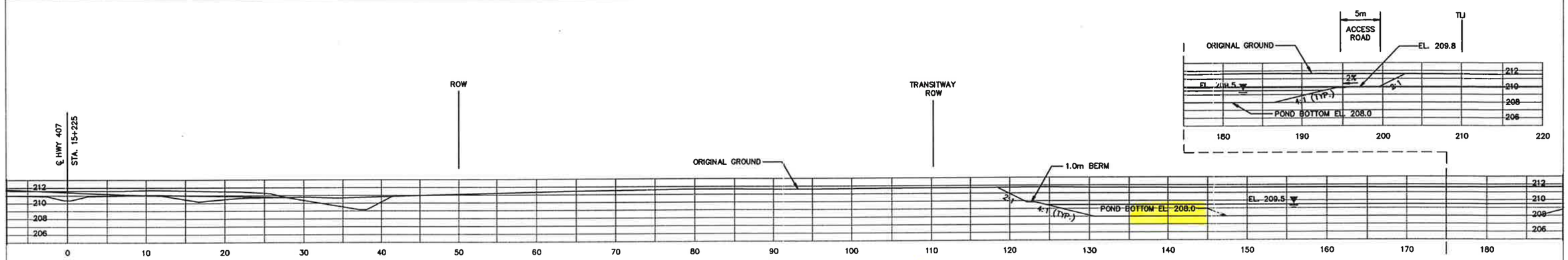
CONSULTANT: Marshall Macklin Monaghan — CONSULTING ENGINEERS • SURVEYORS • PLANNERS

TITLE: HIGHWAY 407 EAST PARTIAL
TYPICAL DETAILS

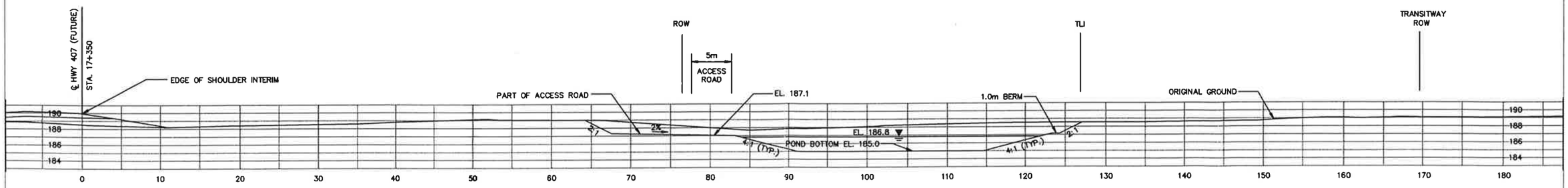
PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	10E2	4R	DD	0051	5



SECTION A–A (POND WD–2)



SECTION B–B (POND G–1)



SECTION C–C (POND B–1)

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CHK	LEAD DISC	PROJ MAN.	DESIGN MAN.	DISC. MAN.
		2	04/18/00	COMPOSITE GRADING PACKAGE	KC	AA	AA	CG		
		1	02/21/00	ISSUED FOR CONSTRUCTION	KJ	AS	AA	CG		

SCALE : N.T.S.

LICENSED PROFESSIONAL ENGINEER — A. C. ADHIKARY — PROVINCE OF ONTARIO

CONSULTANT				
DESIGNED	A. SZALAMIN	AS	02/17/00
DRAWN	K. JAMSHEDJI	KJ	02/17/00
CHECKED	A. ADHIKARY	AA	02/18/00
APPROVED LEAD DISC.	A. ADHIKARY	AA	02/18/00
APPROVED PROJ. MANAGER	C. GAUER	CBG	02/21/00
REVIEWED			
SCALE	NAME (PRINT)	INIT.	DATE

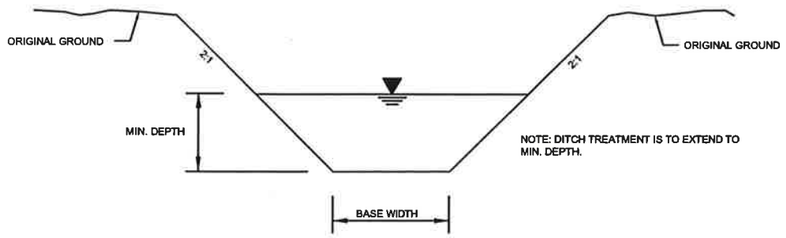
407 ETR Express Toll Route / La route express à péage

SLF Joint Venture

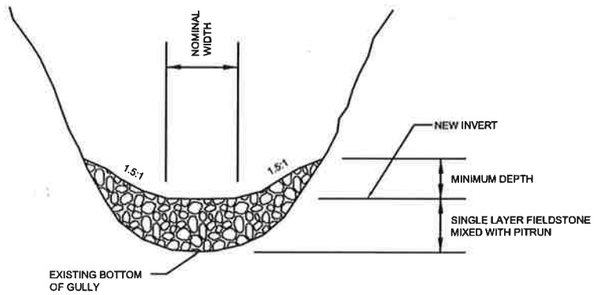
CONSULTANT: Marshall Macklin Monaghan — CONSULTING ENGINEERS • SURVEYORS • PLANNERS

TITLE: HIGHWAY 407 EAST PARTIAL CROSS SECTIONS E2 PONDS

PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	10E2	4R	DD	0056	2



TYPICAL SECTION OF SURFACE DITCHES
(INCLUDING OVERFLOW WEIRS)



B-1 POND OUTLET

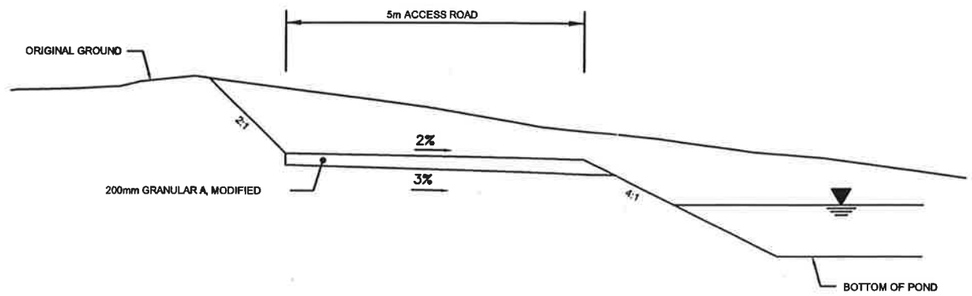
TABLE FOR POND DITCHES AND WIERS

POND	DITCHES	TYPE	SLOPE (%)	BASE WIDTH (m)	MIN. DEPTH (m)	TREATMENT (GRASS OR RIP RAP)
WD-2	INLET		1.3	2.0	1.1	300mmØ
	OUTLET	A	1.3	2.0	0.8	300mmØ
		B	1.3	2.0	0.8	GRASS
	MAINLINE RIGHT	C	0.8	2.0	0.9	GRASS
		D	8.7	2.0	0.5	700mmØ
		E	3.8	2.0	0.6	500mmØ
	OVERFLOW WEIR		0.0	27.0	0.3	300mmØ
G-1	INLET		1.3	1.0	0.45	GRASS
	OUTLET	A	3.4	0.5	0.4	300mmØ
		B	3.4	0.5	0.4	GRASS
B-1	INLET		2.8	1.0	0.65	300mmØ
	OUTLET CHANNEL (NOTE 2)	A	6.7	2.0	0.25	300mmØ
		B	9.1	0.8	0.4	300mmØ FIELDSTONE
		C	6.2	1.0	0.35	250mmØ FIELDSTONE
	OVERFLOW WEIR		0.0	10.0	0.3	300mmØ

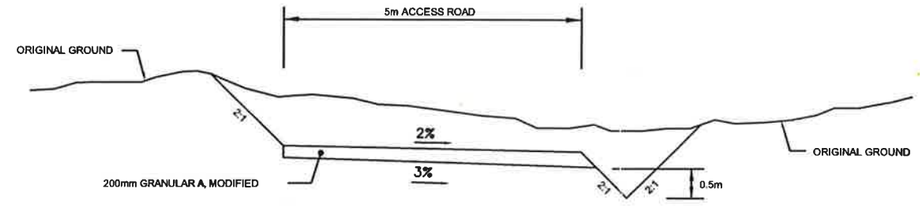
NOTES:

1. ALL RIP RAP PROVIDE IN TWO LAYERS, UNLESS OTHERWISE SPECIFIED.
2. SEE DETAIL ABOVE FOR B-1 OUTLET.

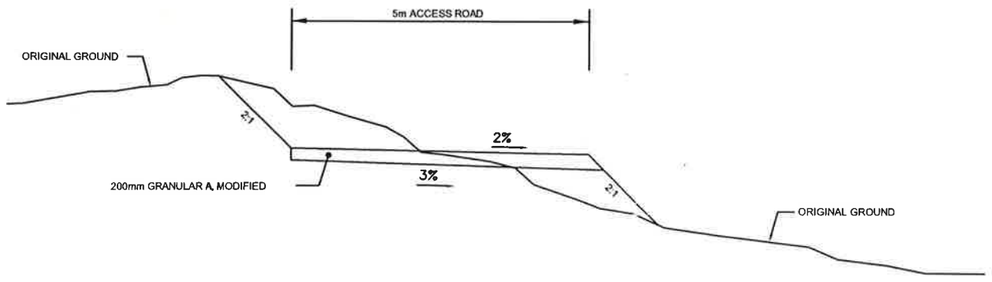
CUT FILL



TYPICAL SECTION OF ACCESS ROAD – AROUND POND



TYPICAL SECTION OF ACCESS ROAD – APPROACH
CUT SECTION



TYPICAL SECTION OF ACCESS ROAD – APPROACH
FILL SECTION

DWG. NO.	REFERENCES	NO.	DATE	REVISIONS	BY	CH	LEAD DISC.	PROJ. MAN.	DESIGN MAN.	DISC. MAN.
		4	05/26/00	MISCELLANEOUS REVISIONS / IA COMMENTS	CH	AA	AA	CG		
		3	05/10/00	REVISED AS PER ENVIRONMENTAL INPUT	CH	AA	AA	CG		
		2	04/18/00	COMPOSITE GRADING PACKAGE	CH	AA	AA	CG		
		1	02/21/00	ISSUED FOR TENDER	CH	AA	AA	CG		

SCALE : N.T.S.

LICENSED PROFESSIONAL ENGINEER
A. C. ADHIKARY
PROVINCE OF ONTARIO

CONSULTANT	DESIGNED	A. SZALAMIH	AS 02/16/00
	DRAWN	C. HOPKINS	CBH 02/17/00
	CHECKED	A. ADHIKARY	AA 02/16/00
	APPROVED LEAD ENG.	A. ADHIKARY	AA 02/21/00
	APPROVED PROJ. MANAGER	C. GAUER	CBG 02/21/00
SLF	REVIEWED DESIGN MANAGER		
	REVIEWED DISC. MANAGER		
SCALE		NAME (PRINT)	INIT. DATE

407 ETR Express Toll Route / La route express à péage

SLF Joint Venture

CONSULTANT
Marshall Macklin Monaghan
CONSULTING ENGINEERS • SURVEYORS • PLANNERS

TITLE
HIGHWAY 407 EAST PARTIAL
TYPICAL POND ACCESS ROAD X-SEC.
AND DRAINAGE DITCH DETAILS

PROJECT NO.	SUBDIVISION	DISC.	DOC.	DRAWING NUMBER	REVISION NUMBER
331030	10E2	4R	DD	0057	4

APPENDIX B

HYDROLOGIC ANALYSIS – EXISTING CONDITION

(VISUAL OTTHYMO MODELLING)

APPENDIX B: Hydrologic Analysis - Existing Condition

Rainfall Data

407 TWY SUB-AREAS- EXISTING CONDITION

VO2 Modelling Schematic 3.1: 407 TWY Sub-Areas Hydrologic Analysis – Existing Condition

(Rouge and Petticoat Watersheds)

VO2 model output files for Rouge, Petticoat

Ontario

IDF CURVE LOOKUP

Active coordinate

43° 52' 45" N, 79° 12' 45" W (43.879167,-79.212500) Modify selection

Retrieved: Wed, 11 Nov 2015 20:42:42 GMT

Map options: Modify selection | Show/hide gauging stations | Re-center selection

Coordinate summary

These are the coordinates in the selection.

IDF Curve: 43° 52' 45" N, 79° 12' 45" W (43.879167,-79.212500)

Coordinate	Location
1	43.865543,-79.250213
2	43.8948,-79.175334

Results

An IDF curve was found for this set of coordinates.

Coordinate: 43.879167,-79.2125002-yr Return Period5-yr Return Period1/3101001,00010100Duration (min)Intensity (mm /hr)

Coefficient summary Notes

Click a return period in the table header for more detail.

Return period	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
A	20.8	28.0	32.7	38.6	43.0	47.4
B	-0.699	-0.699	-0.698	-0.699	-0.698	-0.698

Statistics

Rainfall intensity (mm hr^{-1})

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	118.1	72.8	54.8	33.8	20.8	12.8	5.9	3.7	2.3
5-yr	159.0	98.0	73.8	45.5	28.0	17.2	8.0	4.9	3.0
10-yr	185.3	114.2	86.1	53.0	32.7	20.2	9.4	5.8	3.6
25-yr	219.2	135.1	101.7	62.7	38.6	23.8	11.0	6.8	4.2
50-yr	243.6	150.2	113.2	69.8	43.0	26.5	12.3	7.6	4.7
100-yr	268.6	165.5	124.7	76.9	47.4	29.2	13.6	8.4	5.2

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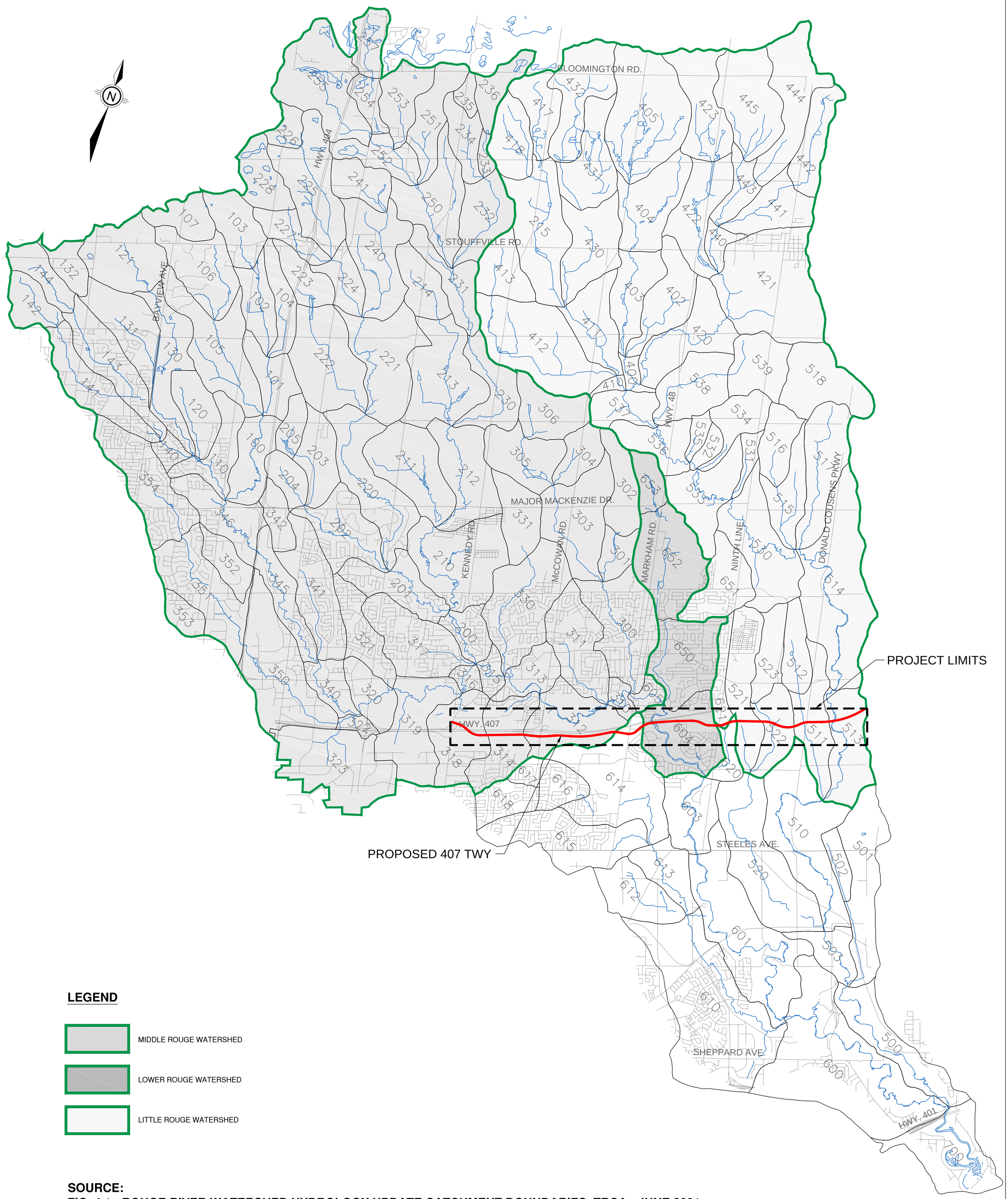
Exit



LEGEND

- MIDDLE ROUGE WATERSHED
- LOWER ROUGE WATERSHED
- LITTLE ROUGE WATERSHED

SOURCE:
FIG. 4.1 - ROUGE RIVER WATERSHED HYDROLOGY UPDATE CATCHMENT BOUNDARIES, TRCA - JUNE 2001.

DATE: JANUARY 2016

SCALE: 0m 250m 500m 1000m 2000m

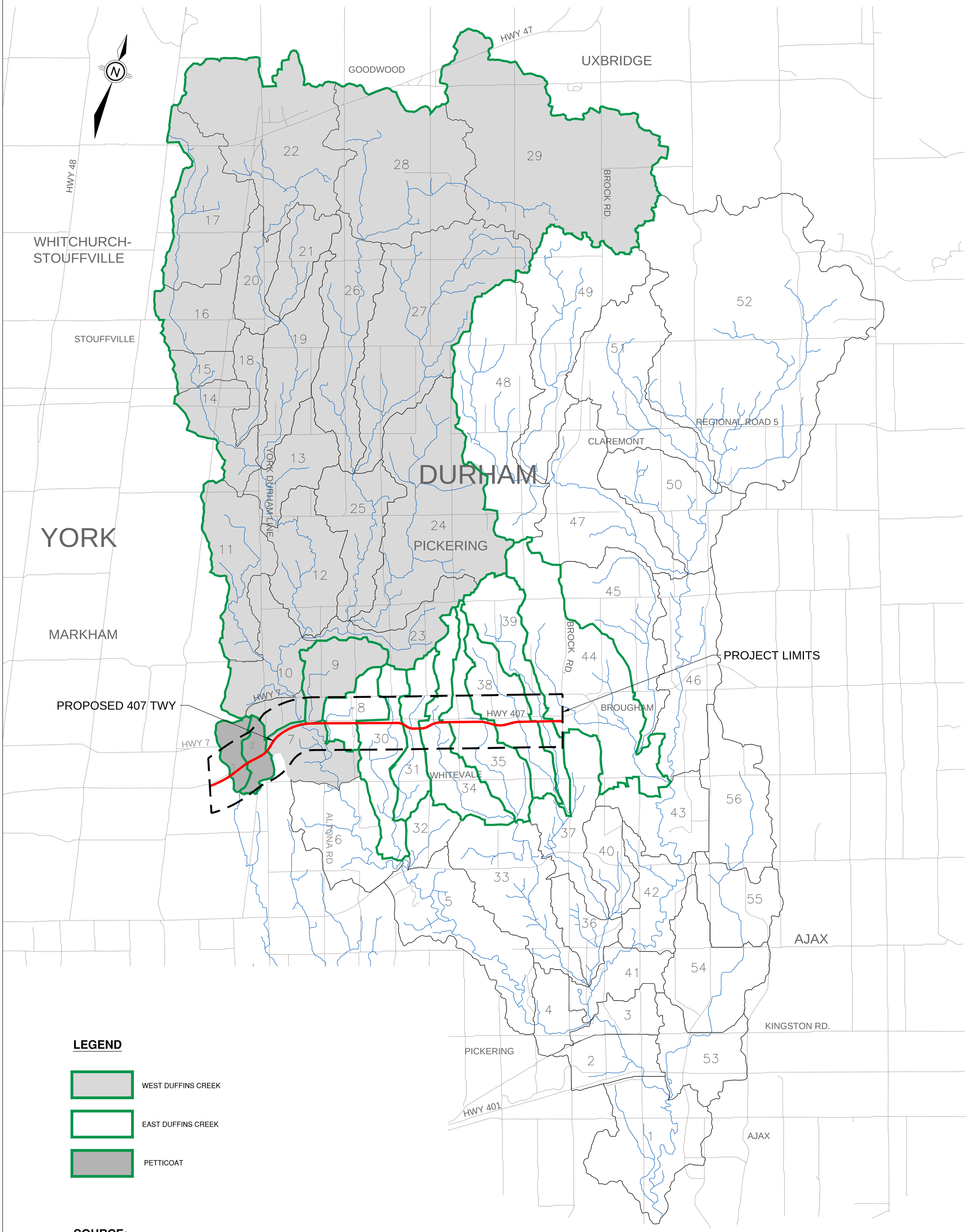
Ontario

PARSONS

625 COCHRANE DRIVE, SUITE 500
MARKHAM, ONTARIO L3R 9R9
TEL: 905-943-0500
FAX: 905-943-0400

407 TRANSITWAY FROM KENNEDY RD TO BROCK RD

FIGURE 3.1 - ROUGE RIVER WATERSHED (TRCA)



LEGEND

- WEST DUFFINS CREEK
- EAST DUFFINS CREEK
- PETTICOAT

SOURCE:

1. **2012 DUFFINS CREEK HYDROLOGY UPDATE, FINAL REPORT, FEB. 2013. (FIG. 2.1 DUFFINS CREEK HYDROLOGIC MODEL - SUBCATCHMENT BOUNDARIES, TRCA - NOV. 2012)**
2. **PETTICOAT CREEK WATERSHED HYDROLOGY UPDATE, FINAL REPORT, OCT. 2006 VO2 SCHEMATIC PETTICOAT CREEK, APPENDIX A.**

DATE: JANUARY 2016

SCALE: 1:40 000 (200m 0m 400m 800m 1200m)

Ontario

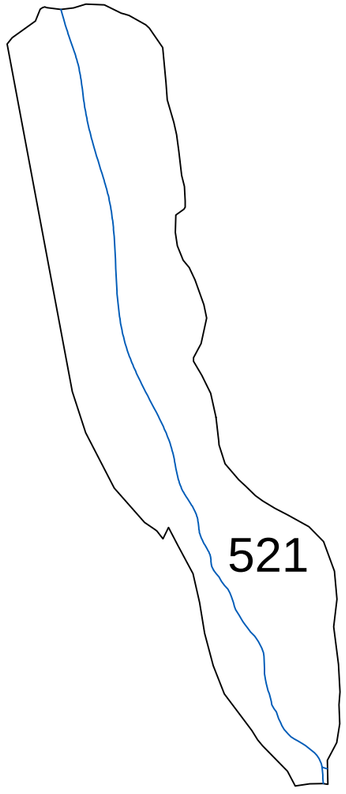
PARSONS

625 COCHRANE DRIVE, SUITE 500
MARKHAM, ONTARIO L3R 9R9
TEL: 905-943-0500
FAX: 905-943-0400

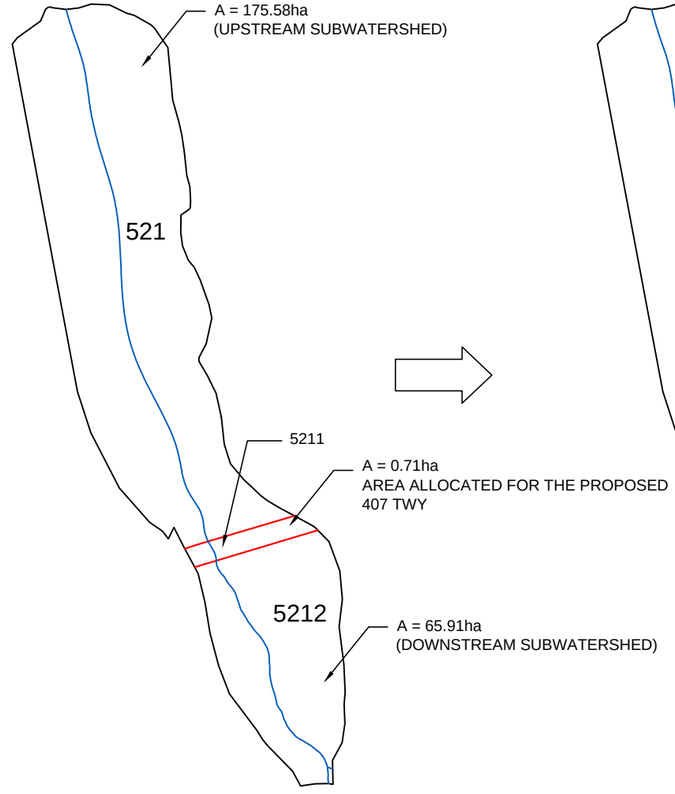
407 TRANSITWAY FROM KENNEDY RD TO BROCK RD

FIGURE 3.2 - DUFFINS CREEK AND PETTICOAT CREEK SUBWATERSHEDS (TRCA)

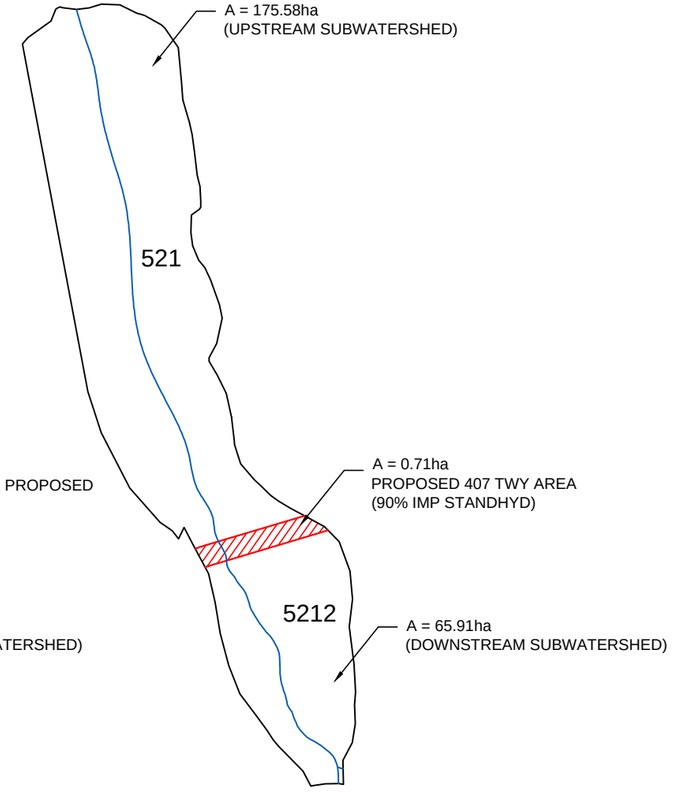
ORIGINAL TRCA MODEL
(EXISTING CONDITION)



PARSONS NEW EXISTING MODEL



PARSONS PROPOSED MODEL



	DATE: JUNE 2015 SCALE: N.T.S	Ontario	PARSONS 625 COCHRANE DRIVE, SUITE 500 MARKHAM, ONTARIO L3R 9R9 TEL: 905-943-0500 FAX: 905-943-0400	HWY 407 TRANSITWAY PH 2 EA - PRELIMINARY DESIGN HYDROLOGIC MODELLING METHODOLOGY	FIGURE No : 3.3

SK-1: HYDROLOGIC MODELLING 407 TWY SUB-AREAS - EXISTING CONDITION

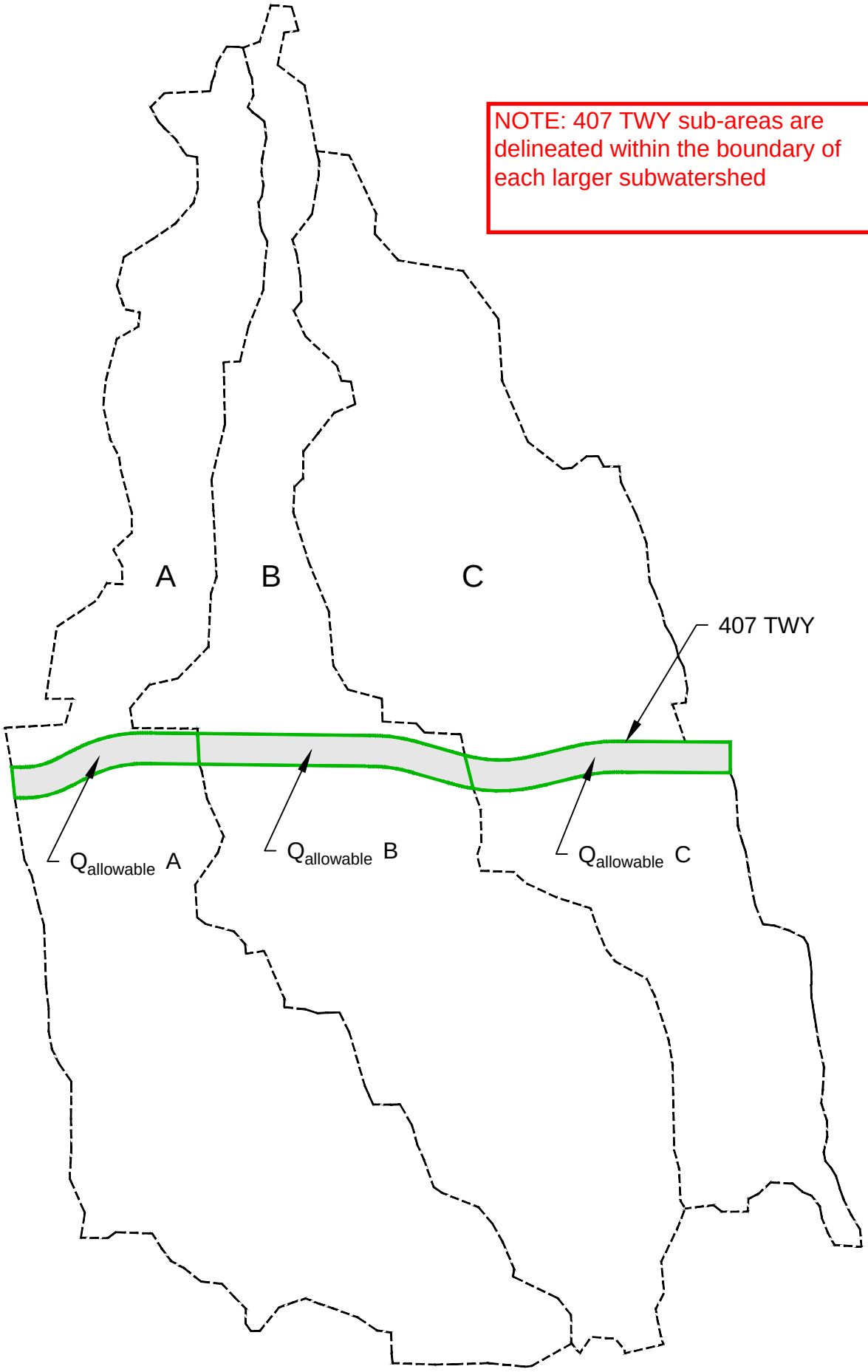


Table 3.1: Original V02 Input Parameters - TRCA model - Rouge River Watershed

Watershed	Catchment ID	Tributary Name	V02 ID	Type	Area (ha)	CN	IA	K (hr-only WilHYD)	TP (hr-only WilHYD)	% XIMP	% TIMP
Rouge	318	Rouge H	318	StandHYD	233.812	65	5	--	--	0.34	0.34
Rouge	314	Rouge H	314	StandHYD	216.838	67	5	--	--	0.32	0.32
Rouge	312	Rouge J	312	WilHYD	268.21	69.9	5	4.54	3.85		
Rouge	614	Morningside Creek	614	StandHYD	440.13	76.7	5			0.4	0.4
Rouge	604	Rouge E	604	StandHYD	285.77	75.8	5			0.29	0.29
Rouge	620	Rouge E	620	WilHYD	63.393	78.7	5	0.42	0.36		
Rouge	621	Rouge E	621	StandHYD	105.63	76.7	5			0.36	0.36
Rouge	521	Little Rouge C	521	StandHYD	180.29	76.7	5			0.62	0.62
Rouge	522	Little Rouge C	522	WilHYD	147.427	76.7	5	1.08	0.918		
Rouge	511	Little Rouge C	511	WilHYD	197.181	76.7	5	1.08	0.916		
Rouge	513	Little Rouge C	513	WilHYD	242.967	76.7	5	1.46	1.232		

Table 3.2: Original V02 Input Parameters - TRCA model - Petticoat Creek Watershed

Watershed	Catchment ID	Tributary Name	V02 ID	Type	Total Area (ha)	CN STAR AMC II	% TIMP	% XIMP	Tp
Petticoat	1	--	1	NasHYD	85.2	69	7	7	1.32
Petticoat	2	--	2	NasHYD	80.3	67	9	9	1.36

Table 3.3: Original V02 Input Parameters - TRCA model - Duffins Creek Watershed

Watershed	Catchment ID	Tributary Name	V02 ID	Type	Total Area (ha)	CN AMC II/Unadjusted	IA	% IMP	% Dir Connected
Duffins	7		704 (rural)	StandHYD NasHYD	314.5	76 70	5 5	39	24
Duffins	9	West Duffins Creek-Unnamed Trib 3	904 (urban) 901 (rural)	StandHYD NasHYD	238.9	77 73	5 5	75	65
Duffins	8	West Duffins Creek-Unnamed Trib 2	804 (urban) 801 (rural)	StandHYD NasHYD	162.7	72 71	5 5	75	65
Duffins	30	Whitevale Creek-Main Branch	3004 (rural)	StandHYD NasHYD	315.7	71 71	5 5	73	62
Duffins	31	West Duffins Creek-Unnamed Trib 1	3104 (urban) 3101 (rural)	StandHYD NasHYD	234	72 72	5 5	0.75	0.65
Duffins	34	Ganatsekiagon Creek-West Branch	3403 (rural)	StandHYD NasHYD	360.2	71 72	5 5	75	65
Duffins	35	Ganatsekiagon Creek-East Branch	3503 (rural)	StandHYD NasHYD	341.8	71 70	5 5	75	65
Duffins	38	Urfe Creek Upper West Branch	3803 (rural)	StandHYD NasHYD	343.9	75 70	5 5	75	65
Duffins	39	Urfe Creek Upper East Branch	3903 (rural)	StandHYD NasHYD	350.5	71 70	5 5	75	65
Duffins	37	Urfe Creek Upper	3704 (urban) 3701 (rural)	StandHYD NasHYD	385	66	5		
Duffins	44	Brougham Creek	4404 (rural)	StandHYD NasHYD	923.2	71 68	5 5	29	16

NOTES:

1 - Model input Parameters for Rouge River are taken from Rouge River Watershed Hydrology Update, Final report, TRCA (June 2001)
Table A2: Model Parameters-Existing Conditions (May 2000)
2 - Model input Parameters for Petticoat Creek are taken from Petticoat Creke Watershed Hydrology Update, Finla Report, TRCA (October 2006)
Table D3: Model parameters - Existing Condition (2004) Petticoat Creek
2 - Model input parameters for Duffins Creek area taken form 2012 Duffins Creek Hydrology Update, Final Report, TRCA (Feb 2013)
Table A1: Model Setup - Existing Land Use Scenario

Table 3.4: Rouge River Watershed - Modified TRCA VO2 Model - Catchment Areas within the Study Limits

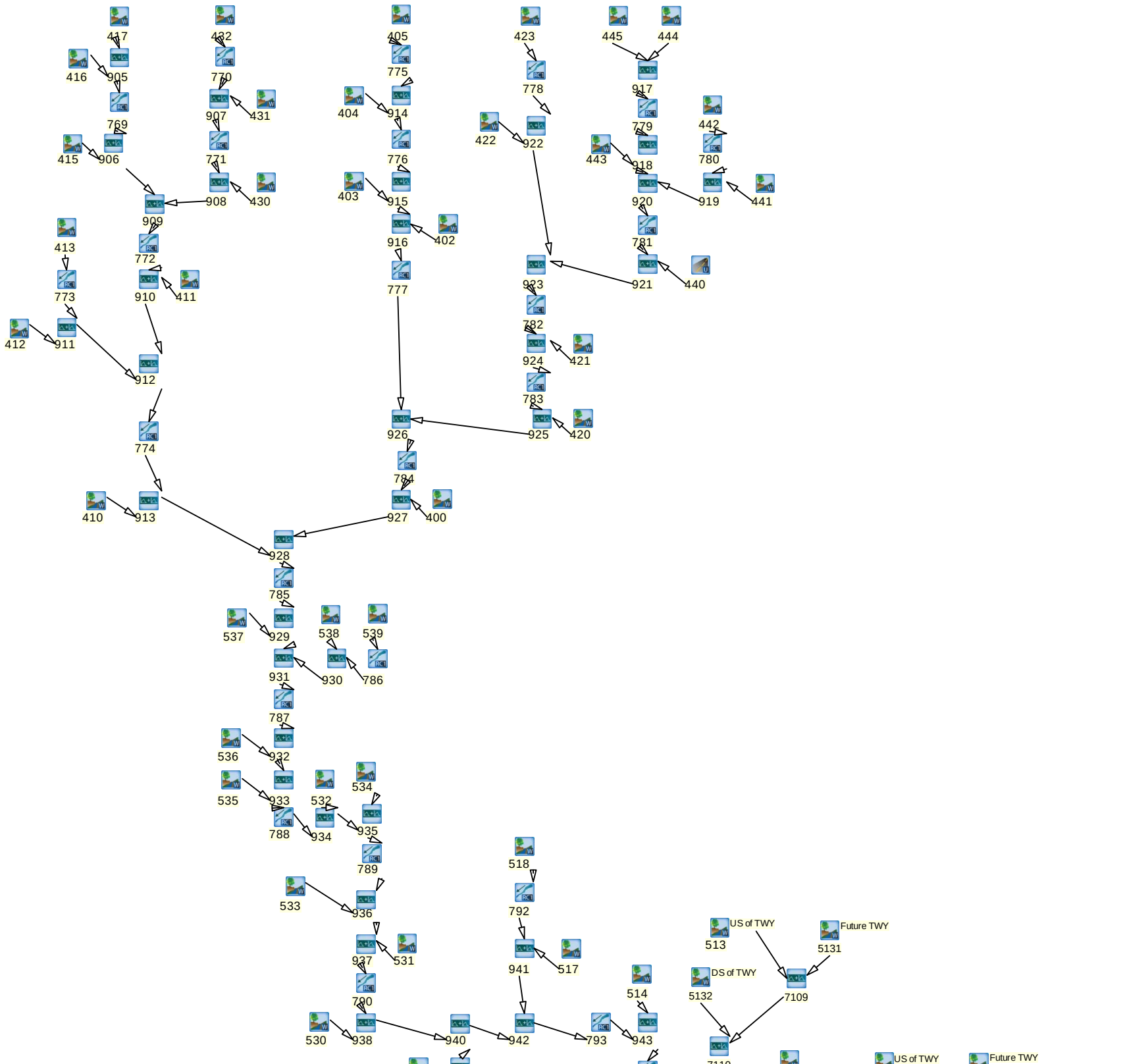
TRCA Data				PARSONS					
Sub-Watershed	Catchment ID	Type	Atot (ha)	TWY AREAS		US AREA		DS AREA	
				VO2 ID	*Area (ha)*	*VO2 ID*	*Area (ha)*	*VO2 ID*	*Area (ha)*
Rouge River-Main Branch	318	Standhyd	233.812	3182	*1.79*	3181	150.55	3183	81.47
	314	Standhyd	216.838	3142	*1.62*	3141	121.24	3143	93.98
	312	WillHyd	268.21	3122	*4.14*	3121	59.20	3123	204.87
	614	Standhyd	440.13	6142	*1.37*	6141	16.44	6143	422.32
	604	Standhyd	285.77	6042	*3.34*	6041	78.55	6043	203.88
	621	Standhyd	64.69	--	--	--	--	--	--
	620	Standhyd	63.39	6201	*0.94*	6202	--	6203	62.45
Rouge River-Little Rouge Branch	521	Standhyd	239.198	5201	*1.12*	5202	172.38	5203	65.70
	522	WillHyd	146.081	5222	*1.52*	5221	68.74	5223	75.82
	511	WillHyd	197.181	5112	*1.60*	5111	102.99	5113	92.59
	513	WillHyd	242.967	5132	*1.82*	5131	58.90	5133	182.25

Table 3.6: Petticoat Creek Watershed - Modified TRCA VO2 Model - Catchment Areas within the Study Limits

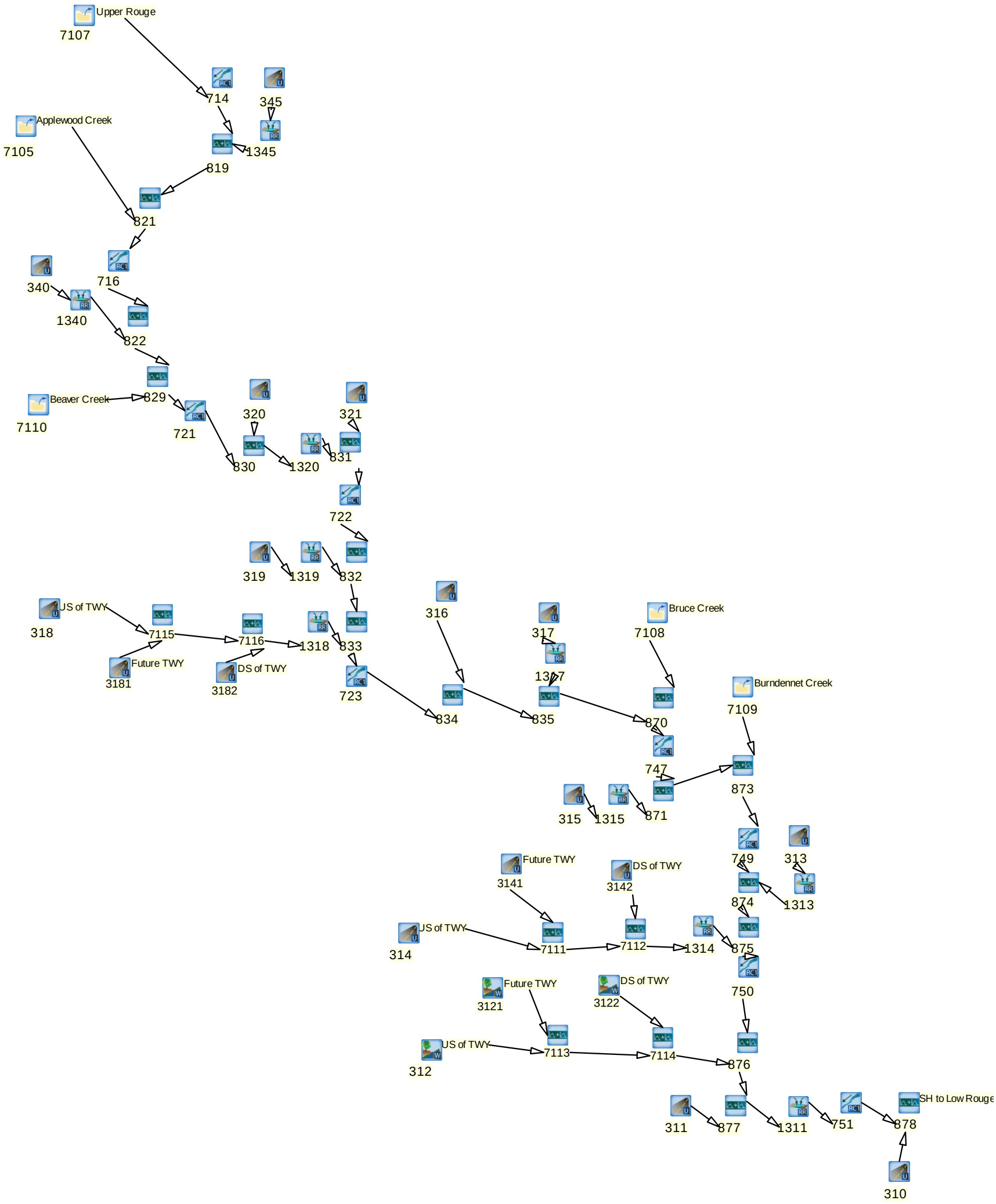
TRCA Data				PARSONS		
Sub-Watershed	**Catchment ID**	**Type**	**Atot (ha)**	**TWY AREAS** *Area (ha)*	**US AREA** *Area (ha)*	**DS AREA** *Area (ha)*
Petticoat	1	NasHYD	85.2	1.13	66.51	17.56
Petticoat	2	NasHYD	80.3	1.18	29.8	49.32

Table 3.8: Duffins Creek Watershed - Modified TRCA VO2 Model - Catchment Areas within the Study Limits

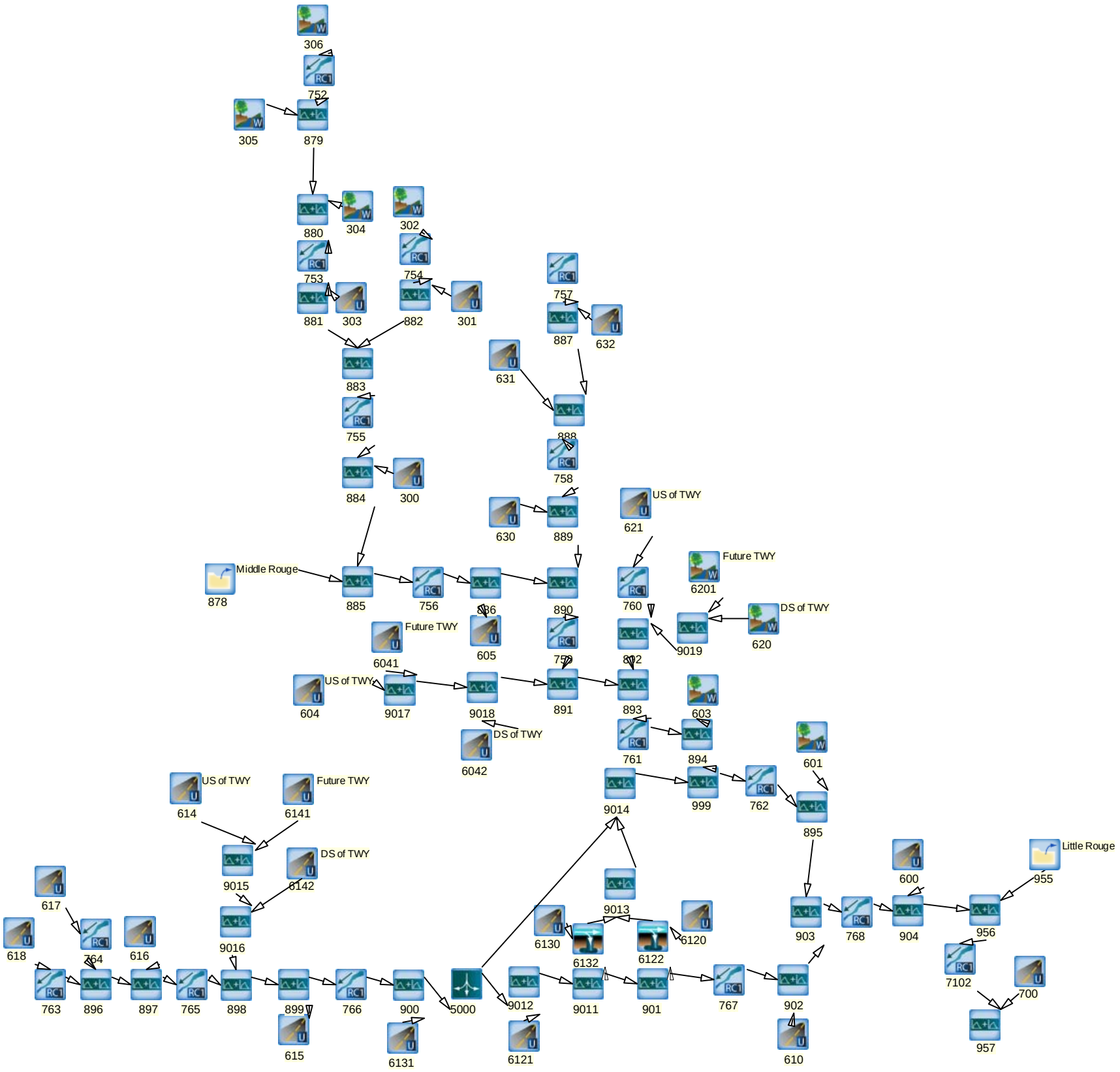
TRCA VO2 MODEL										PARSONS								
Watershed	Catchment ID	VO2 ID			Area				Atot (ha)	TWY AREAS			US AREA			DS AREA		
		Rural	Urban	AddHYD	Rural	%	Urban	%		*Total (ha)*	*Rural*	*Urban*	*Total (CAD)*	*Rural*	*Urban*	*Total (CAD)*	*Rural*	*Urban*
Duffins	7	701	702	703	291.4	92.7%	23.1	7.3%	314.5	3.19	2.96	*0.23*	96.73	89.63	7.10	214.58	198.82	15.76
Duffins	9	901	902	903	237.3	99.3%	1.6	0.7%	238.9	--	--	--						
Duffins	8	801	802	803	156.2	96.0%	6.5	4.0%	162.7	1.41	1.35	*0.06*	121.77	116.91	4.86	39.52	37.94	1.58
Duffins	30	3001	3002	3003	311.2	98.6%	4.5	1.4%	315.7	2.11	2.08	*0.03*	68.82	67.84	0.98	244.77	241.28	3.49
Duffins	31	3101	3102	3103	230.4	98.5%	3.6	1.5%	234	0.78	0.77	*0.01*	102.86	101.28	1.58	130.36	128.35	2.01
Duffins	34	3401	3402	3403	358.8	99.6%	1.4	0.4%	360.2	1.35	1.34	*0.01*	109.71	109.28	0.43	249.14	248.17	0.97
Duffins	35	3501	3502	3503	335.4	98.1%	6.4	1.9%	341.8	2.07	2.03	*0.04*	97.79	95.96	1.83	241.94	237.41	4.53
Duffins	38	3801	3802	3803	337.7	98.2%	6.2	1.8%	343.9	1.86	1.83	*0.03*	207.47	203.73	3.74	134.57	132.14	2.43
Duffins	39	3901	3902	3903	349.4	99.7%	1.1	0.3%	350.5	0.73	0.73	*0.00*	278.48	277.61	0.87	71.29	71.07	0.22
Duffins	37	3701	--	--	385	100.0%	0	--	385									
Duffins	44	4401	4402	4403	898.2	97.3%	25	2.7%	923.2	4.29	4.17	*0.12*	628.09	611.08	17.01	290.82	282.94	7.88



Schematic 1. Visual OTTHYMO model for Little Rouge Creek

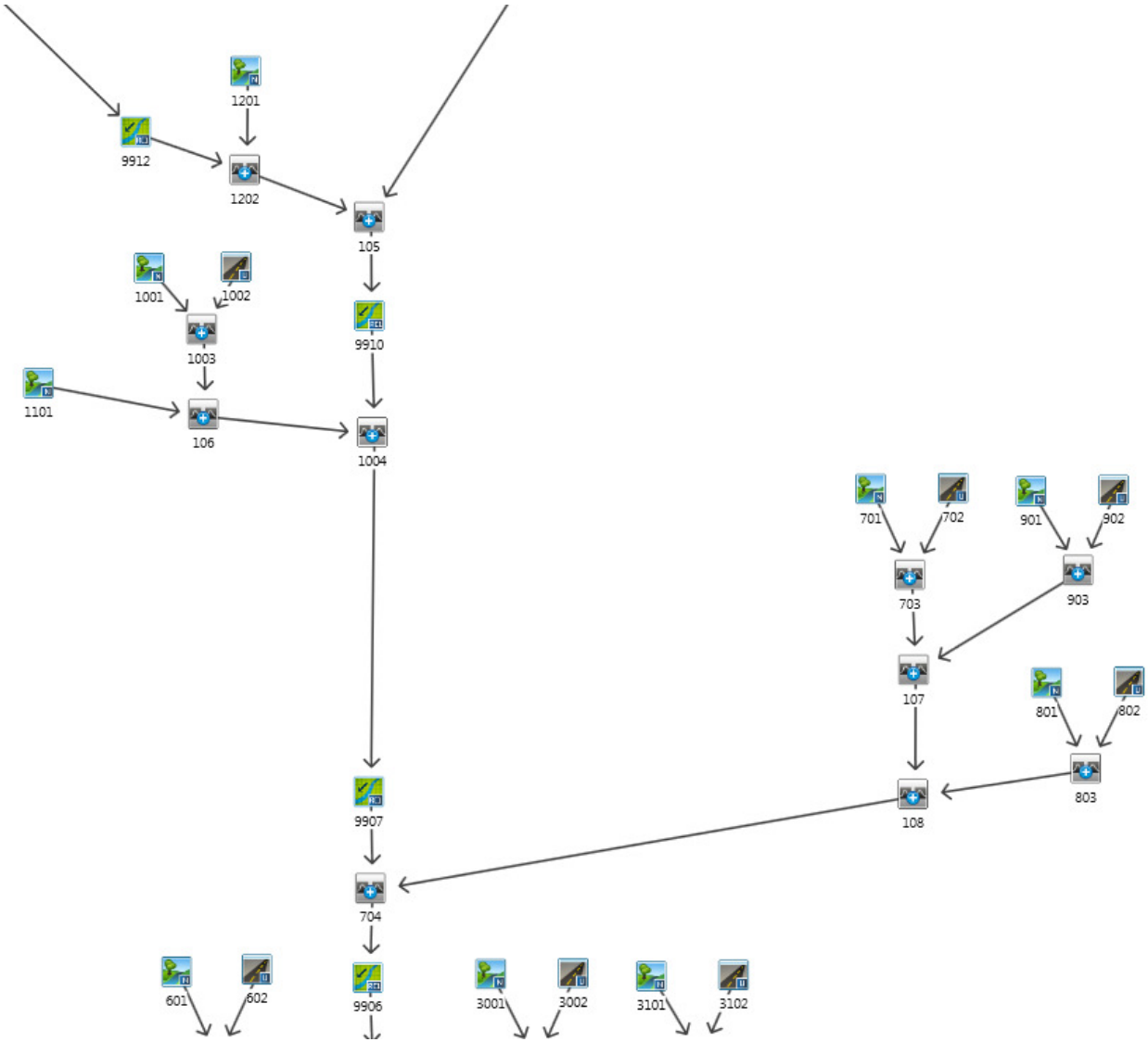


Schematic 2. Visual OTTHYMO model for the middle reach of Rouge River

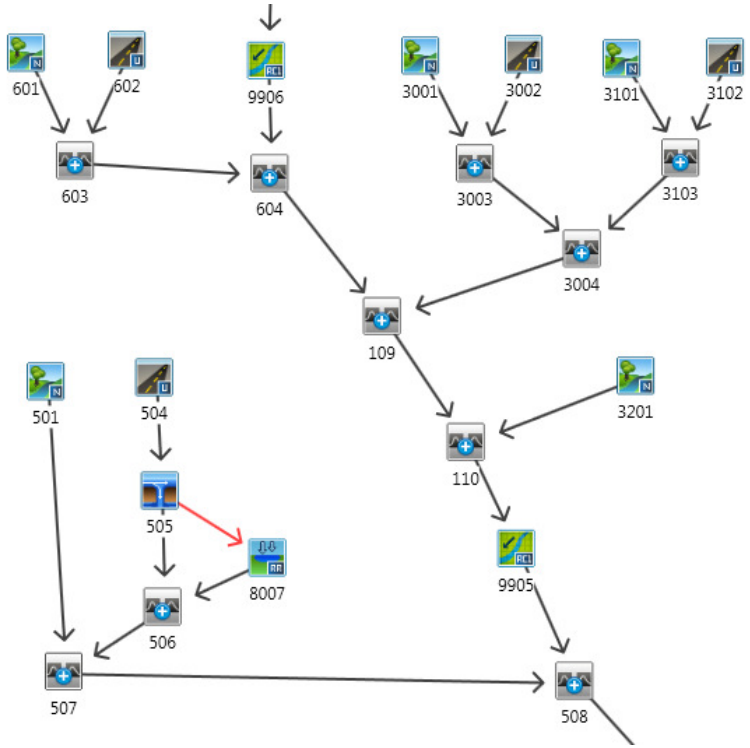


Schematic 3. Regional Visual OTTHYMO model for Rouge River

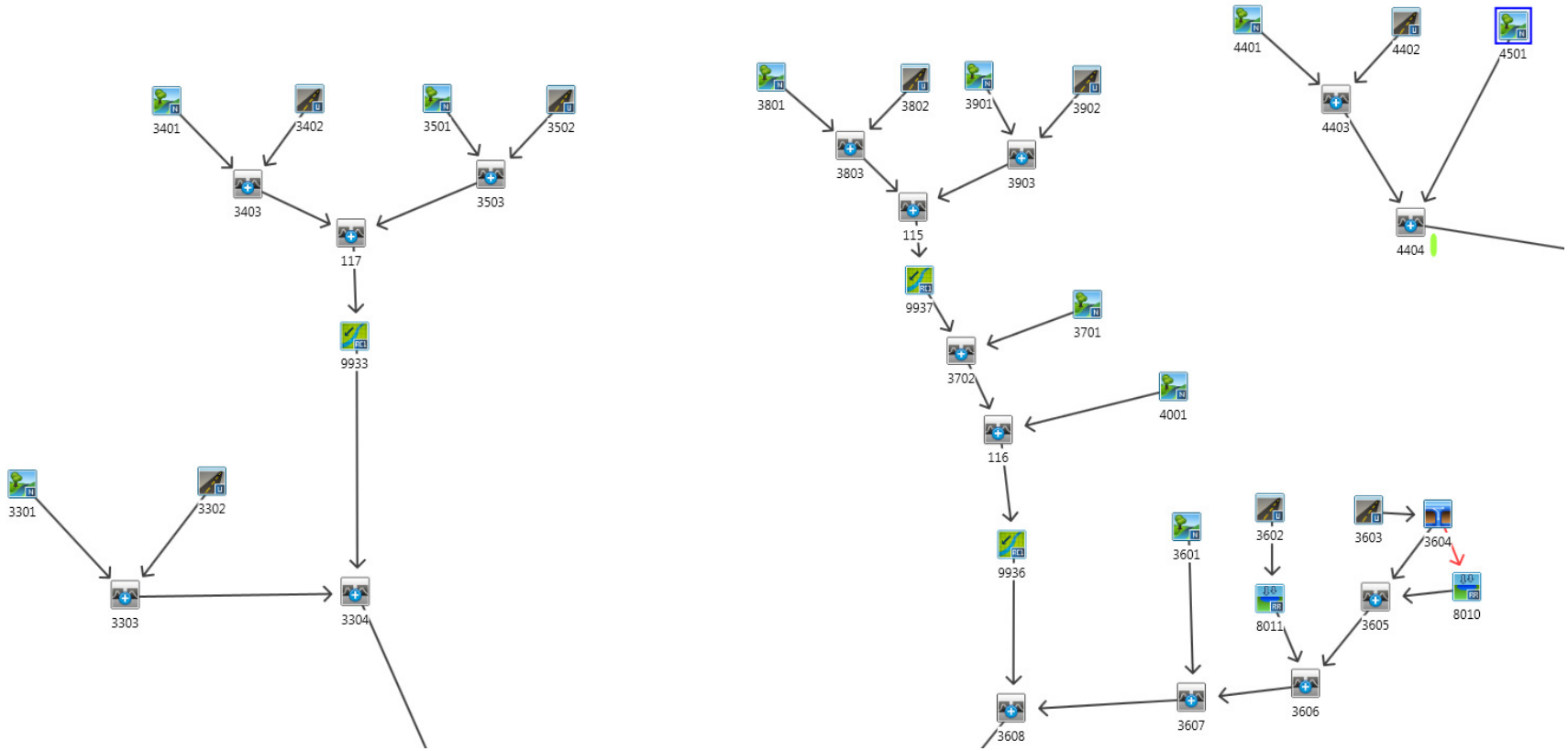
DUFFINS WATERSHED – TRCA MODEL



DUFFINS WATERSHED – TRCA MODEL



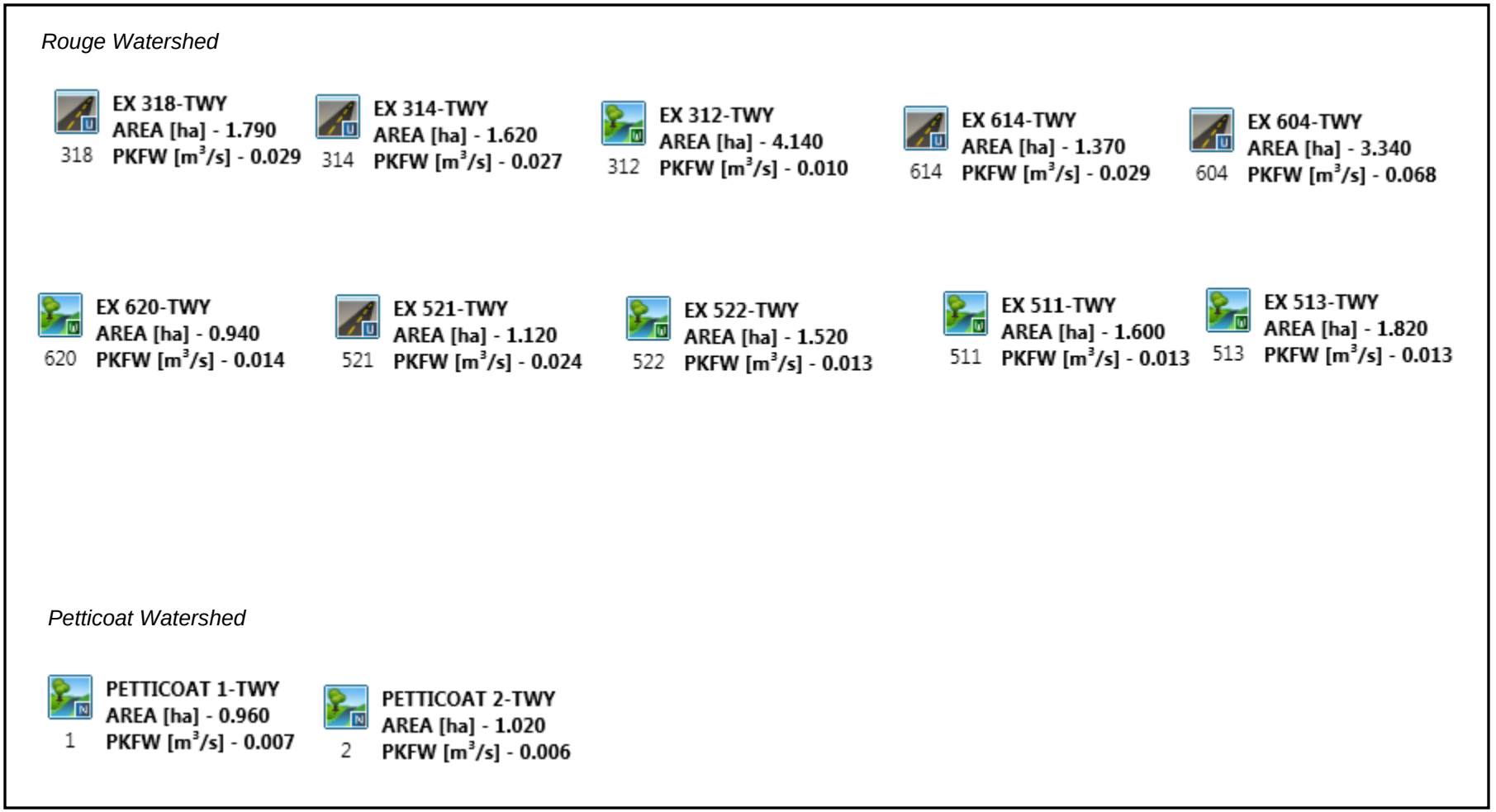
DUFFINS WATERSHED – TRCA MODEL



407 TWY SUB-AREAS

EXISTING CONDITION

VO2 Modelling Schematic 3.1: 407 TWY Sub-Areas Hydrologic Analysis – Existing Condition (Rouge and Petticoat Watersheds)



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        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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***** D E T A I L E D O U T P U T *****

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Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\3d489cf5-f5ae-473e-9c66-27d8c8a6d7e9\scenar

DATE: 10/07/2016 TIME: 09:42:31

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 1 **
****

READ STORM	Filename: C:\Users\p002311c\AppData\Local\Temp\e3179fd1-33f3-4fb4-9423-6b7c3ccf96cb\ff115411
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TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	3.50	7.14	6.75	2.94	10.00	0.42
0.50	0.42	3.75	7.14	7.00	2.94	10.25	0.42
0.75	0.42	4.00	7.14	7.25	2.94	10.50	0.42
1.00	0.42	4.25	7.14	7.50	1.68	10.75	0.42
1.25	0.42	4.50	19.32	7.75	1.68	11.00	0.42
1.50	0.42	4.75	19.32	8.00	1.68	11.25	0.42
1.75	0.42	5.00	19.32	8.25	1.68	11.50	0.42
2.00	0.42	5.25	19.32	8.50	0.84	11.75	0.42
2.25	0.42	5.50	5.46	8.75	0.84	12.00	0.42
2.50	2.52	5.75	5.46	9.00	0.84	12.25	0.42
2.75	2.52	6.00	5.46	9.25	0.84		
3.00	2.52	6.25	5.46	9.50	0.42		
3.25	2.52	6.50	2.94	9.75	0.42		

CALIB STANDHYD (0318)	Area (ha)= 1.79
ID= 1 DT= 5.0 min	Total Imp(%)= 20.00 Dir. Conn.(%)= 20.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.36	1.43
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.30	1.30
Length	(m)=	109.24	40.00

Mannings n = 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	2.52	6.250	5.46	9.33	0.42
0.167	0.00	3.250	2.52	6.333	2.94	9.42	0.42
0.250	0.00	3.333	7.14	6.417	2.94	9.50	0.42
0.333	0.42	3.417	7.14	6.500	2.94	9.58	0.42
0.417	0.42	3.500	7.14	6.583	2.94	9.67	0.42
0.500	0.42	3.583	7.14	6.667	2.94	9.75	0.42
0.583	0.42	3.667	7.14	6.750	2.94	9.83	0.42
0.667	0.42	3.750	7.14	6.833	2.94	9.92	0.42
0.750	0.42	3.833	7.14	6.917	2.94	10.00	0.42
0.833	0.42	3.917	7.14	7.000	2.94	10.08	0.42
0.917	0.42	4.000	7.14	7.083	2.94	10.17	0.42
1.000	0.42	4.083	7.14	7.167	2.94	10.25	0.42
1.083	0.42	4.167	7.14	7.250	2.94	10.33	0.42
1.167	0.42	4.250	7.14	7.333	1.68	10.42	0.42
1.250	0.42	4.333	19.32	7.417	1.68	10.50	0.42
1.333	0.42	4.417	19.32	7.500	1.68	10.58	0.42
1.417	0.42	4.500	19.32	7.583	1.68	10.67	0.42
1.500	0.42	4.583	19.32	7.667	1.68	10.75	0.42
1.583	0.42	4.667	19.32	7.750	1.68	10.83	0.42
1.667	0.42	4.750	19.32	7.833	1.68	10.92	0.42
1.750	0.42	4.833	19.32	7.917	1.68	11.00	0.42
1.833	0.42	4.917	19.32	8.000	1.68	11.08	0.42
1.917	0.42	5.000	19.32	8.083	1.68	11.17	0.42
2.000	0.42	5.083	19.32	8.167	1.68	11.25	0.42
2.083	0.42	5.167	19.32	8.250	1.68	11.33	0.42
2.167	0.42	5.250	19.32	8.333	0.84	11.42	0.42
2.250	0.42	5.333	5.46	8.417	0.84	11.50	0.42
2.333	2.52	5.417	5.46	8.500	0.84	11.58	0.42
2.417	2.52	5.500	5.46	8.583	0.84	11.67	0.42
2.500	2.52	5.583	5.46	8.667	0.84	11.75	0.42
2.583	2.52	5.667	5.46	8.750	0.84	11.83	0.42
2.667	2.52	5.750	5.46	8.833	0.84	11.92	0.42
2.750	2.52	5.833	5.46	8.917	0.84	12.00	0.42
2.833	2.52	5.917	5.46	9.000	0.84	12.08	0.42
2.917	2.52	6.000	5.46	9.083	0.84	12.17	0.42
3.000	2.52	6.083	5.46	9.167	0.84	12.25	0.42
3.083	2.52	6.167	5.46	9.250	0.84		

				TOTALS
Max.Eff.Inten.(mm/hr)=	19.32	4.60		
over (min)	5.00	35.00		
Storage Coeff. (min)=	4.81 (ii)	32.33 (ii)		
Unit Hyd. Tpeak (min)=	5.00	35.00		
Unit Hyd. peak (cms)=	0.22	0.03		
PEAK FLOW (cms)=	0.02	0.01		0.029 (iii)
TIME TO PEAK (hrs)=	5.17	5.58		5.25
RUNOFF VOLUME (mm)=	41.90	7.88		14.67
TOTAL RAINFALL (mm)=	42.00	42.00		42.00
RUNOFF COEFFICIENT =	1.00	0.19		0.35

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 65.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
WILHYD (0312)	Area (ha)=	4.14	Curve Number (CN)= 69.9
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	Recession const.(K)= 4.54
	U.H. Tp(hrs)=	3.85	

U.H. peak (cms)= 0.03

PEAK FLOW (cms)= 0.01 (i)
TIME TO PEAK (hrs)= 9.75

```
     RUNOFF VOLUME    (mm)=   8.18
     TOTAL RAINFALL   (mm)=  42.00
     RUNOFF COEFFICIENT   =   0.19

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0614)|   Area    (ha)=   1.37
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.27         1.10
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      95.57        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32         7.31
               over (min)        5.00        30.00
     Storage Coeff.  (min)=       4.44 (ii)   27.30 (ii)
     Unit Hyd. Tpeak (min)=       5.00        30.00
     Unit Hyd. peak  (cms)=       0.23         0.04
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.02          0.029 (iii)
     TIME TO PEAK    (hrs)=       5.17         5.50           5.25
     RUNOFF VOLUME    (mm)=      41.90        11.99          17.96
     TOTAL RAINFALL   (mm)=      42.00        42.00          42.00
     RUNOFF COEFFICIENT   =       1.00         0.29           0.43

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0604)|   Area    (ha)=   3.34
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.67         2.67
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=     149.22        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32         7.06
               over (min)        5.00        30.00
     Storage Coeff.  (min)=       5.79 (ii)   28.98 (ii)
     Unit Hyd. Tpeak (min)=       5.00        30.00
     Unit Hyd. peak  (cms)=       0.20         0.04
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.04          0.068 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.50           5.25
     RUNOFF VOLUME    (mm)=      41.90        11.59          17.65
     TOTAL RAINFALL   (mm)=      42.00        42.00          42.00
     RUNOFF COEFFICIENT   =       1.00         0.28           0.42

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| WILHYD   (  0620)|   Area    (ha)=   0.94   Curve Number   (CN)= 78.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 0.42
```

```
--------------------   U.H. Tp(hrs)=   0.36

     U.H. peak       (cms)=   0.08

     PEAK FLOW       (cms)=   0.01 (i)
     TIME TO PEAK    (hrs)=   5.33
     RUNOFF VOLUME    (mm)=  12.06
     TOTAL RAINFALL   (mm)=  42.00
     RUNOFF COEFFICIENT   =   0.29

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0521)|   Area    (ha)=   1.12
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.22         0.90
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      86.41        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32         7.31
               over (min)        5.00        30.00
     Storage Coeff.  (min)=       4.18 (ii)   27.04 (ii)
     Unit Hyd. Tpeak (min)=       5.00        30.00
     Unit Hyd. peak  (cms)=       0.24         0.04
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.01          0.024 (iii)
     TIME TO PEAK    (hrs)=       5.08         5.50           5.25
     RUNOFF VOLUME    (mm)=      41.90        11.99          17.96
     TOTAL RAINFALL   (mm)=      42.00        42.00          42.00
     RUNOFF COEFFICIENT   =       1.00         0.29           0.43

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
             YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| WILHYD   (  0522)|   Area    (ha)=   1.52   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 1.08
--------------------   U.H. Tp(hrs)=   0.92

     U.H. peak       (cms)=   0.05

     PEAK FLOW       (cms)=   0.01 (i)
     TIME TO PEAK    (hrs)=   6.08
     RUNOFF VOLUME    (mm)=  11.32
     TOTAL RAINFALL   (mm)=  42.00
     RUNOFF COEFFICIENT   =   0.27

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| WILHYD   (  0511)|   Area    (ha)=   1.60   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 1.08
--------------------   U.H. Tp(hrs)=   0.92

     U.H. peak       (cms)=   0.05

     PEAK FLOW       (cms)=   0.01 (i)
     TIME TO PEAK    (hrs)=   6.08
     RUNOFF VOLUME    (mm)=  11.34
     TOTAL RAINFALL   (mm)=  42.00
     RUNOFF COEFFICIENT   =   0.27

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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--------------------
| CALIB            |
| WILHYD   (  0513)|   Area    (ha)=   1.82   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 1.46
--------------------   U.H. Tp(hrs)=   1.23

     U.H. peak       (cms)=   0.05

     PEAK FLOW       (cms)=   0.01 (i)
     TIME TO PEAK    (hrs)=   6.50
     RUNOFF VOLUME    (mm)=  11.18
     TOTAL RAINFALL   (mm)=  42.00
     RUNOFF COEFFICIENT   =   0.27

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0001)|   Area    (ha)=   0.96   Curve Number   (CN)= 69.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   3.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.32

         NOTE:  RAINFALL WAS TRANSFORMED TO  15.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----							
TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.250	0.00	3.500	7.14	6.750	2.94	10.00	0.42
0.500	0.42	3.750	7.14	7.000	2.94	10.25	0.42
0.750	0.42	4.000	7.14	7.250	2.94	10.50	0.42
1.000	0.42	4.250	7.14	7.500	1.68	10.75	0.42
1.250	0.42	4.500	19.32	7.750	1.68	11.00	0.42
1.500	0.42	4.750	19.32	8.000	1.68	11.25	0.42
1.750	0.42	5.000	19.32	8.250	1.68	11.50	0.42
2.000	0.42	5.250	19.32	8.500	0.84	11.75	0.42
2.250	0.42	5.500	5.46	8.750	0.84	12.00	0.42
2.500	2.52	5.750	5.46	9.000	0.84	12.25	0.42
2.750	2.52	6.000	5.46	9.250	0.84		
3.000	2.52	6.250	5.46	9.500	0.42		
3.250	2.52	6.500	2.94	9.750	0.42		

```
     Unit Hyd Qpeak  (cms)=   0.028

     PEAK FLOW       (cms)=   0.007 (i)
     TIME TO PEAK    (hrs)=   6.500
     RUNOFF VOLUME    (mm)=   9.930
     TOTAL RAINFALL   (mm)=  42.000
     RUNOFF COEFFICIENT   =   0.236

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0002)|   Area    (ha)=   1.02   Curve Number   (CN)= 67.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   3.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.36

     Unit Hyd Qpeak  (cms)=   0.029

     PEAK FLOW       (cms)=   0.006 (i)
     TIME TO PEAK    (hrs)=   6.500
     RUNOFF VOLUME    (mm)=   9.265
     TOTAL RAINFALL   (mm)=  42.000
     RUNOFF COEFFICIENT   =   0.221

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0314)|   Area    (ha)=   1.62
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------

                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.32         1.30
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.30         1.30
```

Length	(m)=	103.92	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	2.52	6.250	5.46	9.33	0.42
0.167	0.00	3.250	2.52	6.333	2.94	9.42	0.42
0.250	0.00	3.333	7.14	6.417	2.94	9.50	0.42
0.333	0.42	3.417	7.14	6.500	2.94	9.58	0.42
0.417	0.42	3.500	7.14	6.583	2.94	9.67	0.42
0.500	0.42	3.583	7.14	6.667	2.94	9.75	0.42
0.583	0.42	3.667	7.14	6.750	2.94	9.83	0.42
0.667	0.42	3.750	7.14	6.833	2.94	9.92	0.42
0.750	0.42	3.833	7.14	6.917	2.94	10.00	0.42
0.833	0.42	3.917	7.14	7.000	2.94	10.08	0.42
0.917	0.42	4.000	7.14	7.083	2.94	10.17	0.42
1.000	0.42	4.083	7.14	7.167	2.94	10.25	0.42
1.083	0.42	4.167	7.14	7.250	2.94	10.33	0.42
1.167	0.42	4.250	7.14	7.333	1.68	10.42	0.42
1.250	0.42	4.333	19.32	7.417	1.68	10.50	0.42
1.333	0.42	4.417	19.32	7.500	1.68	10.58	0.42
1.417	0.42	4.500	19.32	7.583	1.68	10.67	0.42
1.500	0.42	4.583	19.32	7.667	1.68	10.75	0.42
1.583	0.42	4.667	19.32	7.750	1.68	10.83	0.42
1.667	0.42	4.750	19.32	7.833	1.68	10.92	0.42
1.750	0.42	4.833	19.32	7.917	1.68	11.00	0.42
1.833	0.42	4.917	19.32	8.000	1.68	11.08	0.42
1.917	0.42	5.000	19.32	8.083	1.68	11.17	0.42
2.000	0.42	5.083	19.32	8.167	1.68	11.25	0.42
2.083	0.42	5.167	19.32	8.250	1.68	11.33	0.42
2.167	0.42	5.250	19.32	8.333	0.84	11.42	0.42
2.250	0.42	5.333	5.46	8.417	0.84	11.50	0.42
2.333	2.52	5.417	5.46	8.500	0.84	11.58	0.42
2.417	2.52	5.500	5.46	8.583	0.84	11.67	0.42
2.500	2.52	5.583	5.46	8.667	0.84	11.75	0.42
2.583	2.52	5.667	5.46	8.750	0.84	11.83	0.42
2.667	2.52	5.750	5.46	8.833	0.84	11.92	0.42
2.750	2.52	5.833	5.46	8.917	0.84	12.00	0.42
2.833	2.52	5.917	5.46	9.000	0.84	12.08	0.42
2.917	2.52	6.000	5.46	9.083	0.84	12.17	0.42
3.000	2.52	6.083	5.46	9.167	0.84	12.25	0.42
3.083	2.52	6.167	5.46	9.250	0.84		

Max.Eff.Inten.(mm/hr)=	19.32	4.94		
over (min)	5.00	35.00		
Storage Coeff. (min)=	4.66 (ii)	31.41 (ii)		
Unit Hyd. Tpeak (min)=	5.00	35.00		
Unit Hyd. peak (cms)=	0.22	0.03		
			TOTALS	
PEAK FLOW (cms)=	0.02	0.01	0.027 (iii)	
TIME TO PEAK (hrs)=	5.17	5.58	5.25	
RUNOFF VOLUME (mm)=	41.90	8.45	15.13	
TOTAL RAINFALL (mm)=	42.00	42.00	42.00	
RUNOFF COEFFICIENT =	1.00	0.20	0.36	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
V    V   I    SSSSS  U   U    A    L
V    V   I    SS     U   U   A A   L
 V  V    I     SS    U   U  AAAAA  L
 V  V    I      SS   U   U  A   A  L
  VV     I    SSSSS  UUUUU  A   A  LLLLL

 OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
```

```
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
```


***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\eaee4408-a34e-4a1e-b6b8-1fc714180790\scenar
Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\eaee4408-a34e-4a1e-b6b8-1fc714180790\scenar

DATE: 10/07/2016 TIME: 09:42:32

USER:

COMMENTS: _____

**** SIMULATION NUMBER: 2 ****

READ STORM	Filename: C:\Users\p002311c\AppData\Local\Temp\e3179fd1-33f3-4fb4-9423-6b7c3ccf96cb\a96b0fc4
Ptotal= 54.38 mm	Comments: 5yr/12hr

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	3.50	9.25	6.75	3.81	10.00	0.54
0.50	0.54	3.75	9.25	7.00	3.81	10.25	0.54
0.75	0.54	4.00	9.25	7.25	3.81	10.50	0.54
1.00	0.54	4.25	9.25	7.50	2.18	10.75	0.54
1.25	0.54	4.50	25.02	7.75	2.18	11.00	0.54
1.50	0.54	4.75	25.02	8.00	2.18	11.25	0.54
1.75	0.54	5.00	25.02	8.25	2.18	11.50	0.54
2.00	0.54	5.25	25.02	8.50	1.09	11.75	0.54
2.25	0.54	5.50	7.07	8.75	1.09	12.00	0.54
2.50	3.26	5.75	7.07	9.00	1.09	12.25	0.54
2.75	3.26	6.00	7.07	9.25	1.09		
3.00	3.26	6.25	7.07	9.50	0.54		
3.25	3.26	6.50	3.81	9.75	0.54		

CALIB STANDHYD (0318)	Area (ha)= 1.79
ID= 1 DT= 5.0 min	Total Imp(%)= 20.00 Dir. Conn.(%)= 20.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.36	1.43
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.30	1.30
Length	(m)=	109.24	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	3.26	6.250	7.07	9.33	0.54

0.167	0.00	3.250	3.26	6.333	3.81	9.42	0.54
0.250	0.00	3.333	9.25	6.417	3.81	9.50	0.54
0.333	0.54	3.417	9.25	6.500	3.81	9.58	0.54
0.417	0.54	3.500	9.25	6.583	3.81	9.67	0.54
0.500	0.54	3.583	9.25	6.667	3.81	9.75	0.54
0.583	0.54	3.667	9.25	6.750	3.81	9.83	0.54
0.667	0.54	3.750	9.25	6.833	3.81	9.92	0.54
0.750	0.54	3.833	9.25	6.917	3.81	10.00	0.54
0.833	0.54	3.917	9.25	7.000	3.81	10.08	0.54
0.917	0.54	4.000	9.25	7.083	3.81	10.17	0.54
1.000	0.54	4.083	9.25	7.167	3.81	10.25	0.54
1.083	0.54	4.167	9.25	7.250	3.81	10.33	0.54
1.167	0.54	4.250	9.25	7.333	2.18	10.42	0.54
1.250	0.54	4.333	25.02	7.417	2.18	10.50	0.54
1.333	0.54	4.417	25.02	7.500	2.18	10.58	0.54
1.417	0.54	4.500	25.02	7.583	2.18	10.67	0.54
1.500	0.54	4.583	25.02	7.667	2.18	10.75	0.54
1.583	0.54	4.667	25.02	7.750	2.18	10.83	0.54
1.667	0.54	4.750	25.02	7.833	2.18	10.92	0.54
1.750	0.54	4.833	25.02	7.917	2.18	11.00	0.54
1.833	0.54	4.917	25.02	8.000	2.18	11.08	0.54
1.917	0.54	5.000	25.02	8.083	2.18	11.17	0.54
2.000	0.54	5.083	25.02	8.167	2.18	11.25	0.54
2.083	0.54	5.167	25.02	8.250	2.18	11.33	0.54
2.167	0.54	5.250	25.02	8.333	1.09	11.42	0.54
2.250	0.54	5.333	7.07	8.417	1.09	11.50	0.54
2.333	3.26	5.417	7.07	8.500	1.09	11.58	0.54
2.417	3.26	5.500	7.07	8.583	1.09	11.67	0.54
2.500	3.26	5.583	7.07	8.667	1.09	11.75	0.54
2.583	3.26	5.667	7.07	8.750	1.09	11.83	0.54
2.667	3.26	5.750	7.07	8.833	1.09	11.92	0.54
2.750	3.26	5.833	7.07	8.917	1.09	12.00	0.54
2.833	3.26	5.917	7.07	9.000	1.09	12.08	0.54
2.917	3.26	6.000	7.07	9.083	1.09	12.17	0.54
3.000	3.26	6.083	7.07	9.167	1.09	12.25	0.54
3.083	3.26	6.167	7.07	9.250	1.09		

Max.Eff.Inten.(mm/hr)=	25.02	7.85		
over (min)	5.00	30.00		
Storage Coeff. (min)=	4.33 (ii)	26.56 (ii)		
Unit Hyd. Tpeak (min)=	5.00	30.00		
Unit Hyd. peak (cms)=	0.23	0.04		
			TOTALS	
PEAK FLOW (cms)=	0.02	0.02	0.045 (iii)	
TIME TO PEAK (hrs)=	5.17	5.50	5.25	
RUNOFF VOLUME (mm)=	54.28	13.10	21.33	
TOTAL RAINFALL (mm)=	54.38	54.38	54.38	
RUNOFF COEFFICIENT =	1.00	0.24	0.39	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 65.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
WILHYD (0312)	Area (ha)=	4.14	Curve Number (CN)=	69.9
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	Recession const.(K)=	4.54
	U.H. Tp(hrs)=	3.85		

U.H. peak (cms)=	0.03	
PEAK FLOW (cms)=	0.02 (i)	
TIME TO PEAK (hrs)=	9.67	
RUNOFF VOLUME (mm)=	14.14	
TOTAL RAINFALL (mm)=	54.38	
RUNOFF COEFFICIENT =	0.26	

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB		
STANDHYD (0614)	Area (ha)=	1.37

|ID= 1 DT= 5.0 min | Total Imp(%)= 20.00 Dir. Conn.(%)= 20.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.27	1.10
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.30	1.30
Length	(m)=	95.57	40.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		25.02	11.89
over (min)		5.00	25.00
Storage Coeff. (min)=		4.00 (ii)	22.82 (ii)
Unit Hyd. Tpeak (min)=		5.00	25.00
Unit Hyd. peak (cms)=		0.24	0.05

				TOTALS
PEAK FLOW	(cms)=	0.02	0.03	0.046 (iii)
TIME TO PEAK	(hrs)=	5.08	5.42	5.25
RUNOFF VOLUME	(mm)=	54.28	19.27	26.26
TOTAL RAINFALL	(mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT	=	1.00	0.35	0.48

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0604)| Area (ha)= 3.34
ID= 1 DT= 5.0 min	Total Imp(%)= 20.00 Dir. Conn.(%)= 20.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.67	2.67
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.30	1.30
Length	(m)=	149.22	40.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		25.02	11.53
over (min)		5.00	25.00
Storage Coeff. (min)=		5.23 (ii)	24.28 (ii)
Unit Hyd. Tpeak (min)=		5.00	25.00
Unit Hyd. peak (cms)=		0.21	0.05

				TOTALS
PEAK FLOW	(cms)=	0.05	0.06	0.107 (iii)
TIME TO PEAK	(hrs)=	5.25	5.42	5.25
RUNOFF VOLUME	(mm)=	54.28	18.69	25.80
TOTAL RAINFALL	(mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT	=	1.00	0.34	0.47

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.8 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
WILHYD (0620)| Area (ha)= 0.94 Curve Number (CN)= 78.7
ID= 1 DT= 5.0 min	Ia (mm)= 5.00 Recession const.(K)= 0.42
	U.H. Tp(hrs)= 0.36

U.H. peak	(cms)=	0.08
PEAK FLOW	(cms)=	0.02 (i)
TIME TO PEAK	(hrs)=	5.33
RUNOFF VOLUME	(mm)=	20.28
TOTAL RAINFALL	(mm)=	54.38
RUNOFF COEFFICIENT	=	0.37

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (0521)	Area (ha)=	1.12			
ID= 1 DT= 5.0 min	Total Imp(%)=	20.00	Dir. Conn.(%)=	20.00	

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.22	0.90	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	1.30	1.30	
Length	(m)=	86.41	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		25.02	11.89	
over (min)		5.00	25.00	
Storage Coeff.	(min)=	3.77 (ii)	22.59 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	25.00	
Unit Hyd. peak	(cms)=	0.25	0.05	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.02	0.037 (iii)
TIME TO PEAK	(hrs)=	5.00	5.42	5.25
RUNOFF VOLUME	(mm)=	54.28	19.27	26.26
TOTAL RAINFALL	(mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT	=	1.00	0.35	0.48

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
WILHYD (0522)	Area (ha)=	1.52	Curve Number	(CN)=	76.7
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	Recession const.(K)=		1.08
	U.H. Tp(hrs)=	0.92			

U.H. peak	(cms)=	0.05
PEAK FLOW	(cms)=	0.02 (i)
TIME TO PEAK	(hrs)=	6.00
RUNOFF VOLUME	(mm)=	18.49
TOTAL RAINFALL	(mm)=	54.38
RUNOFF COEFFICIENT	=	0.34

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
WILHYD (0511)	Area (ha)=	1.60	Curve Number	(CN)=	76.7
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	Recession const.(K)=		1.08
	U.H. Tp(hrs)=	0.92			

U.H. peak	(cms)=	0.05
PEAK FLOW	(cms)=	0.02 (i)
TIME TO PEAK	(hrs)=	6.00
RUNOFF VOLUME	(mm)=	18.53
TOTAL RAINFALL	(mm)=	54.38
RUNOFF COEFFICIENT	=	0.34

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
WILHYD (0513)	Area (ha)=	1.82	Curve Number	(CN)=	76.7
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	Recession const.(K)=		1.46
	U.H. Tp(hrs)=	1.23			

U.H. peak	(cms)=	0.05
PEAK FLOW	(cms)=	0.02 (i)

TIME TO PEAK (hrs)= 6.50
RUNOFF VOLUME (mm)= 18.36
TOTAL RAINFALL (mm)= 54.38
RUNOFF COEFFICIENT = 0.34

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
NASHYD (0001)	Area (ha)=	0.96	Curve Number (CN)= 69.0
ID= 1 DT=15.0 min	Ia (mm)=	3.00	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	1.32	

NOTE: RAINFALL WAS TRANSFORMED TO 15.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.250	0.00	3.500	9.25	6.750	3.81	10.00	0.54
0.500	0.54	3.750	9.25	7.000	3.81	10.25	0.54
0.750	0.54	4.000	9.25	7.250	3.81	10.50	0.54
1.000	0.54	4.250	9.25	7.500	2.18	10.75	0.54
1.250	0.54	4.500	25.02	7.750	2.18	11.00	0.54
1.500	0.54	4.750	25.02	8.000	2.18	11.25	0.54
1.750	0.54	5.000	25.02	8.250	2.18	11.50	0.54
2.000	0.54	5.250	25.02	8.500	1.09	11.75	0.54
2.250	0.54	5.500	7.07	8.750	1.09	12.00	0.54
2.500	3.26	5.750	7.07	9.000	1.09	12.25	0.54
2.750	3.26	6.000	7.07	9.250	1.09		
3.000	3.26	6.250	7.07	9.500	0.54		
3.250	3.26	6.500	3.81	9.750	0.54		

Unit Hyd Qpeak (cms)= 0.028

PEAK FLOW (cms)= 0.011 (i)
TIME TO PEAK (hrs)= 6.500
RUNOFF VOLUME (mm)= 15.947
TOTAL RAINFALL (mm)= 54.380
RUNOFF COEFFICIENT = 0.293

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
NASHYD (0002)	Area (ha)=	1.02	Curve Number (CN)= 67.0
ID= 1 DT=15.0 min	Ia (mm)=	3.00	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	1.36	

Unit Hyd Qpeak (cms)= 0.029

PEAK FLOW (cms)= 0.010 (i)
TIME TO PEAK (hrs)= 6.500
RUNOFF VOLUME (mm)= 14.954
TOTAL RAINFALL (mm)= 54.380
RUNOFF COEFFICIENT = 0.275

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0314)	Area (ha)=	1.62	
ID= 1 DT= 5.0 min	Total Imp(%)=	20.00	Dir. Conn.(%)= 20.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.32	1.30
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.30	1.30
Length	(m)=	103.92	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr

0.083	0.00	3.167	3.26	6.250	7.07	9.33	0.54
0.167	0.00	3.250	3.26	6.333	3.81	9.42	0.54
0.250	0.00	3.333	9.25	6.417	3.81	9.50	0.54
0.333	0.54	3.417	9.25	6.500	3.81	9.58	0.54
0.417	0.54	3.500	9.25	6.583	3.81	9.67	0.54
0.500	0.54	3.583	9.25	6.667	3.81	9.75	0.54
0.583	0.54	3.667	9.25	6.750	3.81	9.83	0.54
0.667	0.54	3.750	9.25	6.833	3.81	9.92	0.54
0.750	0.54	3.833	9.25	6.917	3.81	10.00	0.54
0.833	0.54	3.917	9.25	7.000	3.81	10.08	0.54
0.917	0.54	4.000	9.25	7.083	3.81	10.17	0.54
1.000	0.54	4.083	9.25	7.167	3.81	10.25	0.54
1.083	0.54	4.167	9.25	7.250	3.81	10.33	0.54
1.167	0.54	4.250	9.25	7.333	2.18	10.42	0.54
1.250	0.54	4.333	25.02	7.417	2.18	10.50	0.54
1.333	0.54	4.417	25.02	7.500	2.18	10.58	0.54
1.417	0.54	4.500	25.02	7.583	2.18	10.67	0.54
1.500	0.54	4.583	25.02	7.667	2.18	10.75	0.54
1.583	0.54	4.667	25.02	7.750	2.18	10.83	0.54
1.667	0.54	4.750	25.02	7.833	2.18	10.92	0.54
1.750	0.54	4.833	25.02	7.917	2.18	11.00	0.54
1.833	0.54	4.917	25.02	8.000	2.18	11.08	0.54
1.917	0.54	5.000	25.02	8.083	2.18	11.17	0.54
2.000	0.54	5.083	25.02	8.167	2.18	11.25	0.54
2.083	0.54	5.167	25.02	8.250	2.18	11.33	0.54
2.167	0.54	5.250	25.02	8.333	1.09	11.42	0.54
2.250	0.54	5.333	7.07	8.417	1.09	11.50	0.54
2.333	3.26	5.417	7.07	8.500	1.09	11.58	0.54
2.417	3.26	5.500	7.07	8.583	1.09	11.67	0.54
2.500	3.26	5.583	7.07	8.667	1.09	11.75	0.54
2.583	3.26	5.667	7.07	8.750	1.09	11.83	0.54
2.667	3.26	5.750	7.07	8.833	1.09	11.92	0.54
2.750	3.26	5.833	7.07	8.917	1.09	12.00	0.54
2.833	3.26	5.917	7.07	9.000	1.09	12.08	0.54
2.917	3.26	6.000	7.07	9.083	1.09	12.17	0.54
3.000	3.26	6.083	7.07	9.167	1.09	12.25	0.54
3.083	3.26	6.167	7.07	9.250	1.09		

Max.Eff.Inten.(mm/hr)=	25.02	8.38		
over (min)	5.00	30.00		
Storage Coeff. (min)=	4.21 (ii)	25.86 (ii)		
Unit Hyd. Tpeak (min)=	5.00	30.00		
Unit Hyd. peak (cms)=	0.24	0.04		
			TOTALS	
PEAK FLOW (cms)=	0.02	0.02	0.042 (iii)	
TIME TO PEAK (hrs)=	5.08	5.50	5.25	
RUNOFF VOLUME (mm)=	54.28	13.97	22.03	
TOTAL RAINFALL (mm)=	54.38	54.38	54.38	
RUNOFF COEFFICIENT =	1.00	0.26	0.41	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
V    V   I    SSSSS  U   U    A    L
V    V   I    SS     U   U   A A   L
 V  V    I     SS    U   U  AAAAA  L
 V  V    I      SS   U   U  A   A  L
  VV     I    SSSSS  UUUUU  A   A  LLLLL

 OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
O   O    T      T    H   H   Y Y   MM MM  O   O
O   O    T      T    H   H    Y    M   M  O   O
 OOO     T      T    H   H    Y    M   M   OOO
```

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Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\d40ee14d-5fde-4d1f-8763-a237004929ac\scenar
Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\d40ee14d-5fde-4d1f-8763-a237004929ac\scenar

DATE: 10/07/2016 TIME: 09:42:32

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 3 **
****

READ STORM | Filename: C:\Users\p002311c\AppData\Local\Temp\e3179fd1-33f3-4fb4-9423-6b7c3ccf96cb\fbcd6a39
Ptotal= 62.71 mm | Comments: 10yr/12hr

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	3.50	10.66	6.75	4.39	10.00	0.63
0.50	0.63	3.75	10.66	7.00	4.39	10.25	0.63
0.75	0.63	4.00	10.66	7.25	4.39	10.50	0.63
1.00	0.63	4.25	10.66	7.50	2.51	10.75	0.63
1.25	0.63	4.50	28.84	7.75	2.51	11.00	0.63
1.50	0.63	4.75	28.84	8.00	2.51	11.25	0.63
1.75	0.63	5.00	28.84	8.25	2.51	11.50	0.63
2.00	0.63	5.25	28.84	8.50	1.25	11.75	0.63
2.25	0.63	5.50	8.15	8.75	1.25	12.00	0.63
2.50	3.76	5.75	8.15	9.00	1.25	12.25	0.63
2.75	3.76	6.00	8.15	9.25	1.25		
3.00	3.76	6.25	8.15	9.50	0.63		
3.25	3.76	6.50	4.39	9.75	0.63		

CALIB STANDHYD (0318) | Area (ha)= 1.79
ID= 1 DT= 5.0 min | Total Imp(%)= 20.00 Dir. Conn.(%)= 20.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.36	1.43
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.30	1.30
Length	(m)=	109.24	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	3.76	6.250	8.15	9.33	0.63
0.167	0.00	3.250	3.76	6.333	4.39	9.42	0.63
0.250	0.00	3.333	10.66	6.417	4.39	9.50	0.63
0.333	0.63	3.417	10.66	6.500	4.39	9.58	0.63
0.417	0.63	3.500	10.66	6.583	4.39	9.67	0.63
0.500	0.63	3.583	10.66	6.667	4.39	9.75	0.63
0.583	0.63	3.667	10.66	6.750	4.39	9.83	0.63
0.667	0.63	3.750	10.66	6.833	4.39	9.92	0.63
0.750	0.63	3.833	10.66	6.917	4.39	10.00	0.63
0.833	0.63	3.917	10.66	7.000	4.39	10.08	0.63

0.917	0.63	4.000	10.66	7.083	4.39	10.17	0.63
1.000	0.63	4.083	10.66	7.167	4.39	10.25	0.63
1.083	0.63	4.167	10.66	7.250	4.39	10.33	0.63
1.167	0.63	4.250	10.66	7.333	2.51	10.42	0.63
1.250	0.63	4.333	28.84	7.417	2.51	10.50	0.63
1.333	0.63	4.417	28.84	7.500	2.51	10.58	0.63
1.417	0.63	4.500	28.84	7.583	2.51	10.67	0.63
1.500	0.63	4.583	28.84	7.667	2.51	10.75	0.63
1.583	0.63	4.667	28.84	7.750	2.51	10.83	0.63
1.667	0.63	4.750	28.84	7.833	2.51	10.92	0.63
1.750	0.63	4.833	28.84	7.917	2.51	11.00	0.63
1.833	0.63	4.917	28.84	8.000	2.51	11.08	0.63
1.917	0.63	5.000	28.84	8.083	2.51	11.17	0.63
2.000	0.63	5.083	28.84	8.167	2.51	11.25	0.63
2.083	0.63	5.167	28.84	8.250	2.51	11.33	0.63
2.167	0.63	5.250	28.84	8.333	1.25	11.42	0.63
2.250	0.63	5.333	8.15	8.417	1.25	11.50	0.63
2.333	3.76	5.417	8.15	8.500	1.25	11.58	0.63
2.417	3.76	5.500	8.15	8.583	1.25	11.67	0.63
2.500	3.76	5.583	8.15	8.667	1.25	11.75	0.63
2.583	3.76	5.667	8.15	8.750	1.25	11.83	0.63
2.667	3.76	5.750	8.15	8.833	1.25	11.92	0.63
2.750	3.76	5.833	8.15	8.917	1.25	12.00	0.63
2.833	3.76	5.917	8.15	9.000	1.25	12.08	0.63
2.917	3.76	6.000	8.15	9.083	1.25	12.17	0.63
3.000	3.76	6.083	8.15	9.167	1.25	12.25	0.63
3.083	3.76	6.167	8.15	9.250	1.25		

Max.Eff.Inten.(mm/hr)=		28.84	10.48	
over (min)		5.00	25.00	
Storage Coeff. (min)=		4.09 (ii)	23.89 (ii)	
Unit Hyd. Tpeak (min)=		5.00	25.00	
Unit Hyd. peak (cms)=		0.24	0.05	
				TOTALS
PEAK FLOW	(cms)=	0.03	0.03	0.058 (iii)
TIME TO PEAK	(hrs)=	5.08	5.42	5.25
RUNOFF VOLUME	(mm)=	62.61	17.12	26.21
TOTAL RAINFALL	(mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT	=	1.00	0.27	0.42

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 65.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
WILHYD (0312)	Area	(ha)=	4.14	Curve Number	(CN)= 69.9
ID= 1 DT= 5.0 min	Ia	(mm)=	5.00	Recession const.(K)=	4.54
	U.H. Tp(hrs)=		3.85		

U.H. peak (cms)= 0.03

PEAK FLOW	(cms)=	0.02 (i)
TIME TO PEAK	(hrs)=	9.67
RUNOFF VOLUME	(mm)=	18.70
TOTAL RAINFALL	(mm)=	62.71
RUNOFF COEFFICIENT	=	0.30

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (0614)	Area	(ha)=	1.37		
ID= 1 DT= 5.0 min	Total Imp(%)=		20.00	Dir. Conn.(%)=	20.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.27	1.10
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.30	1.30
Length	(m)=	95.57	40.00
Mannings n	=	0.013	0.250

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     Max.Eff.Inten.(mm/hr)=      28.84        15.10
               over (min)         5.00        25.00
     Storage Coeff.  (min)=       3.78 (ii)   20.89 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=       0.25         0.05
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.04          0.057 (iii)
     TIME TO PEAK    (hrs)=       5.08         5.42           5.25
     RUNOFF VOLUME    (mm)=      62.61        24.69          32.27
     TOTAL RAINFALL   (mm)=      62.71        62.71          62.71
     RUNOFF COEFFICIENT   =       1.00         0.39           0.51

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB            |
| STANDHYD (  0604)|   Area    (ha)=   3.34
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.67         2.67
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=     149.22        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84        14.67
               over (min)         5.00        25.00
     Storage Coeff.  (min)=       4.94 (ii)   22.24 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=       0.22         0.05
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.09          0.135 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.42           5.25
     RUNOFF VOLUME    (mm)=      62.61        23.99          31.71
     TOTAL RAINFALL   (mm)=      62.71        62.71          62.71
     RUNOFF COEFFICIENT   =       1.00         0.38           0.51

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| WILHYD   (  0620)|   Area    (ha)=   0.94   Curve Number   (CN)= 78.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 0.42
--------------------   U.H. Tp(hrs)=   0.36

     U.H. peak       (cms)=   0.08

     PEAK FLOW       (cms)=   0.03 (i)
     TIME TO PEAK    (hrs)=   5.33
     RUNOFF VOLUME    (mm)=  25.96
     TOTAL RAINFALL   (mm)=  62.71
     RUNOFF COEFFICIENT   =   0.41

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0521)|   Area    (ha)=   1.12
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
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		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.22	0.90	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	1.30	1.30	
Length	(m)=	86.41	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)	=	28.84	15.10	
over (min)		5.00	25.00	
Storage Coeff.	(min)=	3.56 (ii)	20.67 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	25.00	
Unit Hyd. peak	(cms)=	0.26	0.05	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.03	0.047 (iii)
TIME TO PEAK	(hrs)=	5.00	5.42	5.25
RUNOFF VOLUME	(mm)=	62.61	24.69	32.27
TOTAL RAINFALL	(mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT	=	1.00	0.39	0.51

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
WILHYD (0522)	Area	(ha)=	1.52	Curve Number	(CN)= 76.7
ID= 1 DT= 5.0 min	Ia	(mm)=	5.00	Recession const.(K)=	1.08
	U.H. Tp(hrs)=		0.92		

U.H. peak	(cms)=	0.05
PEAK FLOW	(cms)=	0.03 (i)
TIME TO PEAK	(hrs)=	6.00
RUNOFF VOLUME	(mm)=	23.87
TOTAL RAINFALL	(mm)=	62.71
RUNOFF COEFFICIENT	=	0.38

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
WILHYD (0511)	Area	(ha)=	1.60	Curve Number	(CN)= 76.7
ID= 1 DT= 5.0 min	Ia	(mm)=	5.00	Recession const.(K)=	1.08
	U.H. Tp(hrs)=		0.92		

U.H. peak	(cms)=	0.05
PEAK FLOW	(cms)=	0.03 (i)
TIME TO PEAK	(hrs)=	6.00
RUNOFF VOLUME	(mm)=	23.91
TOTAL RAINFALL	(mm)=	62.71
RUNOFF COEFFICIENT	=	0.38

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
WILHYD (0513)	Area	(ha)=	1.82	Curve Number	(CN)= 76.7
ID= 1 DT= 5.0 min	Ia	(mm)=	5.00	Recession const.(K)=	1.46
	U.H. Tp(hrs)=		1.23		

U.H. peak	(cms)=	0.05
PEAK FLOW	(cms)=	0.03 (i)
TIME TO PEAK	(hrs)=	6.42
RUNOFF VOLUME	(mm)=	23.76
TOTAL RAINFALL	(mm)=	62.71
RUNOFF COEFFICIENT	=	0.38

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
NASHYD (0001)	Area (ha)=	0.96	Curve Number (CN)=	69.0	
ID= 1 DT=15.0 min	Ia (mm)=	3.00	# of Linear Res.(N)=	3.00	
	U.H. Tp(hrs)=	1.32			

NOTE: RAINFALL WAS TRANSFORMED TO 15.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.250	0.00	3.500	10.66	6.750	4.39	10.00	0.63
0.500	0.63	3.750	10.66	7.000	4.39	10.25	0.63
0.750	0.63	4.000	10.66	7.250	4.39	10.50	0.63
1.000	0.63	4.250	10.66	7.500	2.51	10.75	0.63
1.250	0.63	4.500	28.84	7.750	2.51	11.00	0.63
1.500	0.63	4.750	28.84	8.000	2.51	11.25	0.63
1.750	0.63	5.000	28.84	8.250	2.51	11.50	0.63
2.000	0.63	5.250	28.84	8.500	1.25	11.75	0.63
2.250	0.63	5.500	8.15	8.750	1.25	12.00	0.63
2.500	3.76	5.750	8.15	9.000	1.25	12.25	0.63
2.750	3.76	6.000	8.15	9.250	1.25		
3.000	3.76	6.250	8.15	9.500	0.63		
3.250	3.76	6.500	4.39	9.750	0.63		

Unit Hyd Qpeak (cms)= 0.028

PEAK FLOW (cms)= 0.014 (i)
TIME TO PEAK (hrs)= 6.500
RUNOFF VOLUME (mm)= 20.506
TOTAL RAINFALL (mm)= 62.710
RUNOFF COEFFICIENT = 0.327

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
NASHYD (0002)	Area (ha)=	1.02	Curve Number (CN)=	67.0	
ID= 1 DT=15.0 min	Ia (mm)=	3.00	# of Linear Res.(N)=	3.00	
	U.H. Tp(hrs)=	1.36			

Unit Hyd Qpeak (cms)= 0.029

PEAK FLOW (cms)= 0.013 (i)
TIME TO PEAK (hrs)= 6.500
RUNOFF VOLUME (mm)= 19.287
TOTAL RAINFALL (mm)= 62.710
RUNOFF COEFFICIENT = 0.308

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (0314)	Area (ha)=	1.62			
ID= 1 DT= 5.0 min	Total Imp(%)=	20.00	Dir. Conn.(%)=	20.00	

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.32	1.30
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.30	1.30
Length	(m)=	103.92	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	3.76	6.250	8.15	9.33	0.63
0.167	0.00	3.250	3.76	6.333	4.39	9.42	0.63
0.250	0.00	3.333	10.66	6.417	4.39	9.50	0.63
0.333	0.63	3.417	10.66	6.500	4.39	9.58	0.63
0.417	0.63	3.500	10.66	6.583	4.39	9.67	0.63
0.500	0.63	3.583	10.66	6.667	4.39	9.75	0.63
0.583	0.63	3.667	10.66	6.750	4.39	9.83	0.63
0.667	0.63	3.750	10.66	6.833	4.39	9.92	0.63

0.750	0.63	3.833	10.66	6.917	4.39	10.00	0.63
0.833	0.63	3.917	10.66	7.000	4.39	10.08	0.63
0.917	0.63	4.000	10.66	7.083	4.39	10.17	0.63
1.000	0.63	4.083	10.66	7.167	4.39	10.25	0.63
1.083	0.63	4.167	10.66	7.250	4.39	10.33	0.63
1.167	0.63	4.250	10.66	7.333	2.51	10.42	0.63
1.250	0.63	4.333	28.84	7.417	2.51	10.50	0.63
1.333	0.63	4.417	28.84	7.500	2.51	10.58	0.63
1.417	0.63	4.500	28.84	7.583	2.51	10.67	0.63
1.500	0.63	4.583	28.84	7.667	2.51	10.75	0.63
1.583	0.63	4.667	28.84	7.750	2.51	10.83	0.63
1.667	0.63	4.750	28.84	7.833	2.51	10.92	0.63
1.750	0.63	4.833	28.84	7.917	2.51	11.00	0.63
1.833	0.63	4.917	28.84	8.000	2.51	11.08	0.63
1.917	0.63	5.000	28.84	8.083	2.51	11.17	0.63
2.000	0.63	5.083	28.84	8.167	2.51	11.25	0.63
2.083	0.63	5.167	28.84	8.250	2.51	11.33	0.63
2.167	0.63	5.250	28.84	8.333	1.25	11.42	0.63
2.250	0.63	5.333	8.15	8.417	1.25	11.50	0.63
2.333	3.76	5.417	8.15	8.500	1.25	11.58	0.63
2.417	3.76	5.500	8.15	8.583	1.25	11.67	0.63
2.500	3.76	5.583	8.15	8.667	1.25	11.75	0.63
2.583	3.76	5.667	8.15	8.750	1.25	11.83	0.63
2.667	3.76	5.750	8.15	8.833	1.25	11.92	0.63
2.750	3.76	5.833	8.15	8.917	1.25	12.00	0.63
2.833	3.76	5.917	8.15	9.000	1.25	12.08	0.63
2.917	3.76	6.000	8.15	9.083	1.25	12.17	0.63
3.000	3.76	6.083	8.15	9.167	1.25	12.25	0.63
3.083	3.76	6.167	8.15	9.250	1.25		

Max.Eff.Inten.(mm/hr)=		28.84	11.15	
over (min)		5.00	25.00	
Storage Coeff. (min)=		3.97 (ii)	23.29 (ii)	
Unit Hyd. Tpeak (min)=		5.00	25.00	
Unit Hyd. peak (cms)=		0.24	0.05	
				TOTALS
PEAK FLOW	(cms)=	0.03	0.03	0.055 (iii)
TIME TO PEAK	(hrs)=	5.08	5.42	5.25
RUNOFF VOLUME	(mm)=	62.61	18.22	27.09
TOTAL RAINFALL	(mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT	=	1.00	0.29	0.43

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
V    V   I    SSSSS  U   U    A    L
V    V   I    SS     U   U   A A   L
 V  V    I     SS    U   U  AAAAA  L
 V  V    I      SS   U   U  A   A  L
  VV     I    SSSSS  UUUUU  A   A  LLLLL

 OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
O   O    T      T    H   H   Y Y   MM MM  O   O
O   O    T      T    H   H    Y    M   M  O   O
 OOO     T      T    H   H    Y    M   M   OOO
```

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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\2dc1480a-5e04-45fc-ae0b-8008740e8a96\scenar
Summary filename:

C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\2dc1480a-5e04-45fc-ae0b-8008740e8a96\scenar

DATE: 10/07/2016 TIME: 09:42:33

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 4 **
****

READ STORM	Filename: C:\Users\p002311c\AppData\Local\Temp\e3179fd1-33f3-4fb4-9423-6b7c3ccf96cb\7566f836
Ptotal= 73.10 mm	Comments: 25yr/12hr

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	3.50	12.43	6.75	5.12	10.00	0.73
0.50	0.73	3.75	12.43	7.00	5.12	10.25	0.73
0.75	0.73	4.00	12.43	7.25	5.12	10.50	0.73
1.00	0.73	4.25	12.43	7.50	2.92	10.75	0.73
1.25	0.73	4.50	33.63	7.75	2.92	11.00	0.73
1.50	0.73	4.75	33.63	8.00	2.92	11.25	0.73
1.75	0.73	5.00	33.63	8.25	2.92	11.50	0.73
2.00	0.73	5.25	33.63	8.50	1.46	11.75	0.73
2.25	0.73	5.50	9.50	8.75	1.46	12.00	0.73
2.50	4.39	5.75	9.50	9.00	1.46	12.25	0.73
2.75	4.39	6.00	9.50	9.25	1.46		
3.00	4.39	6.25	9.50	9.50	0.73		
3.25	4.39	6.50	5.12	9.75	0.73		

CALIB STANDHYD (0318)	Area (ha)= 1.79
ID= 1 DT= 5.0 min	Total Imp(%)= 20.00 Dir. Conn.(%)= 20.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.36	1.43
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.30	1.30
Length	(m)=	109.24	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	4.39	6.250	9.50	9.33	0.73
0.167	0.00	3.250	4.39	6.333	5.12	9.42	0.73
0.250	0.00	3.333	12.43	6.417	5.12	9.50	0.73
0.333	0.73	3.417	12.43	6.500	5.12	9.58	0.73
0.417	0.73	3.500	12.43	6.583	5.12	9.67	0.73
0.500	0.73	3.583	12.43	6.667	5.12	9.75	0.73
0.583	0.73	3.667	12.43	6.750	5.12	9.83	0.73
0.667	0.73	3.750	12.43	6.833	5.12	9.92	0.73
0.750	0.73	3.833	12.43	6.917	5.12	10.00	0.73
0.833	0.73	3.917	12.43	7.000	5.12	10.08	0.73
0.917	0.73	4.000	12.43	7.083	5.12	10.17	0.73
1.000	0.73	4.083	12.43	7.167	5.12	10.25	0.73
1.083	0.73	4.167	12.43	7.250	5.12	10.33	0.73
1.167	0.73	4.250	12.43	7.333	2.92	10.42	0.73
1.250	0.73	4.333	33.63	7.417	2.92	10.50	0.73
1.333	0.73	4.417	33.63	7.500	2.92	10.58	0.73
1.417	0.73	4.500	33.63	7.583	2.92	10.67	0.73
1.500	0.73	4.583	33.63	7.667	2.92	10.75	0.73

1.583	0.73	4.667	33.63	7.750	2.92	10.83	0.73
1.667	0.73	4.750	33.63	7.833	2.92	10.92	0.73
1.750	0.73	4.833	33.63	7.917	2.92	11.00	0.73
1.833	0.73	4.917	33.63	8.000	2.92	11.08	0.73
1.917	0.73	5.000	33.63	8.083	2.92	11.17	0.73
2.000	0.73	5.083	33.63	8.167	2.92	11.25	0.73
2.083	0.73	5.167	33.63	8.250	2.92	11.33	0.73
2.167	0.73	5.250	33.63	8.333	1.46	11.42	0.73
2.250	0.73	5.333	9.50	8.417	1.46	11.50	0.73
2.333	4.39	5.417	9.50	8.500	1.46	11.58	0.73
2.417	4.39	5.500	9.50	8.583	1.46	11.67	0.73
2.500	4.39	5.583	9.50	8.667	1.46	11.75	0.73
2.583	4.39	5.667	9.50	8.750	1.46	11.83	0.73
2.667	4.39	5.750	9.50	8.833	1.46	11.92	0.73
2.750	4.39	5.833	9.50	8.917	1.46	12.00	0.73
2.833	4.39	5.917	9.50	9.000	1.46	12.08	0.73
2.917	4.39	6.000	9.50	9.083	1.46	12.17	0.73
3.000	4.39	6.083	9.50	9.167	1.46	12.25	0.73
3.083	4.39	6.167	9.50	9.250	1.46		

Max.Eff.Inten.(mm/hr)=	33.63	13.77	
over (min)	5.00	25.00	
Storage Coeff. (min)=	3.85 (ii)	21.60 (ii)	
Unit Hyd. Tpeak (min)=	5.00	25.00	
Unit Hyd. peak (cms)=	0.25	0.05	
			TOTALS
PEAK FLOW (cms)=	0.03	0.04	0.074 (iii)
TIME TO PEAK (hrs)=	5.08	5.42	5.25
RUNOFF VOLUME (mm)=	73.00	22.64	32.70
TOTAL RAINFALL (mm)=	73.10	73.10	73.10
RUNOFF COEFFICIENT =	1.00	0.31	0.45

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 65.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
WILHYD (0312)	Area (ha)=	4.14	Curve Number (CN)= 69.9
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	Recession const.(K)= 4.54
	U.H. Tp(hrs)=	3.85	

U.H. peak (cms)=	0.03	
PEAK FLOW (cms)=	0.03 (i)	
TIME TO PEAK (hrs)=	9.58	
RUNOFF VOLUME (mm)=	24.88	
TOTAL RAINFALL (mm)=	73.10	
RUNOFF COEFFICIENT =	0.34	

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0614)	Area (ha)=	1.37	
ID= 1 DT= 5.0 min	Total Imp(%)=	20.00	Dir. Conn.(%)= 20.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=		0.27	1.10
Dep. Storage (mm)=		0.10	5.00
Average Slope (%)=		1.30	1.30
Length (m)=		95.57	40.00
Mannings n =		0.013	0.250
Max.Eff.Inten.(mm/hr)=		33.63	19.33
over (min)		5.00	20.00
Storage Coeff. (min)=		3.55 (ii)	19.05 (ii)
Unit Hyd. Tpeak (min)=		5.00	20.00
Unit Hyd. peak (cms)=		0.26	0.06
			TOTALS
PEAK FLOW (cms)=		0.03	0.05 0.074 (iii)
TIME TO PEAK (hrs)=		5.00	5.33 5.25

RUNOFF VOLUME (mm)=	73.00	31.93	40.13
TOTAL RAINFALL (mm)=	73.10	73.10	73.10
RUNOFF COEFFICIENT =	1.00	0.44	0.55

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0604)| Area (ha)= 3.34
ID= 1 DT= 5.0 min | Total Imp(%)= 20.00 Dir. Conn.(%)= 20.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=		0.67	2.67
Dep. Storage (mm)=		0.10	5.00
Average Slope (%)=		1.30	1.30
Length (m)=		149.22	40.00
Mannings n =		0.013	0.250
Max.Eff.Inten.(mm/hr)=		33.63	18.84
over (min)		5.00	25.00
Storage Coeff. (min)=		4.64 (ii)	20.30 (ii)
Unit Hyd. Tpeak (min)=		5.00	25.00
Unit Hyd. peak (cms)=		0.22	0.05
			TOTALS
PEAK FLOW (cms)=		0.06	0.11	0.172 (iii)
TIME TO PEAK (hrs)=		5.25	5.33	5.25
RUNOFF VOLUME (mm)=		73.00	31.08	39.46
TOTAL RAINFALL (mm)=		73.10	73.10	73.10
RUNOFF COEFFICIENT =		1.00	0.43	0.54

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.8 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
WILHYD (0620)| Area (ha)= 0.94 Curve Number (CN)= 78.7
ID= 1 DT= 5.0 min | Ia (mm)= 5.00 Recession const.(K)= 0.42
U.H. Tp(hrs)= 0.36

U.H. peak (cms)=	0.08	
PEAK FLOW (cms)=	0.04 (i)	
TIME TO PEAK (hrs)=	5.33	
RUNOFF VOLUME (mm)=	33.48	
TOTAL RAINFALL (mm)=	73.10	
RUNOFF COEFFICIENT =	0.46	

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0521)| Area (ha)= 1.12
ID= 1 DT= 5.0 min | Total Imp(%)= 20.00 Dir. Conn.(%)= 20.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=		0.22	0.90
Dep. Storage (mm)=		0.10	5.00
Average Slope (%)=		1.30	1.30
Length (m)=		86.41	40.00
Mannings n =		0.013	0.250
Max.Eff.Inten.(mm/hr)=		33.63	19.33

```
              over (min)        5.00        20.00
     Storage Coeff.  (min)=     3.35 (ii)   18.84 (ii)
     Unit Hyd. Tpeak (min)=     5.00        20.00
     Unit Hyd. peak  (cms)=     0.26         0.06
                                                      *TOTALS*
     PEAK FLOW       (cms)=     0.02         0.04        0.061 (iii)
     TIME TO PEAK    (hrs)=     5.00         5.33         5.25
     RUNOFF VOLUME    (mm)=    73.00        31.93        40.13
     TOTAL RAINFALL   (mm)=    73.10        73.10        73.10
     RUNOFF COEFFICIENT   =     1.00         0.44         0.55

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
             YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| WILHYD   (  0522)|   Area    (ha)=   1.52   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 1.08
--------------------   U.H. Tp(hrs)=   0.92

     U.H. peak       (cms)=   0.05

     PEAK FLOW       (cms)=   0.03 (i)
     TIME TO PEAK    (hrs)=   6.00
     RUNOFF VOLUME    (mm)=  31.08
     TOTAL RAINFALL   (mm)=  73.10
     RUNOFF COEFFICIENT   =   0.43

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| WILHYD   (  0511)|   Area    (ha)=   1.60   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 1.08
--------------------   U.H. Tp(hrs)=   0.92

     U.H. peak       (cms)=   0.05

     PEAK FLOW       (cms)=   0.04 (i)
     TIME TO PEAK    (hrs)=   6.00
     RUNOFF VOLUME    (mm)=  31.11
     TOTAL RAINFALL   (mm)=  73.10
     RUNOFF COEFFICIENT   =   0.43

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| WILHYD   (  0513)|   Area    (ha)=   1.82   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 1.46
--------------------   U.H. Tp(hrs)=   1.23

     U.H. peak       (cms)=   0.05

     PEAK FLOW       (cms)=   0.03 (i)
     TIME TO PEAK    (hrs)=   6.42
     RUNOFF VOLUME    (mm)=  30.97
     TOTAL RAINFALL   (mm)=  73.10
     RUNOFF COEFFICIENT   =   0.42

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0001)|   Area    (ha)=   0.96   Curve Number   (CN)= 69.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   3.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.32

         NOTE:  RAINFALL WAS TRANSFORMED TO  15.0 MIN. TIME STEP.
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---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.250	0.00	3.500	12.43	6.750	5.12	10.00	0.73
0.500	0.73	3.750	12.43	7.000	5.12	10.25	0.73
0.750	0.73	4.000	12.43	7.250	5.12	10.50	0.73
1.000	0.73	4.250	12.43	7.500	2.92	10.75	0.73
1.250	0.73	4.500	33.63	7.750	2.92	11.00	0.73
1.500	0.73	4.750	33.63	8.000	2.92	11.25	0.73
1.750	0.73	5.000	33.63	8.250	2.92	11.50	0.73
2.000	0.73	5.250	33.63	8.500	1.46	11.75	0.73
2.250	0.73	5.500	9.50	8.750	1.46	12.00	0.73
2.500	4.39	5.750	9.50	9.000	1.46	12.25	0.73
2.750	4.39	6.000	9.50	9.250	1.46		
3.000	4.39	6.250	9.50	9.500	0.73		
3.250	4.39	6.500	5.12	9.750	0.73		

Unit Hyd Qpeak (cms)= 0.028

PEAK FLOW (cms)= 0.018 (i)
TIME TO PEAK (hrs)= 6.500
RUNOFF VOLUME (mm)= 26.670
TOTAL RAINFALL (mm)= 73.100
RUNOFF COEFFICIENT = 0.365

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
NASHYD (0002)	Area (ha)=	1.02	Curve Number (CN)=	67.0
ID= 1 DT=15.0 min	Ia (mm)=	3.00	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=	1.36		

Unit Hyd Qpeak (cms)= 0.029

PEAK FLOW (cms)= 0.018 (i)
TIME TO PEAK (hrs)= 6.500
RUNOFF VOLUME (mm)= 25.169
TOTAL RAINFALL (mm)= 73.100
RUNOFF COEFFICIENT = 0.344

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (0314)	Area (ha)=	1.62		
ID= 1 DT= 5.0 min	Total Imp(%)=	20.00	Dir. Conn.(%)=	20.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.32	1.30
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.30	1.30
Length	(m)=	103.92	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	4.39	6.250	9.50	9.33	0.73
0.167	0.00	3.250	4.39	6.333	5.12	9.42	0.73
0.250	0.00	3.333	12.43	6.417	5.12	9.50	0.73
0.333	0.73	3.417	12.43	6.500	5.12	9.58	0.73
0.417	0.73	3.500	12.43	6.583	5.12	9.67	0.73
0.500	0.73	3.583	12.43	6.667	5.12	9.75	0.73
0.583	0.73	3.667	12.43	6.750	5.12	9.83	0.73
0.667	0.73	3.750	12.43	6.833	5.12	9.92	0.73
0.750	0.73	3.833	12.43	6.917	5.12	10.00	0.73
0.833	0.73	3.917	12.43	7.000	5.12	10.08	0.73
0.917	0.73	4.000	12.43	7.083	5.12	10.17	0.73
1.000	0.73	4.083	12.43	7.167	5.12	10.25	0.73
1.083	0.73	4.167	12.43	7.250	5.12	10.33	0.73
1.167	0.73	4.250	12.43	7.333	2.92	10.42	0.73
1.250	0.73	4.333	33.63	7.417	2.92	10.50	0.73
1.333	0.73	4.417	33.63	7.500	2.92	10.58	0.73

1.417	0.73	4.500	33.63	7.583	2.92	10.67	0.73
1.500	0.73	4.583	33.63	7.667	2.92	10.75	0.73
1.583	0.73	4.667	33.63	7.750	2.92	10.83	0.73
1.667	0.73	4.750	33.63	7.833	2.92	10.92	0.73
1.750	0.73	4.833	33.63	7.917	2.92	11.00	0.73
1.833	0.73	4.917	33.63	8.000	2.92	11.08	0.73
1.917	0.73	5.000	33.63	8.083	2.92	11.17	0.73
2.000	0.73	5.083	33.63	8.167	2.92	11.25	0.73
2.083	0.73	5.167	33.63	8.250	2.92	11.33	0.73
2.167	0.73	5.250	33.63	8.333	1.46	11.42	0.73
2.250	0.73	5.333	9.50	8.417	1.46	11.50	0.73
2.333	4.39	5.417	9.50	8.500	1.46	11.58	0.73
2.417	4.39	5.500	9.50	8.583	1.46	11.67	0.73
2.500	4.39	5.583	9.50	8.667	1.46	11.75	0.73
2.583	4.39	5.667	9.50	8.750	1.46	11.83	0.73
2.667	4.39	5.750	9.50	8.833	1.46	11.92	0.73
2.750	4.39	5.833	9.50	8.917	1.46	12.00	0.73
2.833	4.39	5.917	9.50	9.000	1.46	12.08	0.73
2.917	4.39	6.000	9.50	9.083	1.46	12.17	0.73
3.000	4.39	6.083	9.50	9.167	1.46	12.25	0.73
3.083	4.39	6.167	9.50	9.250	1.46		

Max.Eff.Inten.(mm/hr)=	33.63	14.60	
over (min)	5.00	25.00	
Storage Coeff. (min)=	3.74 (ii)	21.08 (ii)	
Unit Hyd. Tpeak (min)=	5.00	25.00	
Unit Hyd. peak (cms)=	0.25	0.05	
			TOTALS
PEAK FLOW (cms)=	0.03	0.04	0.070 (iii)
TIME TO PEAK (hrs)=	5.08	5.42	5.25
RUNOFF VOLUME (mm)=	73.00	24.00	33.79
TOTAL RAINFALL (mm)=	73.10	73.10	73.10
RUNOFF COEFFICIENT =	1.00	0.33	0.46

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
V    V   I    SSSSS  U   U    A    L
V    V   I    SS     U   U   A A   L
 V  V    I     SS    U   U  AAAAA  L
 V  V    I      SS   U   U  A   A  L
  VV     I    SSSSS  UUUUU  A   A  LLLLL

 OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
O   O    T      T    H   H   Y Y   MM MM  O   O
O   O    T      T    H   H    Y    M   M  O   O
 OOO     T      T    H   H    Y    M   M   OOO
```


***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\eb9f9d4b-6e1d-484b-b03e-38486baeb3c4\scenar
Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\eb9f9d4b-6e1d-484b-b03e-38486baeb3c4\scenar

DATE: 10/07/2016 TIME: 09:42:33

USER:

COMMENTS: _____

**** SIMULATION NUMBER: 5 **

READ STORM	Filename: C:\Users\p002311c\AppData\Local\Temp\e3179fd1-33f3-4fb4-9423-6b7c3ccf96cb\ec1505e3
Ptotal= 80.82 mm	Comments: 50yr/12hr

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	3.50	13.74	6.75	5.66	10.00	0.81
0.50	0.81	3.75	13.74	7.00	5.66	10.25	0.81
0.75	0.81	4.00	13.74	7.25	5.66	10.50	0.81
1.00	0.81	4.25	13.74	7.50	3.23	10.75	0.81
1.25	0.81	4.50	37.17	7.75	3.23	11.00	0.81
1.50	0.81	4.75	37.17	8.00	3.23	11.25	0.81
1.75	0.81	5.00	37.17	8.25	3.23	11.50	0.81
2.00	0.81	5.25	37.17	8.50	1.62	11.75	0.81
2.25	0.81	5.50	10.50	8.75	1.62	12.00	0.81
2.50	4.85	5.75	10.50	9.00	1.62	12.25	0.81
2.75	4.85	6.00	10.50	9.25	1.62		
3.00	4.85	6.25	10.50	9.50	0.81		
3.25	4.85	6.50	5.66	9.75	0.81		

CALIB STANDHYD (0318) ID= 1 DT= 5.0 min	Area (ha)= 1.79 Total Imp(%)= 20.00 Dir. Conn.(%)= 20.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.36	1.43
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.30	1.30
Length	(m)=	109.24	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	4.85	6.250	10.50	9.33	0.81
0.167	0.00	3.250	4.85	6.333	5.66	9.42	0.81
0.250	0.00	3.333	13.74	6.417	5.66	9.50	0.81
0.333	0.81	3.417	13.74	6.500	5.66	9.58	0.81
0.417	0.81	3.500	13.74	6.583	5.66	9.67	0.81
0.500	0.81	3.583	13.74	6.667	5.66	9.75	0.81
0.583	0.81	3.667	13.74	6.750	5.66	9.83	0.81
0.667	0.81	3.750	13.74	6.833	5.66	9.92	0.81
0.750	0.81	3.833	13.74	6.917	5.66	10.00	0.81
0.833	0.81	3.917	13.74	7.000	5.66	10.08	0.81
0.917	0.81	4.000	13.74	7.083	5.66	10.17	0.81
1.000	0.81	4.083	13.74	7.167	5.66	10.25	0.81
1.083	0.81	4.167	13.74	7.250	5.66	10.33	0.81
1.167	0.81	4.250	13.74	7.333	3.23	10.42	0.81
1.250	0.81	4.333	37.17	7.417	3.23	10.50	0.81
1.333	0.81	4.417	37.17	7.500	3.23	10.58	0.81
1.417	0.81	4.500	37.17	7.583	3.23	10.67	0.81
1.500	0.81	4.583	37.17	7.667	3.23	10.75	0.81
1.583	0.81	4.667	37.17	7.750	3.23	10.83	0.81
1.667	0.81	4.750	37.17	7.833	3.23	10.92	0.81
1.750	0.81	4.833	37.17	7.917	3.23	11.00	0.81
1.833	0.81	4.917	37.17	8.000	3.23	11.08	0.81
1.917	0.81	5.000	37.17	8.083	3.23	11.17	0.81
2.000	0.81	5.083	37.17	8.167	3.23	11.25	0.81
2.083	0.81	5.167	37.17	8.250	3.23	11.33	0.81
2.167	0.81	5.250	37.17	8.333	1.62	11.42	0.81

2.250	0.81	5.333	10.50	8.417	1.62	11.50	0.81
2.333	4.85	5.417	10.50	8.500	1.62	11.58	0.81
2.417	4.85	5.500	10.50	8.583	1.62	11.67	0.81
2.500	4.85	5.583	10.50	8.667	1.62	11.75	0.81
2.583	4.85	5.667	10.50	8.750	1.62	11.83	0.81
2.667	4.85	5.750	10.50	8.833	1.62	11.92	0.81
2.750	4.85	5.833	10.50	8.917	1.62	12.00	0.81
2.833	4.85	5.917	10.50	9.000	1.62	12.08	0.81
2.917	4.85	6.000	10.50	9.083	1.62	12.17	0.81
3.000	4.85	6.083	10.50	9.167	1.62	12.25	0.81
3.083	4.85	6.167	10.50	9.250	1.62		

Max.Eff.Inten.(mm/hr)=	37.17	16.37	
over (min)	5.00	25.00	
Storage Coeff. (min)=	3.70 (ii)	20.26 (ii)	
Unit Hyd. Tpeak (min)=	5.00	25.00	
Unit Hyd. peak (cms)=	0.25	0.05	
			TOTALS
PEAK FLOW (cms)=	0.04	0.05	0.087 (iii)
TIME TO PEAK (hrs)=	5.08	5.42	5.25
RUNOFF VOLUME (mm)=	80.72	27.04	37.77
TOTAL RAINFALL (mm)=	80.82	80.82	80.82
RUNOFF COEFFICIENT =	1.00	0.33	0.47

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 65.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
WILHYD (0312)	Area (ha)=	4.14	Curve Number (CN)= 69.9
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	Recession const.(K)= 4.54
	U.H. Tp(hrs)=	3.85	

U.H. peak (cms)= 0.03

PEAK FLOW (cms)= 0.03 (i)
TIME TO PEAK (hrs)= 9.58
RUNOFF VOLUME (mm)= 29.77
TOTAL RAINFALL (mm)= 80.82
RUNOFF COEFFICIENT = 0.37

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0614)	Area (ha)=	1.37	
ID= 1 DT= 5.0 min	Total Imp(%)=	20.00	Dir. Conn.(%)= 20.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.27	1.10	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	1.30	1.30	
Length (m)=	95.57	40.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	37.17	22.96	
over (min)	5.00	20.00	
Storage Coeff. (min)=	3.41 (ii)	17.88 (ii)	
Unit Hyd. Tpeak (min)=	5.00	20.00	
Unit Hyd. peak (cms)=	0.26	0.06	
			TOTALS
PEAK FLOW (cms)=	0.03	0.06	0.087 (iii)
TIME TO PEAK (hrs)=	5.00	5.33	5.25
RUNOFF VOLUME (mm)=	80.72	37.58	46.20
TOTAL RAINFALL (mm)=	80.82	80.82	80.82
RUNOFF COEFFICIENT =	1.00	0.46	0.57

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (0604)	Area (ha)= 3.34				
ID= 1 DT= 5.0 min	Total Imp(%)= 20.00	Dir. Conn.(%)= 20.00			
		IMPERVIOUS	PERVIOUS (i)		
Surface Area	(ha)=	0.67	2.67		
Dep. Storage	(mm)=	0.10	5.00		
Average Slope	(%)=	1.30	1.30		
Length	(m)=	149.22	40.00		
Mannings n	=	0.013	0.250		
Max.Eff.Inten.(mm/hr)=		37.17	22.42		
over (min)		5.00	20.00		
Storage Coeff.	(min)=	4.46 (ii)	19.07 (ii)		
Unit Hyd. Tpeak	(min)=	5.00	20.00		
Unit Hyd. peak	(cms)=	0.23	0.06		
				TOTALS	
PEAK FLOW	(cms)=	0.07	0.14	0.205 (iii)	
TIME TO PEAK	(hrs)=	5.17	5.33	5.25	
RUNOFF VOLUME	(mm)=	80.72	36.64	45.45	
TOTAL RAINFALL	(mm)=	80.82	80.82	80.82	
RUNOFF COEFFICIENT	=	1.00	0.45	0.56	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.8 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
WILHYD (0620)	Area (ha)= 0.94	Curve Number (CN)= 78.7			
ID= 1 DT= 5.0 min	Ia (mm)= 5.00	Recession const.(K)= 0.42			
	U.H. Tp(hrs)= 0.36				
U.H. peak	(cms)= 0.08				
PEAK FLOW	(cms)= 0.04 (i)				
TIME TO PEAK	(hrs)= 5.33				
RUNOFF VOLUME	(mm)= 39.33				
TOTAL RAINFALL	(mm)= 80.82				
RUNOFF COEFFICIENT	= 0.49				

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (0521)	Area (ha)= 1.12				
ID= 1 DT= 5.0 min	Total Imp(%)= 20.00	Dir. Conn.(%)= 20.00			
		IMPERVIOUS	PERVIOUS (i)		
Surface Area	(ha)=	0.22	0.90		
Dep. Storage	(mm)=	0.10	5.00		
Average Slope	(%)=	1.30	1.30		
Length	(m)=	86.41	40.00		
Mannings n	=	0.013	0.250		
Max.Eff.Inten.(mm/hr)=		37.17	22.96		
over (min)		5.00	20.00		
Storage Coeff.	(min)=	3.21 (ii)	17.68 (ii)		
Unit Hyd. Tpeak	(min)=	5.00	20.00		
Unit Hyd. peak	(cms)=	0.27	0.06		
				TOTALS	
PEAK FLOW	(cms)=	0.02	0.05	0.071 (iii)	
TIME TO PEAK	(hrs)=	4.92	5.33	5.25	
RUNOFF VOLUME	(mm)=	80.72	37.58	46.20	

```
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.46           0.57

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB             |
| WILHYD   (  0522)|   Area    (ha)=   1.52   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 1.08
--------------------   U.H. Tp(hrs)=   0.92

     U.H. peak       (cms)=   0.05

     PEAK FLOW       (cms)=   0.04 (i)
     TIME TO PEAK    (hrs)=   5.92
     RUNOFF VOLUME    (mm)=  36.71
     TOTAL RAINFALL   (mm)=  80.82
     RUNOFF COEFFICIENT   =   0.45

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB             |
| WILHYD   (  0511)|   Area    (ha)=   1.60   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 1.08
--------------------   U.H. Tp(hrs)=   0.92

     U.H. peak       (cms)=   0.05

     PEAK FLOW       (cms)=   0.04 (i)
     TIME TO PEAK    (hrs)=   5.92
     RUNOFF VOLUME    (mm)=  36.75
     TOTAL RAINFALL   (mm)=  80.82
     RUNOFF COEFFICIENT   =   0.45

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB             |
| WILHYD   (  0513)|   Area    (ha)=   1.82   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 1.46
--------------------   U.H. Tp(hrs)=   1.23

     U.H. peak       (cms)=   0.05

     PEAK FLOW       (cms)=   0.04 (i)
     TIME TO PEAK    (hrs)=   6.42
     RUNOFF VOLUME    (mm)=  36.61
     TOTAL RAINFALL   (mm)=  80.82
     RUNOFF COEFFICIENT   =   0.45

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0001)|   Area    (ha)=   0.96   Curve Number   (CN)= 69.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   3.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.32

         NOTE:  RAINFALL WAS TRANSFORMED TO  15.0 MIN. TIME STEP.


                        ---- TRANSFORMED HYETOGRAPH ----
    TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
     hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
   0.250    0.00 | 3.500   13.74 | 6.750    5.66 | 10.00    0.81
   0.500    0.81 | 3.750   13.74 | 7.000    5.66 | 10.25    0.81
   0.750    0.81 | 4.000   13.74 | 7.250    5.66 | 10.50    0.81
   1.000    0.81 | 4.250   13.74 | 7.500    3.23 | 10.75    0.81
   1.250    0.81 | 4.500   37.17 | 7.750    3.23 | 11.00    0.81
```

1.500	0.81	4.750	37.17	8.000	3.23	11.25	0.81
1.750	0.81	5.000	37.17	8.250	3.23	11.50	0.81
2.000	0.81	5.250	37.17	8.500	1.62	11.75	0.81
2.250	0.81	5.500	10.50	8.750	1.62	12.00	0.81
2.500	4.85	5.750	10.50	9.000	1.62	12.25	0.81
2.750	4.85	6.000	10.50	9.250	1.62		
3.000	4.85	6.250	10.50	9.500	0.81		
3.250	4.85	6.500	5.66	9.750	0.81		

Unit Hyd Qpeak (cms)= 0.028

PEAK FLOW (cms)= 0.021 (i)
TIME TO PEAK (hrs)= 6.500
RUNOFF VOLUME (mm)= 31.546
TOTAL RAINFALL (mm)= 80.820
RUNOFF COEFFICIENT = 0.390

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
NASHYD (0002) | Area (ha)= 1.02 Curve Number (CN)= 67.0
ID= 1 DT=15.0 min | Ia (mm)= 3.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 1.36

Unit Hyd Qpeak (cms)= 0.029

PEAK FLOW (cms)= 0.021 (i)
TIME TO PEAK (hrs)= 6.500
RUNOFF VOLUME (mm)= 29.838
TOTAL RAINFALL (mm)= 80.820
RUNOFF COEFFICIENT = 0.369

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0314) | Area (ha)= 1.62
ID= 1 DT= 5.0 min | Total Imp(%)= 20.00 Dir. Conn.(%)= 20.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.32	1.30
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.30	1.30
Length	(m)=	103.92	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	4.85	6.250	10.50	9.33	0.81
0.167	0.00	3.250	4.85	6.333	5.66	9.42	0.81
0.250	0.00	3.333	13.74	6.417	5.66	9.50	0.81
0.333	0.81	3.417	13.74	6.500	5.66	9.58	0.81
0.417	0.81	3.500	13.74	6.583	5.66	9.67	0.81
0.500	0.81	3.583	13.74	6.667	5.66	9.75	0.81
0.583	0.81	3.667	13.74	6.750	5.66	9.83	0.81
0.667	0.81	3.750	13.74	6.833	5.66	9.92	0.81
0.750	0.81	3.833	13.74	6.917	5.66	10.00	0.81
0.833	0.81	3.917	13.74	7.000	5.66	10.08	0.81
0.917	0.81	4.000	13.74	7.083	5.66	10.17	0.81
1.000	0.81	4.083	13.74	7.167	5.66	10.25	0.81
1.083	0.81	4.167	13.74	7.250	5.66	10.33	0.81
1.167	0.81	4.250	13.74	7.333	3.23	10.42	0.81
1.250	0.81	4.333	37.17	7.417	3.23	10.50	0.81
1.333	0.81	4.417	37.17	7.500	3.23	10.58	0.81
1.417	0.81	4.500	37.17	7.583	3.23	10.67	0.81
1.500	0.81	4.583	37.17	7.667	3.23	10.75	0.81
1.583	0.81	4.667	37.17	7.750	3.23	10.83	0.81
1.667	0.81	4.750	37.17	7.833	3.23	10.92	0.81
1.750	0.81	4.833	37.17	7.917	3.23	11.00	0.81
1.833	0.81	4.917	37.17	8.000	3.23	11.08	0.81
1.917	0.81	5.000	37.17	8.083	3.23	11.17	0.81
2.000	0.81	5.083	37.17	8.167	3.23	11.25	0.81

2.083	0.81	5.167	37.17	8.250	3.23	11.33	0.81
2.167	0.81	5.250	37.17	8.333	1.62	11.42	0.81
2.250	0.81	5.333	10.50	8.417	1.62	11.50	0.81
2.333	4.85	5.417	10.50	8.500	1.62	11.58	0.81
2.417	4.85	5.500	10.50	8.583	1.62	11.67	0.81
2.500	4.85	5.583	10.50	8.667	1.62	11.75	0.81
2.583	4.85	5.667	10.50	8.750	1.62	11.83	0.81
2.667	4.85	5.750	10.50	8.833	1.62	11.92	0.81
2.750	4.85	5.833	10.50	8.917	1.62	12.00	0.81
2.833	4.85	5.917	10.50	9.000	1.62	12.08	0.81
2.917	4.85	6.000	10.50	9.083	1.62	12.17	0.81
3.000	4.85	6.083	10.50	9.167	1.62	12.25	0.81
3.083	4.85	6.167	10.50	9.250	1.62		

Max.Eff.Inten.(mm/hr)=	37.17	17.32	
over (min)	5.00	20.00	
Storage Coeff. (min)=	3.59 (ii)	19.79 (ii)	
Unit Hyd. Tpeak (min)=	5.00	20.00	
Unit Hyd. peak (cms)=	0.26	0.06	
			TOTALS
PEAK FLOW (cms)=	0.03	0.05	0.084 (iii)
TIME TO PEAK (hrs)=	5.00	5.33	5.25
RUNOFF VOLUME (mm)=	80.72	28.61	39.03
TOTAL RAINFALL (mm)=	80.82	80.82	80.82
RUNOFF COEFFICIENT =	1.00	0.35	0.48

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
```


***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\01f887c6-c09a-4e39-80f8-b4f4bd1d7e02\scenar
Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\01f887c6-c09a-4e39-80f8-b4f4bd1d7e02\scenar

DATE: 10/07/2016 TIME: 09:42:33

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 6 **

****

READ STORM	Filename: C:\Users\p002311c\AppData\Local\Temp\e3179fd1-33f3-4fb4-9423-6b7c3ccf96cb\229b97a5
Ptotal= 88.54 mm	Comments: 100yr/12hr

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	3.50	15.05	6.75	6.20	10.00	0.89
0.50	0.89	3.75	15.05	7.00	6.20	10.25	0.89
0.75	0.89	4.00	15.05	7.25	6.20	10.50	0.89
1.00	0.89	4.25	15.05	7.50	3.54	10.75	0.89
1.25	0.89	4.50	40.71	7.75	3.54	11.00	0.89
1.50	0.89	4.75	40.71	8.00	3.54	11.25	0.89
1.75	0.89	5.00	40.71	8.25	3.54	11.50	0.89
2.00	0.89	5.25	40.71	8.50	1.77	11.75	0.89
2.25	0.89	5.50	11.51	8.75	1.77	12.00	0.89
2.50	5.31	5.75	11.51	9.00	1.77	12.25	0.89
2.75	5.31	6.00	11.51	9.25	1.77		
3.00	5.31	6.25	11.51	9.50	0.89		
3.25	5.31	6.50	6.20	9.75	0.89		

CALIB STANDHYD (0318)	Area (ha)= 1.79
ID= 1 DT= 5.0 min	Total Imp(%)= 20.00 Dir. Conn.(%)= 20.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.36	1.43
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.30	1.30
Length	(m)=	109.24	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	5.31	6.250	11.51	9.33	0.89
0.167	0.00	3.250	5.31	6.333	6.20	9.42	0.89
0.250	0.00	3.333	15.05	6.417	6.20	9.50	0.89
0.333	0.89	3.417	15.05	6.500	6.20	9.58	0.89
0.417	0.89	3.500	15.05	6.583	6.20	9.67	0.89
0.500	0.89	3.583	15.05	6.667	6.20	9.75	0.89
0.583	0.89	3.667	15.05	6.750	6.20	9.83	0.89
0.667	0.89	3.750	15.05	6.833	6.20	9.92	0.89
0.750	0.89	3.833	15.05	6.917	6.20	10.00	0.89
0.833	0.89	3.917	15.05	7.000	6.20	10.08	0.89
0.917	0.89	4.000	15.05	7.083	6.20	10.17	0.89
1.000	0.89	4.083	15.05	7.167	6.20	10.25	0.89
1.083	0.89	4.167	15.05	7.250	6.20	10.33	0.89
1.167	0.89	4.250	15.05	7.333	3.54	10.42	0.89
1.250	0.89	4.333	40.71	7.417	3.54	10.50	0.89
1.333	0.89	4.417	40.71	7.500	3.54	10.58	0.89
1.417	0.89	4.500	40.71	7.583	3.54	10.67	0.89
1.500	0.89	4.583	40.71	7.667	3.54	10.75	0.89
1.583	0.89	4.667	40.71	7.750	3.54	10.83	0.89
1.667	0.89	4.750	40.71	7.833	3.54	10.92	0.89
1.750	0.89	4.833	40.71	7.917	3.54	11.00	0.89
1.833	0.89	4.917	40.71	8.000	3.54	11.08	0.89
1.917	0.89	5.000	40.71	8.083	3.54	11.17	0.89
2.000	0.89	5.083	40.71	8.167	3.54	11.25	0.89
2.083	0.89	5.167	40.71	8.250	3.54	11.33	0.89
2.167	0.89	5.250	40.71	8.333	1.77	11.42	0.89
2.250	0.89	5.333	11.51	8.417	1.77	11.50	0.89
2.333	5.31	5.417	11.51	8.500	1.77	11.58	0.89
2.417	5.31	5.500	11.51	8.583	1.77	11.67	0.89
2.500	5.31	5.583	11.51	8.667	1.77	11.75	0.89
2.583	5.31	5.667	11.51	8.750	1.77	11.83	0.89
2.667	5.31	5.750	11.51	8.833	1.77	11.92	0.89
2.750	5.31	5.833	11.51	8.917	1.77	12.00	0.89
2.833	5.31	5.917	11.51	9.000	1.77	12.08	0.89

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               2.917    5.31 | 6.000   11.51 | 9.083    1.77 | 12.17    0.89
               3.000    5.31 | 6.083   11.51 | 9.167    1.77 | 12.25    0.89
               3.083    5.31 | 6.167   11.51 | 9.250    1.77 |

     Max.Eff.Inten.(mm/hr)=      40.71        19.10
               over (min)         5.00        20.00
     Storage Coeff.  (min)=       3.57 (ii)   19.14 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.26         0.06
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.06          0.102 (iii)
     TIME TO PEAK    (hrs)=       5.08         5.33           5.25
     RUNOFF VOLUME    (mm)=      88.44        31.68          43.02
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       1.00         0.36           0.49

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
             YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  65.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB            |
| WILHYD   (  0312)|   Area    (ha)=   4.14   Curve Number   (CN)= 69.9
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 4.54
--------------------   U.H. Tp(hrs)=   3.85

     U.H. peak       (cms)=   0.03

     PEAK FLOW       (cms)=   0.04 (i)
     TIME TO PEAK    (hrs)=   9.58
     RUNOFF VOLUME    (mm)=  34.90
     TOTAL RAINFALL   (mm)=  88.54
     RUNOFF COEFFICIENT   =   0.39

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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| CALIB            |
| STANDHYD (  0614)|   Area    (ha)=   1.37
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.27         1.10
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      95.57        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        26.33
               over (min)         5.00        20.00
     Storage Coeff.  (min)=       3.29 (ii)   16.99 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.27         0.06
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.07          0.099 (iii)
     TIME TO PEAK    (hrs)=       5.00         5.33           5.25
     RUNOFF VOLUME    (mm)=      88.44        43.43          52.42
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       1.00         0.49           0.59

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
             YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB            |
| STANDHYD (  0604)|   Area    (ha)=   3.34
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.67         2.67
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=     149.22        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        25.75
               over (min)        5.00        20.00
     Storage Coeff.  (min)=       4.30 (ii)   18.12 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.23         0.06
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.08         0.16          0.235 (iii)
     TIME TO PEAK    (hrs)=       5.17         5.33           5.25
     RUNOFF VOLUME    (mm)=      88.44        42.39          51.60
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       1.00         0.48           0.58

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| WILHYD   (  0620)|   Area    (ha)=   0.94   Curve Number   (CN)= 78.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 0.42
--------------------   U.H. Tp(hrs)=   0.36

     U.H. peak       (cms)=   0.08

     PEAK FLOW       (cms)=   0.05 (i)
     TIME TO PEAK    (hrs)=   5.33
     RUNOFF VOLUME    (mm)=  45.33
     TOTAL RAINFALL   (mm)=  88.54
     RUNOFF COEFFICIENT   =   0.51

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0521)|   Area    (ha)=   1.12
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.22         0.90
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      86.41        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        26.33
               over (min)        5.00        20.00
     Storage Coeff.  (min)=       3.10 (ii)   16.80 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.27         0.06
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.06          0.081 (iii)
     TIME TO PEAK    (hrs)=       4.92         5.33           5.25
     RUNOFF VOLUME    (mm)=      88.44        43.43          52.42
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       1.00         0.49           0.59

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
```

CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
WILHYD (0522)	Area (ha)=	1.52	Curve Number (CN)=	76.7
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	Recession const.(K)=	1.08
	U.H. Tp(hrs)=	0.92		

U.H. peak (cms)= 0.05

PEAK FLOW (cms)= 0.05 (i)
TIME TO PEAK (hrs)= 5.92
RUNOFF VOLUME (mm)= 42.54
TOTAL RAINFALL (mm)= 88.54
RUNOFF COEFFICIENT = 0.48

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
WILHYD (0511)	Area (ha)=	1.60	Curve Number (CN)=	76.7
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	Recession const.(K)=	1.08
	U.H. Tp(hrs)=	0.92		

U.H. peak (cms)= 0.05

PEAK FLOW (cms)= 0.05 (i)
TIME TO PEAK (hrs)= 5.92
RUNOFF VOLUME (mm)= 42.58
TOTAL RAINFALL (mm)= 88.54
RUNOFF COEFFICIENT = 0.48

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
WILHYD (0513)	Area (ha)=	1.82	Curve Number (CN)=	76.7
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	Recession const.(K)=	1.46
	U.H. Tp(hrs)=	1.23		

U.H. peak (cms)= 0.05

PEAK FLOW (cms)= 0.05 (i)
TIME TO PEAK (hrs)= 6.42
RUNOFF VOLUME (mm)= 42.45
TOTAL RAINFALL (mm)= 88.54
RUNOFF COEFFICIENT = 0.48

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
NASHYD (0001)	Area (ha)=	0.96	Curve Number (CN)=	69.0
ID= 1 DT=15.0 min	Ia (mm)=	3.00	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=	1.32		

NOTE: RAINFALL WAS TRANSFORMED TO 15.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.250	0.00	3.500	15.05	6.750	6.20	10.00	0.89
0.500	0.89	3.750	15.05	7.000	6.20	10.25	0.89
0.750	0.89	4.000	15.05	7.250	6.20	10.50	0.89
1.000	0.89	4.250	15.05	7.500	3.54	10.75	0.89
1.250	0.89	4.500	40.71	7.750	3.54	11.00	0.89
1.500	0.89	4.750	40.71	8.000	3.54	11.25	0.89
1.750	0.89	5.000	40.71	8.250	3.54	11.50	0.89
2.000	0.89	5.250	40.71	8.500	1.77	11.75	0.89
2.250	0.89	5.500	11.51	8.750	1.77	12.00	0.89
2.500	5.31	5.750	11.51	9.000	1.77	12.25	0.89
2.750	5.31	6.000	11.51	9.250	1.77		
3.000	5.31	6.250	11.51	9.500	0.89		
3.250	5.31	6.500	6.20	9.750	0.89		

Unit Hyd Qpeak (cms)= 0.028

PEAK FLOW (cms)= 0.025 (i)
TIME TO PEAK (hrs)= 6.500
RUNOFF VOLUME (mm)= 36.642
TOTAL RAINFALL (mm)= 88.540
RUNOFF COEFFICIENT = 0.414

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB		
NASHYD (0002)	Area (ha)= 1.02	Curve Number (CN)= 67.0
ID= 1 DT=15.0 min	Ia (mm)= 3.00	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)= 1.36	

Unit Hyd Qpeak (cms)= 0.029

PEAK FLOW (cms)= 0.024 (i)
TIME TO PEAK (hrs)= 6.500
RUNOFF VOLUME (mm)= 34.731
TOTAL RAINFALL (mm)= 88.540
RUNOFF COEFFICIENT = 0.392

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB		
STANDHYD (0314)	Area (ha)= 1.62	
ID= 1 DT= 5.0 min	Total Imp(%)= 20.00	Dir. Conn.(%)= 20.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.32	1.30
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.30	1.30
Length	(m)=	103.92	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	5.31	6.250	11.51	9.33	0.89
0.167	0.00	3.250	5.31	6.333	6.20	9.42	0.89
0.250	0.00	3.333	15.05	6.417	6.20	9.50	0.89
0.333	0.89	3.417	15.05	6.500	6.20	9.58	0.89
0.417	0.89	3.500	15.05	6.583	6.20	9.67	0.89
0.500	0.89	3.583	15.05	6.667	6.20	9.75	0.89
0.583	0.89	3.667	15.05	6.750	6.20	9.83	0.89
0.667	0.89	3.750	15.05	6.833	6.20	9.92	0.89
0.750	0.89	3.833	15.05	6.917	6.20	10.00	0.89
0.833	0.89	3.917	15.05	7.000	6.20	10.08	0.89
0.917	0.89	4.000	15.05	7.083	6.20	10.17	0.89
1.000	0.89	4.083	15.05	7.167	6.20	10.25	0.89
1.083	0.89	4.167	15.05	7.250	6.20	10.33	0.89
1.167	0.89	4.250	15.05	7.333	3.54	10.42	0.89
1.250	0.89	4.333	40.71	7.417	3.54	10.50	0.89
1.333	0.89	4.417	40.71	7.500	3.54	10.58	0.89
1.417	0.89	4.500	40.71	7.583	3.54	10.67	0.89
1.500	0.89	4.583	40.71	7.667	3.54	10.75	0.89
1.583	0.89	4.667	40.71	7.750	3.54	10.83	0.89
1.667	0.89	4.750	40.71	7.833	3.54	10.92	0.89
1.750	0.89	4.833	40.71	7.917	3.54	11.00	0.89
1.833	0.89	4.917	40.71	8.000	3.54	11.08	0.89
1.917	0.89	5.000	40.71	8.083	3.54	11.17	0.89
2.000	0.89	5.083	40.71	8.167	3.54	11.25	0.89
2.083	0.89	5.167	40.71	8.250	3.54	11.33	0.89
2.167	0.89	5.250	40.71	8.333	1.77	11.42	0.89
2.250	0.89	5.333	11.51	8.417	1.77	11.50	0.89
2.333	5.31	5.417	11.51	8.500	1.77	11.58	0.89
2.417	5.31	5.500	11.51	8.583	1.77	11.67	0.89
2.500	5.31	5.583	11.51	8.667	1.77	11.75	0.89
2.583	5.31	5.667	11.51	8.750	1.77	11.83	0.89
2.667	5.31	5.750	11.51	8.833	1.77	11.92	0.89

2.750	5.31	5.833	11.51	8.917	1.77	12.00	0.89
2.833	5.31	5.917	11.51	9.000	1.77	12.08	0.89
2.917	5.31	6.000	11.51	9.083	1.77	12.17	0.89
3.000	5.31	6.083	11.51	9.167	1.77	12.25	0.89
3.083	5.31	6.167	11.51	9.250	1.77		

Max.Eff.Inten.(mm/hr)=	40.71	20.15	
over (min)	5.00	20.00	
Storage Coeff. (min)=	3.46 (ii)	18.71 (ii)	
Unit Hyd. Tpeak (min)=	5.00	20.00	
Unit Hyd. peak (cms)=	0.26	0.06	
			TOTALS
PEAK FLOW (cms)=	0.04	0.06	0.096 (iii)
TIME TO PEAK (hrs)=	5.00	5.33	5.25
RUNOFF VOLUME (mm)=	88.44	33.45	44.44
TOTAL RAINFALL (mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT =	1.00	0.38	0.50

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

FINISH

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APPENDIX C

HYDROLOGIC ANALYSIS – WATER CROSSINGS

APPENDIX C: Hydrologic Analysis - Water Crossings

WATER CROSSINGS

DRAINAGE AREA MAPS

WC#10
WC#9
WC#6
WC#7
WC#8
WC#5
WC#4
WC#3
WC#2
407 TRANSITWAY
407 TRANSITWAY
314-C
EXTERNAL
314-B
A = 54.08 ha
314-A
A = 61.45 ha

DATE: SEPTEMBER 2016	Ontario	PARSONS 625 COCHRANE DRIVE, SUITE 500 MARKHAM, ONTARIO L3R 9R9 TEL: 905-943-0500 FAX: 905-943-0400	407 TRANSITWAY FROM KENNEDY RD TO BROCK RD
SCALE: NTS			FIGURE 4.3 - DRAINAGE AREA MAP WC#3,4,5

WC#4
WC#5
407 TRANSITWAY
WC#6
WC#7
WC#8
WC#9
WC#10
WC#11
WC#12
407 TRANSITWAY
407 TRANSITWAY
407 TRANSITWAY

312-A
A = 18.57 ha

312-B
A = 24.80 ha

	DATE: SEPTEMBER 2016	Ontario	PARSONS 625 COCHRANE DRIVE, SUITE 500 MARKHAM, ONTARIO L3R 9R9 TEL: 905-943-0500 FAX: 905-943-0400	407 TRANSITWAY FROM KENNEDY RD TO BROCK RD
	SCALE: NTS			FIGURE 4.4 - DRAINAGE AREA MAP WC#11,12

621-A
A = 32.02 ha

407 TRANSITWAY

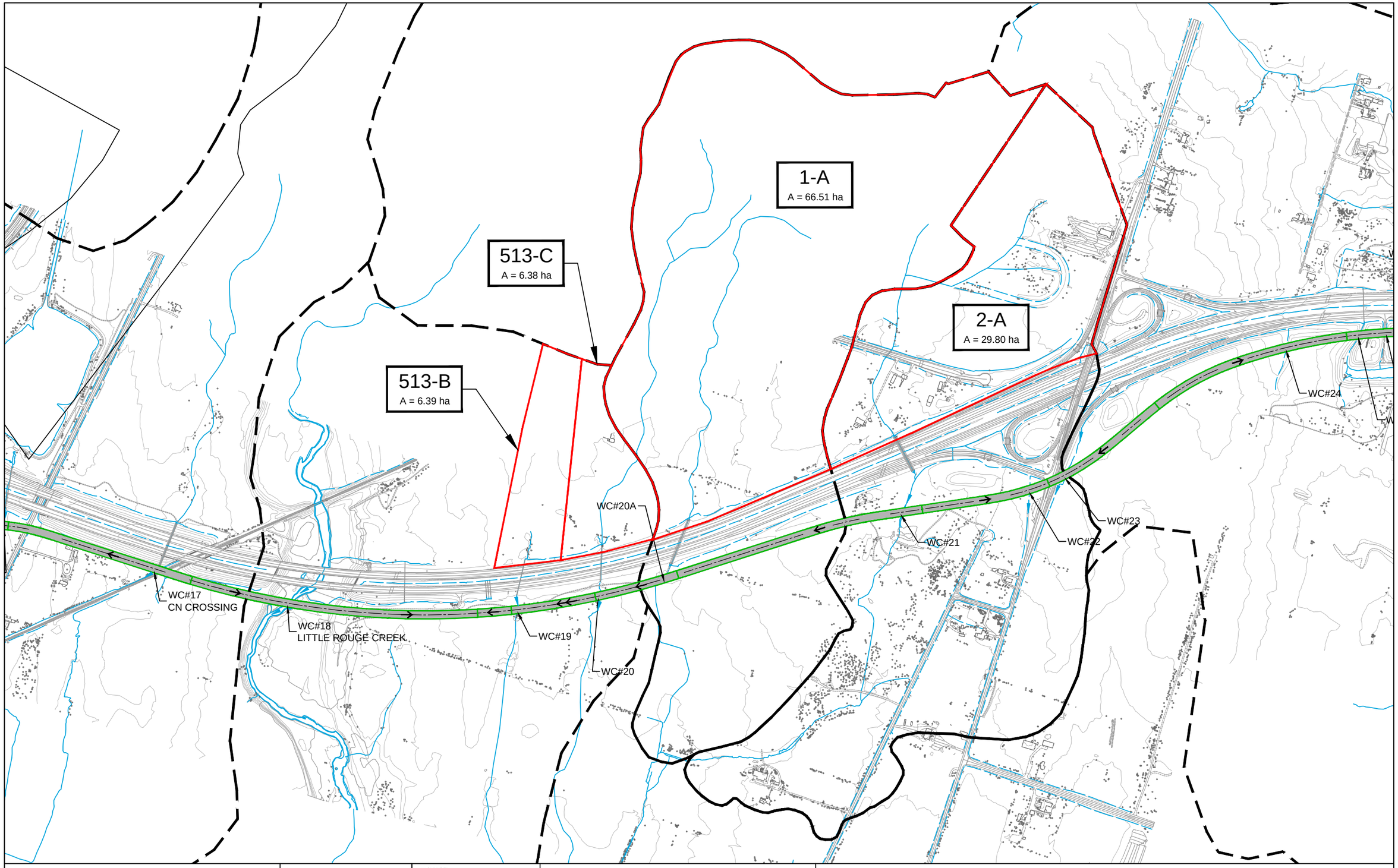
WC#15C
LITTLE ROUGE TRIB B

WC#15B
LITTLE ROUGE TRIB A

WC#15A

WC#15

DATE: SEPTEMBER 2016	Ontario	PARSONS 625 COCHRANE DRIVE, SUITE 500 MARKHAM, ONTARIO L3R 9R9 TEL: 905-943-0500 FAX: 905-943-0400	407 TRANSITWAY FROM KENNEDY RD TO BROCK RD
SCALE: NTS			FIGURE 4.5 - DRAINAGE AREA MAP WC#15A



DATE: SEPTEMBER 2016	Ontario	PARSONS	625 COCHRANE DRIVE, SUITE 500 MARKHAM, ONTARIO L3R 9R9 TEL: 905-943-0500 FAX: 905-943-0400	407 TRANSITWAY FROM KENNEDY RD TO BROCK RD
SCALE: NTS				FIGURE 4.6 - DRAINAGE AREA MAP WC#19,20,20A,21

9-A
A = 235.62 ha

8-A
A = 121.78 ha

30-A
A = 68.82 ha

31-A
A = 102.86 ha

(WC#28)

WC#28 & 29
WEST DUFFINS CREEK

WC#31

WC#32

WC#30

WC#33

WC#34

WC#35

WC#36

WC#37

	DATE: SEPTEMBER 2016	Ontario	PARSONS 625 COCHRANE DRIVE, SUITE 500 MARKHAM, ONTARIO L3R 9R9 TEL: 905-943-0500 FAX: 905-943-0400	407 TRANSITWAY FROM KENNEDY RD TO BROCK RD
	SCALE: NTS			FIGURE 4.7 - DRAINAGE AREA MAP WC#29,30,35,36

34-A
A = 109.71 ha

35-A
A = 97.78 ha

WC#37

WC#38

WC#39

DATE: SEPTEMBER 2016	Ontario	PARSONS 625 COCHRANE DRIVE, SUITE 500 MARKHAM, ONTARIO L3R 9R9 TEL: 905-943-0500 FAX: 905-943-0400	407 TRANSITWAY FROM KENNEDY RD TO BROCK RD
SCALE: NTS			FIGURE 4.8 - DRAINAGE AREA MAP WC#37,41

39-A
A = 278.49 ha

38-A
A = 207.46 ha

WC#38
WC#39
WC#40
WC#41
WC#42
WC#43
WC#44

DATE: SEPTEMBER 2016	Ontario	PARSONS	407 TRANSITWAY FROM KENNEDY RD TO BROCK RD
SCALE: NTS		625 COCHRANE DRIVE, SUITE 500 MARKHAM, ONTARIO L3R 9R9 TEL: 905-943-0500 FAX: 905-943-0400	FIGURE 4.9 - DRAINAGE AREA MAP WC#43,44

WATER CROSSINGS

4HR CHICAGO – HYDROLOGIC ANALYSIS

VO2 Modelling Schematic 4.1: Visual Otthymo Modelling – Determination of Upstream Flows (Rouge & Petticoat)

```
       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
```


***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\d6ada9ac-d485-4e15-be02-671e9e98a383\49572e04-5c75-4f9f-a86a-e14a2c2b20c3\scenar
Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\d6ada9ac-d485-4e15-be02-671e9e98a383\49572e04-5c75-4f9f-a86a-e14a2c2b20c3\scenar

DATE: 10/07/2016 TIME: 09:47:13

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 1 **
****

| CHICAGO STORM | Ptotal= 32.11 mm |

IDF curve parameters: A= 424.160
B= 1.500
C= 0.723
used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step = 10.00 min
Time to peak ratio = 0.33

The CORRELATION coefficient is = 0.9996

TIME (min)	INPUT INT. (mm/hr)	TAB. INT. (mm/hr)
5.	118.10	109.60
10.	72.80	72.55
15.	54.80	55.88
30.	33.80	35.01
60.	20.80	21.59
120.	12.80	13.19
360.	5.90	6.00
720.	3.70	3.64
1440.	2.30	2.21

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.17	2.52	1.17	14.01	2.17	5.26	3.17	2.96
0.33	2.84	1.33	72.55	2.33	4.61	3.33	2.78
0.50	3.26	1.50	17.78	2.50	4.11	3.50	2.62
0.67	3.88	1.67	10.40	2.67	3.73	3.67	2.48
0.83	4.89	1.83	7.68	2.83	3.42	3.83	2.36
1.00	6.88	2.00	6.21	3.00	3.17	4.00	2.25

CALIB				
STANDHYD (0010)	Area (ha)= 61.45			
ID= 1 DT= 5.0 min	Total Imp(%)= 32.00	Dir. Conn.(%)= 32.00		

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	19.66	41.79
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.20	1.20
Length	(m)=	1202.00	1202.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.52	1.083	14.01	2.083	5.26	3.08	2.96
0.167	2.52	1.167	14.01	2.167	5.26	3.17	2.96
0.250	2.84	1.250	72.55	2.250	4.61	3.25	2.78
0.333	2.84	1.333	72.55	2.333	4.61	3.33	2.78
0.417	3.26	1.417	17.78	2.417	4.11	3.42	2.62
0.500	3.26	1.500	17.78	2.500	4.11	3.50	2.62
0.583	3.88	1.583	10.40	2.583	3.73	3.58	2.48
0.667	3.88	1.667	10.40	2.667	3.73	3.67	2.48
0.750	4.89	1.750	7.68	2.750	3.42	3.75	2.36
0.833	4.89	1.833	7.68	2.833	3.42	3.83	2.36
0.917	6.88	1.917	6.21	2.917	3.17	3.92	2.25
1.000	6.88	2.000	6.21	3.000	3.17	4.00	2.25

Max.Eff.Inten.(mm/hr)=		54.30	3.10	
over (min)		15.00	270.00	
Storage Coeff. (min)=		13.73 (ii)	268.04 (ii)	
Unit Hyd. Tpeak (min)=		15.00	270.00	
Unit Hyd. peak (cms)=		0.08	0.00	
				TOTALS
PEAK FLOW	(cms)=	2.00	0.07	2.000 (iii)
TIME TO PEAK	(hrs)=	1.50	6.25	1.50
RUNOFF VOLUME	(mm)=	32.01	4.83	13.52
TOTAL RAINFALL	(mm)=	32.11	32.11	32.11
RUNOFF COEFFICIENT	=	1.00	0.15	0.42

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB				
STANDHYD (0020)	Area (ha)= 54.08			
ID= 1 DT= 5.0 min	Total Imp(%)= 32.00	Dir. Conn.(%)= 32.00		

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	17.31	36.77
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.20	1.20
Length	(m)=	1202.00	1202.00
Mannings n	=	0.013	0.250

Max.Eff.Inten.(mm/hr)=		54.30	3.10	
over (min)		15.00	270.00	
Storage Coeff. (min)=		13.73 (ii)	268.04 (ii)	
Unit Hyd. Tpeak (min)=		15.00	270.00	
Unit Hyd. peak (cms)=		0.08	0.00	
				TOTALS
PEAK FLOW	(cms)=	1.76	0.06	1.760 (iii)
TIME TO PEAK	(hrs)=	1.50	6.25	1.50
RUNOFF VOLUME	(mm)=	32.01	4.83	13.52
TOTAL RAINFALL	(mm)=	32.11	32.11	32.11
RUNOFF COEFFICIENT	=	1.00	0.15	0.42

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (0030)	Area (ha)= 30.00				
ID= 1 DT= 5.0 min	Total Imp(%)= 32.00	Dir. Conn.(%)= 32.00			

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	9.60	20.40	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	1.20	1.20	
Length	(m)=	1202.00	1202.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		54.30	3.10	
over (min)		15.00	270.00	
Storage Coeff.	(min)=	13.73 (ii)	268.04 (ii)	
Unit Hyd. Tpeak	(min)=	15.00	270.00	
Unit Hyd. peak	(cms)=	0.08	0.00	
				TOTALS
PEAK FLOW	(cms)=	0.98	0.03	0.976 (iii)
TIME TO PEAK	(hrs)=	1.50	6.25	1.50
RUNOFF VOLUME	(mm)=	32.01	4.83	13.52
TOTAL RAINFALL	(mm)=	32.11	32.11	32.11
RUNOFF COEFFICIENT	=	1.00	0.15	0.42

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB				
WILHYD (0040)	Area (ha)= 18.57	Curve Number (CN)= 69.9		
ID= 1 DT= 5.0 min	Ia (mm)= 5.00	Recession const.(K)= 4.54		
	U.H. Tp(hrs)= 3.85			

U.H. peak	(cms)=	0.15
PEAK FLOW	(cms)=	0.03 (i)
TIME TO PEAK	(hrs)=	6.00
RUNOFF VOLUME	(mm)=	5.11
TOTAL RAINFALL	(mm)=	32.11
RUNOFF COEFFICIENT	=	0.16

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB				
WILHYD (0050)	Area (ha)= 24.80	Curve Number (CN)= 69.9		
ID= 1 DT= 5.0 min	Ia (mm)= 5.00	Recession const.(K)= 4.54		
	U.H. Tp(hrs)= 3.85			

U.H. peak	(cms)=	0.20
PEAK FLOW	(cms)=	0.04 (i)
TIME TO PEAK	(hrs)=	6.00
RUNOFF VOLUME	(mm)=	5.17
TOTAL RAINFALL	(mm)=	32.11
RUNOFF COEFFICIENT	=	0.16

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB				
STANDHYD (0060)	Area (ha)= 32.02			
ID= 1 DT= 5.0 min	Total Imp(%)= 36.00	Dir. Conn.(%)= 36.00		

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	11.53	20.49
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.20	1.20
Length	(m)=	685.00	685.00

Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)	=	72.55	4.61	
over (min)		10.00	165.00	
Storage Coeff. (min)	=	8.72 (ii)	163.62 (ii)	
Unit Hyd. Tpeak (min)	=	10.00	165.00	
Unit Hyd. peak (cms)	=	0.12	0.01	
				TOTALS
PEAK FLOW (cms)	=	1.50	0.08	1.501 (iii)
TIME TO PEAK (hrs)	=	1.42	4.50	1.42
RUNOFF VOLUME (mm)	=	32.01	7.05	16.03
TOTAL RAINFALL (mm)	=	32.11	32.11	32.11
RUNOFF COEFFICIENT	=	1.00	0.22	0.50

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
NASHYD (0100)	Area (ha)=	66.51	Curve Number (CN)= 69.0
ID= 1 DT= 5.0 min	Ia (mm)=	3.00	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	1.32	

Unit Hyd Qpeak (cms)= 1.925

PEAK FLOW	(cms)=	0.320 (i)
TIME TO PEAK	(hrs)=	3.167
RUNOFF VOLUME	(mm)=	5.916
TOTAL RAINFALL	(mm)=	32.108
RUNOFF COEFFICIENT	=	0.184

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
NASHYD (0110)	Area (ha)=	29.80	Curve Number (CN)= 67.0
ID= 1 DT= 5.0 min	Ia (mm)=	3.00	# of Linear Res.(N)= 3.00
	U.H. Tp(hrs)=	1.36	

Unit Hyd Qpeak (cms)= 0.837

PEAK FLOW	(cms)=	0.131 (i)
TIME TO PEAK	(hrs)=	3.250
RUNOFF VOLUME	(mm)=	5.494
TOTAL RAINFALL	(mm)=	32.108
RUNOFF COEFFICIENT	=	0.171

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
WILHYD (0080)	Area (ha)=	6.39	Curve Number (CN)= 76.7
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	Recession const.(K)= 1.46
	U.H. Tp(hrs)=	1.23	

U.H. peak (cms)= 0.16

PEAK FLOW	(cms)=	0.03 (i)
TIME TO PEAK	(hrs)=	3.08
RUNOFF VOLUME	(mm)=	6.78
TOTAL RAINFALL	(mm)=	32.11
RUNOFF COEFFICIENT	=	0.21

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
WILHYD (0090)	Area (ha)=	6.38	Curve Number (CN)= 76.7
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	Recession const.(K)= 1.46
	U.H. Tp(hrs)=	1.23	

U.H. peak (cms)= 0.16

```
     PEAK FLOW       (cms)=   0.03 (i)
     TIME TO PEAK    (hrs)=   3.08
     RUNOFF VOLUME    (mm)=   6.78
     TOTAL RAINFALL   (mm)=  32.11
     RUNOFF COEFFICIENT   =   0.21

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0016)|   Area    (ha)= 184.76
|ID= 1 DT= 5.0 min |   Total Imp(%)=  34.00   Dir. Conn.(%)=  34.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      62.82       121.94
     Dep. Storage     (mm)=       1.50         4.00
     Average Slope     (%)=       0.70         0.70
     Length            (m)=    1109.83        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      54.30         7.59
               over (min)        15.00        45.00
     Storage Coeff.  (min)=      15.38 (ii)   42.51 (ii)
     Unit Hyd. Tpeak (min)=      15.00        45.00
     Unit Hyd. peak  (cms)=       0.07         0.03
                                                        *TOTALS*
     PEAK FLOW       (cms)=       6.07         1.14          6.396 (iii)
     TIME TO PEAK    (hrs)=       1.50         2.08           1.50
     RUNOFF VOLUME    (mm)=      30.61         7.60          15.42
     TOTAL RAINFALL   (mm)=      32.11        32.11          32.11
     RUNOFF COEFFICIENT   =       0.95         0.24           0.48


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  77.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| WILHYD   (  0070)|   Area    (ha)=  46.71   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 0.97
--------------------   U.H. Tp(hrs)=   0.82

     U.H. peak       (cms)=   1.75

     PEAK FLOW       (cms)=   0.29 (i)
     TIME TO PEAK    (hrs)=   2.42
     RUNOFF VOLUME    (mm)=   7.01
     TOTAL RAINFALL   (mm)=  32.11
     RUNOFF COEFFICIENT   =   0.22

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------
================================================================================================================================

       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****

  Input   filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat
```

Output filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\d6ada9ac-d485-4e15-be02-671e9e98a383\57119167-848c-46aa-9126-2f8af298bdc3\scenar
Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\d6ada9ac-d485-4e15-be02-671e9e98a383\57119167-848c-46aa-9126-2f8af298bdc3\scenar

DATE: 10/07/2016 TIME: 09:47:13

USER:

COMMENTS: _____

**** SIMULATION NUMBER: 2 **

| CHICAGO STORM |
| Ptotal= 42.88 mm |

IDF curve parameters: A= 578.969
B= 1.508
C= 0.727
used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step = 5.00 min
Time to peak ratio = 0.33

The CORRELATION coefficient is = 0.9997

TIME (min)	INPUT INT. (mm/hr)	TAB. INT. (mm/hr)
5.	159.00	148.35
10.	98.00	98.02
15.	73.80	75.40
30.	45.50	47.13
60.	28.00	28.98
120.	17.20	17.67
360.	8.00	8.00
720.	4.90	4.84
1440.	3.00	2.93

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.08	3.15	1.08	11.09	2.08	7.60	3.08	4.04
0.17	3.31	1.17	15.85	2.17	7.02	3.17	3.91
0.25	3.50	1.25	33.48	2.25	6.54	3.25	3.78
0.33	3.72	1.33	148.35	2.33	6.13	3.33	3.66
0.42	3.97	1.42	42.72	2.42	5.77	3.42	3.56
0.50	4.27	1.50	24.29	2.50	5.46	3.50	3.46
0.58	4.63	1.58	17.63	2.58	5.19	3.58	3.36
0.67	5.06	1.67	14.10	2.67	4.95	3.67	3.27
0.75	5.61	1.75	11.87	2.75	4.73	3.75	3.19
0.83	6.33	1.83	10.33	2.83	4.53	3.83	3.11
0.92	7.30	1.92	9.19	2.92	4.36	3.92	3.04
1.00	8.74	2.00	8.31	3.00	4.19	4.00	2.97

| CALIB |
| STANDHYD (0010) |
|ID= 1 DT= 5.0 min |

Area (ha)= 61.45
Total Imp(%)= 32.00 Dir. Conn.(%)= 32.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	19.66	41.79
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.20	1.20
Length	(m)=	1202.00	1202.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		95.53	5.84
over (min)		10.00	210.00
Storage Coeff. (min)=		10.95 (ii)	208.31 (ii)

Unit Hyd. Tpeak (min)=	10.00	210.00	
Unit Hyd. peak (cms)=	0.11	0.01	
			TOTALS
PEAK FLOW (cms)=	3.44	0.16	3.441 (iii)
TIME TO PEAK (hrs)=	1.42	5.17	1.42
RUNOFF VOLUME (mm)=	42.78	8.80	19.68
TOTAL RAINFALL (mm)=	42.88	42.88	42.88
RUNOFF COEFFICIENT =	1.00	0.21	0.46

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0020) | Area (ha)= 54.08
ID= 1 DT= 5.0 min | Total Imp(%)= 32.00 Dir. Conn.(%)= 32.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=		17.31	36.77	
Dep. Storage (mm)=		0.10	5.00	
Average Slope (%)=		1.20	1.20	
Length (m)=		1202.00	1202.00	
Mannings n =		0.013	0.250	
Max.Eff.Inten.(mm/hr)=		95.53	5.84	
over (min)		10.00	210.00	
Storage Coeff. (min)=		10.95 (ii)	208.31 (ii)	
Unit Hyd. Tpeak (min)=		10.00	210.00	
Unit Hyd. peak (cms)=		0.11	0.01	
				TOTALS
PEAK FLOW (cms)=		3.03	0.14	3.028 (iii)
TIME TO PEAK (hrs)=		1.42	5.17	1.42
RUNOFF VOLUME (mm)=		42.78	8.80	19.68
TOTAL RAINFALL (mm)=		42.88	42.88	42.88
RUNOFF COEFFICIENT =		1.00	0.21	0.46

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0030) | Area (ha)= 30.00
ID= 1 DT= 5.0 min | Total Imp(%)= 32.00 Dir. Conn.(%)= 32.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=		9.60	20.40	
Dep. Storage (mm)=		0.10	5.00	
Average Slope (%)=		1.20	1.20	
Length (m)=		1202.00	1202.00	
Mannings n =		0.013	0.250	
Max.Eff.Inten.(mm/hr)=		95.53	5.84	
over (min)		10.00	210.00	
Storage Coeff. (min)=		10.95 (ii)	208.31 (ii)	
Unit Hyd. Tpeak (min)=		10.00	210.00	
Unit Hyd. peak (cms)=		0.11	0.01	
				TOTALS
PEAK FLOW (cms)=		1.68	0.08	1.680 (iii)
TIME TO PEAK (hrs)=		1.42	5.17	1.42
RUNOFF VOLUME (mm)=		42.78	8.80	19.67
TOTAL RAINFALL (mm)=		42.88	42.88	42.88
RUNOFF COEFFICIENT =		1.00	0.21	0.46

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------------------------------------------------------------------
--------------------
| CALIB            |
| WILHYD   (  0040)|   Area    (ha)=  18.57   Curve Number   (CN)= 69.9
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 4.54
--------------------   U.H. Tp(hrs)=   3.85

     U.H. peak       (cms)=   0.15

     PEAK FLOW       (cms)=   0.05 (i)
     TIME TO PEAK    (hrs)=   6.00
     RUNOFF VOLUME    (mm)=   9.46
     TOTAL RAINFALL   (mm)=  42.88
     RUNOFF COEFFICIENT   =   0.22

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| WILHYD   (  0050)|   Area    (ha)=  24.80   Curve Number   (CN)= 69.9
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 4.54
--------------------   U.H. Tp(hrs)=   3.85

     U.H. peak       (cms)=   0.20

     PEAK FLOW       (cms)=   0.07 (i)
     TIME TO PEAK    (hrs)=   6.00
     RUNOFF VOLUME    (mm)=   9.52
     TOTAL RAINFALL   (mm)=  42.88
     RUNOFF COEFFICIENT   =   0.22

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0060)|   Area    (ha)=  32.02
|ID= 1 DT= 5.0 min |   Total Imp(%)=  36.00   Dir. Conn.(%)=  36.00
--------------------

                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      11.53         20.49
     Dep. Storage     (mm)=       0.10          5.00
     Average Slope     (%)=       1.20          1.20
     Length            (m)=     685.00        685.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=      95.53          8.42
               over (min)        10.00        130.00
     Storage Coeff.  (min)=       7.82 (ii)   129.54 (ii)
     Unit Hyd. Tpeak (min)=      10.00        130.00
     Unit Hyd. peak  (cms)=       0.13          0.01
                                                          *TOTALS*
     PEAK FLOW       (cms)=       2.38          0.16          2.388 (iii)
     TIME TO PEAK    (hrs)=       1.42          3.83           1.42
     RUNOFF VOLUME    (mm)=      42.78         12.47          23.38
     TOTAL RAINFALL   (mm)=      42.88         42.88          42.88
     RUNOFF COEFFICIENT   =       1.00          0.29           0.55


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
        (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
             THAN THE STORAGE COEFFICIENT.
       (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0100)|   Area    (ha)=  66.51   Curve Number   (CN)= 69.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   3.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.32

     Unit Hyd Qpeak  (cms)=   1.925

     PEAK FLOW       (cms)=   0.570 (i)
     TIME TO PEAK    (hrs)=   3.167
     RUNOFF VOLUME    (mm)=  10.329
     TOTAL RAINFALL   (mm)=  42.883
     RUNOFF COEFFICIENT   =   0.241
```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0110)|   Area    (ha)=  29.80   Curve Number   (CN)= 67.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   3.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.36

     Unit Hyd Qpeak  (cms)=   0.837

     PEAK FLOW       (cms)=   0.233 (i)
     TIME TO PEAK    (hrs)=   3.250
     RUNOFF VOLUME    (mm)=   9.641
     TOTAL RAINFALL   (mm)=  42.883
     RUNOFF COEFFICIENT   =   0.225

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| WILHYD   (  0080)|   Area    (ha)=   6.39   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 1.46
--------------------   U.H. Tp(hrs)=   1.23

     U.H. peak       (cms)=   0.16

     PEAK FLOW       (cms)=   0.06 (i)
     TIME TO PEAK    (hrs)=   3.08
     RUNOFF VOLUME    (mm)=  12.20
     TOTAL RAINFALL   (mm)=  42.88
     RUNOFF COEFFICIENT   =   0.28

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| WILHYD   (  0090)|   Area    (ha)=   6.38   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 1.46
--------------------   U.H. Tp(hrs)=   1.23

     U.H. peak       (cms)=   0.16

     PEAK FLOW       (cms)=   0.06 (i)
     TIME TO PEAK    (hrs)=   3.08
     RUNOFF VOLUME    (mm)=  12.20
     TOTAL RAINFALL   (mm)=  42.88
     RUNOFF COEFFICIENT   =   0.28

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0016)|   Area    (ha)= 184.76
|ID= 1 DT= 5.0 min |   Total Imp(%)=  34.00   Dir. Conn.(%)=  34.00
--------------------

                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      62.82       121.94
     Dep. Storage     (mm)=       1.50         4.00
     Average Slope     (%)=       0.70         0.70
     Length            (m)=    1109.83        40.00
     Mannings n            =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      74.85        17.81
               over (min)        15.00        35.00
     Storage Coeff.  (min)=      13.53 (ii)   32.81 (ii)
     Unit Hyd. Tpeak (min)=      15.00        35.00
     Unit Hyd. peak  (cms)=       0.08         0.03
                                                        *TOTALS*
     PEAK FLOW       (cms)=       9.23         2.49        10.086 (iii)
     TIME TO PEAK    (hrs)=       1.50         1.92          1.50
     RUNOFF VOLUME    (mm)=      41.38        13.18         22.77
     TOTAL RAINFALL   (mm)=      42.88        42.88         42.88
     RUNOFF COEFFICIENT   =       0.97         0.31          0.53


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
```

CN* = 77.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
WILHYD (0070)	Area (ha)=	46.71	Curve Number (CN)= 76.7
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	Recession const.(K)= 0.97
	U.H. Tp(hrs)=	0.82	

U.H. peak (cms)= 1.75

PEAK FLOW (cms)= 0.53 (i)
TIME TO PEAK (hrs)= 2.42
RUNOFF VOLUME (mm)= 12.42
TOTAL RAINFALL (mm)= 42.88
RUNOFF COEFFICIENT = 0.29

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
 V    V   I    SSSSS  U   U    A    L
 V    V   I    SS     U   U   A A   L
  V  V    I     SS    U   U  AAAAA  L
  V  V    I      SS   U   U  A   A  L
   VV     I    SSSSS  UUUUU  A   A  LLLLL

  OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
 O   O    T      T    H   H   Y Y   MM MM  O   O
 O   O    T      T    H   H    Y    M   M  O   O
  OOO     T      T    H   H    Y    M   M   OOO
```


***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\d6ada9ac-d485-4e15-be02-671e9e98a383\27611596-b518-470d-a659-07bede5e4649\scenar
Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\d6ada9ac-d485-4e15-be02-671e9e98a383\27611596-b518-470d-a659-07bede5e4649\scenar

DATE: 10/07/2016 TIME: 09:47:13

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 3 **
****

CHICAGO STORM	IDF curve parameters:	A= 665.492
Ptotal= 50.39 mm		B= 1.500
		C= 0.723

used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step = 5.00 min
Time to peak ratio = 0.33

The CORRELATION coefficient is = 0.9996

TIME	INPUT INT.	TAB. INT.

(min)	(mm/hr)	(mm/hr)
5.	185.30	171.95
10.	114.20	113.83
15.	86.10	87.68
30.	53.00	54.94
60.	32.70	33.87
120.	20.20	20.70
360.	9.40	9.41
720.	5.80	5.71
1440.	3.60	3.46

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.08	3.75	1.08	13.10	2.08	9.01	3.08	4.81
0.17	3.94	1.17	18.68	2.17	8.32	3.17	4.65
0.25	4.17	1.25	39.21	2.25	7.75	3.25	4.50
0.33	4.43	1.33	171.95	2.33	7.27	3.33	4.36
0.42	4.73	1.42	49.94	2.42	6.85	3.42	4.23
0.50	5.08	1.50	28.53	2.50	6.49	3.50	4.11
0.58	5.50	1.58	20.76	2.58	6.16	3.58	4.00
0.67	6.01	1.67	16.63	2.67	5.88	3.67	3.90
0.75	6.66	1.75	14.02	2.75	5.62	3.75	3.80
0.83	7.50	1.83	12.21	2.83	5.39	3.83	3.70
0.92	8.66	1.92	10.87	2.92	5.18	3.92	3.62
1.00	10.34	2.00	9.83	3.00	4.99	4.00	3.53

CALIB			
STANDHYD (0010)	Area (ha)= 61.45		
ID= 1 DT= 5.0 min	Total Imp(%)= 32.00	Dir. Conn.(%)= 32.00	
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	19.66	41.79	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	1.20	1.20	
Length (m)=	1202.00	1202.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	110.95	8.01	
over (min)	10.00	185.00	
Storage Coeff. (min)=	10.32 (ii)	184.26 (ii)	
Unit Hyd. Tpeak (min)=	10.00	185.00	
Unit Hyd. peak (cms)=	0.11	0.01	
			TOTALS
PEAK FLOW (cms)=	4.13	0.24	4.131 (iii)
TIME TO PEAK (hrs)=	1.42	4.75	1.42
RUNOFF VOLUME (mm)=	50.29	12.08	24.31
TOTAL RAINFALL (mm)=	50.39	50.39	50.39
RUNOFF COEFFICIENT =	1.00	0.24	0.48

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0020)	Area (ha)= 54.08		
ID= 1 DT= 5.0 min	Total Imp(%)= 32.00	Dir. Conn.(%)= 32.00	
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	17.31	36.77	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	1.20	1.20	
Length (m)=	1202.00	1202.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	110.95	8.01	
over (min)	10.00	185.00	
Storage Coeff. (min)=	10.32 (ii)	184.26 (ii)	
Unit Hyd. Tpeak (min)=	10.00	185.00	
Unit Hyd. peak (cms)=	0.11	0.01	
			TOTALS

PEAK FLOW	(cms)=	3.63	0.21	3.635 (iii)
TIME TO PEAK	(hrs)=	1.42	4.75	1.42
RUNOFF VOLUME	(mm)=	50.29	12.08	24.31
TOTAL RAINFALL	(mm)=	50.39	50.39	50.39
RUNOFF COEFFICIENT	=	1.00	0.24	0.48

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0030)	Area (ha)=	30.00	
ID= 1 DT= 5.0 min	Total Imp(%)=	32.00	Dir. Conn.(%)= 32.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	9.60	20.40
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.20	1.20
Length	(m)=	1202.00	1202.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		110.95	8.01
over (min)		10.00	185.00
Storage Coeff.	(min)=	10.32 (ii)	184.26 (ii)
Unit Hyd. Tpeak	(min)=	10.00	185.00
Unit Hyd. peak	(cms)=	0.11	0.01

				TOTALS
PEAK FLOW	(cms)=	2.01	0.12	2.017 (iii)
TIME TO PEAK	(hrs)=	1.42	4.75	1.42
RUNOFF VOLUME	(mm)=	50.29	12.08	24.30
TOTAL RAINFALL	(mm)=	50.39	50.39	50.39
RUNOFF COEFFICIENT	=	1.00	0.24	0.48

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
WILHYD (0040)	Area (ha)=	18.57	Curve Number (CN)= 69.9
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	Recession const.(K)= 4.54
	U.H. Tp(hrs)=	3.85	

U.H. peak	(cms)=	0.15
PEAK FLOW	(cms)=	0.07 (i)
TIME TO PEAK	(hrs)=	5.92
RUNOFF VOLUME	(mm)=	13.01
TOTAL RAINFALL	(mm)=	50.39
RUNOFF COEFFICIENT	=	0.26

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
WILHYD (0050)	Area (ha)=	24.80	Curve Number (CN)= 69.9
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	Recession const.(K)= 4.54
	U.H. Tp(hrs)=	3.85	

U.H. peak	(cms)=	0.20
PEAK FLOW	(cms)=	0.10 (i)
TIME TO PEAK	(hrs)=	5.92
RUNOFF VOLUME	(mm)=	13.08
TOTAL RAINFALL	(mm)=	50.39
RUNOFF COEFFICIENT	=	0.26

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (0060)	Area (ha)= 32.02				
ID= 1 DT= 5.0 min	Total Imp(%)= 36.00	Dir. Conn.(%)= 36.00			

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	11.53	20.49	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	1.20	1.20	
Length	(m)=	685.00	685.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		171.95	11.38	
over (min)		5.00	115.00	
Storage Coeff. (min)=		6.18 (ii)	114.06 (ii)	
Unit Hyd. Tpeak (min)=		5.00	115.00	
Unit Hyd. peak (cms)=		0.19	0.01	
				TOTALS
PEAK FLOW	(cms)=	3.46	0.23	3.468 (iii)
TIME TO PEAK	(hrs)=	1.33	3.50	1.33
RUNOFF VOLUME	(mm)=	50.29	16.81	28.86
TOTAL RAINFALL	(mm)=	50.39	50.39	50.39
RUNOFF COEFFICIENT	=	1.00	0.33	0.57

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB				
NASHYD (0100)	Area (ha)= 66.51	Curve Number (CN)= 69.0		
ID= 1 DT= 5.0 min	Ia (mm)= 3.00	# of Linear Res.(N)= 3.00		
	U.H. Tp(hrs)= 1.32			

Unit Hyd Qpeak	(cms)=	1.925
PEAK FLOW	(cms)=	0.769 (i)
TIME TO PEAK	(hrs)=	3.167
RUNOFF VOLUME	(mm)=	13.904
TOTAL RAINFALL	(mm)=	50.387
RUNOFF COEFFICIENT	=	0.276

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB				
NASHYD (0110)	Area (ha)= 29.80	Curve Number (CN)= 67.0		
ID= 1 DT= 5.0 min	Ia (mm)= 3.00	# of Linear Res.(N)= 3.00		
	U.H. Tp(hrs)= 1.36			

Unit Hyd Qpeak	(cms)=	0.837
PEAK FLOW	(cms)=	0.316 (i)
TIME TO PEAK	(hrs)=	3.167
RUNOFF VOLUME	(mm)=	13.018
TOTAL RAINFALL	(mm)=	50.387
RUNOFF COEFFICIENT	=	0.258

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB				
WILHYD (0080)	Area (ha)= 6.39	Curve Number (CN)= 76.7		
ID= 1 DT= 5.0 min	Ia (mm)= 5.00	Recession const.(K)= 1.46		
	U.H. Tp(hrs)= 1.23			

U.H. peak	(cms)=	0.16
PEAK FLOW	(cms)=	0.08 (i)
TIME TO PEAK	(hrs)=	3.00
RUNOFF VOLUME	(mm)=	16.52
TOTAL RAINFALL	(mm)=	50.39
RUNOFF COEFFICIENT	=	0.33

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
WILHYD (0090)	Area (ha)=	6.38	Curve Number (CN)=	76.7
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	Recession const.(K)=	1.46
	U.H. Tp(hrs)=	1.23		

U.H. peak (cms)= 0.16

PEAK FLOW (cms)= 0.08 (i)
TIME TO PEAK (hrs)= 3.00
RUNOFF VOLUME (mm)= 16.52
TOTAL RAINFALL (mm)= 50.39
RUNOFF COEFFICIENT = 0.33

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (0016)	Area (ha)=	184.76			
ID= 1 DT= 5.0 min	Total Imp(%)=	34.00	Dir. Conn.(%)=	34.00	

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	62.82	121.94	
Dep. Storage	(mm)=	1.50	4.00	
Average Slope	(%)=	0.70	0.70	
Length	(m)=	1109.83	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		87.03	23.92	
over (min)		15.00	30.00	
Storage Coeff.	(min)=	12.74 (ii)	29.88 (ii)	
Unit Hyd. Tpeak	(min)=	15.00	30.00	
Unit Hyd. peak	(cms)=	0.08	0.04	
				TOTALS
PEAK FLOW	(cms)=	11.07	3.60	12.630 (iii)
TIME TO PEAK	(hrs)=	1.50	1.83	1.50
RUNOFF VOLUME	(mm)=	48.89	17.60	28.24
TOTAL RAINFALL	(mm)=	50.39	50.39	50.39
RUNOFF COEFFICIENT	=	0.97	0.35	0.56

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 77.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
WILHYD (0070)	Area (ha)=	46.71	Curve Number (CN)=	76.7
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	Recession const.(K)=	0.97
	U.H. Tp(hrs)=	0.82		

U.H. peak (cms)= 1.75

PEAK FLOW (cms)= 0.72 (i)
TIME TO PEAK (hrs)= 2.42
RUNOFF VOLUME (mm)= 16.74
TOTAL RAINFALL (mm)= 50.39
RUNOFF COEFFICIENT = 0.33

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
V    V   I    SSSSS  U   U    A    L
V    V   I    SS     U   U   A A   L
 V  V    I     SS    U   U  AAAAA  L
 V  V    I      SS   U   U  A   A  L
  VV     I    SSSSS  UUUUU  A   A  LLLLL

 OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
O   O    T      T    H   H   Y Y   MM MM  O   O
O   O    T      T    H   H    Y    M   M  O   O
 OOO     T      T    H   H    Y    M   M   OOO
```

Developed and Distributed by Civica Infrastructure

***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\d6ada9ac-d485-4e15-be02-671e9e98a383\13745b2c-8c0b-42a8-877c-70ede88522a4\scenar
Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\d6ada9ac-d485-4e15-be02-671e9e98a383\13745b2c-8c0b-42a8-877c-70ede88522a4\scenar

DATE: 10/07/2016 TIME: 09:47:14

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 4 **
****

| CHICAGO STORM |
| Ptotal= 59.36 mm |

IDF curve parameters: A= 792.607
B= 1.500
C= 0.725
used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step = 5.00 min
Time to peak ratio = 0.33

The CORRELATION coefficient is = 0.9997

TIME (min)	INPUT INT. (mm/hr)	TAB. INT. (mm/hr)
5.	219.20	204.03
10.	135.10	134.91
15.	101.70	103.84
30.	62.70	64.98
60.	38.60	40.01
120.	23.80	24.42
360.	11.00	11.08
720.	6.80	6.71
1440.	4.20	4.06

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.08	4.38	1.08	15.39	2.08	10.56	3.08	5.63
0.17	4.62	1.17	21.96	2.17	9.76	3.17	5.44
0.25	4.88	1.25	46.25	2.25	9.09	3.25	5.27
0.33	5.18	1.33	204.03	2.33	8.52	3.33	5.11
0.42	5.53	1.42	58.96	2.42	8.03	3.42	4.95
0.50	5.94	1.50	33.61	2.50	7.60	3.50	4.81
0.58	6.44	1.58	24.43	2.58	7.22	3.58	4.68
0.67	7.05	1.67	19.55	2.67	6.88	3.67	4.56
0.75	7.81	1.75	16.47	2.75	6.58	3.75	4.44
0.83	8.80	1.83	14.34	2.83	6.31	3.83	4.33
0.92	10.15	1.92	12.76	2.92	6.06	3.92	4.23
1.00	12.14	2.00	11.54	3.00	5.84	4.00	4.13

| CALIB |
| STANDHYD (0010)| Area (ha)= 61.45
|ID= 1 DT= 5.0 min | Total Imp(%)= 32.00 Dir. Conn.(%)= 32.00

IMPERVIOUS PERVIOUS (i)

Surface Area (ha)=	19.66	41.79	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	1.20	1.20	
Length (m)=	1202.00	1202.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	131.49	11.05	
over (min)	10.00	165.00	
Storage Coeff. (min)=	9.64 (ii)	162.61 (ii)	
Unit Hyd. Tpeak (min)=	10.00	165.00	
Unit Hyd. peak (cms)=	0.11	0.01	
			TOTALS
PEAK FLOW (cms)=	5.06	0.37	5.070 (iii)
TIME TO PEAK (hrs)=	1.42	4.42	1.42
RUNOFF VOLUME (mm)=	59.26	16.46	30.16
TOTAL RAINFALL (mm)=	59.36	59.36	59.36
RUNOFF COEFFICIENT =	1.00	0.28	0.51

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0020) | Area (ha)= 54.08
ID= 1 DT= 5.0 min | Total Imp(%)= 32.00 Dir. Conn.(%)= 32.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=		17.31	36.77	
Dep. Storage (mm)=		0.10	5.00	
Average Slope (%)=		1.20	1.20	
Length (m)=		1202.00	1202.00	
Mannings n =		0.013	0.250	
Max.Eff.Inten.(mm/hr)=		131.49	11.05	
over (min)		10.00	165.00	
Storage Coeff. (min)=		9.64 (ii)	162.61 (ii)	
Unit Hyd. Tpeak (min)=		10.00	165.00	
Unit Hyd. peak (cms)=		0.11	0.01	
				TOTALS
PEAK FLOW (cms)=		4.45	0.32	4.462 (iii)
TIME TO PEAK (hrs)=		1.42	4.42	1.42
RUNOFF VOLUME (mm)=		59.26	16.46	30.16
TOTAL RAINFALL (mm)=		59.36	59.36	59.36
RUNOFF COEFFICIENT =		1.00	0.28	0.51

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0030) | Area (ha)= 30.00
ID= 1 DT= 5.0 min | Total Imp(%)= 32.00 Dir. Conn.(%)= 32.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=		9.60	20.40	
Dep. Storage (mm)=		0.10	5.00	
Average Slope (%)=		1.20	1.20	
Length (m)=		1202.00	1202.00	
Mannings n =		0.013	0.250	
Max.Eff.Inten.(mm/hr)=		131.49	11.05	
over (min)		10.00	165.00	
Storage Coeff. (min)=		9.64 (ii)	162.61 (ii)	
Unit Hyd. Tpeak (min)=		10.00	165.00	
Unit Hyd. peak (cms)=		0.11	0.01	
				TOTALS
PEAK FLOW (cms)=		2.47	0.18	2.475 (iii)
TIME TO PEAK (hrs)=		1.42	4.42	1.42
RUNOFF VOLUME (mm)=		59.26	16.46	30.15

```
     TOTAL RAINFALL   (mm)=      59.36        59.36          59.36
     RUNOFF COEFFICIENT   =       1.00         0.28           0.51


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| WILHYD   (  0040)|   Area    (ha)=  18.57   Curve Number   (CN)= 69.9
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 4.54
--------------------   U.H. Tp(hrs)=   3.85

     U.H. peak       (cms)=   0.15

     PEAK FLOW       (cms)=   0.10 (i)
     TIME TO PEAK    (hrs)=   5.92
     RUNOFF VOLUME    (mm)=  17.73
     TOTAL RAINFALL   (mm)=  59.36
     RUNOFF COEFFICIENT   =   0.30

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB             |
| WILHYD   (  0050)|   Area    (ha)=  24.80   Curve Number   (CN)= 69.9
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 4.54
--------------------   U.H. Tp(hrs)=   3.85

     U.H. peak       (cms)=   0.20

     PEAK FLOW       (cms)=   0.13 (i)
     TIME TO PEAK    (hrs)=   5.92
     RUNOFF VOLUME    (mm)=  17.80
     TOTAL RAINFALL   (mm)=  59.36
     RUNOFF COEFFICIENT   =   0.30

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD (  0060)|   Area    (ha)=  32.02
|ID= 1 DT= 5.0 min |   Total Imp(%)=  36.00   Dir. Conn.(%)=  36.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      11.53         20.49
     Dep. Storage     (mm)=       0.10          5.00
     Average Slope     (%)=       1.20          1.20
     Length            (m)=     685.00        685.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     204.03         15.40
               over (min)         5.00        105.00
     Storage Coeff.  (min)=       5.77 (ii)  101.35 (ii)
     Unit Hyd. Tpeak (min)=       5.00        105.00
     Unit Hyd. peak  (cms)=       0.20          0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       4.25          0.34          4.260 (iii)
     TIME TO PEAK    (hrs)=       1.33          3.25           1.33
     RUNOFF VOLUME    (mm)=      59.26         22.47          35.71
     TOTAL RAINFALL   (mm)=      59.36         59.36          59.36
     RUNOFF COEFFICIENT   =       1.00          0.38           0.60


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| NASHYD   (  0100)|   Area    (ha)=  66.51   Curve Number   (CN)= 69.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   3.00   # of Linear Res.(N)= 3.00
```

```
--------------------   U.H. Tp(hrs)=   1.32

     Unit Hyd Qpeak  (cms)=   1.925

     PEAK FLOW       (cms)=   1.037 (i)
     TIME TO PEAK    (hrs)=   3.083
     RUNOFF VOLUME    (mm)=  18.631
     TOTAL RAINFALL   (mm)=  59.356
     RUNOFF COEFFICIENT   =   0.314

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0110)|   Area    (ha)=  29.80   Curve Number   (CN)= 67.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   3.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.36

     Unit Hyd Qpeak  (cms)=   0.837

     PEAK FLOW       (cms)=   0.427 (i)
     TIME TO PEAK    (hrs)=   3.167
     RUNOFF VOLUME    (mm)=  17.502
     TOTAL RAINFALL   (mm)=  59.356
     RUNOFF COEFFICIENT   =   0.295

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| WILHYD   (  0080)|   Area    (ha)=   6.39   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 1.46
--------------------   U.H. Tp(hrs)=   1.23

     U.H. peak       (cms)=   0.16

     PEAK FLOW       (cms)=   0.10 (i)
     TIME TO PEAK    (hrs)=   3.00
     RUNOFF VOLUME    (mm)=  22.16
     TOTAL RAINFALL   (mm)=  59.36
     RUNOFF COEFFICIENT   =   0.37

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| WILHYD   (  0090)|   Area    (ha)=   6.38   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 1.46
--------------------   U.H. Tp(hrs)=   1.23

     U.H. peak       (cms)=   0.16

     PEAK FLOW       (cms)=   0.10 (i)
     TIME TO PEAK    (hrs)=   3.00
     RUNOFF VOLUME    (mm)=  22.16
     TOTAL RAINFALL   (mm)=  59.36
     RUNOFF COEFFICIENT   =   0.37

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0016)|   Area    (ha)= 184.76
|ID= 1 DT= 5.0 min |   Total Imp(%)=  34.00   Dir. Conn.(%)=  34.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      62.82       121.94
     Dep. Storage     (mm)=       1.50         4.00
     Average Slope     (%)=       0.70         0.70
     Length            (m)=    1109.83        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     131.49        38.78
               over (min)        10.00        25.00
     Storage Coeff.  (min)=      10.80 (ii)   24.92 (ii)
     Unit Hyd. Tpeak (min)=      10.00        25.00
     Unit Hyd. peak  (cms)=       0.11         0.05
```

				TOTALS
PEAK FLOW	(cms)=	15.24	5.52	17.197 (iii)
TIME TO PEAK	(hrs)=	1.42	1.75	1.42
RUNOFF VOLUME	(mm)=	57.86	23.35	35.08
TOTAL RAINFALL	(mm)=	59.36	59.36	59.36
RUNOFF COEFFICIENT	=	0.97	0.39	0.59

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 77.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
WILHYD (0070)	Area	(ha)= 46.71	Curve Number (CN)= 76.7
ID= 1 DT= 5.0 min	Ia	(mm)= 5.00	Recession const.(K)= 0.97
	U.H. Tp(hrs)=	0.82	

U.H. peak (cms)= 1.75

PEAK FLOW (cms)= 0.98 (i)
TIME TO PEAK (hrs)= 2.42
RUNOFF VOLUME (mm)= 22.38
TOTAL RAINFALL (mm)= 59.36
RUNOFF COEFFICIENT = 0.38

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
V    V   I    SSSSS  U   U    A    L
V    V   I    SS     U   U   A A   L
 V  V    I     SS    U   U  AAAAA  L
 V  V    I      SS   U   U  A   A  L
  VV     I    SSSSS  UUUUU  A   A  LLLLL

 OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
O   O    T      T    H   H   Y Y   MM MM  O   O
O   O    T      T    H   H    Y    M   M  O   O
 OOO     T      T    H   H    Y    M   M   OOO
```


***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\d6ada9ac-d485-4e15-be02-671e9e98a383\263fa0a2-70b5-42d1-86aa-e0d1b64db732\scenar
Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\d6ada9ac-d485-4e15-be02-671e9e98a383\263fa0a2-70b5-42d1-86aa-e0d1b64db732\scenar

DATE: 10/07/2016 TIME: 09:47:14

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 5 **
****

CHICAGO STORM	IDF curve parameters:	A= 878.493
Ptotal= 66.15 mm		B= 1.500
		C= 0.724

407 TWY - WC (4hr CHI) - ROU

used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step = 5.00 min
Time to peak ratio = 0.33

The CORRELATION coefficient is = 0.9997

TIME (min)	INPUT INT. (mm/hr)	TAB. INT. (mm/hr)
5.	243.60	226.56
10.	150.20	149.90
15.	113.20	115.42
30.	69.80	72.27
60.	43.00	44.52
120.	26.50	27.20
360.	12.30	12.35
720.	7.60	7.49
1440.	4.70	4.54

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.08	4.90	1.08	17.18	2.08	11.80	3.08	6.30
0.17	5.16	1.17	24.50	2.17	10.90	3.17	6.09
0.25	5.46	1.25	51.51	2.25	10.16	3.25	5.89
0.33	5.79	1.33	226.56	2.33	9.52	3.33	5.71
0.42	6.18	1.42	65.63	2.42	8.97	3.42	5.54
0.50	6.65	1.50	37.45	2.50	8.49	3.50	5.38
0.58	7.20	1.58	27.24	2.58	8.07	3.58	5.24
0.67	7.87	1.67	21.81	2.67	7.69	3.67	5.10
0.75	8.72	1.75	18.38	2.75	7.36	3.75	4.97
0.83	9.83	1.83	16.01	2.83	7.05	3.83	4.85
0.92	11.34	1.92	14.25	2.92	6.78	3.92	4.73
1.00	13.55	2.00	12.89	3.00	6.53	4.00	4.62

CALIB
STANDHYD (0010) | Area (ha)= 61.45
ID= 1 DT= 5.0 min | Total Imp(%)= 32.00 Dir. Conn.(%)= 32.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	19.66	41.79	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	1.20	1.20	
Length	(m)=	1202.00	1202.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		146.10	13.53	
over (min)		10.00	155.00	
Storage Coeff. (min)=		9.24 (ii)	150.30 (ii)	
Unit Hyd. Tpeak (min)=		10.00	155.00	
Unit Hyd. peak (cms)=		0.12	0.01	
				TOTALS
PEAK FLOW	(cms)=	5.74	0.47	5.758 (iii)
TIME TO PEAK	(hrs)=	1.42	4.17	1.42
RUNOFF VOLUME	(mm)=	66.05	20.08	34.79
TOTAL RAINFALL	(mm)=	66.15	66.15	66.15
RUNOFF COEFFICIENT	=	1.00	0.30	0.53

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0020) | Area (ha)= 54.08
ID= 1 DT= 5.0 min | Total Imp(%)= 32.00 Dir. Conn.(%)= 32.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	17.31	36.77
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.20	1.20

Length (m)=	1202.00	1202.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	146.10	13.53	
over (min)	10.00	155.00	
Storage Coeff. (min)=	9.24 (ii)	150.30 (ii)	
Unit Hyd. Tpeak (min)=	10.00	155.00	
Unit Hyd. peak (cms)=	0.12	0.01	
			TOTALS
PEAK FLOW (cms)=	5.05	0.42	5.067 (iii)
TIME TO PEAK (hrs)=	1.42	4.17	1.42
RUNOFF VOLUME (mm)=	66.05	20.08	34.79
TOTAL RAINFALL (mm)=	66.15	66.15	66.15
RUNOFF COEFFICIENT =	1.00	0.30	0.53

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB		
STANDHYD (0030)	Area (ha)=	30.00
ID= 1 DT= 5.0 min	Total Imp(%)=	32.00 Dir. Conn.(%)= 32.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=		9.60	20.40
Dep. Storage (mm)=		0.10	5.00
Average Slope (%)=		1.20	1.20
Length (m)=		1202.00	1202.00
Mannings n =		0.013	0.250
Max.Eff.Inten.(mm/hr)=		146.10	13.53
over (min)		10.00	155.00
Storage Coeff. (min)=		9.24 (ii)	150.30 (ii)
Unit Hyd. Tpeak (min)=		10.00	155.00
Unit Hyd. peak (cms)=		0.12	0.01
			TOTALS
PEAK FLOW (cms)=		2.80	0.23	2.811 (iii)
TIME TO PEAK (hrs)=		1.42	4.17	1.42
RUNOFF VOLUME (mm)=		66.05	20.08	34.78
TOTAL RAINFALL (mm)=		66.15	66.15	66.15
RUNOFF COEFFICIENT =		1.00	0.30	0.53

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
WILHYD (0040)	Area (ha)=	18.57	Curve Number (CN)= 69.9
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	Recession const.(K)= 4.54
	U.H. Tp(hrs)=	3.85	

U.H. peak (cms)= 0.15

PEAK FLOW (cms)=	0.12 (i)
TIME TO PEAK (hrs)=	5.92
RUNOFF VOLUME (mm)=	21.61
TOTAL RAINFALL (mm)=	66.15
RUNOFF COEFFICIENT =	0.33

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
WILHYD (0050)	Area (ha)=	24.80	Curve Number (CN)= 69.9
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	Recession const.(K)= 4.54
	U.H. Tp(hrs)=	3.85	

U.H. peak (cms)= 0.20

```
     PEAK FLOW       (cms)=   0.16 (i)
     TIME TO PEAK    (hrs)=   5.92
     RUNOFF VOLUME    (mm)=  21.67
     TOTAL RAINFALL   (mm)=  66.15
     RUNOFF COEFFICIENT   =   0.33

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0060)|   Area    (ha)=  32.02
|ID= 1 DT= 5.0 min |   Total Imp(%)=  36.00   Dir. Conn.(%)=  36.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      11.53        20.49
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.20         1.20
     Length            (m)=     685.00       685.00
     Mannings n            =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     226.56        18.61
               over (min)         5.00        95.00
     Storage Coeff.  (min)=       5.53 (ii)   94.14 (ii)
     Unit Hyd. Tpeak (min)=       5.00        95.00
     Unit Hyd. peak  (cms)=       0.20         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       4.82         0.43          4.835 (iii)
     TIME TO PEAK    (hrs)=       1.33         3.00           1.33
     RUNOFF VOLUME    (mm)=      66.05        27.04          41.08
     TOTAL RAINFALL   (mm)=      66.15        66.15          66.15
     RUNOFF COEFFICIENT   =       1.00         0.41           0.62


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0100)|   Area    (ha)=  66.51   Curve Number   (CN)= 69.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   3.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.32

     Unit Hyd Qpeak  (cms)=   1.925

     PEAK FLOW       (cms)=   1.256 (i)
     TIME TO PEAK    (hrs)=   3.083
     RUNOFF VOLUME    (mm)=  22.497
     TOTAL RAINFALL   (mm)=  66.150
     RUNOFF COEFFICIENT   =   0.340

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0110)|   Area    (ha)=  29.80   Curve Number   (CN)= 67.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   3.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.36

     Unit Hyd Qpeak  (cms)=   0.837

     PEAK FLOW       (cms)=   0.518 (i)
     TIME TO PEAK    (hrs)=   3.167
     RUNOFF VOLUME    (mm)=  21.183
     TOTAL RAINFALL   (mm)=  66.150
     RUNOFF COEFFICIENT   =   0.320

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| WILHYD   (  0080)|   Area    (ha)=   6.39   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 1.46
--------------------   U.H. Tp(hrs)=   1.23
```

```
     U.H. peak       (cms)=   0.16

     PEAK FLOW       (cms)=   0.12 (i)
     TIME TO PEAK    (hrs)=   3.00
     RUNOFF VOLUME    (mm)=  26.72
     TOTAL RAINFALL   (mm)=  66.15
     RUNOFF COEFFICIENT   =   0.40

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
-------------------------------------------------------------------------------
-------------------
| CALIB             |
| WILHYD   (  0090)|   Area    (ha)=   6.38   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 1.46
-------------------   U.H. Tp(hrs)=   1.23

     U.H. peak       (cms)=   0.16

     PEAK FLOW       (cms)=   0.12 (i)
     TIME TO PEAK    (hrs)=   3.00
     RUNOFF VOLUME    (mm)=  26.72
     TOTAL RAINFALL   (mm)=  66.15
     RUNOFF COEFFICIENT   =   0.40

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
-------------------------------------------------------------------------------
-------------------
| CALIB             |
| STANDHYD (  0016)|   Area    (ha)= 184.76
|ID= 1 DT= 5.0 min |   Total Imp(%)=  34.00   Dir. Conn.(%)=  34.00
-------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      62.82       121.94
     Dep. Storage     (mm)=       1.50         4.00
     Average Slope     (%)=       0.70         0.70
     Length            (m)=    1109.83        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     146.10        46.83
               over (min)        10.00        25.00
     Storage Coeff.  (min)=      10.35 (ii)   23.45 (ii)
     Unit Hyd. Tpeak (min)=      10.00        25.00
     Unit Hyd. peak  (cms)=       0.11         0.05
                                                      *TOTALS*
     PEAK FLOW       (cms)=      17.32         6.90        19.839 (iii)
     TIME TO PEAK    (hrs)=       1.42         1.67          1.42
     RUNOFF VOLUME    (mm)=      64.65        27.99         40.45
     TOTAL RAINFALL   (mm)=      66.15        66.15         66.15
     RUNOFF COEFFICIENT   =       0.98         0.42          0.61


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  77.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-------------------
| CALIB             |
| WILHYD   (  0070)|   Area    (ha)=  46.71   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 0.97
-------------------   U.H. Tp(hrs)=   0.82

     U.H. peak       (cms)=   1.75

     PEAK FLOW       (cms)=   1.19 (i)
     TIME TO PEAK    (hrs)=   2.42
     RUNOFF VOLUME    (mm)=  26.94
     TOTAL RAINFALL   (mm)=  66.15
     RUNOFF COEFFICIENT   =   0.41

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
-------------------------------------------------------------------------------
===============================================================================================================

       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
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```
 V  V    I     SS    U   U  AAAAA  L
 V  V    I      SS   U   U  A   A  L
  VV     I    SSSSS  UUUUU  A   A  LLLLL

 OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
O   O    T      T    H   H   Y Y   MM MM  O   O
O   O    T      T    H   H    Y    M   M  O   O
 OOO     T      T    H   H    Y    M   M   OOO
```


***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\d6ada9ac-d485-4e15-be02-671e9e98a383\69caafa6-5720-4b8a-a9d5-55a1f9e4e4d0\scenar
Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\d6ada9ac-d485-4e15-be02-671e9e98a383\69caafa6-5720-4b8a-a9d5-55a1f9e4e4d0\scenar

DATE: 10/07/2016 TIME: 09:47:14

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 6 **
****

CHICAGO STORM
Ptotal= 73.18 mm

IDF curve parameters: A= 966.620
B= 1.507
C= 0.723
used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step = 5.00 min
Time to peak ratio = 0.33

The CORRELATION coefficient is = 0.9996

TIME (min)	INPUT INT. (mm/hr)	TAB. INT. (mm/hr)
5.	268.60	249.56
10.	165.50	165.26
15.	124.70	127.32
30.	76.90	79.78
60.	47.40	49.19
120.	29.20	30.07
360.	13.60	13.67
720.	8.40	8.29
1440.	5.20	5.03

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.08	5.44	1.08	19.04	2.08	13.08	3.08	6.99
0.17	5.73	1.17	27.14	2.17	12.09	3.17	6.75
0.25	6.06	1.25	56.99	2.25	11.27	3.25	6.54
0.33	6.43	1.33	249.56	2.33	10.56	3.33	6.34
0.42	6.86	1.42	72.58	2.42	9.95	3.42	6.15
0.50	7.37	1.50	41.46	2.50	9.42	3.50	5.98
0.58	7.99	1.58	30.17	2.58	8.95	3.58	5.81
0.67	8.74	1.67	24.16	2.67	8.54	3.67	5.66
0.75	9.68	1.75	20.37	2.75	8.16	3.75	5.52
0.83	10.90	1.83	17.74	2.83	7.83	3.83	5.38
0.92	12.57	1.92	15.79	2.92	7.52	3.92	5.25
1.00	15.03	2.00	14.29	3.00	7.24	4.00	5.13

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--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0010)|   Area    (ha)=  61.45
|ID= 1 DT= 5.0 min |   Total Imp(%)=  32.00   Dir. Conn.(%)=  32.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      19.66         41.79
     Dep. Storage     (mm)=       0.10          5.00
     Average Slope     (%)=       1.20          1.20
     Length            (m)=    1202.00       1202.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     161.07         16.26
               over (min)       10.00        140.00
     Storage Coeff.  (min)=       8.89 (ii)  139.94 (ii)
     Unit Hyd. Tpeak (min)=      10.00        140.00
     Unit Hyd. peak  (cms)=       0.12          0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       6.46          0.60          6.477 (iii)
     TIME TO PEAK    (hrs)=       1.42          3.92           1.42
     RUNOFF VOLUME    (mm)=      73.08         24.05          39.74
     TOTAL RAINFALL   (mm)=      73.18         73.18          73.18
     RUNOFF COEFFICIENT   =       1.00          0.33           0.54


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0020)|   Area    (ha)=  54.08
|ID= 1 DT= 5.0 min |   Total Imp(%)=  32.00   Dir. Conn.(%)=  32.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      17.31         36.77
     Dep. Storage     (mm)=       0.10          5.00
     Average Slope     (%)=       1.20          1.20
     Length            (m)=    1202.00       1202.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     161.07         16.26
               over (min)       10.00        140.00
     Storage Coeff.  (min)=       8.89 (ii)  139.94 (ii)
     Unit Hyd. Tpeak (min)=      10.00        140.00
     Unit Hyd. peak  (cms)=       0.12          0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       5.68          0.52          5.700 (iii)
     TIME TO PEAK    (hrs)=       1.42          3.92           1.42
     RUNOFF VOLUME    (mm)=      73.08         24.05          39.74
     TOTAL RAINFALL   (mm)=      73.18         73.18          73.18
     RUNOFF COEFFICIENT   =       1.00          0.33           0.54


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0030)|   Area    (ha)=  30.00
|ID= 1 DT= 5.0 min |   Total Imp(%)=  32.00   Dir. Conn.(%)=  32.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       9.60         20.40
     Dep. Storage     (mm)=       0.10          5.00
     Average Slope     (%)=       1.20          1.20
     Length            (m)=    1202.00       1202.00
     Mannings n           =      0.013         0.250
```

```
     Max.Eff.Inten.(mm/hr)=     161.07        16.26
               over (min)       10.00       140.00
     Storage Coeff.  (min)=       8.89 (ii)  139.94 (ii)
     Unit Hyd. Tpeak (min)=      10.00       140.00
     Unit Hyd. peak  (cms)=       0.12         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       3.15         0.29          3.162 (iii)
     TIME TO PEAK    (hrs)=       1.42         3.92           1.42
     RUNOFF VOLUME    (mm)=      73.08        24.05          39.74
     TOTAL RAINFALL   (mm)=      73.18        73.18          73.18
     RUNOFF COEFFICIENT   =       1.00         0.33           0.54


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| WILHYD   (  0040)|   Area    (ha)=  18.57   Curve Number   (CN)= 69.9
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 4.54
--------------------   U.H. Tp(hrs)=   3.85

     U.H. peak       (cms)=   0.15

     PEAK FLOW       (cms)=   0.15 (i)
     TIME TO PEAK    (hrs)=   5.92
     RUNOFF VOLUME    (mm)=  25.85
     TOTAL RAINFALL   (mm)=  73.18
     RUNOFF COEFFICIENT   =   0.35

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| WILHYD   (  0050)|   Area    (ha)=  24.80   Curve Number   (CN)= 69.9
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 4.54
--------------------   U.H. Tp(hrs)=   3.85

     U.H. peak       (cms)=   0.20

     PEAK FLOW       (cms)=   0.20 (i)
     TIME TO PEAK    (hrs)=   5.92
     RUNOFF VOLUME    (mm)=  25.92
     TOTAL RAINFALL   (mm)=  73.18
     RUNOFF COEFFICIENT   =   0.35

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0060)|   Area    (ha)=  32.02
|ID= 1 DT= 5.0 min |   Total Imp(%)=  36.00   Dir. Conn.(%)=  36.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      11.53        20.49
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.20         1.20
     Length            (m)=     685.00       685.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     249.56        22.09
               over (min)        5.00        90.00
     Storage Coeff.  (min)=       5.32 (ii)   88.07 (ii)
     Unit Hyd. Tpeak (min)=       5.00        90.00
     Unit Hyd. peak  (cms)=       0.21         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       5.42         0.54          5.434 (iii)
     TIME TO PEAK    (hrs)=       1.33         2.92           1.33
     RUNOFF VOLUME    (mm)=      73.08        31.99          46.78
     TOTAL RAINFALL   (mm)=      73.18        73.18          73.18
     RUNOFF COEFFICIENT   =       1.00         0.44           0.64


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
```

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
NASHYD (0100)	Area (ha)=	66.51	Curve Number (CN)=	69.0
ID= 1 DT= 5.0 min	Ia (mm)=	3.00	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=	1.32		

Unit Hyd Qpeak (cms)= 1.925

PEAK FLOW (cms)= 1.496 (i)
TIME TO PEAK (hrs)= 3.083
RUNOFF VOLUME (mm)= 26.727
TOTAL RAINFALL (mm)= 73.185
RUNOFF COEFFICIENT = 0.365

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
NASHYD (0110)	Area (ha)=	29.80	Curve Number (CN)=	67.0
ID= 1 DT= 5.0 min	Ia (mm)=	3.00	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=	1.36		

Unit Hyd Qpeak (cms)= 0.837

PEAK FLOW (cms)= 0.618 (i)
TIME TO PEAK (hrs)= 3.167
RUNOFF VOLUME (mm)= 25.223
TOTAL RAINFALL (mm)= 73.185
RUNOFF COEFFICIENT = 0.345

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
WILHYD (0080)	Area (ha)=	6.39	Curve Number (CN)=	76.7
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	Recession const.(K)=	1.46
	U.H. Tp(hrs)=	1.23		

U.H. peak (cms)= 0.16

PEAK FLOW (cms)= 0.15 (i)
TIME TO PEAK (hrs)= 2.92
RUNOFF VOLUME (mm)= 31.65
TOTAL RAINFALL (mm)= 73.18
RUNOFF COEFFICIENT = 0.43

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
WILHYD (0090)	Area (ha)=	6.38	Curve Number (CN)=	76.7
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	Recession const.(K)=	1.46
	U.H. Tp(hrs)=	1.23		

U.H. peak (cms)= 0.16

PEAK FLOW (cms)= 0.15 (i)
TIME TO PEAK (hrs)= 2.92
RUNOFF VOLUME (mm)= 31.65
TOTAL RAINFALL (mm)= 73.18
RUNOFF COEFFICIENT = 0.43

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (0016)	Area (ha)=	184.76		
ID= 1 DT= 5.0 min	Total Imp(%)=	34.00	Dir. Conn.(%)=	34.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	62.82	121.94
Dep. Storage	(mm)=	1.50	4.00

```
                                        407 TWY - WC (4hr CHI) - ROU
     Average Slope     (%)=       0.70         0.70
     Length            (m)=    1109.83        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     161.07        55.54
               over (min)        10.00        25.00
     Storage Coeff.  (min)=       9.96 (ii)   22.19 (ii)
     Unit Hyd. Tpeak (min)=      10.00        25.00
     Unit Hyd. peak  (cms)=       0.11         0.05
                                                        *TOTALS*
     PEAK FLOW       (cms)=      19.49         8.52        22.656 (iii)
     TIME TO PEAK    (hrs)=       1.42         1.67          1.42
     RUNOFF VOLUME    (mm)=      71.68        33.00         46.15
     TOTAL RAINFALL   (mm)=      73.18        73.18         73.18
     RUNOFF COEFFICIENT   =       0.98         0.45          0.63


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  77.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| WILHYD   (  0070)|   Area    (ha)=  46.71   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 0.97
--------------------   U.H. Tp(hrs)=   0.82

     U.H. peak       (cms)=   1.75

     PEAK FLOW       (cms)=   1.41 (i)
     TIME TO PEAK    (hrs)=   2.42
     RUNOFF VOLUME    (mm)=  31.88
     TOTAL RAINFALL   (mm)=  73.18
     RUNOFF COEFFICIENT   =   0.44

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------
================================================================================================================

       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

  Output  filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\d6ada9ac-d485-4e15-be02-671e9e98a383\1ba67ba2-1549-4f13-b0b0-71f4b266633
5\scenar
  Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\d6ada9ac-d485-4e15-be02-671e9e98a383\1ba67ba2-1549-4f13-b0b0-71f4b266633
5\scenar


DATE: 10/07/2016                          TIME: 09:47:15

USER:


COMMENTS: _____________________________________________________________
```

****
** SIMULATION NUMBER: 7 **
****

READ STORM	Filename: C:\Users\p002311c\AppData\Local\Temp\4b171776-4f0b-4fb0-8e8b-fdac0d700575\f6ef4abf
Ptotal=212.00 mm	Comments: HURRICANE HAZEL - FINAL 12 HOURS

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
1.00	6.00	4.00	13.00	7.00	23.00	10.00	53.00
2.00	4.00	5.00	17.00	8.00	13.00	11.00	38.00
3.00	6.00	6.00	13.00	9.00	13.00	12.00	13.00

CALIB STANDHYD (0010)	Area (ha)= 61.45
ID= 1 DT= 5.0 min	Total Imp(%)= 32.00 Dir. Conn.(%)= 32.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	19.66	41.79
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.20	1.20
Length	(m)=	1202.00	1202.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	6.00	3.083	13.00	6.083	23.00	9.08	53.00
0.167	6.00	3.167	13.00	6.167	23.00	9.17	53.00
0.250	6.00	3.250	13.00	6.250	23.00	9.25	53.00
0.333	6.00	3.333	13.00	6.333	23.00	9.33	53.00
0.417	6.00	3.417	13.00	6.417	23.00	9.42	53.00
0.500	6.00	3.500	13.00	6.500	23.00	9.50	53.00
0.583	6.00	3.583	13.00	6.583	23.00	9.58	53.00
0.667	6.00	3.667	13.00	6.667	23.00	9.67	53.00
0.750	6.00	3.750	13.00	6.750	23.00	9.75	53.00
0.833	6.00	3.833	13.00	6.833	23.00	9.83	53.00
0.917	6.00	3.917	13.00	6.917	23.00	9.92	53.00
1.000	6.00	4.000	13.00	7.000	23.00	10.00	53.00
1.083	4.00	4.083	17.00	7.083	13.00	10.08	38.00
1.167	4.00	4.167	17.00	7.167	13.00	10.17	38.00
1.250	4.00	4.250	17.00	7.250	13.00	10.25	38.00
1.333	4.00	4.333	17.00	7.333	13.00	10.33	38.00
1.417	4.00	4.417	17.00	7.417	13.00	10.42	38.00
1.500	4.00	4.500	17.00	7.500	13.00	10.50	38.00
1.583	4.00	4.583	17.00	7.583	13.00	10.58	38.00
1.667	4.00	4.667	17.00	7.667	13.00	10.67	38.00
1.750	4.00	4.750	17.00	7.750	13.00	10.75	38.00
1.833	4.00	4.833	17.00	7.833	13.00	10.83	38.00
1.917	4.00	4.917	17.00	7.917	13.00	10.92	38.00
2.000	4.00	5.000	17.00	8.000	13.00	11.00	38.00
2.083	6.00	5.083	13.00	8.083	13.00	11.08	13.00
2.167	6.00	5.167	13.00	8.167	13.00	11.17	13.00
2.250	6.00	5.250	13.00	8.250	13.00	11.25	13.00
2.333	6.00	5.333	13.00	8.333	13.00	11.33	13.00
2.417	6.00	5.417	13.00	8.417	13.00	11.42	13.00
2.500	6.00	5.500	13.00	8.500	13.00	11.50	13.00
2.583	6.00	5.583	13.00	8.583	13.00	11.58	13.00
2.667	6.00	5.667	13.00	8.667	13.00	11.67	13.00
2.750	6.00	5.750	13.00	8.750	13.00	11.75	13.00
2.833	6.00	5.833	13.00	8.833	13.00	11.83	13.00
2.917	6.00	5.917	13.00	8.917	13.00	11.92	13.00
3.000	6.00	6.000	13.00	9.000	13.00	12.00	13.00

Max.Eff.Inten.(mm/hr)=		53.00	40.06
	over (min)	15.00	110.00
Storage Coeff. (min)=		13.86 (ii)	105.24 (ii)
Unit Hyd. Tpeak (min)=		15.00	110.00

Unit Hyd. peak (cms)=	0.08	0.01		
				TOTALS
PEAK FLOW (cms)=	2.85	2.79		4.490 (iii)
TIME TO PEAK (hrs)=	10.00	11.75		11.00
RUNOFF VOLUME (mm)=	211.90	129.02		155.54
TOTAL RAINFALL (mm)=	212.00	212.00		212.00
RUNOFF COEFFICIENT =	1.00	0.61		0.73

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0020)	Area (ha)= 54.08		
ID= 1 DT= 5.0 min	Total Imp(%)= 32.00	Dir. Conn.(%)= 32.00	
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	17.31	36.77	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	1.20	1.20	
Length (m)=	1202.00	1202.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	53.00	40.06	
over (min)	15.00	110.00	
Storage Coeff. (min)=	13.86 (ii)	105.24 (ii)	
Unit Hyd. Tpeak (min)=	15.00	110.00	
Unit Hyd. peak (cms)=	0.08	0.01	
			TOTALS
PEAK FLOW (cms)=	2.51	2.45	3.951 (iii)
TIME TO PEAK (hrs)=	10.00	11.75	11.00
RUNOFF VOLUME (mm)=	211.90	129.02	155.54
TOTAL RAINFALL (mm)=	212.00	212.00	212.00
RUNOFF COEFFICIENT =	1.00	0.61	0.73

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0030)	Area (ha)= 30.00		
ID= 1 DT= 5.0 min	Total Imp(%)= 32.00	Dir. Conn.(%)= 32.00	
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	9.60	20.40	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	1.20	1.20	
Length (m)=	1202.00	1202.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	53.00	40.06	
over (min)	15.00	110.00	
Storage Coeff. (min)=	13.86 (ii)	105.24 (ii)	
Unit Hyd. Tpeak (min)=	15.00	110.00	
Unit Hyd. peak (cms)=	0.08	0.01	
			TOTALS
PEAK FLOW (cms)=	1.39	1.36	2.192 (iii)
TIME TO PEAK (hrs)=	10.00	11.75	11.00
RUNOFF VOLUME (mm)=	211.90	129.02	155.54
TOTAL RAINFALL (mm)=	212.00	212.00	212.00
RUNOFF COEFFICIENT =	1.00	0.61	0.73

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------------------------------------------------------------------
--------------------
| CALIB            |
| WILHYD   (  0040)|   Area    (ha)=  18.57   Curve Number   (CN)= 69.9
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 4.54
--------------------   U.H. Tp(hrs)=   3.85

     U.H. peak       (cms)=   0.15

     PEAK FLOW       (cms)=   0.66 (i)
     TIME TO PEAK    (hrs)=  13.58
     RUNOFF VOLUME    (mm)= 134.81
     TOTAL RAINFALL   (mm)= 212.00
     RUNOFF COEFFICIENT   =   0.64

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| WILHYD   (  0050)|   Area    (ha)=  24.80   Curve Number   (CN)= 69.9
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 4.54
--------------------   U.H. Tp(hrs)=   3.85

     U.H. peak       (cms)=   0.20

     PEAK FLOW       (cms)=   0.88 (i)
     TIME TO PEAK    (hrs)=  13.58
     RUNOFF VOLUME    (mm)= 134.81
     TOTAL RAINFALL   (mm)= 212.00
     RUNOFF COEFFICIENT   =   0.64

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0060)|   Area    (ha)=  32.02
|ID= 1 DT= 5.0 min |   Total Imp(%)=  36.00   Dir. Conn.(%)=  36.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      11.53         20.49
     Dep. Storage     (mm)=       0.10          5.00
     Average Slope     (%)=       1.20          1.20
     Length            (m)=     685.00        685.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=      53.00         45.49
               over (min)        10.00         75.00
     Storage Coeff.  (min)=       9.89 (ii)    71.87 (ii)
     Unit Hyd. Tpeak (min)=      10.00         75.00
     Unit Hyd. peak  (cms)=       0.11          0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.69          1.80          2.989 (iii)
     TIME TO PEAK    (hrs)=      10.00         11.17          11.00
     RUNOFF VOLUME    (mm)=     211.90        150.79         172.79
     TOTAL RAINFALL   (mm)=     212.00        212.00         212.00
     RUNOFF COEFFICIENT   =       1.00          0.71           0.82


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  0100)|   Area    (ha)=  66.51   Curve Number   (CN)= 69.0
|ID= 1 DT= 5.0 min |   Ia      (mm)=   3.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   1.32

     Unit Hyd Qpeak  (cms)=   1.925

     PEAK FLOW       (cms)=   5.220 (i)
     TIME TO PEAK    (hrs)=  11.417
     RUNOFF VOLUME    (mm)= 135.187
     TOTAL RAINFALL   (mm)= 212.000
     RUNOFF COEFFICIENT   =   0.638
```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
NASHYD (0110)	Area	(ha)=	29.80	Curve Number	(CN)= 67.0
ID= 1 DT= 5.0 min	Ia	(mm)=	3.00	# of Linear Res.(N)=	3.00
	U.H. Tp(hrs)=		1.36		

Unit Hyd Qpeak (cms)= 0.837

PEAK FLOW (cms)= 2.250 (i)
TIME TO PEAK (hrs)= 11.500
RUNOFF VOLUME (mm)= 130.741
TOTAL RAINFALL (mm)= 212.000
RUNOFF COEFFICIENT = 0.617

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
WILHYD (0080)	Area	(ha)=	6.39	Curve Number	(CN)= 76.7
ID= 1 DT= 5.0 min	Ia	(mm)=	5.00	Recession const.(K)=	1.46
	U.H. Tp(hrs)=		1.23		

U.H. peak (cms)= 0.16

PEAK FLOW (cms)= 0.47 (i)
TIME TO PEAK (hrs)= 11.42
RUNOFF VOLUME (mm)= 150.15
TOTAL RAINFALL (mm)= 212.00
RUNOFF COEFFICIENT = 0.71

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
WILHYD (0090)	Area	(ha)=	6.38	Curve Number	(CN)= 76.7
ID= 1 DT= 5.0 min	Ia	(mm)=	5.00	Recession const.(K)=	1.46
	U.H. Tp(hrs)=		1.23		

U.H. peak (cms)= 0.16

PEAK FLOW (cms)= 0.47 (i)
TIME TO PEAK (hrs)= 11.42
RUNOFF VOLUME (mm)= 150.15
TOTAL RAINFALL (mm)= 212.00
RUNOFF COEFFICIENT = 0.71

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (0016)	Area	(ha)=	184.76		
ID= 1 DT= 5.0 min	Total Imp(%)=		34.00	Dir. Conn.(%)=	34.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	62.82	121.94	
Dep. Storage	(mm)=	1.50	4.00	
Average Slope	(%)=	0.70	0.70	
Length	(m)=	1109.83	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		53.00	47.03	
over (min)		15.00	30.00	
Storage Coeff.	(min)=	15.53 (ii)	28.61 (ii)	
Unit Hyd. Tpeak	(min)=	15.00	30.00	
Unit Hyd. peak	(cms)=	0.07	0.04	
				TOTALS
PEAK FLOW	(cms)=	9.03	13.67	22.262 (iii)
TIME TO PEAK	(hrs)=	10.00	10.25	10.08
RUNOFF VOLUME	(mm)=	210.50	152.41	172.16
TOTAL RAINFALL	(mm)=	212.00	212.00	212.00
RUNOFF COEFFICIENT	=	0.99	0.72	0.81

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 77.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| WILHYD   (  0070)|   Area    (ha)=  46.71   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 0.97
--------------------   U.H. Tp(hrs)=   0.82

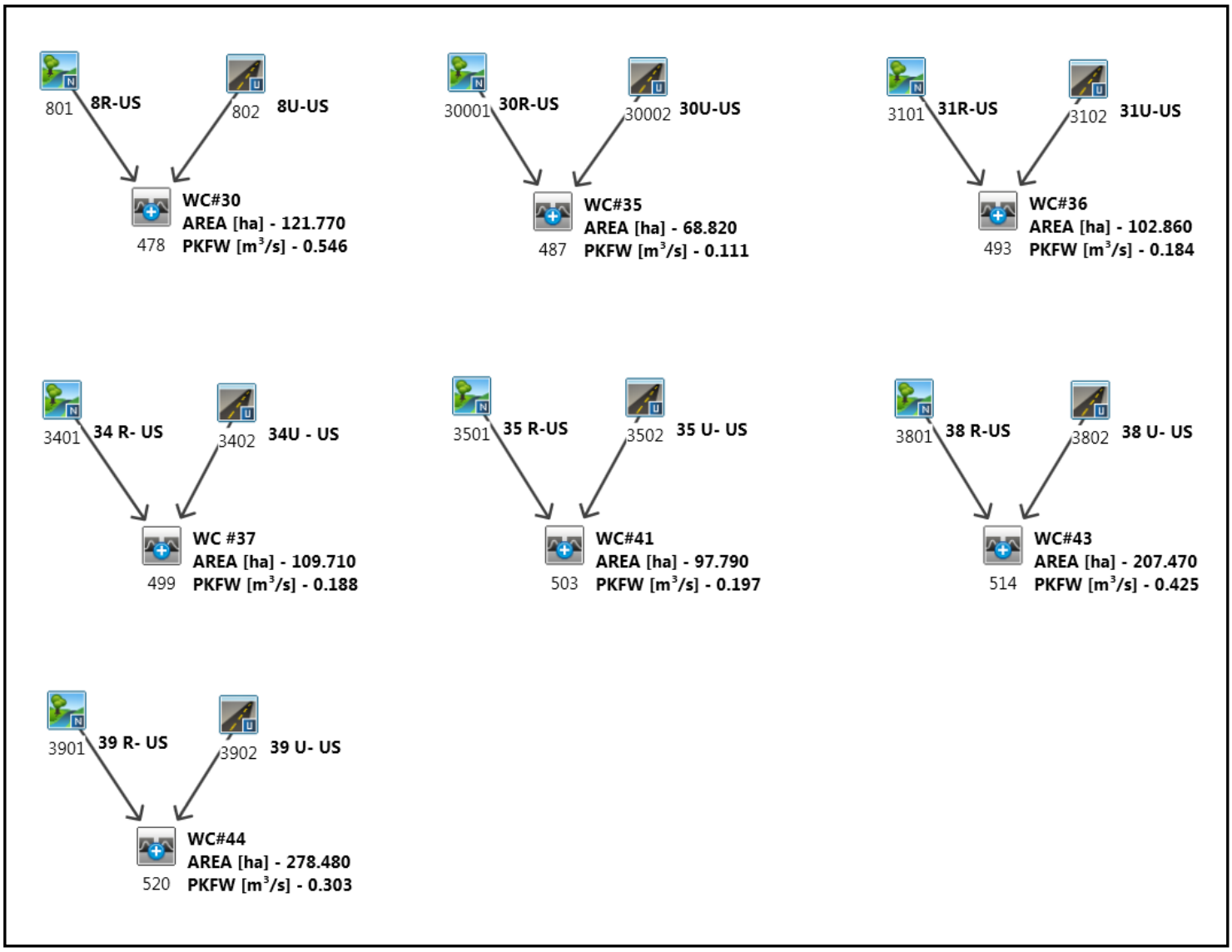
     U.H. peak       (cms)=   1.75

     PEAK FLOW       (cms)=   4.02 (i)
     TIME TO PEAK    (hrs)=  11.08
     RUNOFF VOLUME    (mm)= 150.37
     TOTAL RAINFALL   (mm)= 212.00
     RUNOFF COEFFICIENT   =   0.71

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------

 FINISH
================================================================================================================
```

VO2 Modelling Schematic 4.2: Visual Otthymo Modelling – Determination of Upstream Flows (Duffins)



```
       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
```


***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\d6ada9ac-d485-4e15-be02-671e9e98a383\7ba80486-3604-4a42-96eb-8e036ce1da9b\scenar
Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\d6ada9ac-d485-4e15-be02-671e9e98a383\7ba80486-3604-4a42-96eb-8e036ce1da9b\scenar

DATE: 10/07/2016 TIME: 09:48:05

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 1 **
****

CHICAGO STORM	Ptotal= 32.06 mm

IDF curve parameters: A= 424.160
B= 1.500
C= 0.723
used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step = 15.00 min
Time to peak ratio = 0.33

The CORRELATION coefficient is = 0.9996

TIME (min)	INPUT INT. (mm/hr)	TAB. INT. (mm/hr)
5.	118.10	109.60
10.	72.80	72.55
15.	54.80	55.88
30.	33.80	35.01
60.	20.80	21.59
120.	12.80	13.19
360.	5.90	6.00
720.	3.70	3.64
1440.	2.30	2.21

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	2.89	1.25	55.88	2.25	4.55	3.25	2.75
0.50	3.63	1.50	12.75	2.50	3.87	3.50	2.53
0.75	5.08	1.75	7.56	2.75	3.39	3.75	2.34
1.00	10.15	2.00	5.61	3.00	3.03	4.00	2.19

```
| CALIB            |
| NASHYD   (  0801)|   Area    (ha)= 116.91   Curve Number   (CN)= 71.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 1.50
-------------------   U.H. Tp(hrs)=   1.43

     Unit Hyd Qpeak  (cms)=   1.396

     PEAK FLOW       (cms)=   0.274 (i)
     TIME TO PEAK    (hrs)=   4.000
     RUNOFF VOLUME    (mm)=   5.563
     TOTAL RAINFALL   (mm)=  32.056
     RUNOFF COEFFICIENT   =   0.174

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0802)|   Area    (ha)=   4.86
|ID= 1 DT=15.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  65.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.64         1.22
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     180.00        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      55.88        11.18
               over (min)        15.00        30.00
     Storage Coeff.  (min)=       4.59 (ii)   25.46 (ii)
     Unit Hyd. Tpeak (min)=      15.00        30.00
     Unit Hyd. peak  (cms)=       0.11         0.04
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.48         0.02          0.485 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.50           1.25
     RUNOFF VOLUME    (mm)=      30.06         8.19          22.40
     TOTAL RAINFALL   (mm)=      32.06        32.06          32.06
     RUNOFF COEFFICIENT   =       0.94         0.26           0.70

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0478)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0801):   116.91   0.274     4.00     5.56
     + ID2= 2 (  0802):     4.86   0.485     1.25    22.40
       ================================================
       ID = 3 (  0478):   121.77   0.546     1.25     6.23

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   ( 30001)|   Area    (ha)=  67.84   Curve Number   (CN)= 71.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 1.50
-------------------   U.H. Tp(hrs)=   2.62

     Unit Hyd Qpeak  (cms)=   0.442

     PEAK FLOW       (cms)=   0.094 (i)
     TIME TO PEAK    (hrs)=   4.750
     RUNOFF VOLUME    (mm)=   5.582
     TOTAL RAINFALL   (mm)=  32.056
     RUNOFF COEFFICIENT   =   0.174

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD ( 30002)|   Area    (ha)=   0.98
|ID= 1 DT=15.0 min |   Total Imp(%)=  73.00   Dir. Conn.(%)=  62.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.72         0.26
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      80.83        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      55.88        10.87
               over (min)        15.00        30.00
     Storage Coeff.  (min)=       2.84 (ii)   23.94 (ii)
     Unit Hyd. Tpeak (min)=      15.00        30.00
     Unit Hyd. peak  (cms)=       0.11         0.04
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.09         0.01          0.096 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.50           1.25
     RUNOFF VOLUME    (mm)=      30.06         7.95          21.64
     TOTAL RAINFALL   (mm)=      32.06        32.06          32.06
     RUNOFF COEFFICIENT   =       0.94         0.25           0.68

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0487)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 ( 30001):    67.84   0.094     4.75     5.58
      + ID2= 2 ( 30002):     0.98   0.096     1.25    21.64
        ================================================
        ID = 3 (  0487):    68.82   0.111     1.25     5.81

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  3101)|   Area    (ha)= 101.28   Curve Number   (CN)= 72.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 1.50
--------------------   U.H. Tp(hrs)=   2.64

     Unit Hyd Qpeak  (cms)=   0.655

     PEAK FLOW       (cms)=   0.145 (i)
     TIME TO PEAK    (hrs)=   4.750
     RUNOFF VOLUME    (mm)=   5.803
     TOTAL RAINFALL   (mm)=  32.056
     RUNOFF COEFFICIENT   =   0.181

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  3102)|   Area    (ha)=   1.58
|ID= 1 DT=15.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  65.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.19         0.40
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     102.63        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      55.88        11.18
               over (min)        15.00        30.00
     Storage Coeff.  (min)=       3.27 (ii)   24.15 (ii)
     Unit Hyd. Tpeak (min)=      15.00        30.00
```

```
     Unit Hyd. peak  (cms)=       0.11         0.04
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.16         0.01          0.161 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.50           1.25
     RUNOFF VOLUME    (mm)=      30.06         8.19          22.40
     TOTAL RAINFALL   (mm)=      32.06        32.06          32.06
     RUNOFF COEFFICIENT   =       0.94         0.26           0.70

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0493)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  3101):   101.28   0.145     4.75     5.80
      + ID2= 2 (  3102):     1.58   0.161     1.25    22.40
        ================================================
        ID = 3 (  0493):   102.86   0.184     1.25     6.06

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  3401)|   Area    (ha)= 109.28   Curve Number   (CN)= 72.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 2.00
--------------------   U.H. Tp(hrs)=   3.33

     Unit Hyd Qpeak  (cms)=   0.852

     PEAK FLOW       (cms)=   0.188 (i)
     TIME TO PEAK    (hrs)=   5.250
     RUNOFF VOLUME    (mm)=   5.814
     TOTAL RAINFALL   (mm)=  32.056
     RUNOFF COEFFICIENT   =   0.181

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  3402)|   Area    (ha)=   0.43
|ID= 1 DT=15.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  65.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.32         0.11
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      53.54        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      55.88        10.75
                 over (min)      15.00        30.00
     Storage Coeff.  (min)=       2.22 (ii)   23.42 (ii)
     Unit Hyd. Tpeak (min)=      15.00        30.00
     Unit Hyd. peak  (cms)=       0.11         0.04
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.00          0.044 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.50           1.25
     RUNOFF VOLUME    (mm)=      30.06         7.91          22.28
     TOTAL RAINFALL   (mm)=      32.06        32.06          32.06
     RUNOFF COEFFICIENT   =       0.94         0.25           0.70

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
--------------------
| ADD HYD  (  0499)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  3401):   109.28   0.188     5.25     5.81
     + ID2= 2 (  3402):     0.43   0.044     1.25    22.28
       ================================================
       ID = 3 (  0499):   109.71   0.188     5.25     5.88

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  3501)|   Area    (ha)=  95.96   Curve Number   (CN)= 70.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 2.00
--------------------   U.H. Tp(hrs)=   3.11

     Unit Hyd Qpeak  (cms)=   0.801

     PEAK FLOW       (cms)=   0.163 (i)
     TIME TO PEAK    (hrs)=   5.250
     RUNOFF VOLUME    (mm)=   5.383
     TOTAL RAINFALL   (mm)=  32.056
     RUNOFF COEFFICIENT   =   0.168

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  3502)|   Area    (ha)=   1.83
|ID= 1 DT=15.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  65.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.37         0.46
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     110.45        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      55.88        10.75
               over (min)        15.00        30.00
     Storage Coeff.  (min)=       3.42 (ii)   24.62 (ii)
     Unit Hyd. Tpeak (min)=      15.00        30.00
     Unit Hyd. peak  (cms)=       0.11         0.04
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.18         0.01          0.187 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.50           1.25
     RUNOFF VOLUME    (mm)=      30.06         7.91          22.30
     TOTAL RAINFALL   (mm)=      32.06        32.06          32.06
     RUNOFF COEFFICIENT   =       0.94         0.25           0.70

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0503)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  3501):    95.96   0.163     5.25     5.38
     + ID2= 2 (  3502):     1.83   0.187     1.25    22.30
       ================================================
       ID = 3 (  0503):    97.79   0.197     1.25     5.70

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
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```
| NASHYD   (  3801)|   Area    (ha)= 203.73   Curve Number   (CN)= 70.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 1.50
-------------------   U.H. Tp(hrs)=   2.44

     Unit Hyd Qpeak  (cms)=   1.425

     PEAK FLOW       (cms)=   0.291 (i)
     TIME TO PEAK    (hrs)=   4.500
     RUNOFF VOLUME    (mm)=   5.371
     TOTAL RAINFALL   (mm)=  32.056
     RUNOFF COEFFICIENT   =   0.168

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-------------------
| CALIB             |
| STANDHYD (  3802)|   Area    (ha)=   3.74
|ID= 1 DT=15.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  65.00
-------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.81          0.94
     Dep. Storage     (mm)=       2.00          5.00
     Average Slope     (%)=       1.00          1.00
     Length            (m)=     157.90         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=      55.88         12.59
               over (min)        15.00         30.00
     Storage Coeff.  (min)=       4.24 (ii)    24.14 (ii)
     Unit Hyd. Tpeak (min)=      15.00         30.00
     Unit Hyd. peak  (cms)=       0.11          0.04
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.37          0.02          0.377 (iii)
     TIME TO PEAK    (hrs)=       1.25          1.50           1.25
     RUNOFF VOLUME    (mm)=      30.06          9.12          22.72
     TOTAL RAINFALL   (mm)=      32.06         32.06          32.06
     RUNOFF COEFFICIENT   =       0.94          0.28           0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

-------------------
| ADD HYD  (  0514)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
-------------------           (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  3801):   203.73   0.291     4.50     5.37
     + ID2= 2 (  3802):     3.74   0.377     1.25    22.72
       ================================================
       ID = 3 (  0514):   207.47   0.425     1.25     5.68

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
-------------------
| CALIB             |
| NASHYD   (  3901)|   Area    (ha)= 277.61   Curve Number   (CN)= 70.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 1.50
-------------------   U.H. Tp(hrs)=   3.25

     Unit Hyd Qpeak  (cms)=   1.458

     PEAK FLOW       (cms)=   0.303 (i)
     TIME TO PEAK    (hrs)=   5.250
     RUNOFF VOLUME    (mm)=   5.376
     TOTAL RAINFALL   (mm)=  32.056
     RUNOFF COEFFICIENT   =   0.168

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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```
| CALIB            |
| STANDHYD (  3902)|   Area    (ha)=   0.87
|ID= 1 DT=15.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  65.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.65         0.22
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      76.16        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      55.88        10.75
               over (min)        15.00        30.00
     Storage Coeff.  (min)=       2.74 (ii)   23.94 (ii)
     Unit Hyd. Tpeak (min)=      15.00        30.00
     Unit Hyd. peak  (cms)=       0.11         0.04
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.09         0.00          0.089 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.50           1.25
     RUNOFF VOLUME    (mm)=      30.06         7.91          22.29
     TOTAL RAINFALL   (mm)=      32.06        32.06          32.06
     RUNOFF COEFFICIENT   =       0.94         0.25           0.70

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0520)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  3901):   277.61   0.303     5.25     5.38
     + ID2= 2 (  3902):     0.87   0.089     1.25    22.29
       ================================================
       ID = 3 (  0520):   278.48   0.303     5.25     5.43

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
================================================================================================================

       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

  Output  filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\d6ada9ac-d485-4e15-be02-671e9e98a383\78c5e424-7dc4-4056-9b7c-027f512d30f
4\scenar
  Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\d6ada9ac-d485-4e15-be02-671e9e98a383\78c5e424-7dc4-4056-9b7c-027f512d30f
4\scenar


DATE: 10/07/2016                          TIME: 09:48:05

USER:
```

COMMENTS: _____

```
---------------------------------------------------------------------------------------------------------
  ***************************
  ** SIMULATION NUMBER:   2 **
  ***************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 578.969
| Ptotal= 42.81 mm |                          B=   1.508
--------------------                          C=   0.727
                         used in:   INTENSITY =  A / (t + B)^C

                         Duration of storm  =  4.00 hrs
                         Storm time step    = 15.00 min
                         Time to peak ratio =  0.33

                      The CORRELATION coefficient is = 0.9997

                       TIME       INPUT INT.           TAB. INT.
                      (min)        (mm/hr)              (mm/hr)
                         5.         159.00               148.35
                        10.          98.00                98.02
                        15.          73.80                75.40
                        30.          45.50                47.13
                        60.          28.00                28.98
                       120.          17.20                17.67
                       360.           8.00                 8.00
                       720.           4.90                 4.84
                      1440.           3.00                 2.93


                  TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                   hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                  0.25    3.81 |  1.25   75.40 |  2.25    6.02 |  3.25    3.63
                  0.50    4.79 |  1.50   16.99 |  2.50    5.11 |  3.50    3.33
                  0.75    6.72 |  1.75   10.03 |  2.75    4.48 |  3.75    3.09
                  1.00   13.50 |  2.00    7.43 |  3.00    4.00 |  4.00    2.88


---------------------------------------------------------------------------
--------------------
| CALIB              |
| NASHYD   (  0801)|   Area    (ha)= 116.91   Curve Number   (CN)= 71.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 1.50
--------------------   U.H. Tp(hrs)=   1.43

     Unit Hyd Qpeak  (cms)=   1.396

     PEAK FLOW       (cms)=   0.492 (i)
     TIME TO PEAK    (hrs)=   4.000
     RUNOFF VOLUME    (mm)=  10.036
     TOTAL RAINFALL   (mm)=  42.805
     RUNOFF COEFFICIENT   =   0.234

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

---------------------------------------------------------------------------
--------------------
| CALIB              |
| STANDHYD (  0802)|   Area    (ha)=   4.86
|ID= 1 DT=15.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  65.00
--------------------

                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.64          1.22
     Dep. Storage     (mm)=       2.00          5.00
     Average Slope     (%)=       1.00          1.00
     Length            (m)=     180.00         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=      75.40         29.43
               over (min)        15.00         30.00
     Storage Coeff.  (min)=       4.07 (ii)    18.24 (ii)
     Unit Hyd. Tpeak (min)=      15.00         30.00
     Unit Hyd. peak  (cms)=       0.11          0.05
                                                    *TOTALS*
```

PEAK FLOW	(cms)=	0.65	0.05	0.671 (iii)
TIME TO PEAK	(hrs)=	1.25	1.50	1.25
RUNOFF VOLUME	(mm)=	40.81	14.02	31.43
TOTAL RAINFALL	(mm)=	42.81	42.81	42.81
RUNOFF COEFFICIENT	=	0.95	0.33	0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0478)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0801):	116.91	0.492	4.00	10.04
+ ID2= 2 (0802):	4.86	0.671	1.25	31.43
ID = 3 (0478):	121.77	0.795	1.25	10.89

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB
NASHYD (30001)
ID= 1 DT=15.0 min

Area (ha)= 67.84 Curve Number (CN)= 71.0
Ia (mm)= 5.00 # of Linear Res.(N)= 1.50
U.H. Tp(hrs)= 2.62

Unit Hyd Qpeak (cms)= 0.442

PEAK FLOW	(cms)=	0.170 (i)
TIME TO PEAK	(hrs)=	4.750
RUNOFF VOLUME	(mm)=	10.072
TOTAL RAINFALL	(mm)=	42.805
RUNOFF COEFFICIENT	=	0.235

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (30002)
ID= 1 DT=15.0 min

Area (ha)= 0.98
Total Imp(%)= 73.00 Dir. Conn.(%)= 62.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.72	0.26	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	80.83	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		75.40	28.66	
over (min)		15.00	30.00	
Storage Coeff. (min)=		2.52 (ii)	16.84 (ii)	
Unit Hyd. Tpeak (min)=		15.00	30.00	
Unit Hyd. peak (cms)=		0.11	0.05	
				TOTALS
PEAK FLOW	(cms)=	0.13	0.01	0.132 (iii)
TIME TO PEAK	(hrs)=	1.25	1.50	1.25
RUNOFF VOLUME	(mm)=	40.81	13.64	30.47
TOTAL RAINFALL	(mm)=	42.81	42.81	42.81
RUNOFF COEFFICIENT	=	0.95	0.32	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
--------------------
| ADD HYD  (  0487)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 ( 30001):    67.84   0.170     4.75    10.07
     + ID2= 2 ( 30002):     0.98   0.132     1.25    30.47
       ================================================
       ID = 3 (  0487):    68.82   0.173     4.00    10.36

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  3101)|   Area    (ha)= 101.28   Curve Number   (CN)= 72.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 1.50
--------------------   U.H. Tp(hrs)=   2.64

     Unit Hyd Qpeak  (cms)=   0.655

     PEAK FLOW       (cms)=   0.262 (i)
     TIME TO PEAK    (hrs)=   4.750
     RUNOFF VOLUME    (mm)=  10.439
     TOTAL RAINFALL   (mm)=  42.805
     RUNOFF COEFFICIENT   =   0.244

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  3102)|   Area    (ha)=   1.58
|ID= 1 DT=15.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  65.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.19         0.40
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     102.63        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      75.40        29.43
               over (min)        15.00        30.00
     Storage Coeff.  (min)=       2.91 (ii)   17.08 (ii)
     Unit Hyd. Tpeak (min)=      15.00        30.00
     Unit Hyd. peak  (cms)=       0.11         0.05
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.21         0.02          0.222 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.50           1.25
     RUNOFF VOLUME    (mm)=      40.81        14.02          31.42
     TOTAL RAINFALL   (mm)=      42.81        42.81          42.81
     RUNOFF COEFFICIENT   =       0.95         0.33           0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0493)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  3101):   101.28   0.262     4.75    10.44
     + ID2= 2 (  3102):     1.58   0.222     1.25    31.42
       ================================================
       ID = 3 (  0493):   102.86   0.268     1.25    10.76

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  3401)|   Area    (ha)= 109.28   Curve Number   (CN)= 72.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 2.00
```

```
--------------------   U.H. Tp(hrs)=   3.33

     Unit Hyd Qpeak  (cms)=   0.852

     PEAK FLOW       (cms)=   0.338 (i)
     TIME TO PEAK    (hrs)=   5.250
     RUNOFF VOLUME    (mm)=  10.459
     TOTAL RAINFALL   (mm)=  42.805
     RUNOFF COEFFICIENT   =   0.244

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  3402)|   Area    (ha)=   0.43
|ID= 1 DT=15.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  65.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.32         0.11
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      53.54        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      75.40        28.36
               over (min)        15.00        30.00
     Storage Coeff.  (min)=       1.97 (ii)   16.35 (ii)
     Unit Hyd. Tpeak (min)=      15.00        30.00
     Unit Hyd. peak  (cms)=       0.11         0.05
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.06         0.00          0.061 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.50           1.25
     RUNOFF VOLUME    (mm)=      40.81        13.58          31.25
     TOTAL RAINFALL   (mm)=      42.81        42.81          42.81
     RUNOFF COEFFICIENT   =       0.95         0.32           0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0499)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  3401):   109.28   0.338     5.25    10.46
      + ID2= 2 (  3402):     0.43   0.061     1.25    31.25
        ================================================
        ID = 3 (  0499):   109.71   0.338     5.25    10.54

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  3501)|   Area    (ha)=  95.96   Curve Number   (CN)= 70.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 2.00
--------------------   U.H. Tp(hrs)=   3.11

     Unit Hyd Qpeak  (cms)=   0.801

     PEAK FLOW       (cms)=   0.294 (i)
     TIME TO PEAK    (hrs)=   5.000
     RUNOFF VOLUME    (mm)=   9.740
     TOTAL RAINFALL   (mm)=  42.805
     RUNOFF COEFFICIENT   =   0.228

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  3502)|   Area    (ha)=   1.83
```

|ID= 1 DT=15.0 min | Total Imp(%)= 75.00 Dir. Conn.(%)= 65.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	1.37	0.46	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	110.45	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		75.40	28.36	
over (min)		15.00	30.00	
Storage Coeff.	(min)=	3.04 (ii)	17.42 (ii)	
Unit Hyd. Tpeak	(min)=	15.00	30.00	
Unit Hyd. peak	(cms)=	0.11	0.05	
				TOTALS
PEAK FLOW	(cms)=	0.25	0.02	0.256 (iii)
TIME TO PEAK	(hrs)=	1.25	1.50	1.25
RUNOFF VOLUME	(mm)=	40.81	13.58	31.27
TOTAL RAINFALL	(mm)=	42.81	42.81	42.81
RUNOFF COEFFICIENT	=	0.95	0.32	0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0503)|	AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (3501):		95.96	0.294	5.00	9.74
+ ID2= 2 (3502):		1.83	0.256	1.25	31.27
ID = 3 (0503):		97.79	0.294	5.00	10.14

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB	
NASHYD (3801)|	Area (ha)= 203.73 Curve Number (CN)= 70.0
ID= 1 DT=15.0 min		Ia (mm)= 5.00 # of Linear Res.(N)= 1.50
		U.H. Tp(hrs)= 2.44

Unit Hyd Qpeak (cms)= 1.425

PEAK FLOW (cms)= 0.527 (i)
TIME TO PEAK (hrs)= 4.500
RUNOFF VOLUME (mm)= 9.719
TOTAL RAINFALL (mm)= 42.805
RUNOFF COEFFICIENT = 0.227

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (3802)|	Area (ha)= 3.74
ID= 1 DT=15.0 min		Total Imp(%)= 75.00 Dir. Conn.(%)= 65.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	2.81	0.94	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	157.90	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		75.40	32.97	
over (min)		15.00	30.00	
Storage Coeff.	(min)=	3.76 (ii)	17.30 (ii)	
Unit Hyd. Tpeak	(min)=	15.00	30.00	
Unit Hyd. peak	(cms)=	0.11	0.05	
				TOTALS
PEAK FLOW	(cms)=	0.50	0.05	0.522 (iii)

```
     TIME TO PEAK    (hrs)=       1.25         1.50          1.25
     RUNOFF VOLUME    (mm)=      40.81        15.44         31.92
     TOTAL RAINFALL   (mm)=      42.81        42.81         42.81
     RUNOFF COEFFICIENT   =       0.95         0.36          0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0514)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  3801):   203.73   0.527     4.50     9.72
     + ID2= 2 (  3802):     3.74   0.522     1.25    31.92
       ================================================
       ID = 3 (  0514):   207.47   0.618     1.25    10.12

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  3901)|   Area    (ha)= 277.61   Curve Number   (CN)= 70.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 1.50
--------------------   U.H. Tp(hrs)=   3.25

     Unit Hyd Qpeak  (cms)=   1.458

     PEAK FLOW       (cms)=   0.549 (i)
     TIME TO PEAK    (hrs)=   5.250
     RUNOFF VOLUME    (mm)=   9.728
     TOTAL RAINFALL   (mm)=  42.805
     RUNOFF COEFFICIENT   =   0.227

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  3902)|   Area    (ha)=   0.87
|ID= 1 DT=15.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  65.00
--------------------

                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.65         0.22
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      76.16        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      75.40        28.36
               over (min)        15.00        30.00
     Storage Coeff.  (min)=       2.43 (ii)   16.81 (ii)
     Unit Hyd. Tpeak (min)=      15.00        30.00
     Unit Hyd. peak  (cms)=       0.11         0.05
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.12         0.01          0.122 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.50           1.25
     RUNOFF VOLUME    (mm)=      40.81        13.58          31.26
     TOTAL RAINFALL   (mm)=      42.81        42.81          42.81
     RUNOFF COEFFICIENT   =       0.95         0.32           0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| ADD HYD  (  0520)|
|   1 +  2 =  3    |          AREA     QPEAK     TPEAK      R.V.
-------------------            (ha)     (cms)     (hrs)      (mm)
       ID1= 1 (  3901):    277.61    0.549      5.25      9.73
     + ID2= 2 (  3902):      0.87    0.122      1.25     31.26
       ================================================
       ID = 3 (  0520):    278.48    0.549      5.25      9.80

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

```
      V    V   I    SSSSS  U   U    A    L
      V    V   I    SS     U   U   A A   L
       V  V    I     SS    U   U  AAAAA  L
       V  V    I      SS   U   U  A   A  L
        VV     I    SSSSS  UUUUU  A   A  LLLLL

       OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
      O   O    T      T    H   H   Y Y   MM MM  O   O
      O   O    T      T    H   H    Y    M   M  O   O
       OOO     T      T    H   H    Y    M   M   OOO
```

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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\d6ada9ac-d485-4e15-be02-671e9e98a383\bee95df8-b291-443b-9222-90593c753ea7\scenar
Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\d6ada9ac-d485-4e15-be02-671e9e98a383\bee95df8-b291-443b-9222-90593c753ea7\scenar

DATE: 10/07/2016 TIME: 09:48:06

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 3 **
****

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-------------------
| CHICAGO STORM    |    IDF curve parameters: A= 665.492
| Ptotal= 50.29 mm |                          B=   1.500
-------------------                          C=   0.723
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  4.00 hrs
                       Storm time step    = 15.00 min
                       Time to peak ratio =  0.33

                     The CORRELATION coefficient is = 0.9996

                      TIME       INPUT INT.          TAB. INT.
                     (min)        (mm/hr)             (mm/hr)
                        5.         185.30              171.95
                       10.         114.20              113.83
                       15.          86.10               87.68
                       30.          53.00               54.94
                       60.          32.70               33.87
                      120.          20.20               20.70
                      360.           9.40                9.41
                      720.           5.80                5.71
                     1440.           3.60                3.46
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	4.54	1.25	87.68	2.25	7.14	3.25	4.32
0.50	5.69	1.50	20.01	2.50	6.08	3.50	3.97
0.75	7.97	1.75	11.86	2.75	5.32	3.75	3.68
1.00	15.92	2.00	8.81	3.00	4.76	4.00	3.43

CALIB NASHYD (0801) | ID= 1 DT=15.0 min	Area (ha)= 116.91 Curve Number (CN)= 71.0 Ia (mm)= 5.00 # of Linear Res.(N)= 1.50 U.H. Tp(hrs)= 1.43

Unit Hyd Qpeak (cms)= 1.396

PEAK FLOW (cms)= 0.670 (i)
TIME TO PEAK (hrs)= 4.000
RUNOFF VOLUME (mm)= 13.683
TOTAL RAINFALL (mm)= 50.294
RUNOFF COEFFICIENT = 0.272

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (0802) | ID= 1 DT=15.0 min	Area (ha)= 4.86 Total Imp(%)= 75.00 Dir. Conn.(%)= 65.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	3.64	1.22	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	180.00	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		87.68	39.70	
over (min)		15.00	30.00	
Storage Coeff.	(min)=	3.83 (ii)	16.40 (ii)	
Unit Hyd. Tpeak	(min)=	15.00	30.00	
Unit Hyd. peak	(cms)=	0.11	0.05	
				TOTALS
PEAK FLOW	(cms)=	0.76	0.07	0.790 (iii)
TIME TO PEAK	(hrs)=	1.25	1.50	1.25
RUNOFF VOLUME	(mm)=	48.29	18.61	37.90
TOTAL RAINFALL	(mm)=	50.29	50.29	50.29
RUNOFF COEFFICIENT	=	0.96	0.37	0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0478) | 1 + 2 = 3 |	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0801):	116.91	0.670	4.00	13.68
+ ID2= 2 (0802):	4.86	0.790	1.25	37.90
ID = 3 (0478):	121.77	0.966	1.25	14.65

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB NASHYD (30001) | ID= 1 DT=15.0 min	Area (ha)= 67.84 Curve Number (CN)= 71.0 Ia (mm)= 5.00 # of Linear Res.(N)= 1.50 U.H. Tp(hrs)= 2.62

```
     Unit Hyd Qpeak  (cms)=   0.442

     PEAK FLOW       (cms)=   0.232 (i)
     TIME TO PEAK    (hrs)=   4.750
     RUNOFF VOLUME    (mm)=  13.731
     TOTAL RAINFALL   (mm)=  50.294
     RUNOFF COEFFICIENT   =   0.273

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD ( 30002)|   Area    (ha)=   0.98
|ID= 1 DT=15.0 min |   Total Imp(%)=  73.00   Dir. Conn.(%)=  62.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.72         0.26
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      80.83        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      87.68        38.71
               over (min)        15.00        30.00
     Storage Coeff.  (min)=       2.37 (ii)   15.07 (ii)
     Unit Hyd. Tpeak (min)=      15.00        30.00
     Unit Hyd. peak  (cms)=       0.11         0.05
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.15         0.02          0.155 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.50           1.25
     RUNOFF VOLUME    (mm)=      48.29        18.14          36.82
     TOTAL RAINFALL   (mm)=      50.29        50.29          50.29
     RUNOFF COEFFICIENT   =       0.96         0.36           0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0487)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 ( 30001):    67.84   0.232     4.75    13.73
     + ID2= 2 ( 30002):     0.98   0.155     1.25    36.82
       ================================================
       ID = 3 (  0487):    68.82   0.235     4.00    14.06

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| NASHYD   (  3101)|   Area    (ha)= 101.28   Curve Number   (CN)= 72.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 1.50
--------------------   U.H. Tp(hrs)=   2.64

     Unit Hyd Qpeak  (cms)=   0.655

     PEAK FLOW       (cms)=   0.356 (i)
     TIME TO PEAK    (hrs)=   4.750
     RUNOFF VOLUME    (mm)=  14.206
     TOTAL RAINFALL   (mm)=  50.294
     RUNOFF COEFFICIENT   =   0.282

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  3102)|   Area    (ha)=   1.58
|ID= 1 DT=15.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  65.00
--------------------
```

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	1.19	0.40	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	102.63	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		87.68	39.70	
over (min)		15.00	30.00	
Storage Coeff.	(min)=	2.73 (ii)	15.31 (ii)	
Unit Hyd. Tpeak	(min)=	15.00	30.00	
Unit Hyd. peak	(cms)=	0.11	0.05	
				TOTALS
PEAK FLOW	(cms)=	0.25	0.02	0.261 (iii)
TIME TO PEAK	(hrs)=	1.25	1.50	1.25
RUNOFF VOLUME	(mm)=	48.29	18.61	37.90
TOTAL RAINFALL	(mm)=	50.29	50.29	50.29
RUNOFF COEFFICIENT	=	0.96	0.37	0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0493)		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
1 + 2 = 3	ID1= 1 (3101):	101.28	0.356	4.75	14.21
	+ ID2= 2 (3102):	1.58	0.261	1.25	37.90
	ID = 3 (0493):	102.86	0.360	4.00	14.57

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB NASHYD (3401) ID= 1 DT=15.0 min			
Area	(ha)= 109.28	Curve Number	(CN)= 72.0
Ia	(mm)= 5.00	# of Linear Res.(N)= 2.00	
U.H. Tp(hrs)=	3.33		

Unit Hyd Qpeak (cms)= 0.852

PEAK FLOW (cms)= 0.460 (i)
TIME TO PEAK (hrs)= 5.250
RUNOFF VOLUME (mm)= 14.233
TOTAL RAINFALL (mm)= 50.294
RUNOFF COEFFICIENT = 0.283

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (3402) ID= 1 DT=15.0 min			
Area	(ha)= 0.43		
Total Imp(%)=	75.00	Dir. Conn.(%)=	65.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.32	0.11	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	53.54	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		87.68	38.32	
over (min)		15.00	15.00	
Storage Coeff.	(min)=	1.85 (ii)	14.60 (ii)	
Unit Hyd. Tpeak	(min)=	15.00	15.00	
Unit Hyd. peak	(cms)=	0.11	0.07	
				TOTALS
PEAK FLOW	(cms)=	0.07	0.01	0.076 (iii)
TIME TO PEAK	(hrs)=	1.25	1.25	1.25
RUNOFF VOLUME	(mm)=	48.29	18.07	37.70

```
     TOTAL RAINFALL   (mm)=      50.29        50.29          50.29
     RUNOFF COEFFICIENT   =       0.96         0.36           0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0499)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  3401):   109.28   0.460     5.25    14.23
     + ID2= 2 (  3402):     0.43   0.076     1.25    37.70
       ================================================
       ID = 3 (  0499):   109.71   0.460     5.25    14.33

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  3501)|   Area    (ha)=  95.96   Curve Number   (CN)= 70.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 2.00
--------------------   U.H. Tp(hrs)=   3.11

     Unit Hyd Qpeak  (cms)=   0.801

     PEAK FLOW       (cms)=   0.402 (i)
     TIME TO PEAK    (hrs)=   5.000
     RUNOFF VOLUME    (mm)=  13.302
     TOTAL RAINFALL   (mm)=  50.294
     RUNOFF COEFFICIENT   =   0.264

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  3502)|   Area    (ha)=   1.83
|ID= 1 DT=15.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  65.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.37         0.46
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     110.45        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      87.68        38.32
               over (min)        15.00        30.00
     Storage Coeff.  (min)=       2.86 (ii)   15.61 (ii)
     Unit Hyd. Tpeak (min)=      15.00        30.00
     Unit Hyd. peak  (cms)=       0.11         0.05
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.29         0.03          0.301 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.50           1.25
     RUNOFF VOLUME    (mm)=      48.29        18.07          37.71
     TOTAL RAINFALL   (mm)=      50.29        50.29          50.29
     RUNOFF COEFFICIENT   =       0.96         0.36           0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0503)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
```

	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (3501):	95.96	0.402	5.00	13.30
+ ID2= 2 (3502):	1.83	0.301	1.25	37.71
ID = 3 (0503):	97.79	0.402	5.00	13.76

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB NASHYD (3801) | ID= 1 DT=15.0 min	Area (ha)= 203.73	Curve Number (CN)= 70.0
	Ia (mm)= 5.00	# of Linear Res.(N)= 1.50
	U.H. Tp(hrs)= 2.44	

Unit Hyd Qpeak (cms)= 1.425

PEAK FLOW (cms)= 0.720 (i)
TIME TO PEAK (hrs)= 4.500
RUNOFF VOLUME (mm)= 13.273
TOTAL RAINFALL (mm)= 50.294
RUNOFF COEFFICIENT = 0.264

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (3802) | ID= 1 DT=15.0 min	Area (ha)= 3.74	
	Total Imp(%)= 75.00	Dir. Conn.(%)= 65.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	2.81	0.94	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	157.90	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		87.68	44.21	
over (min)		15.00	30.00	
Storage Coeff.	(min)=	3.54 (ii)	15.59 (ii)	
Unit Hyd. Tpeak	(min)=	15.00	30.00	
Unit Hyd. peak	(cms)=	0.11	0.05	
				TOTALS
PEAK FLOW	(cms)=	0.59	0.06	0.615 (iii)
TIME TO PEAK	(hrs)=	1.25	1.50	1.25
RUNOFF VOLUME	(mm)=	48.29	20.36	38.52
TOTAL RAINFALL	(mm)=	50.29	50.29	50.29
RUNOFF COEFFICIENT	=	0.96	0.40	0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0514)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (3801):	203.73	0.720	4.50	13.27
+ ID2= 2 (3802):	3.74	0.615	1.25	38.52
ID = 3 (0514):	207.47	0.751	1.25	13.73

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB NASHYD (3901) | ID= 1 DT=15.0 min	Area (ha)= 277.61	Curve Number (CN)= 70.0
	Ia (mm)= 5.00	# of Linear Res.(N)= 1.50
	U.H. Tp(hrs)= 3.25	

Unit Hyd Qpeak (cms)= 1.458

```
     PEAK FLOW       (cms)=   0.749 (i)
     TIME TO PEAK    (hrs)=   5.250
     RUNOFF VOLUME    (mm)=  13.285
     TOTAL RAINFALL   (mm)=  50.294
     RUNOFF COEFFICIENT   =   0.264

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  3902)|   Area    (ha)=   0.87
|ID= 1 DT=15.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  65.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.65         0.22
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      76.16        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      87.68        38.32
                 over (min)      15.00        30.00
     Storage Coeff.  (min)=       2.29 (ii)   15.04 (ii)
     Unit Hyd. Tpeak (min)=      15.00        30.00
     Unit Hyd. peak  (cms)=       0.11         0.05
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.14         0.01          0.144 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.50           1.25
     RUNOFF VOLUME    (mm)=      48.29        18.07          37.70
     TOTAL RAINFALL   (mm)=      50.29        50.29          50.29
     RUNOFF COEFFICIENT   =       0.96         0.36           0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0520)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  3901):   277.61   0.749     5.25    13.29
     + ID2= 2 (  3902):     0.87   0.144     1.25    37.70
       ================================================
       ID = 3 (  0520):   278.48   0.749     5.25    13.36

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
================================================================================================================================

       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

  Output  filename:
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C:\Users\p002311c\AppData\Local\CEG\VO3\d6ada9ac-d485-4e15-be02-671e9e98a383\2ccbe2d1-160d-45fe-8dd0-9e4681c487e2\scenar
  Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\d6ada9ac-d485-4e15-be02-671e9e98a383\2ccbe2d1-160d-45fe-8dd0-9e4681c487e2\scenar

DATE: 10/07/2016 TIME: 09:48:06

USER:

COMMENTS: _____

  ****
  ** SIMULATION NUMBER: 4 **
  ****

| CHICAGO STORM | Ptotal= 59.25 mm |

IDF curve parameters: A= 792.607
B= 1.500
C= 0.725
used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step = 15.00 min
Time to peak ratio = 0.33

The CORRELATION coefficient is = 0.9997

TIME (min)	INPUT INT. (mm/hr)	TAB. INT. (mm/hr)
5.	219.20	204.03
10.	135.10	134.91
15.	101.70	103.84
30.	62.70	64.98
60.	38.60	40.01
120.	23.80	24.42
360.	11.00	11.08
720.	6.80	6.71
1440.	4.20	4.06

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	5.31	1.25	103.84	2.25	8.37	3.25	5.06
0.50	6.67	1.50	23.54	2.50	7.12	3.50	4.64
0.75	9.34	1.75	13.92	2.75	6.23	3.75	4.30
1.00	18.72	2.00	10.33	3.00	5.57	4.00	4.01

| CALIB | NASHYD (0801) | ID= 1 DT=15.0 min |

Area (ha)= 116.91 Curve Number (CN)= 71.0
Ia (mm)= 5.00 # of Linear Res.(N)= 1.50
U.H. Tp(hrs)= 1.43

Unit Hyd Qpeak (cms)= 1.396

PEAK FLOW (cms)= 0.905 (i)
TIME TO PEAK (hrs)= 4.000
RUNOFF VOLUME (mm)= 18.514
TOTAL RAINFALL (mm)= 59.248
RUNOFF COEFFICIENT = 0.312

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB | STANDHYD (0802) | ID= 1 DT=15.0 min |

Area (ha)= 4.86
Total Imp(%)= 75.00 Dir. Conn.(%)= 65.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	3.64	1.22

```
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     180.00        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     103.84        54.08
               over (min)       15.00        15.00
     Storage Coeff.  (min)=       3.58 (ii)   14.69 (ii)
     Unit Hyd. Tpeak (min)=      15.00        15.00
     Unit Hyd. peak  (cms)=       0.11         0.07
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.90         0.12          1.019 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.25           1.25
     RUNOFF VOLUME    (mm)=      57.25        24.56          45.80
     TOTAL RAINFALL   (mm)=      59.25        59.25          59.25
     RUNOFF COEFFICIENT   =       0.97         0.41           0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0478)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0801):   116.91   0.905     4.00    18.51
     + ID2= 2 (  0802):     4.86   1.019     1.25    45.80
       ================================================
       ID = 3 (  0478):   121.77   1.268     1.25    19.60

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   ( 30001)|   Area    (ha)=  67.84   Curve Number   (CN)= 71.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 1.50
--------------------   U.H. Tp(hrs)=   2.62

     Unit Hyd Qpeak  (cms)=   0.442

     PEAK FLOW       (cms)=   0.314 (i)
     TIME TO PEAK    (hrs)=   4.750
     RUNOFF VOLUME    (mm)=  18.581
     TOTAL RAINFALL   (mm)=  59.248
     RUNOFF COEFFICIENT   =   0.314

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD ( 30002)|   Area    (ha)=   0.98
|ID= 1 DT=15.0 min |   Total Imp(%)=  73.00   Dir. Conn.(%)=  62.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.72         0.26
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      80.83        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     103.84        52.82
               over (min)       15.00        15.00
     Storage Coeff.  (min)=       2.21 (ii)   13.43 (ii)
     Unit Hyd. Tpeak (min)=      15.00        15.00
     Unit Hyd. peak  (cms)=       0.11         0.08
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.18         0.03          0.202 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.25           1.25
     RUNOFF VOLUME    (mm)=      57.25        23.97          44.60
     TOTAL RAINFALL   (mm)=      59.25        59.25          59.25
     RUNOFF COEFFICIENT   =       0.97         0.40           0.75
```

```
***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0487)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 ( 30001):    67.84   0.314     4.75    18.58
     + ID2= 2 ( 30002):     0.98   0.202     1.25    44.60
       ================================================
       ID = 3 (  0487):    68.82   0.317     4.00    18.95

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  3101)|   Area    (ha)= 101.28   Curve Number   (CN)= 72.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 1.50
--------------------   U.H. Tp(hrs)=   2.64

     Unit Hyd Qpeak  (cms)=   0.655

     PEAK FLOW       (cms)=   0.481 (i)
     TIME TO PEAK    (hrs)=   4.750
     RUNOFF VOLUME    (mm)=  19.185
     TOTAL RAINFALL   (mm)=  59.248
     RUNOFF COEFFICIENT   =   0.324

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  3102)|   Area    (ha)=   1.58
|ID= 1 DT=15.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  65.00
--------------------

                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.19         0.40
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     102.63        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     103.84        54.08
               over (min)        15.00        15.00
     Storage Coeff.  (min)=       2.56 (ii)   13.67 (ii)
     Unit Hyd. Tpeak (min)=      15.00        15.00
     Unit Hyd. peak  (cms)=       0.11         0.08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.30         0.04          0.336 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.25           1.25
     RUNOFF VOLUME    (mm)=      57.25        24.56          45.80
     TOTAL RAINFALL   (mm)=      59.25        59.25          59.25
     RUNOFF COEFFICIENT   =       0.97         0.41           0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0493)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  3101):   101.28   0.481     4.75    19.18
```

```
      + ID2= 2 (  3102):     1.58   0.336     1.25    45.80
        ================================================
        ID = 3 (  0493):   102.86   0.485     4.00    19.59

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  3401)|   Area    (ha)= 109.28   Curve Number   (CN)= 72.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 2.00
--------------------   U.H. Tp(hrs)=   3.33

     Unit Hyd Qpeak  (cms)=   0.852

     PEAK FLOW       (cms)=   0.622 (i)
     TIME TO PEAK    (hrs)=   5.250
     RUNOFF VOLUME    (mm)=  19.222
     TOTAL RAINFALL   (mm)=  59.248
     RUNOFF COEFFICIENT   =   0.324

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  3402)|   Area    (ha)=   0.43
|ID= 1 DT=15.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  65.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.32         0.11
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      53.54        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     103.84        52.31
                over (min)       15.00        15.00
     Storage Coeff.  (min)=       1.73 (ii)   12.99 (ii)
     Unit Hyd. Tpeak (min)=      15.00        15.00
     Unit Hyd. peak  (cms)=       0.11         0.08
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.08         0.01          0.091 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.25           1.25
     RUNOFF VOLUME    (mm)=      57.25        23.89          45.56
     TOTAL RAINFALL   (mm)=      59.25        59.25          59.25
     RUNOFF COEFFICIENT   =       0.97         0.40           0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0499)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  3401):   109.28   0.622     5.25    19.22
      + ID2= 2 (  3402):     0.43   0.091     1.25    45.56
        ================================================
        ID = 3 (  0499):   109.71   0.622     5.25    19.32

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  3501)|   Area    (ha)=  95.96   Curve Number   (CN)= 70.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 2.00
--------------------   U.H. Tp(hrs)=   3.11

     Unit Hyd Qpeak  (cms)=   0.801

     PEAK FLOW       (cms)=   0.545 (i)
```

```
     TIME TO PEAK    (hrs)=   5.000
     RUNOFF VOLUME    (mm)=  18.033
     TOTAL RAINFALL   (mm)=  59.248
     RUNOFF COEFFICIENT   =   0.304

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  3502)|   Area    (ha)=   1.83
|ID= 1 DT=15.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  65.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.37         0.46
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     110.45        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     103.84        52.31
               over (min)        15.00        15.00
     Storage Coeff.  (min)=       2.67 (ii)   13.93 (ii)
     Unit Hyd. Tpeak (min)=      15.00        15.00
     Unit Hyd. peak  (cms)=       0.11         0.07
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.34         0.04          0.387 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.25           1.25
     RUNOFF VOLUME    (mm)=      57.25        23.89          45.57
     TOTAL RAINFALL   (mm)=      59.25        59.25          59.25
     RUNOFF COEFFICIENT   =       0.97         0.40           0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0503)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  3501):    95.96   0.545     5.00    18.03
     + ID2= 2 (  3502):     1.83   0.387     1.25    45.57
       ================================================
       ID = 3 (  0503):    97.79   0.545     5.00    18.55

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  3801)|   Area    (ha)= 203.73   Curve Number   (CN)= 70.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 1.50
--------------------   U.H. Tp(hrs)=   2.44

     Unit Hyd Qpeak  (cms)=   1.425

     PEAK FLOW       (cms)=   0.976 (i)
     TIME TO PEAK    (hrs)=   4.500
     RUNOFF VOLUME    (mm)=  17.994
     TOTAL RAINFALL   (mm)=  59.248
     RUNOFF COEFFICIENT   =   0.304

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  3802)|   Area    (ha)=   3.74
|ID= 1 DT=15.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  65.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.81         0.94
     Dep. Storage     (mm)=       2.00         5.00
```

```
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     157.90        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     103.84        59.83
               over (min)        15.00        15.00
     Storage Coeff.  (min)=       3.31 (ii)   13.98 (ii)
     Unit Hyd. Tpeak (min)=      15.00        15.00
     Unit Hyd. peak  (cms)=       0.11         0.07
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.70         0.10          0.799 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.25           1.25
     RUNOFF VOLUME    (mm)=      57.25        26.69          46.55
     TOTAL RAINFALL   (mm)=      59.25        59.25          59.25
     RUNOFF COEFFICIENT   =       0.97         0.45           0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0514)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  3801):   203.73   0.976     4.50    17.99
      + ID2= 2 (  3802):     3.74   0.799     1.25    46.55
        ================================================
        ID = 3 (  0514):   207.47   0.999     4.00    18.51

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  3901)|   Area    (ha)= 277.61   Curve Number   (CN)= 70.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 1.50
--------------------   U.H. Tp(hrs)=   3.25

     Unit Hyd Qpeak  (cms)=   1.458

     PEAK FLOW       (cms)=   1.016 (i)
     TIME TO PEAK    (hrs)=   5.250
     RUNOFF VOLUME    (mm)=  18.011
     TOTAL RAINFALL   (mm)=  59.248
     RUNOFF COEFFICIENT   =   0.304

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  3902)|   Area    (ha)=   0.87
|ID= 1 DT=15.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  65.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.65         0.22
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      76.16        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     103.84        52.31
               over (min)        15.00        15.00
     Storage Coeff.  (min)=       2.14 (ii)   13.40 (ii)
     Unit Hyd. Tpeak (min)=      15.00        15.00
     Unit Hyd. peak  (cms)=       0.11         0.08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.16         0.02          0.185 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.25           1.25
     RUNOFF VOLUME    (mm)=      57.25        23.88          45.56
     TOTAL RAINFALL   (mm)=      59.25        59.25          59.25
     RUNOFF COEFFICIENT   =       0.97         0.40           0.77
```

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0520)|	AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (3901):		277.61	1.016	5.25	18.01
+ ID2= 2 (3902):		0.87	0.185	1.25	45.56
ID = 3 (0520):		278.48	1.016	5.25	18.10

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
V    V   I    SSSSS  U   U    A    L
V    V   I    SS     U   U   A A   L
 V  V    I     SS    U   U  AAAAA  L
 V  V    I      SS   U   U  A   A  L
  VV     I    SSSSS  UUUUU  A   A  LLLLL

 OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
O   O    T      T    H   H   Y Y   MM MM  O   O
O   O    T      T    H   H    Y    M   M  O   O
 OOO     T      T    H   H    Y    M   M   OOO
```


***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\d6ada9ac-d485-4e15-be02-671e9e98a383\0ab79267-c919-471b-a00a-5c31e6e18240\scenar
Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\d6ada9ac-d485-4e15-be02-671e9e98a383\0ab79267-c919-471b-a00a-5c31e6e18240\scenar

DATE: 10/07/2016 TIME: 09:48:07

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 5 **
****

CHICAGO STORM		IDF curve parameters: A= 878.493
Ptotal= 66.03 mm		B= 1.500
		C= 0.724

used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step = 15.00 min
Time to peak ratio = 0.33

The CORRELATION coefficient is = 0.9997

TIME	INPUT INT.	TAB. INT.

(min)	(mm/hr)	(mm/hr)
5.	243.60	226.56
10.	150.20	149.90
15.	113.20	115.42
30.	69.80	72.27
60.	43.00	44.52
120.	26.50	27.20
360.	12.30	12.35
720.	7.60	7.49
1440.	4.70	4.54

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	5.94	1.25	115.42	2.25	9.36	3.25	5.65
0.50	7.45	1.50	26.25	2.50	7.95	3.50	5.19
0.75	10.44	1.75	15.54	2.75	6.97	3.75	4.81
1.00	20.88	2.00	11.54	3.00	6.23	4.00	4.49

CALIB NASHYD (0801) ID= 1 DT=15.0 min	Area (ha)= 116.91 Curve Number (CN)= 71.0 Ia (mm)= 5.00 # of Linear Res.(N)= 1.50 U.H. Tp(hrs)= 1.43

Unit Hyd Qpeak (cms)= 1.396

PEAK FLOW (cms)= 1.098 (i)
TIME TO PEAK (hrs)= 4.000
RUNOFF VOLUME (mm)= 22.468
TOTAL RAINFALL (mm)= 66.029
RUNOFF COEFFICIENT = 0.340

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (0802) ID= 1 DT=15.0 min	Area (ha)= 4.86 Total Imp(%)= 75.00 Dir. Conn.(%)= 65.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	3.64	1.22	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	180.00	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		115.42	65.42	
over (min)		15.00	15.00	
Storage Coeff. (min)=		3.43 (ii)	13.73 (ii)	
Unit Hyd. Tpeak (min)=		15.00	15.00	
Unit Hyd. peak (cms)=		0.11	0.08	
				TOTALS
PEAK FLOW	(cms)=	1.00	0.15	1.152 (iii)
TIME TO PEAK	(hrs)=	1.25	1.25	1.25
RUNOFF VOLUME	(mm)=	64.03	29.33	51.88
TOTAL RAINFALL	(mm)=	66.03	66.03	66.03
RUNOFF COEFFICIENT	=	0.97	0.44	0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0478) 1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0801):	116.91	1.098	4.00	22.47
+ ID2= 2 (0802):	4.86	1.152	1.25	51.88

```
       ID = 3 (  0478):   121.77   1.463     1.25    23.64

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   ( 30001)|   Area    (ha)=  67.84   Curve Number   (CN)= 71.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 1.50
--------------------   U.H. Tp(hrs)=   2.62

     Unit Hyd Qpeak  (cms)=   0.442

     PEAK FLOW       (cms)=   0.381 (i)
     TIME TO PEAK    (hrs)=   4.750
     RUNOFF VOLUME    (mm)=  22.548
     TOTAL RAINFALL   (mm)=  66.029
     RUNOFF COEFFICIENT   =   0.341

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD ( 30002)|   Area    (ha)=   0.98
|ID= 1 DT=15.0 min |   Total Imp(%)=  73.00   Dir. Conn.(%)=  62.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.72         0.26
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      80.83        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     115.42        63.96
                over (min)       15.00        15.00
     Storage Coeff.  (min)=       2.12 (ii)   12.51 (ii)
     Unit Hyd. Tpeak (min)=      15.00        15.00
     Unit Hyd. peak  (cms)=       0.11         0.08
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.19         0.03          0.228 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.25           1.25
     RUNOFF VOLUME    (mm)=      64.03        28.66          50.58
     TOTAL RAINFALL   (mm)=      66.03        66.03          66.03
     RUNOFF COEFFICIENT   =       0.97         0.43           0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0487)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 ( 30001):    67.84   0.381     4.75    22.55
     + ID2= 2 ( 30002):     0.98   0.228     1.25    50.58
       ==========================================================
       ID = 3 (  0487):    68.82   0.384     4.00    22.95

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  3101)|   Area    (ha)= 101.28   Curve Number   (CN)= 72.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 1.50
--------------------   U.H. Tp(hrs)=   2.64

     Unit Hyd Qpeak  (cms)=   0.655

     PEAK FLOW       (cms)=   0.583 (i)
     TIME TO PEAK    (hrs)=   4.750
     RUNOFF VOLUME    (mm)=  23.250
```

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     TOTAL RAINFALL   (mm)=  66.029
     RUNOFF COEFFICIENT   =   0.352

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  3102)|   Area    (ha)=   1.58
|ID= 1 DT=15.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  65.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.19         0.40
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     102.63        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     115.42        65.42
               over (min)       15.00        15.00
     Storage Coeff.  (min)=       2.45 (ii)   12.75 (ii)
     Unit Hyd. Tpeak (min)=      15.00        15.00
     Unit Hyd. peak  (cms)=       0.11         0.08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.33         0.05          0.379 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.25           1.25
     RUNOFF VOLUME    (mm)=      64.03        29.33          51.88
     TOTAL RAINFALL   (mm)=      66.03        66.03          66.03
     RUNOFF COEFFICIENT   =       0.97         0.44           0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0493)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  3101):   101.28   0.583     4.75    23.25
     + ID2= 2 (  3102):     1.58   0.379     1.25    51.88
       ================================================
       ID = 3 (  0493):   102.86   0.588     4.00    23.69

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| NASHYD   (  3401)|   Area    (ha)= 109.28   Curve Number   (CN)= 72.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 2.00
--------------------   U.H. Tp(hrs)=   3.33

     Unit Hyd Qpeak  (cms)=   0.852

     PEAK FLOW       (cms)=   0.754 (i)
     TIME TO PEAK    (hrs)=   5.250
     RUNOFF VOLUME    (mm)=  23.295
     TOTAL RAINFALL   (mm)=  66.029
     RUNOFF COEFFICIENT   =   0.353

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  3402)|   Area    (ha)=   0.43
|ID= 1 DT=15.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  65.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.32         0.11
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      53.54        40.00
```

```
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     115.42        63.37
               over (min)       15.00        15.00
     Storage Coeff.  (min)=      1.66 (ii)   12.09 (ii)
     Unit Hyd. Tpeak (min)=     15.00        15.00
     Unit Hyd. peak  (cms)=      0.11         0.08
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.09         0.01       0.103 (iii)
     TIME TO PEAK    (hrs)=      1.25         1.25        1.25
     RUNOFF VOLUME    (mm)=     64.03        28.57       51.61
     TOTAL RAINFALL   (mm)=     66.03        66.03       66.03
     RUNOFF COEFFICIENT   =      0.97         0.43        0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0499)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  3401):   109.28   0.754     5.25    23.30
     + ID2= 2 (  3402):     0.43   0.103     1.25    51.61
       ================================================
       ID = 3 (  0499):   109.71   0.754     5.25    23.41

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  3501)|   Area    (ha)=  95.96   Curve Number   (CN)= 70.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 2.00
--------------------   U.H. Tp(hrs)=   3.11

     Unit Hyd Qpeak  (cms)=   0.801

     PEAK FLOW       (cms)=   0.663 (i)
     TIME TO PEAK    (hrs)=   5.000
     RUNOFF VOLUME    (mm)=  21.912
     TOTAL RAINFALL   (mm)=  66.029
     RUNOFF COEFFICIENT   =   0.332

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  3502)|   Area    (ha)=   1.83
|ID= 1 DT=15.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  65.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.37         0.46
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     110.45        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     115.42        63.37
               over (min)       15.00        15.00
     Storage Coeff.  (min)=      2.56 (ii)   12.99 (ii)
     Unit Hyd. Tpeak (min)=     15.00        15.00
     Unit Hyd. peak  (cms)=      0.11         0.08
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.38         0.06       0.437 (iii)
     TIME TO PEAK    (hrs)=      1.25         1.25        1.25
     RUNOFF VOLUME    (mm)=     64.03        28.56       51.61
     TOTAL RAINFALL   (mm)=     66.03        66.03       66.03
     RUNOFF COEFFICIENT   =      0.97         0.43        0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
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(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0503)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (3501):	95.96	0.663	5.00	21.91
	+ ID2= 2 (3502):	1.83	0.437	1.25	51.61
	ID = 3 (0503):	97.79	0.663	5.00	22.47

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB NASHYD (3801) | ID= 1 DT=15.0 min			
Area (ha)= 203.73	Curve Number (CN)= 70.0		
Ia (mm)= 5.00	# of Linear Res.(N)= 1.50		
U.H. Tp(hrs)= 2.44			

Unit Hyd Qpeak (cms)= 1.425

PEAK FLOW (cms)= 1.186 (i)
TIME TO PEAK (hrs)= 4.500
RUNOFF VOLUME (mm)= 21.864
TOTAL RAINFALL (mm)= 66.029
RUNOFF COEFFICIENT = 0.331

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (3802) | ID= 1 DT=15.0 min			
Area (ha)= 3.74			
Total Imp(%)= 75.00	Dir. Conn.(%)= 65.00		

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	2.81	0.94	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	157.90	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		115.42	72.04	
over (min)		15.00	15.00	
Storage Coeff. (min)=		3.17 (ii)	13.08 (ii)	
Unit Hyd. Tpeak (min)=		15.00	15.00	
Unit Hyd. peak (cms)=		0.11	0.08	
				TOTALS
PEAK FLOW	(cms)=	0.77	0.13	0.904 (iii)
TIME TO PEAK	(hrs)=	1.25	1.25	1.25
RUNOFF VOLUME	(mm)=	64.03	31.73	52.72
TOTAL RAINFALL	(mm)=	66.03	66.03	66.03
RUNOFF COEFFICIENT	=	0.97	0.48	0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0514)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (3801):	203.73	1.186	4.50	21.86
	+ ID2= 2 (3802):	3.74	0.904	1.25	52.72
	ID = 3 (0514):	207.47	1.211	4.00	22.42

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB			
NASHYD (3901)	Area (ha)= 277.61	Curve Number (CN)= 70.0	
ID= 1 DT=15.0 min	Ia (mm)= 5.00	# of Linear Res.(N)= 1.50	
	U.H. Tp(hrs)= 3.25		

Unit Hyd Qpeak (cms)= 1.458

PEAK FLOW (cms)= 1.234 (i)
TIME TO PEAK (hrs)= 5.250
RUNOFF VOLUME (mm)= 21.885
TOTAL RAINFALL (mm)= 66.029
RUNOFF COEFFICIENT = 0.331

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (3902)	Area (ha)= 0.87		
ID= 1 DT=15.0 min	Total Imp(%)= 75.00	Dir. Conn.(%)= 65.00	

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.65	0.22	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	76.16	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		115.42	63.37	
over (min)		15.00	15.00	
Storage Coeff. (min)=		2.05 (ii)	12.48 (ii)	
Unit Hyd. Tpeak (min)=		15.00	15.00	
Unit Hyd. peak (cms)=		0.11	0.08	
				TOTALS
PEAK FLOW	(cms)=	0.18	0.03	0.208 (iii)
TIME TO PEAK	(hrs)=	1.25	1.25	1.25
RUNOFF VOLUME	(mm)=	64.03	28.56	51.61
TOTAL RAINFALL	(mm)=	66.03	66.03	66.03
RUNOFF COEFFICIENT	=	0.97	0.43	0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0520)		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (3901):		277.61	1.234	5.25	21.88
+ ID2= 2 (3902):		0.87	0.208	1.25	51.61
ID = 3 (0520):		278.48	1.234	5.25	21.98

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
V    V   I    SSSSS  U   U    A    L
V    V   I    SS     U   U   A A   L
 V  V    I     SS    U   U  AAAAA  L
 V  V    I      SS   U   U  A   A  L
  VV     I    SSSSS  UUUUU  A   A  LLLLL

 OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
O   O    T      T    H   H   Y Y   MM MM  O   O
O   O    T      T    H   H    Y    M   M  O   O
 OOO     T      T    H   H    Y    M   M   OOO
```

***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\d6ada9ac-d485-4e15-be02-671e9e98a383\c8d67c86-ffd2-4dfb-a96e-fb2d55da9e85\scenar
Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\d6ada9ac-d485-4e15-be02-671e9e98a383\c8d67c86-ffd2-4dfb-a96e-fb2d55da9e85\scenar

DATE: 10/07/2016 TIME: 09:48:07

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 6 **
****

| CHICAGO STORM |
| Ptotal= 73.05 mm |

IDF curve parameters: A= 966.620
B= 1.507
C= 0.723
used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step = 15.00 min
Time to peak ratio = 0.33

The CORRELATION coefficient is = 0.9996

TIME (min)	INPUT INT. (mm/hr)	TAB. INT. (mm/hr)
5.	268.60	249.56
10.	165.50	165.26
15.	124.70	127.32
30.	76.90	79.78
60.	47.40	49.19
120.	29.20	30.07
360.	13.60	13.67
720.	8.40	8.29
1440.	5.20	5.03

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	6.59	1.25	127.32	2.25	10.38	3.25	6.28
0.50	8.27	1.50	29.08	2.50	8.83	3.50	5.76
0.75	11.58	1.75	17.23	2.75	7.73	3.75	5.34
1.00	23.14	2.00	12.80	3.00	6.91	4.00	4.98

| CALIB |
| NASHYD (0801) |
|ID= 1 DT=15.0 min |

Area (ha)= 116.91 Curve Number (CN)= 71.0
Ia (mm)= 5.00 # of Linear Res.(N)= 1.50
U.H. Tp(hrs)= 1.43

Unit Hyd Qpeak (cms)= 1.396

PEAK FLOW (cms)= 1.308 (i)
TIME TO PEAK (hrs)= 4.000
RUNOFF VOLUME (mm)= 26.794
TOTAL RAINFALL (mm)= 73.050
RUNOFF COEFFICIENT = 0.367

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0802)	Area (ha)= 4.86		
ID= 1 DT=15.0 min	Total Imp(%)= 75.00	Dir. Conn.(%)= 65.00	

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	3.64	1.22	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	180.00	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		127.32	77.72	
over (min)		15.00	15.00	
Storage Coeff. (min)=		3.30 (ii)	12.91 (ii)	
Unit Hyd. Tpeak (min)=		15.00	15.00	
Unit Hyd. peak (cms)=		0.11	0.08	
				TOTALS
PEAK FLOW	(cms)=	1.11	0.18	1.291 (iii)
TIME TO PEAK	(hrs)=	1.25	1.25	1.25
RUNOFF VOLUME	(mm)=	71.05	34.47	58.25
TOTAL RAINFALL	(mm)=	73.05	73.05	73.05
RUNOFF COEFFICIENT	=	0.97	0.47	0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0478)		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
1 + 2 = 3	ID1= 1 (0801):	116.91	1.308	4.00	26.79
	+ ID2= 2 (0802):	4.86	1.291	1.25	58.25
	ID = 3 (0478):	121.77	1.670	1.25	28.05

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB			
NASHYD (30001)	Area (ha)= 67.84	Curve Number (CN)= 71.0	
ID= 1 DT=15.0 min	Ia (mm)= 5.00	# of Linear Res.(N)= 1.50	
	U.H. Tp(hrs)= 2.62		

Unit Hyd Qpeak (cms)= 0.442

PEAK FLOW (cms)= 0.455 (i)
TIME TO PEAK (hrs)= 4.750
RUNOFF VOLUME (mm)= 26.890
TOTAL RAINFALL (mm)= 73.050
RUNOFF COEFFICIENT = 0.368

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (30002)	Area (ha)= 0.98		
ID= 1 DT=15.0 min	Total Imp(%)= 73.00	Dir. Conn.(%)= 62.00	

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.72	0.26
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	1.00
Length	(m)=	80.83	40.00
Mannings n	=	0.013	0.250

```
     Max.Eff.Inten.(mm/hr)=     127.32        76.08
               over (min)       15.00        15.00
     Storage Coeff.  (min)=      2.04 (ii)   11.73 (ii)
     Unit Hyd. Tpeak (min)=     15.00        15.00
     Unit Hyd. peak  (cms)=      0.11         0.08
                                                        *TOTALS*
     PEAK FLOW       (cms)=      0.21         0.04          0.256 (iii)
     TIME TO PEAK    (hrs)=      1.25         1.25           1.25
     RUNOFF VOLUME    (mm)=     71.05        33.73          56.86
     TOTAL RAINFALL   (mm)=     73.05        73.05          73.05
     RUNOFF COEFFICIENT   =      0.97         0.46           0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0487)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 ( 30001):    67.84   0.455     4.75    26.89
      + ID2= 2 ( 30002):     0.98   0.256     1.25    56.86
        ================================================
        ID = 3 (  0487):    68.82   0.457     4.00    27.32

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  3101)|   Area    (ha)= 101.28   Curve Number   (CN)= 72.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 1.50
--------------------   U.H. Tp(hrs)=   2.64

     Unit Hyd Qpeak  (cms)=   0.655

     PEAK FLOW       (cms)=   0.694 (i)
     TIME TO PEAK    (hrs)=   4.750
     RUNOFF VOLUME    (mm)=  27.691
     TOTAL RAINFALL   (mm)=  73.050
     RUNOFF COEFFICIENT   =   0.379

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  3102)|   Area    (ha)=   1.58
|ID= 1 DT=15.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  65.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.19         0.40
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     102.63        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     127.32        77.72
               over (min)       15.00        15.00
     Storage Coeff.  (min)=      2.36 (ii)   11.97 (ii)
     Unit Hyd. Tpeak (min)=     15.00        15.00
     Unit Hyd. peak  (cms)=      0.11         0.08
                                                        *TOTALS*
     PEAK FLOW       (cms)=      0.36         0.06          0.425 (iii)
     TIME TO PEAK    (hrs)=      1.25         1.25           1.25
     RUNOFF VOLUME    (mm)=     71.05        34.47          58.25
     TOTAL RAINFALL   (mm)=     73.05        73.05          73.05
     RUNOFF COEFFICIENT   =      0.97         0.47           0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
```

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0493)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (3101):		101.28	0.694	4.75	27.69
+ ID2= 2 (3102):		1.58	0.425	1.25	58.25
ID = 3 (0493):		102.86	0.699	4.00	28.16

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB			
NASHYD (3401)	Area (ha)= 109.28	Curve Number (CN)= 72.0	
ID= 1 DT=15.0 min	Ia (mm)= 5.00	# of Linear Res.(N)= 2.00	
	U.H. Tp(hrs)= 3.33		

Unit Hyd Qpeak (cms)= 0.852

PEAK FLOW (cms)= 0.898 (i)
TIME TO PEAK (hrs)= 5.250
RUNOFF VOLUME (mm)= 27.745
TOTAL RAINFALL (mm)= 73.050
RUNOFF COEFFICIENT = 0.380

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (3402)	Area (ha)= 0.43		
ID= 1 DT=15.0 min	Total Imp(%)= 75.00	Dir. Conn.(%)= 65.00	

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.32	0.11	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	53.54	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		127.32	75.39	
over (min)		15.00	15.00	
Storage Coeff.	(min)=	1.59 (ii)	11.32 (ii)	
Unit Hyd. Tpeak	(min)=	15.00	15.00	
Unit Hyd. peak	(cms)=	0.11	0.08	
				TOTALS
PEAK FLOW	(cms)=	0.10	0.02	0.116 (iii)
TIME TO PEAK	(hrs)=	1.25	1.25	1.25
RUNOFF VOLUME	(mm)=	71.05	33.62	57.94
TOTAL RAINFALL	(mm)=	73.05	73.05	73.05
RUNOFF COEFFICIENT	=	0.97	0.46	0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0499)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (3401):		109.28	0.898	5.25	27.75
+ ID2= 2 (3402):		0.43	0.116	1.25	57.94
ID = 3 (0499):		109.71	0.898	5.25	27.86

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| CALIB            |
| NASHYD   (  3501)|   Area    (ha)=  95.96   Curve Number   (CN)= 70.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 2.00
--------------------   U.H. Tp(hrs)=   3.11

     Unit Hyd Qpeak  (cms)=   0.801

     PEAK FLOW       (cms)=   0.791 (i)
     TIME TO PEAK    (hrs)=   5.000
     RUNOFF VOLUME    (mm)=  26.163
     TOTAL RAINFALL   (mm)=  73.050
     RUNOFF COEFFICIENT   =   0.358

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  3502)|   Area    (ha)=   1.83
|ID= 1 DT=15.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  65.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.37         0.46
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     110.45        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     127.32        75.39
               over (min)       15.00        15.00
     Storage Coeff.  (min)=       2.46 (ii)   12.19 (ii)
     Unit Hyd. Tpeak (min)=      15.00        15.00
     Unit Hyd. peak  (cms)=       0.11         0.08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.42         0.07          0.489 (iii)
     TIME TO PEAK    (hrs)=       1.25         1.25           1.25
     RUNOFF VOLUME    (mm)=      71.05        33.62          57.95
     TOTAL RAINFALL   (mm)=      73.05        73.05          73.05
     RUNOFF COEFFICIENT   =       0.97         0.46           0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0503)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  3501):    95.96   0.791     5.00    26.16
     + ID2= 2 (  3502):     1.83   0.489     1.25    57.95
       ================================================
       ID = 3 (  0503):    97.79   0.791     5.00    26.76

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| NASHYD   (  3801)|   Area    (ha)= 203.73   Curve Number   (CN)= 70.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 1.50
--------------------   U.H. Tp(hrs)=   2.44

     Unit Hyd Qpeak  (cms)=   1.425

     PEAK FLOW       (cms)=   1.417 (i)
     TIME TO PEAK    (hrs)=   4.500
     RUNOFF VOLUME    (mm)=  26.106
     TOTAL RAINFALL   (mm)=  73.050
     RUNOFF COEFFICIENT   =   0.357
```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (3802)	Area (ha)= 3.74				
ID= 1 DT=15.0 min	Total Imp(%)= 75.00	Dir. Conn.(%)= 65.00			

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	2.81	0.94	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	157.90	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		127.32	85.22	
over (min)		15.00	15.00	
Storage Coeff. (min)=		3.05 (ii)	12.31 (ii)	
Unit Hyd. Tpeak (min)=		15.00	15.00	
Unit Hyd. peak (cms)=		0.11	0.08	
				TOTALS
PEAK FLOW	(cms)=	0.85	0.16	1.014 (iii)
TIME TO PEAK	(hrs)=	1.25	1.25	1.25
RUNOFF VOLUME	(mm)=	71.05	37.15	59.18
TOTAL RAINFALL	(mm)=	73.05	73.05	73.05
RUNOFF COEFFICIENT	=	0.97	0.51	0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0514)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (3801):	203.73	1.417	4.50	26.11
+	ID2= 2 (3802):	3.74	1.014	1.25	59.18
	ID = 3 (0514):	207.47	1.444	4.00	26.70

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB				
NASHYD (3901)	Area (ha)= 277.61	Curve Number (CN)= 70.0		
ID= 1 DT=15.0 min	Ia (mm)= 5.00	# of Linear Res.(N)= 1.50		
	U.H. Tp(hrs)= 3.25			

Unit Hyd Qpeak (cms)= 1.458

PEAK FLOW	(cms)=	1.474 (i)
TIME TO PEAK	(hrs)=	5.250
RUNOFF VOLUME	(mm)=	26.131
TOTAL RAINFALL	(mm)=	73.050
RUNOFF COEFFICIENT	=	0.358

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (3902)	Area (ha)= 0.87				
ID= 1 DT=15.0 min	Total Imp(%)= 75.00	Dir. Conn.(%)= 65.00			

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.65	0.22
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	1.00
Length	(m)=	76.16	40.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		127.32	75.39

over (min)		15.00	15.00	
Storage Coeff. (min)=		1.97 (ii)	11.70 (ii)	
Unit Hyd. Tpeak (min)=		15.00	15.00	
Unit Hyd. peak (cms)=		0.11	0.08	
				TOTALS
PEAK FLOW	(cms)=	0.20	0.03	0.233 (iii)
TIME TO PEAK	(hrs)=	1.25	1.25	1.25
RUNOFF VOLUME	(mm)=	71.05	33.62	57.94
TOTAL RAINFALL	(mm)=	73.05	73.05	73.05
RUNOFF COEFFICIENT	=	0.97	0.46	0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0520)|				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (3901):	277.61	1.474	5.25	26.13
+ ID2= 2 (3902):	0.87	0.233	1.25	57.94
ID = 3 (0520):	278.48	1.474	5.25	26.23

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
```


***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\d6ada9ac-d485-4e15-be02-671e9e98a383\264cf8f9-484b-4e23-85b5-73968364a316\scenar
Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\d6ada9ac-d485-4e15-be02-671e9e98a383\264cf8f9-484b-4e23-85b5-73968364a316\scenar

DATE: 10/07/2016 TIME: 09:48:08

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 7 **
****

READ STORM	Filename: C:\Users\p002311c\AppData\Local\Temp\b6559327-24d7-4fc0-b71d-a85219babec0\6b4e8188
Ptotal=212.00 mm	Comments: * REGIONAL DESIGN STORM

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.20	6.00	3.20	13.00	6.20	23.00	9.20	53.00
0.40	6.00	3.40	13.00	6.40	23.00	9.40	53.00
0.60	6.00	3.60	13.00	6.60	23.00	9.60	53.00
0.80	6.00	3.80	13.00	6.80	23.00	9.80	53.00
1.00	6.00	4.00	13.00	7.00	23.00	10.00	53.00
1.20	4.00	4.20	17.00	7.20	13.00	10.20	38.00
1.40	4.00	4.40	17.00	7.40	13.00	10.40	38.00
1.60	4.00	4.60	17.00	7.60	13.00	10.60	38.00
1.80	4.00	4.80	17.00	7.80	13.00	10.80	38.00
2.00	4.00	5.00	17.00	8.00	13.00	11.00	38.00
2.20	6.00	5.20	13.00	8.20	13.00	11.20	13.00
2.40	6.00	5.40	13.00	8.40	13.00	11.40	13.00
2.60	6.00	5.60	13.00	8.60	13.00	11.60	13.00
2.80	6.00	5.80	13.00	8.80	13.00	11.80	13.00
3.00	6.00	6.00	13.00	9.00	13.00	12.00	13.00

CALIB NASHYD (0801) ID= 1 DT=15.0 min	Area (ha)= 116.91 Curve Number (CN)= 71.0 Ia (mm)= 5.00 # of Linear Res.(N)= 1.50 U.H. Tp(hrs)= 1.43

NOTE: RAINFALL WAS TRANSFORMED TO 15.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.250	6.00	3.250	13.00	6.250	23.00	9.25	53.00
0.500	6.00	3.500	13.00	6.500	23.00	9.50	53.00
0.750	6.00	3.750	13.00	6.750	23.00	9.75	53.00
1.000	6.00	4.000	13.00	7.000	23.00	10.00	53.00
1.250	4.00	4.250	17.00	7.250	13.00	10.25	38.00
1.500	4.00	4.500	17.00	7.500	13.00	10.50	38.00
1.750	4.00	4.750	17.00	7.750	13.00	10.75	38.00
2.000	4.00	5.000	17.00	8.000	13.00	11.00	38.00
2.250	6.00	5.250	13.00	8.250	13.00	11.25	13.00
2.500	6.00	5.500	13.00	8.500	13.00	11.50	13.00
2.750	6.00	5.750	13.00	8.750	13.00	11.75	13.00
3.000	6.00	6.000	13.00	9.000	13.00	12.00	13.00

Unit Hyd Qpeak (cms)= 1.396

PEAK FLOW (cms)= 5.711 (i)
TIME TO PEAK (hrs)= 11.750
RUNOFF VOLUME (mm)= 137.064
TOTAL RAINFALL (mm)= 212.000
RUNOFF COEFFICIENT = 0.647

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (0802) ID= 1 DT=15.0 min	Area (ha)= 4.86 Total Imp(%)= 75.00 Dir. Conn.(%)= 65.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	3.64	1.22
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	1.00
Length	(m)=	180.00	40.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		53.00	66.65
over (min)		15.00	15.00
Storage Coeff. (min)=		4.69 (ii)	14.91 (ii)
Unit Hyd. Tpeak (min)=		15.00	15.00
Unit Hyd. peak (cms)=		0.11	0.07

TOTALS

PEAK FLOW	(cms)=	0.47	0.22	0.685 (iii)
TIME TO PEAK	(hrs)=	10.00	10.00	10.00
RUNOFF VOLUME	(mm)=	210.00	155.72	191.00
TOTAL RAINFALL	(mm)=	212.00	212.00	212.00
RUNOFF COEFFICIENT	=	0.99	0.73	0.90

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0478)		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
1 + 2 = 3	ID1= 1 (0801):	116.91	5.711	11.75	137.06
	+ ID2= 2 (0802):	4.86	0.685	10.00	191.00
	ID = 3 (0478):	121.77	5.972	11.00	139.22

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB NASHYD (30001) | ID= 1 DT=15.0 min

Area (ha)= 67.84 Curve Number (CN)= 71.0
Ia (mm)= 5.00 # of Linear Res.(N)= 1.50
U.H. Tp(hrs)= 2.62

Unit Hyd Qpeak (cms)= 0.442

PEAK FLOW	(cms)=	2.151 (i)
TIME TO PEAK	(hrs)=	12.500
RUNOFF VOLUME	(mm)=	137.555
TOTAL RAINFALL	(mm)=	212.000
RUNOFF COEFFICIENT	=	0.649

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (30002) | ID= 1 DT=15.0 min

Area (ha)= 0.98
Total Imp(%)= 73.00 Dir. Conn.(%)= 62.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.72	0.26	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	80.83	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)	=	53.00	66.55	
over (min)		15.00	15.00	
Storage Coeff.	(min)=	2.90 (ii)	13.12 (ii)	
Unit Hyd. Tpeak	(min)=	15.00	15.00	
Unit Hyd. peak	(cms)=	0.11	0.08	
				TOTALS
PEAK FLOW	(cms)=	0.09	0.05	0.138 (iii)
TIME TO PEAK	(hrs)=	9.75	10.00	10.00
RUNOFF VOLUME	(mm)=	210.00	153.99	188.71
TOTAL RAINFALL	(mm)=	212.00	212.00	212.00
RUNOFF COEFFICIENT	=	0.99	0.73	0.89

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0487)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 ( 30001):    67.84   2.151    12.50   137.56
     + ID2= 2 ( 30002):     0.98   0.138    10.00   188.71
       ================================================
       ID = 3 (  0487):    68.82   2.168    12.00   138.28

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| NASHYD   (  3101)|   Area    (ha)= 101.28   Curve Number   (CN)= 72.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 1.50
--------------------   U.H. Tp(hrs)=   2.64

     Unit Hyd Qpeak  (cms)=   0.655

     PEAK FLOW       (cms)=   3.241 (i)
     TIME TO PEAK    (hrs)=  12.500
     RUNOFF VOLUME    (mm)= 139.795
     TOTAL RAINFALL   (mm)= 212.000
     RUNOFF COEFFICIENT   =   0.659

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  3102)|   Area    (ha)=   1.58
|ID= 1 DT=15.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  65.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.19         0.40
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     102.63        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      53.00        66.65
               over (min)        15.00        15.00
     Storage Coeff.  (min)=       3.34 (ii)   13.56 (ii)
     Unit Hyd. Tpeak (min)=      15.00        15.00
     Unit Hyd. peak  (cms)=       0.11         0.08
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.15         0.07          0.223 (iii)
     TIME TO PEAK    (hrs)=       9.75        10.00          10.00
     RUNOFF VOLUME    (mm)=     210.00       155.72         190.99
     TOTAL RAINFALL   (mm)=     212.00       212.00         212.00
     RUNOFF COEFFICIENT   =       0.99         0.73           0.90

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0493)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  3101):   101.28   3.241    12.50   139.79
     + ID2= 2 (  3102):     1.58   0.223    10.00   190.99
       ================================================
       ID = 3 (  0493):   102.86   3.269    12.00   140.58

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| NASHYD   (  3401)|   Area    (ha)= 109.28   Curve Number   (CN)= 72.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 2.00
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--------------------   U.H. Tp(hrs)=   3.33

     Unit Hyd Qpeak  (cms)=   0.852

     PEAK FLOW       (cms)=   4.092 (i)
     TIME TO PEAK    (hrs)=  13.000
     RUNOFF VOLUME    (mm)= 140.065
     TOTAL RAINFALL   (mm)= 212.000
     RUNOFF COEFFICIENT   =   0.661

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB            |
| STANDHYD (  3402)|   Area    (ha)=   0.43
|ID= 1 DT=15.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  65.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.32         0.11
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      53.54        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      53.00        66.14
               over (min)        15.00        15.00
     Storage Coeff.  (min)=       2.26 (ii)   12.52 (ii)
     Unit Hyd. Tpeak (min)=      15.00        15.00
     Unit Hyd. peak  (cms)=       0.11         0.08
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.02          0.061 (iii)
     TIME TO PEAK    (hrs)=       9.75        10.00          10.00
     RUNOFF VOLUME    (mm)=     210.00       153.76         190.30
     TOTAL RAINFALL   (mm)=     212.00       212.00         212.00
     RUNOFF COEFFICIENT   =       0.99         0.73           0.90

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0499)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  3401):   109.28   4.092    13.00   140.07
      + ID2= 2 (  3402):     0.43   0.061    10.00   190.30
        ================================================
        ID = 3 (  0499):   109.71   4.092    13.00   140.26

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  3501)|   Area    (ha)=  95.96   Curve Number   (CN)= 70.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 2.00
--------------------   U.H. Tp(hrs)=   3.11

     Unit Hyd Qpeak  (cms)=   0.801

     PEAK FLOW       (cms)=   3.677 (i)
     TIME TO PEAK    (hrs)=  12.750
     RUNOFF VOLUME    (mm)= 135.586
     TOTAL RAINFALL   (mm)= 212.000
     RUNOFF COEFFICIENT   =   0.640

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  3502)|   Area    (ha)=   1.83
```

|ID= 1 DT=15.0 min | Total Imp(%)= 75.00 Dir. Conn.(%)= 65.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	1.37	0.46	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	110.45	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		53.00	66.14	
over (min)		15.00	15.00	
Storage Coeff.	(min)=	3.50 (ii)	13.75 (ii)	
Unit Hyd. Tpeak	(min)=	15.00	15.00	
Unit Hyd. peak	(cms)=	0.11	0.08	
				TOTALS
PEAK FLOW	(cms)=	0.18	0.08	0.258 (iii)
TIME TO PEAK	(hrs)=	9.75	10.00	10.00
RUNOFF VOLUME	(mm)=	210.00	153.76	190.31
TOTAL RAINFALL	(mm)=	212.00	212.00	212.00
RUNOFF COEFFICIENT	=	0.99	0.73	0.90

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0503)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (3501):		95.96	3.677	12.75	135.59
+ ID2= 2 (3502):		1.83	0.258	10.00	190.31
ID = 3 (0503):		97.79	3.678	12.75	136.61

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB				
NASHYD (3801)		Area	(ha)= 203.73	Curve Number (CN)= 70.0
ID= 1 DT=15.0 min		Ia	(mm)= 5.00	# of Linear Res.(N)= 1.50
		U.H. Tp(hrs)=	2.44	

Unit Hyd Qpeak (cms)= 1.425

PEAK FLOW (cms)= 6.744 (i)
TIME TO PEAK (hrs)= 12.250
RUNOFF VOLUME (mm)= 135.293
TOTAL RAINFALL (mm)= 212.000
RUNOFF COEFFICIENT = 0.638

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB				
STANDHYD (3802)		Area	(ha)= 3.74	
ID= 1 DT=15.0 min		Total Imp(%)=	75.00	Dir. Conn.(%)= 65.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	2.81	0.94	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	157.90	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		53.00	68.11	
over (min)		15.00	15.00	
Storage Coeff.	(min)=	4.33 (ii)	14.46 (ii)	
Unit Hyd. Tpeak	(min)=	15.00	15.00	
Unit Hyd. peak	(cms)=	0.11	0.07	
				TOTALS
PEAK FLOW	(cms)=	0.36	0.17	0.532 (iii)

```
     TIME TO PEAK    (hrs)=      10.00        10.00         10.00
     RUNOFF VOLUME    (mm)=     210.00       161.55        193.04
     TOTAL RAINFALL   (mm)=     212.00       212.00        212.00
     RUNOFF COEFFICIENT   =       0.99         0.76          0.91

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0514)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  3801):   203.73   6.744    12.25   135.29
     + ID2= 2 (  3802):     3.74   0.532    10.00   193.04
       ================================================
       ID = 3 (  0514):   207.47   6.844    12.00   136.33

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD   (  3901)|   Area    (ha)= 277.61   Curve Number   (CN)= 70.0
|ID= 1 DT=15.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 1.50
--------------------   U.H. Tp(hrs)=   3.25

     Unit Hyd Qpeak  (cms)=   1.458

     PEAK FLOW       (cms)=   7.217 (i)
     TIME TO PEAK    (hrs)=  13.000
     RUNOFF VOLUME    (mm)= 135.421
     TOTAL RAINFALL   (mm)= 212.000
     RUNOFF COEFFICIENT   =   0.639

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  3902)|   Area    (ha)=   0.87
|ID= 1 DT=15.0 min |   Total Imp(%)=  75.00   Dir. Conn.(%)=  65.00
--------------------

                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.65         0.22
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      76.16        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      53.00        66.14
               over (min)        15.00        15.00
     Storage Coeff.  (min)=       2.80 (ii)   13.05 (ii)
     Unit Hyd. Tpeak (min)=      15.00        15.00
     Unit Hyd. peak  (cms)=       0.11         0.08
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.08         0.04          0.123 (iii)
     TIME TO PEAK    (hrs)=       9.75        10.00          10.00
     RUNOFF VOLUME    (mm)=     210.00       153.76         190.31
     TOTAL RAINFALL   (mm)=     212.00       212.00         212.00
     RUNOFF COEFFICIENT   =       0.99         0.73           0.90

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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```

ADD HYD (0520)					
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (3901):	277.61	7.217	13.00	135.42
+ ID2= 2 (3902):	0.87	0.123	10.00	190.31
ID = 3 (0520):	278.48	7.217	13.00	135.59

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

FINISH

APPENDIX D

HYDROLOGIC ANALYSIS – TRANSITWAY AREAS

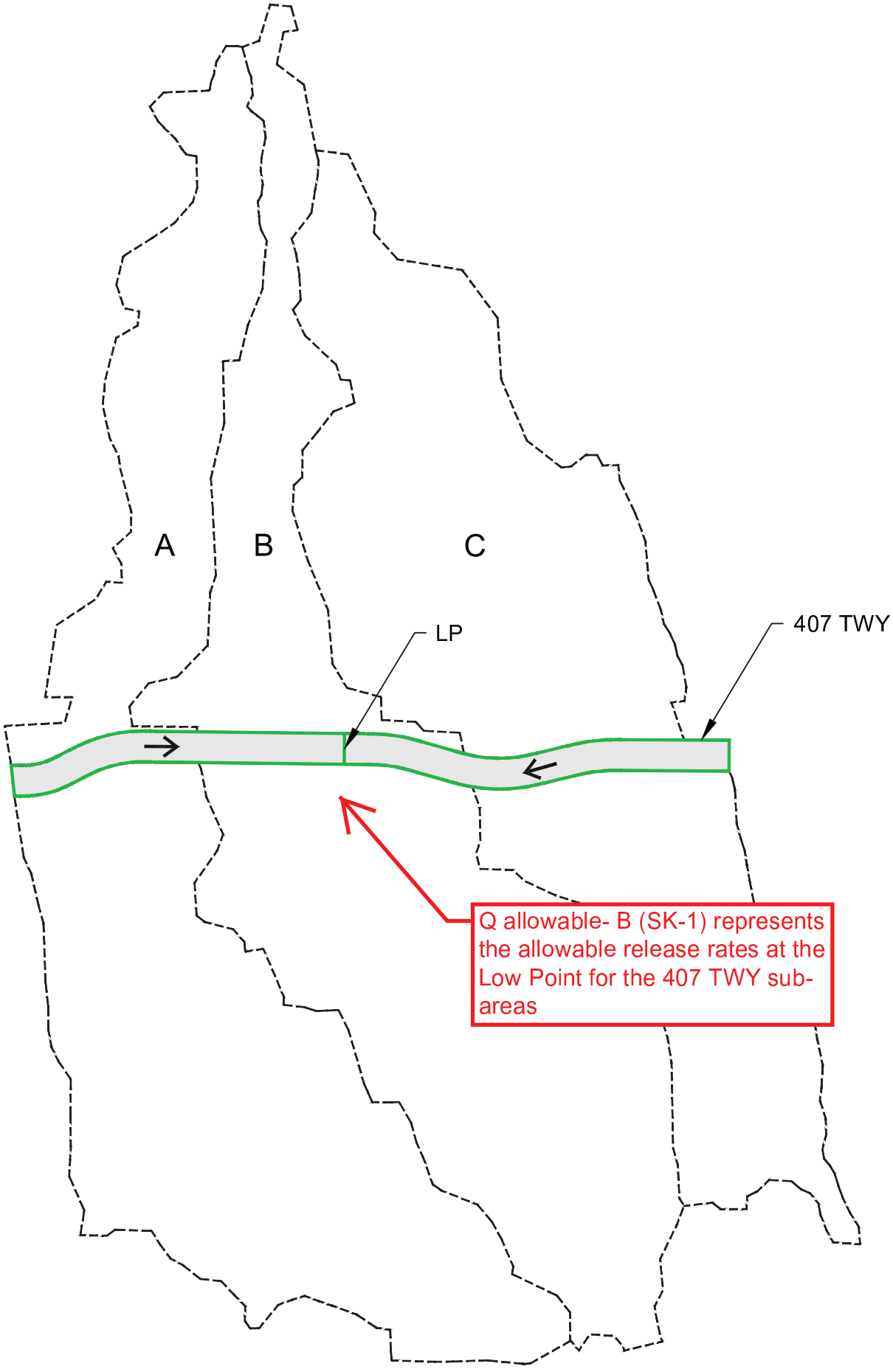
POST-DEVELOPMENT CONDITION

APPENDIX D: Hydrologic Analysis Transitway Areas - Post-Development Condition

Hydrologic Analysis - Post-Development Condition Without SWM

Hydrologic Analysis - Post-Development Condition With SWM

SK-2 - HYDROLOGIC MODELLING 407 TWY SUB-AREAS - POST-DEV COND



KENNEDY RD
AREA - 318
318–1 | 0.42 | 90
318–2 | 0.46 | 90
AREA - 314
314–3 | 1.12 | 90
314–4 | 0.84 | 90
McCOWAN RD
AREA - 312
POND R-5
MATCHLINE - STA 2+810
POND R-4
STA 0+463.30
HP 189.81m
STA 0+925.40
LP 179.85m
ES-1b
ES-2b
ES-2a
ES-3
ES-4
WC#11
407 ETR
407 TRANSITWAY
WC#3
WC#4
WC#5
STA 2+234.50
HP 193.25m
312–1 | 0.68 | 90
ES-1a
314–1 | 0.88 | 90
314–2 | 0.52 | 90
AREA - 318
AREA - 314
AREA - 312

AREA - 312
MATCHLINE - STA 2+810
MARKHAM RD
AREA - 604
604–1 | 1.07 | 90
AREA - 614
POND R-2
312–2 | 0.85 | 90
614–1 | 0.89 | 90
614–2 | 1.43 | 90
POND R-6
407 ETR
614–3 | 0.71 | 90
STA 4+634.90
HP 179.94m
POND R1
ES-9b
ES-8a
ES-8b
ES-9a
WC#13
ES-5
ES-6
407 TRANSITWAY
ES-7b
ES-7c
ES-7a
WC#12
STA 5+343.80
LP 167.54m
MARKHAM STATION
(REFER TO FIGURE 5.1 FOR STATION DRAINAGE PLAN AND SWMF-1 DETAILS.)
STA 4+263.30
LP 177.42m
PUMP TO MARKHAM RD ROADSIDE DITCH
AREA - 614
AREA - 604
MATCHLINE - STA 5+620

AREA - 604
NINTH LINE
AREA - 521
POND 81
AREA - 522
AREA - 621
POND R-3a
POND 80
604–2 | 1.52 | 90
521–1 | 0.42 | 90
521–2 | 0.82 | 90
522–1 | 0.18 | 90
604–3 | 1.18 | 90
POND R-3b
407 ETR
POND LR1
ES-12
ES-13
522–2 | 0.74 | 90
DONALD COUSENS PKWY
407 TRANSITWAY
ES-14
WC#15C
WC#15B
ES-11
WC#15A
STA 7+683.30
HP 189.05m
620–1 | 0.78 | 90
185.10
STA 8+168.00
LP 184.66m
NINTH LINE STATION
(REFER TO FIGURE 5.2 FOR STATION DRAINAGE PLAN AND SWMF-2 DETAILS.)
AREA - 620
AREA - 521
AREA - 522
PUMP TO DONALD COUSENS POND
MATCHLINE - STA 8+260

AREA - 511
RESOR RD
AREA - 513
AREA - 1 (PETTICOAT)
MATCHLINE - STA 10+806 (SEE FIGURE 4.2)
POND LR-3
511–1 | 0.85 | 90
513–1 | 1.29 | 90
513–3 | 0.38 | 90
513–4 | 0.38 | 90
1–1 | 1.13 | 90
STA 10+806.30
HP 203.45m
WC#16
522–3 | 0.82 | 90
ES-17
WC#17
STA 9+049.30
HP 201.47m
ES-18a
WC#18
POND LR5
ES-19
ES-22b
ES-22a
WC#21
407 TRANSITWAY
ES-18b
ES-20
WC#19
ES-21
WC#20
WC#20A
STA 9+730.00
LP 197.90m
513–2 | 0.15 | 90
DONALD COUSENS STATION
(REFER TO FIGURE 5.3 FOR STATION DRAINAGE PLAN AND SWMF-3 DETAILS.)
AREA - 511
AREA - 513

LEGEND
PROPOSED 407 TWY
EXISTING WATERCOURSE
SUBWATERSHED DRAINAGE AREA BOUNDARY
ENHANCED SWALE (ES-1)
GRASSED SWALE
PROPOSED CULVERT (TWY FLOWS) TO ES
OVERLAND FLOW ROUTE
AREA ID
318–1 | 0.88 | 90
A (ha)
% IMPERVIOUSNESS

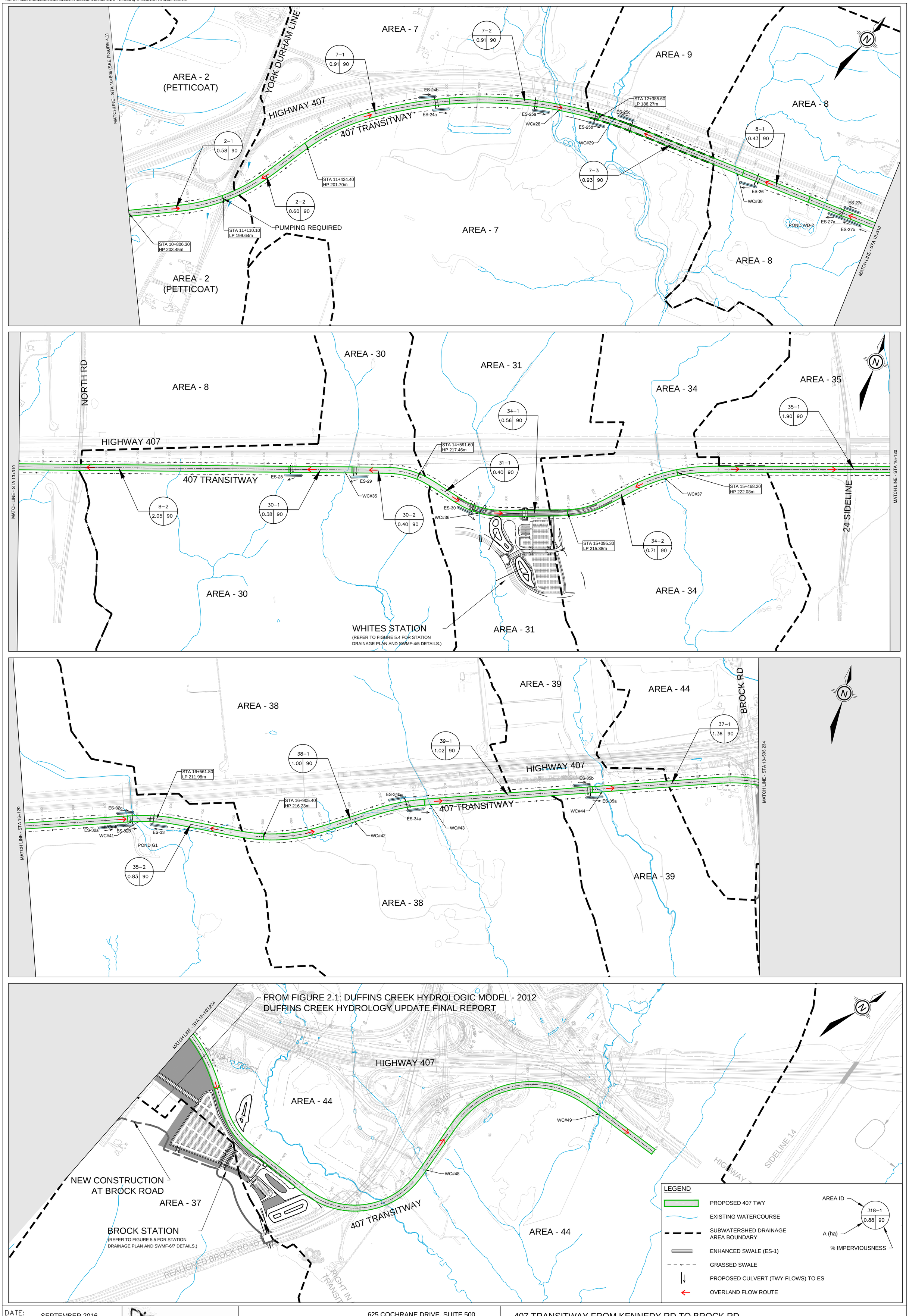
DATE: SEPTEMBER 2016
SCALE: 1:5000

Ontario

PARSONS
625 COCHRANE DRIVE, SUITE 500
MARKHAM, ONTARIO L3R 9R9
TEL: 905-943-0500
FAX: 905-943-0400

407 TRANSITWAY FROM KENNEDY RD TO BROCK RD

FIGURE 4.1 - DRAINAGE AREA MAP ROUGE



DATE: SEPTEMBER 2016

SCALE: 1:5000

Ontario

PARSONS

625 COCHRANE DRIVE, SUITE 500
MARKHAM, ONTARIO L3R 9R9
TEL: 905-943-0500
FAX: 905-943-0400

407 TRANSITWAY FROM KENNEDY RD TO BROCK RD

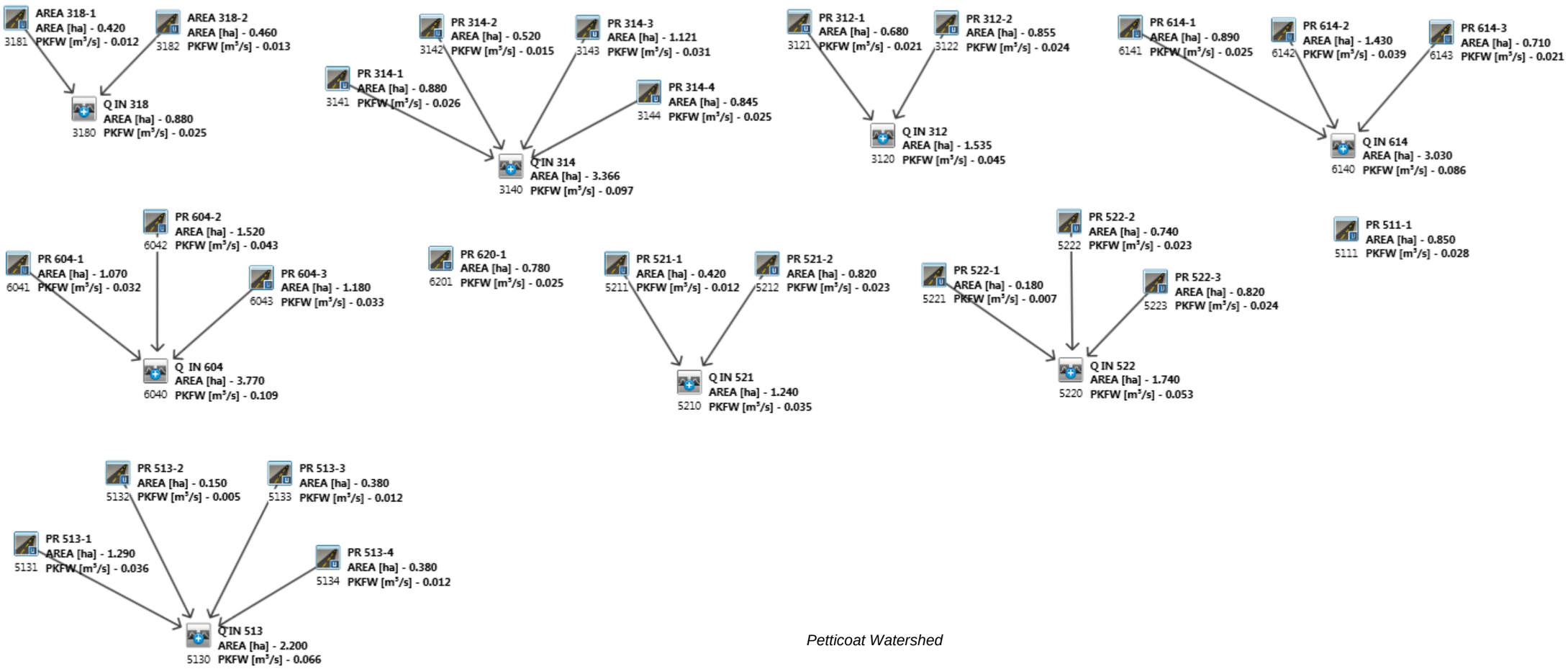
FIGURE 4.2 - DRAINAGE AREA MAP PETTICOAT & DUFFINS

HYDROLOGIC ANALYSIS

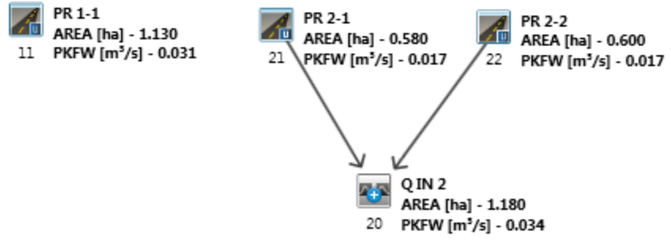
POST-DEVELOPMENT CONDITION WITHOUT SWM

VO2 Modelling Schematic 4.3: 407 TWY Sub-Areas Hydrologic Analysis – Proposed Condition without SWM (Rouge and Petticoat Watershed)

Rouge Watershed



Petticoat Watershed



```
       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
```


***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\7227bba8-acf1-44e8-a728-77a76a4c8901\scenar
Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\7227bba8-acf1-44e8-a728-77a76a4c8901\scenar

DATE: 10/07/2016 TIME: 09:43:15

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 1 **
****

READ STORM	Filename: C:\Users\p002311c\AppData\Local\Temp\db0fe791-7419-44ec-813d-9df9ab04fb68\9240ca00
Ptotal= 42.00 mm	Comments: 2yr/12hr

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	3.50	7.14	6.75	2.94	10.00	0.42
0.50	0.42	3.75	7.14	7.00	2.94	10.25	0.42
0.75	0.42	4.00	7.14	7.25	2.94	10.50	0.42
1.00	0.42	4.25	7.14	7.50	1.68	10.75	0.42
1.25	0.42	4.50	19.32	7.75	1.68	11.00	0.42
1.50	0.42	4.75	19.32	8.00	1.68	11.25	0.42
1.75	0.42	5.00	19.32	8.25	1.68	11.50	0.42
2.00	0.42	5.25	19.32	8.50	0.84	11.75	0.42
2.25	0.42	5.50	5.46	8.75	0.84	12.00	0.42
2.50	2.52	5.75	5.46	9.00	0.84	12.25	0.42
2.75	2.52	6.00	5.46	9.25	0.84		
3.00	2.52	6.25	5.46	9.50	0.42		
3.25	2.52	6.50	2.94	9.75	0.42		

CALIB	
STANDHYD (3141)	Area (ha)= 0.88
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.62	0.26
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	3.57
Length	(m)=	6.00	462.10

Mannings n = 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	2.52	6.250	5.46	9.33	0.42
0.167	0.00	3.250	2.52	6.333	2.94	9.42	0.42
0.250	0.00	3.333	7.14	6.417	2.94	9.50	0.42
0.333	0.42	3.417	7.14	6.500	2.94	9.58	0.42
0.417	0.42	3.500	7.14	6.583	2.94	9.67	0.42
0.500	0.42	3.583	7.14	6.667	2.94	9.75	0.42
0.583	0.42	3.667	7.14	6.750	2.94	9.83	0.42
0.667	0.42	3.750	7.14	6.833	2.94	9.92	0.42
0.750	0.42	3.833	7.14	6.917	2.94	10.00	0.42
0.833	0.42	3.917	7.14	7.000	2.94	10.08	0.42
0.917	0.42	4.000	7.14	7.083	2.94	10.17	0.42
1.000	0.42	4.083	7.14	7.167	2.94	10.25	0.42
1.083	0.42	4.167	7.14	7.250	2.94	10.33	0.42
1.167	0.42	4.250	7.14	7.333	1.68	10.42	0.42
1.250	0.42	4.333	19.32	7.417	1.68	10.50	0.42
1.333	0.42	4.417	19.32	7.500	1.68	10.58	0.42
1.417	0.42	4.500	19.32	7.583	1.68	10.67	0.42
1.500	0.42	4.583	19.32	7.667	1.68	10.75	0.42
1.583	0.42	4.667	19.32	7.750	1.68	10.83	0.42
1.667	0.42	4.750	19.32	7.833	1.68	10.92	0.42
1.750	0.42	4.833	19.32	7.917	1.68	11.00	0.42
1.833	0.42	4.917	19.32	8.000	1.68	11.08	0.42
1.917	0.42	5.000	19.32	8.083	1.68	11.17	0.42
2.000	0.42	5.083	19.32	8.167	1.68	11.25	0.42
2.083	0.42	5.167	19.32	8.250	1.68	11.33	0.42
2.167	0.42	5.250	19.32	8.333	0.84	11.42	0.42
2.250	0.42	5.333	5.46	8.417	0.84	11.50	0.42
2.333	2.52	5.417	5.46	8.500	0.84	11.58	0.42
2.417	2.52	5.500	5.46	8.583	0.84	11.67	0.42
2.500	2.52	5.583	5.46	8.667	0.84	11.75	0.42
2.583	2.52	5.667	5.46	8.750	0.84	11.83	0.42
2.667	2.52	5.750	5.46	8.833	0.84	11.92	0.42
2.750	2.52	5.833	5.46	8.917	0.84	12.00	0.42
2.833	2.52	5.917	5.46	9.000	0.84	12.08	0.42
2.917	2.52	6.000	5.46	9.083	0.84	12.17	0.42
3.000	2.52	6.083	5.46	9.167	0.84	12.25	0.42
3.083	2.52	6.167	5.46	9.250	0.84		

Max.Eff.Inten.(mm/hr)=	19.32	10.63		
over (min)	5.00	65.00		
Storage Coeff. (min)=	0.74 (ii)	63.86 (ii)		
Unit Hyd. Tpeak (min)=	5.00	65.00		
Unit Hyd. peak (cms)=	0.34	0.02		
			TOTALS	
PEAK FLOW (cms)=	0.02	0.00	0.026 (iii)	
TIME TO PEAK (hrs)=	4.50	6.08	5.25	
RUNOFF VOLUME (mm)=	41.90	13.33	27.58	
TOTAL RAINFALL (mm)=	42.00	42.00	42.00	
RUNOFF COEFFICIENT =	1.00	0.32	0.66	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (3142) ID= 1 DT= 5.0 min	Area (ha)= 0.52 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.36	0.16
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	0.30
Length	(m)=	6.00	274.60
Mannings n	=	0.013	0.250

```
     Max.Eff.Inten.(mm/hr)=      19.32        10.63
               over (min)         5.00       100.00
     Storage Coeff.  (min)=       0.74 (ii)   97.83 (ii)
     Unit Hyd. Tpeak (min)=       5.00       100.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.015 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.75           5.25
     RUNOFF VOLUME    (mm)=      41.90        13.33          27.51
     TOTAL RAINFALL   (mm)=      42.00        42.00          42.00
     RUNOFF COEFFICIENT   =       1.00         0.32           0.66

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  3143)|   Area    (ha)=   1.12
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.78         0.34
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.30
     Length            (m)=       6.00       590.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        10.63
               over (min)         5.00       155.00
     Storage Coeff.  (min)=       0.74 (ii)  154.37 (ii)
     Unit Hyd. Tpeak (min)=       5.00       155.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.00          0.031 (iii)
     TIME TO PEAK    (hrs)=       4.50         7.75           5.25
     RUNOFF VOLUME    (mm)=      41.90        13.33          27.54
     TOTAL RAINFALL   (mm)=      42.00        42.00          42.00
     RUNOFF COEFFICIENT   =       1.00         0.32           0.66

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  3144)|   Area    (ha)=   0.85
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.59         0.25
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         4.35
     Length            (m)=       6.00       444.50
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        10.63
               over (min)         5.00        60.00
     Storage Coeff.  (min)=       0.74 (ii)   58.85 (ii)
     Unit Hyd. Tpeak (min)=       5.00        60.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.00          0.025 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.00           5.25
     RUNOFF VOLUME    (mm)=      41.90        13.33          27.58
     TOTAL RAINFALL   (mm)=      42.00        42.00          42.00
     RUNOFF COEFFICIENT   =       1.00         0.32           0.66

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
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```
       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  3140)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  3141):     0.88   0.026     5.25    27.58
      + ID2= 2 (  3142):     0.52   0.015     5.25    27.51
        ================================================
        ID = 3 (  3140):     1.40   0.041     5.25    27.55

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD  (  3140)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  3140):     1.40   0.041     5.25    27.55
      + ID2= 2 (  3143):     1.12   0.031     5.25    27.54
        ================================================
        ID = 1 (  3140):     2.52   0.071     5.25    27.55

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD  (  3140)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  3140):     2.52   0.071     5.25    27.55
      + ID2= 2 (  3144):     0.85   0.025     5.25    27.58
        ================================================
        ID = 3 (  3140):     3.37   0.097     5.25    27.55

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  6041)|   Area    (ha)=   1.07
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.75         0.32
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         3.10
     Length            (m)=       6.00       565.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        14.21
               over (min)         5.00        70.00
     Storage Coeff.  (min)=       0.74 (ii)   66.88 (ii)
     Unit Hyd. Tpeak (min)=       5.00        70.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.032 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.17          5.25
     RUNOFF VOLUME    (mm)=      41.90        17.35         29.59
     TOTAL RAINFALL   (mm)=      42.00        42.00         42.00
     RUNOFF COEFFICIENT   =       1.00         0.41          0.70

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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| CALIB            |
| STANDHYD (  6042)|   Area    (ha)=   1.52
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.06         0.46
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         1.40
     Length            (m)=       6.00       800.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        14.21
               over (min)         5.00       105.00
     Storage Coeff.  (min)=       0.74 (ii)  104.17 (ii)
     Unit Hyd. Tpeak (min)=       5.00       105.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.01          0.043 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.83          5.25
     RUNOFF VOLUME    (mm)=      41.90        17.35         29.59
     TOTAL RAINFALL   (mm)=      42.00        42.00         42.00
     RUNOFF COEFFICIENT   =       1.00         0.41          0.70

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------
| CALIB            |
| STANDHYD (  6043)|   Area    (ha)=   1.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.83         0.35
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.50
     Length            (m)=       6.00       620.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        14.21
               over (min)         5.00       125.00
     Storage Coeff.  (min)=       0.74 (ii)  121.63 (ii)
     Unit Hyd. Tpeak (min)=       5.00       125.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.033 (iii)
     TIME TO PEAK    (hrs)=       4.50         7.17          5.25
     RUNOFF VOLUME    (mm)=      41.90        17.35         29.57
     TOTAL RAINFALL   (mm)=      42.00        42.00         42.00
     RUNOFF COEFFICIENT   =       1.00         0.41          0.70

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  6040)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  6041):     1.07   0.032     5.25    29.59
      + ID2= 2 (  6042):     1.52   0.043     5.25    29.59
        ==========================================================
        ID = 3 (  6040):     2.59   0.076     5.25    29.59

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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ADD HYD (6040)		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
3 + 2 = 1	ID1= 3 (6040):	2.59	0.076	5.25	29.59
	+ ID2= 2 (6043):	1.18	0.033	5.25	29.57
	ID = 1 (6040):	3.77	0.109	5.25	29.58

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB STANDHYD (5212) | Area (ha)= 0.82
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.57	0.25	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.20	
Length	(m)=	6.00	433.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)	=	19.32	14.65	
over (min)		5.00	130.00	
Storage Coeff.	(min)=	0.74 (ii)	127.49 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	130.00	
Unit Hyd. peak	(cms)=	0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.00	0.023 (iii)
TIME TO PEAK	(hrs)=	4.50	7.25	5.25
RUNOFF VOLUME	(mm)=	41.90	17.83	29.78
TOTAL RAINFALL	(mm)=	42.00	42.00	42.00
RUNOFF COEFFICIENT	=	1.00	0.42	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (5211) | Area (ha)= 0.42
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.29	0.13	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.20	
Length	(m)=	6.00	220.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)	=	19.32	14.65	
over (min)		5.00	90.00	
Storage Coeff.	(min)=	0.74 (ii)	85.17 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	90.00	
Unit Hyd. peak	(cms)=	0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.01	0.00	0.012 (iii)
TIME TO PEAK	(hrs)=	4.50	6.50	5.25
RUNOFF VOLUME	(mm)=	41.90	17.83	29.75
TOTAL RAINFALL	(mm)=	42.00	42.00	42.00
RUNOFF COEFFICIENT	=	1.00	0.42	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (5210)		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
1 + 2 = 3	ID1= 1 (5211):	0.42	0.012	5.25	29.75
	+ ID2= 2 (5212):	0.82	0.023	5.25	29.78
	ID = 3 (5210):	1.24	0.035	5.25	29.77

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB STANDHYD (6142) | Area (ha)= 1.43
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	1.00	0.43	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.25	
Length	(m)=	6.00	753.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)	=	19.32	14.65	
over (min)		5.00	170.00	
Storage Coeff.	(min)=	0.74 (ii)	165.96 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	170.00	
Unit Hyd. peak	(cms)=	0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.04	0.01	0.039 (iii)
TIME TO PEAK	(hrs)=	4.50	7.92	5.25
RUNOFF VOLUME	(mm)=	41.90	17.83	29.80
TOTAL RAINFALL	(mm)=	42.00	42.00	42.00
RUNOFF COEFFICIENT	=	1.00	0.42	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (6143) | Area (ha)= 0.71
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.50	0.21	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.90	
Length	(m)=	6.00	372.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)	=	19.32	14.65	
over (min)		5.00	75.00	
Storage Coeff.	(min)=	0.74 (ii)	74.43 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	75.00	
Unit Hyd. peak	(cms)=	0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.00	0.021 (iii)
TIME TO PEAK	(hrs)=	4.50	6.25	5.25
RUNOFF VOLUME	(mm)=	41.90	17.83	29.81
TOTAL RAINFALL	(mm)=	42.00	42.00	42.00
RUNOFF COEFFICIENT	=	1.00	0.42	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB            |
| STANDHYD (  6141)|   Area    (ha)=   0.89
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.62         0.27
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.25
     Length            (m)=       6.00       470.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        14.65
               over (min)         5.00       130.00
     Storage Coeff.  (min)=       0.74 (ii)  125.26 (ii)
     Unit Hyd. Tpeak (min)=       5.00       130.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.00          0.025 (iii)
     TIME TO PEAK    (hrs)=       4.50         7.25           5.25
     RUNOFF VOLUME    (mm)=      41.90        17.83          29.79
     TOTAL RAINFALL   (mm)=      42.00        42.00          42.00
     RUNOFF COEFFICIENT   =       1.00         0.42           0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| ADD HYD  (  6140)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  6141):     0.89   0.025     5.25    29.79
     + ID2= 2 (  6142):     1.43   0.039     5.25    29.80
       ================================================
       ID = 3 (  6140):     2.32   0.064     5.25    29.80

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD  (  6140)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  6140):     2.32   0.064     5.25    29.80
     + ID2= 2 (  6143):     0.71   0.021     5.25    29.81
       ================================================
       ID = 1 (  6140):     3.03   0.086     5.25    29.80

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| CALIB            |
| STANDHYD (  5131)|   Area    (ha)=   1.29
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.90         0.39
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.70
     Length            (m)=       6.00       681.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        14.65
               over (min)         5.00       115.00
     Storage Coeff.  (min)=       0.74 (ii)  114.95 (ii)
     Unit Hyd. Tpeak (min)=       5.00       115.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.036 (iii)
```

TIME TO PEAK (hrs)=	4.50	7.00	5.25
RUNOFF VOLUME (mm)=	41.90	17.83	29.82
TOTAL RAINFALL (mm)=	42.00	42.00	42.00
RUNOFF COEFFICIENT =	1.00	0.42	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (5132)	Area (ha)= 0.15		
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00	

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.10	0.05	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	0.70	
Length (m)=	6.00	80.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	19.32	17.32	
over (min)	5.00	35.00	
Storage Coeff. (min)=	0.74 (ii)	30.29 (ii)	
Unit Hyd. Tpeak (min)=	5.00	35.00	
Unit Hyd. peak (cms)=	0.34	0.04	
			TOTALS
PEAK FLOW (cms)=	0.00	0.00	0.005 (iii)
TIME TO PEAK (hrs)=	4.50	5.50	5.25
RUNOFF VOLUME (mm)=	41.90	17.83	29.76
TOTAL RAINFALL (mm)=	42.00	42.00	42.00
RUNOFF COEFFICIENT =	1.00	0.42	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (5133)	Area (ha)= 0.38		
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00	

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.27	0.11	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	0.60	
Length (m)=	6.00	200.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	19.32	14.65	
over (min)	5.00	60.00	
Storage Coeff. (min)=	0.74 (ii)	58.09 (ii)	
Unit Hyd. Tpeak (min)=	5.00	60.00	
Unit Hyd. peak (cms)=	0.34	0.02	
			TOTALS
PEAK FLOW (cms)=	0.01	0.00	0.012 (iii)
TIME TO PEAK (hrs)=	4.50	6.00	5.25
RUNOFF VOLUME (mm)=	41.90	17.83	29.77
TOTAL RAINFALL (mm)=	42.00	42.00	42.00
RUNOFF COEFFICIENT =	1.00	0.42	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  5134)|   Area    (ha)=   0.38
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.27         0.11
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.60
     Length            (m)=       6.00       200.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        14.65
               over (min)         5.00        60.00
     Storage Coeff.  (min)=       0.74 (ii)   58.09 (ii)
     Unit Hyd. Tpeak (min)=       5.00        60.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.012 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.00           5.25
     RUNOFF VOLUME    (mm)=      41.90        17.83          29.77
     TOTAL RAINFALL   (mm)=      42.00        42.00          42.00
     RUNOFF COEFFICIENT   =       1.00         0.42           0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  5130)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  5131):     1.29   0.036     5.25    29.82
     + ID2= 2 (  5132):     0.15   0.005     5.25    29.76
       ==========================================================
       ID = 3 (  5130):     1.44   0.042     5.25    29.81

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD  (  5130)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  5130):     1.44   0.042     5.25    29.81
     + ID2= 2 (  5133):     0.38   0.012     5.25    29.77
       ==========================================================
       ID = 1 (  5130):     1.82   0.054     5.25    29.80

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD  (  5130)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  5130):     1.82   0.054     5.25    29.80
     + ID2= 2 (  5134):     0.38   0.012     5.25    29.77
       ==========================================================
       ID = 3 (  5130):     2.20   0.066     5.25    29.80

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0011)|   Area    (ha)=   1.13
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
```

Surface Area	(ha)=	0.79	0.34	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	1.50	0.60	
Length	(m)=	6.00	596.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)	=	19.32	11.35	
over (min)		5.00	125.00	
Storage Coeff.	(min)=	0.81 (ii)	123.12 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	125.00	
Unit Hyd. peak	(cms)=	0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.03	0.00	0.031 (iii)
TIME TO PEAK	(hrs)=	4.50	7.17	5.25
RUNOFF VOLUME	(mm)=	41.90	14.15	27.96
TOTAL RAINFALL	(mm)=	42.00	42.00	42.00
RUNOFF COEFFICIENT	=	1.00	0.34	0.67

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 69.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0021)	Area (ha)=	0.58	
ID= 1 DT= 5.0 min	Total Imp(%)=	70.00	Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.41	0.17	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	1.50	0.60	
Length	(m)=	6.00	304.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)	=	19.32	10.63	
over (min)		5.00	85.00	
Storage Coeff.	(min)=	0.81 (ii)	84.63 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	85.00	
Unit Hyd. peak	(cms)=	0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.00	0.017 (iii)
TIME TO PEAK	(hrs)=	4.50	6.50	5.25
RUNOFF VOLUME	(mm)=	41.90	13.33	27.54
TOTAL RAINFALL	(mm)=	42.00	42.00	42.00
RUNOFF COEFFICIENT	=	1.00	0.32	0.66

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0022)	Area (ha)=	0.60	
ID= 1 DT= 5.0 min	Total Imp(%)=	70.00	Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.42	0.18	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	1.50	0.60	
Length	(m)=	6.00	314.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)	=	19.32	10.63	
over (min)		5.00	90.00	
Storage Coeff.	(min)=	0.81 (ii)	86.28 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	90.00	
Unit Hyd. peak	(cms)=	0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.00	0.017 (iii)

```
     TIME TO PEAK    (hrs)=       4.50         6.58          5.25
     RUNOFF VOLUME    (mm)=      41.90        13.33         27.54
     TOTAL RAINFALL   (mm)=      42.00        42.00         42.00
     RUNOFF COEFFICIENT   =       1.00         0.32          0.66

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0020)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0021):     0.58   0.017     5.25    27.54
     + ID2= 2 (  0022):     0.60   0.017     5.25    27.54
       ================================================
       ID = 3 (  0020):     1.18   0.034     5.25    27.54

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  3121)|   Area    (ha)=   0.68
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.48         0.20
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         4.50
     Length            (m)=       6.00       355.50
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        12.55
               over (min)        5.00        50.00
     Storage Coeff.  (min)=       0.74 (ii)   47.82 (ii)
     Unit Hyd. Tpeak (min)=       5.00        50.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.00          0.021 (iii)
     TIME TO PEAK    (hrs)=       4.50         5.83          5.25
     RUNOFF VOLUME    (mm)=      41.90        14.54         28.18
     TOTAL RAINFALL   (mm)=      42.00        42.00         42.00
     RUNOFF COEFFICIENT   =       1.00         0.35          0.67

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  69.9    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB            |
| STANDHYD (  3122)|   Area    (ha)=   0.86
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.60         0.26
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.25
     Length            (m)=       6.00       450.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        11.69
               over (min)        5.00       135.00
     Storage Coeff.  (min)=       0.74 (ii)  133.55 (ii)
     Unit Hyd. Tpeak (min)=       5.00       135.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.00          0.024 (iii)
```

```
     TIME TO PEAK    (hrs)=       4.50         7.33          5.25
     RUNOFF VOLUME    (mm)=      41.90        14.54         28.13
     TOTAL RAINFALL   (mm)=      42.00        42.00         42.00
     RUNOFF COEFFICIENT   =       1.00         0.35          0.67

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  69.9    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| ADD HYD  (  3120)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  3121):     0.68   0.021     5.25    28.18
     + ID2= 2 (  3122):     0.86   0.024     5.25    28.13
       ================================================
       ID = 3 (  3120):     1.53   0.045     5.25    28.15

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  6201)|   Area    (ha)=   0.78
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.55         0.23
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         2.80
     Length            (m)=       6.00       410.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        16.22
               over (min)        5.00        55.00
     Storage Coeff.  (min)=       0.74 (ii)   54.11 (ii)
     Unit Hyd. Tpeak (min)=       5.00        55.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.025 (iii)
     TIME TO PEAK    (hrs)=       4.50         5.92          5.25
     RUNOFF VOLUME    (mm)=      41.90        18.95         30.39
     TOTAL RAINFALL   (mm)=      42.00        42.00         42.00
     RUNOFF COEFFICIENT   =       1.00         0.45          0.72

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  78.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  5221)|   Area    (ha)=   0.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.13         0.05
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         1.25
     Length            (m)=       6.00        97.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        17.32
               over (min)        5.00        30.00
     Storage Coeff.  (min)=       0.74 (ii)   28.62 (ii)
     Unit Hyd. Tpeak (min)=       5.00        30.00
     Unit Hyd. peak  (cms)=       0.34         0.04
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.00          0.007 (iii)
```

TIME TO PEAK (hrs)=	4.50	5.50	5.25
RUNOFF VOLUME (mm)=	41.90	17.83	29.77
TOTAL RAINFALL (mm)=	42.00	42.00	42.00
RUNOFF COEFFICIENT =	1.00	0.42	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (5222) | Area (ha)= 0.74
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.52	0.22	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	1.25	
Length (m)=	6.00	388.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	19.32	14.65	
over (min)	5.00	70.00	
Storage Coeff. (min)=	0.74 (ii)	69.22 (ii)	
Unit Hyd. Tpeak (min)=	5.00	70.00	
Unit Hyd. peak (cms)=	0.34	0.02	
			TOTALS
PEAK FLOW (cms)=	0.02	0.01	0.023 (iii)
TIME TO PEAK (hrs)=	4.50	6.17	5.25
RUNOFF VOLUME (mm)=	41.90	17.83	29.81
TOTAL RAINFALL (mm)=	42.00	42.00	42.00
RUNOFF COEFFICIENT =	1.00	0.42	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (5223) | Area (ha)= 0.82
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.57	0.25	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	0.50	
Length (m)=	6.00	432.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	19.32	14.65	
over (min)	5.00	100.00	
Storage Coeff. (min)=	0.74 (ii)	96.89 (ii)	
Unit Hyd. Tpeak (min)=	5.00	100.00	
Unit Hyd. peak (cms)=	0.34	0.01	
			TOTALS
PEAK FLOW (cms)=	0.02	0.00	0.024 (iii)
TIME TO PEAK (hrs)=	4.50	6.67	5.25
RUNOFF VOLUME (mm)=	41.90	17.83	29.80
TOTAL RAINFALL (mm)=	42.00	42.00	42.00
RUNOFF COEFFICIENT =	1.00	0.42	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  5220)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  5221):     0.18   0.007     5.25    29.77
     + ID2= 2 (  5222):     0.74   0.023     5.25    29.81
       ================================================
       ID = 3 (  5220):     0.92   0.029     5.25    29.80

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| ADD HYD  (  5220)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  5220):     0.92   0.029     5.25    29.80
     + ID2= 2 (  5223):     0.82   0.024     5.25    29.80
       ================================================
       ID = 1 (  5220):     1.74   0.053     5.25    29.80

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| CALIB            |
| STANDHYD (  5111)|   Area    (ha)=   0.85
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.59         0.25
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         5.67
     Length            (m)=       6.00       449.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        15.64
               over (min)        5.00        50.00
     Storage Coeff.  (min)=       0.74 (ii)   47.01 (ii)
     Unit Hyd. Tpeak (min)=       5.00        50.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.028 (iii)
     TIME TO PEAK    (hrs)=       4.50         5.83           5.25
     RUNOFF VOLUME    (mm)=      41.90        17.83          29.83
     TOTAL RAINFALL   (mm)=      42.00        42.00          42.00
     RUNOFF COEFFICIENT   =       1.00         0.42           0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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| CALIB            |
| STANDHYD (  3181)|   Area    (ha)=   0.42
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.29         0.13
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         0.30
     Length            (m)=       6.00       220.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32         9.96
               over (min)        5.00        90.00
     Storage Coeff.  (min)=       0.74 (ii)   87.97 (ii)
     Unit Hyd. Tpeak (min)=       5.00        90.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.012 (iii)
```

TIME TO PEAK (hrs)=	4.50	6.58	5.25
RUNOFF VOLUME (mm)=	40.00	12.56	26.16
TOTAL RAINFALL (mm)=	42.00	42.00	42.00
RUNOFF COEFFICIENT =	0.95	0.30	0.62

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 65.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (3182)	Area (ha)= 0.46
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.32	0.14	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	2.00	0.30	
Length	(m)=	6.00	243.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		19.32	9.96	
over (min)		5.00	95.00	
Storage Coeff. (min)=		0.74 (ii)	93.34 (ii)	
Unit Hyd. Tpeak (min)=		5.00	95.00	
Unit Hyd. peak (cms)=		0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.01	0.00	0.013 (iii)
TIME TO PEAK	(hrs)=	4.50	6.67	5.25
RUNOFF VOLUME	(mm)=	40.00	12.56	26.17
TOTAL RAINFALL	(mm)=	42.00	42.00	42.00
RUNOFF COEFFICIENT	=	0.95	0.30	0.62

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 65.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (3180)		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (3181):		0.42	0.012	5.25	26.16
+ ID2= 2 (3182):		0.46	0.013	5.25	26.17
ID = 3 (3180):		0.88	0.025	5.25	26.16

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
V    V   I    SSSSS  U   U    A    L
V    V   I    SS     U   U   A A   L
 V  V    I     SS    U   U  AAAAA  L
 V  V    I      SS   U   U  A   A  L
  VV     I    SSSSS  UUUUU  A   A  LLLLL

 OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
O   O    T      T    H   H   Y Y   MM MM  O   O
O   O    T      T    H   H    Y    M   M  O   O
 OOO     T      T    H   H    Y    M   M   OOO
```


***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\49834fc6-0b13-4846-ada6-616d303cee88\scenar
Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\49834fc6-0b13-4846-ada6-616d303cee88\scenar

DATE: 10/07/2016 TIME: 09:43:16

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 2 **
****

READ STORM	Filename: C:\Users\p002311c\AppData\Local\Temp\db0fe791-7419-44ec-813d-9df9ab04fb68\1b7b6b69
Ptotal= 54.38 mm	Comments: 5yr/12hr

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	3.50	9.25	6.75	3.81	10.00	0.54
0.50	0.54	3.75	9.25	7.00	3.81	10.25	0.54
0.75	0.54	4.00	9.25	7.25	3.81	10.50	0.54
1.00	0.54	4.25	9.25	7.50	2.18	10.75	0.54
1.25	0.54	4.50	25.02	7.75	2.18	11.00	0.54
1.50	0.54	4.75	25.02	8.00	2.18	11.25	0.54
1.75	0.54	5.00	25.02	8.25	2.18	11.50	0.54
2.00	0.54	5.25	25.02	8.50	1.09	11.75	0.54
2.25	0.54	5.50	7.07	8.75	1.09	12.00	0.54
2.50	3.26	5.75	7.07	9.00	1.09	12.25	0.54
2.75	3.26	6.00	7.07	9.25	1.09		
3.00	3.26	6.25	7.07	9.50	0.54		
3.25	3.26	6.50	3.81	9.75	0.54		

CALIB	
STANDHYD (3141)	Area (ha)= 0.88
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.62	0.26
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	3.57
Length	(m)=	6.00	462.10
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	3.26	6.250	7.07	9.33	0.54
0.167	0.00	3.250	3.26	6.333	3.81	9.42	0.54
0.250	0.00	3.333	9.25	6.417	3.81	9.50	0.54
0.333	0.54	3.417	9.25	6.500	3.81	9.58	0.54
0.417	0.54	3.500	9.25	6.583	3.81	9.67	0.54
0.500	0.54	3.583	9.25	6.667	3.81	9.75	0.54
0.583	0.54	3.667	9.25	6.750	3.81	9.83	0.54
0.667	0.54	3.750	9.25	6.833	3.81	9.92	0.54
0.750	0.54	3.833	9.25	6.917	3.81	10.00	0.54
0.833	0.54	3.917	9.25	7.000	3.81	10.08	0.54
0.917	0.54	4.000	9.25	7.083	3.81	10.17	0.54

1.000	0.54	4.083	9.25	7.167	3.81	10.25	0.54
1.083	0.54	4.167	9.25	7.250	3.81	10.33	0.54
1.167	0.54	4.250	9.25	7.333	2.18	10.42	0.54
1.250	0.54	4.333	25.02	7.417	2.18	10.50	0.54
1.333	0.54	4.417	25.02	7.500	2.18	10.58	0.54
1.417	0.54	4.500	25.02	7.583	2.18	10.67	0.54
1.500	0.54	4.583	25.02	7.667	2.18	10.75	0.54
1.583	0.54	4.667	25.02	7.750	2.18	10.83	0.54
1.667	0.54	4.750	25.02	7.833	2.18	10.92	0.54
1.750	0.54	4.833	25.02	7.917	2.18	11.00	0.54
1.833	0.54	4.917	25.02	8.000	2.18	11.08	0.54
1.917	0.54	5.000	25.02	8.083	2.18	11.17	0.54
2.000	0.54	5.083	25.02	8.167	2.18	11.25	0.54
2.083	0.54	5.167	25.02	8.250	2.18	11.33	0.54
2.167	0.54	5.250	25.02	8.333	1.09	11.42	0.54
2.250	0.54	5.333	7.07	8.417	1.09	11.50	0.54
2.333	3.26	5.417	7.07	8.500	1.09	11.58	0.54
2.417	3.26	5.500	7.07	8.583	1.09	11.67	0.54
2.500	3.26	5.583	7.07	8.667	1.09	11.75	0.54
2.583	3.26	5.667	7.07	8.750	1.09	11.83	0.54
2.667	3.26	5.750	7.07	8.833	1.09	11.92	0.54
2.750	3.26	5.833	7.07	8.917	1.09	12.00	0.54
2.833	3.26	5.917	7.07	9.000	1.09	12.08	0.54
2.917	3.26	6.000	7.07	9.083	1.09	12.17	0.54
3.000	3.26	6.083	7.07	9.167	1.09	12.25	0.54
3.083	3.26	6.167	7.07	9.250	1.09		

Max.Eff.Inten.(mm/hr)=	25.02	17.50	
over (min)	5.00	55.00	
Storage Coeff. (min)=	0.67 (ii)	52.37 (ii)	
Unit Hyd. Tpeak (min)=	5.00	55.00	
Unit Hyd. peak (cms)=	0.34	0.02	
			TOTALS
PEAK FLOW (cms)=	0.03	0.01	0.036 (iii)
TIME TO PEAK (hrs)=	4.50	5.92	5.25
RUNOFF VOLUME (mm)=	54.28	20.88	37.54
TOTAL RAINFALL (mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT =	1.00	0.38	0.69

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB		
STANDHYD (3142)	Area (ha)=	0.52
ID= 1 DT= 5.0 min	Total Imp(%)=	70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.36	0.16
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	0.30
Length	(m)=	6.00	274.60
Mannings n	=	0.013	0.250

Max.Eff.Inten.(mm/hr)=	25.02	16.91	
over (min)	5.00	85.00	
Storage Coeff. (min)=	0.67 (ii)	81.30 (ii)	
Unit Hyd. Tpeak (min)=	5.00	85.00	
Unit Hyd. peak (cms)=	0.34	0.01	
			TOTALS
PEAK FLOW (cms)=	0.02	0.00	0.020 (iii)
TIME TO PEAK (hrs)=	4.50	6.42	5.25
RUNOFF VOLUME (mm)=	54.28	20.88	37.49
TOTAL RAINFALL (mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT =	1.00	0.38	0.69

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB            |
| STANDHYD (  3143)|   Area    (ha)=   1.12
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.78         0.34
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.30
     Length            (m)=       6.00       590.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02        16.91
               over (min)        5.00       130.00
     Storage Coeff.  (min)=       0.67 (ii)  128.26 (ii)
     Unit Hyd. Tpeak (min)=       5.00       130.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.01          0.040 (iii)
     TIME TO PEAK    (hrs)=       4.50         7.25          5.25
     RUNOFF VOLUME    (mm)=      54.28        20.88         37.51
     TOTAL RAINFALL   (mm)=      54.38        54.38         54.38
     RUNOFF COEFFICIENT   =       1.00         0.38          0.69

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  3144)|   Area    (ha)=   0.85
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.59         0.25
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         4.35
     Length            (m)=       6.00       444.50
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02        18.06
               over (min)        5.00        50.00
     Storage Coeff.  (min)=       0.67 (ii)   47.68 (ii)
     Unit Hyd. Tpeak (min)=       5.00        50.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.035 (iii)
     TIME TO PEAK    (hrs)=       4.50         5.83          5.25
     RUNOFF VOLUME    (mm)=      54.28        20.88         37.55
     TOTAL RAINFALL   (mm)=      54.38        54.38         54.38
     RUNOFF COEFFICIENT   =       1.00         0.38          0.69

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  3140)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  3141):     0.88   0.036     5.25    37.54
     + ID2= 2 (  3142):     0.52   0.020     5.25    37.49
       ================================================
       ID = 3 (  3140):     1.40   0.056     5.25    37.52

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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| ADD HYD  (  3140)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  3140):     1.40   0.056     5.25    37.52
     + ID2= 2 (  3143):     1.12   0.040     5.25    37.51
       ================================================
       ID = 1 (  3140):     2.52   0.096     5.25    37.52

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| ADD HYD  (  3140)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  3140):     2.52   0.096     5.25    37.52
     + ID2= 2 (  3144):     0.85   0.035     5.25    37.55
       ================================================
       ID = 3 (  3140):     3.37   0.132     5.25    37.53

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| CALIB            |
| STANDHYD (  6041)|   Area    (ha)=   1.07
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.75         0.32
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         3.10
     Length            (m)=       6.00       565.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02        22.60
               over (min)        5.00        60.00
     Storage Coeff.  (min)=       0.67 (ii)   55.61 (ii)
     Unit Hyd. Tpeak (min)=       5.00        60.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.01          0.045 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.00           5.25
     RUNOFF VOLUME    (mm)=      54.28        26.39          40.30
     TOTAL RAINFALL   (mm)=      54.38        54.38          54.38
     RUNOFF COEFFICIENT   =       1.00         0.49           0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  6042)|   Area    (ha)=   1.52
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.06         0.46
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         1.40
     Length            (m)=       6.00       800.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02        21.93
               over (min)        5.00        90.00
     Storage Coeff.  (min)=       0.67 (ii)   87.64 (ii)
     Unit Hyd. Tpeak (min)=       5.00        90.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
```

PEAK FLOW	(cms)=	0.05	0.01	0.058 (iii)
TIME TO PEAK	(hrs)=	4.50	6.50	5.25
RUNOFF VOLUME	(mm)=	54.28	26.39	40.30
TOTAL RAINFALL	(mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT	=	1.00	0.49	0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.8 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (6043) | Area (ha)= 1.18
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.83	0.35
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	0.50
Length	(m)=	6.00	620.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		25.02	21.93
over (min)		5.00	105.00
Storage Coeff. (min)=		0.67 (ii)	102.32 (ii)
Unit Hyd. Tpeak (min)=		5.00	105.00
Unit Hyd. peak (cms)=		0.34	0.01

				TOTALS
PEAK FLOW	(cms)=	0.04	0.01	0.044 (iii)
TIME TO PEAK	(hrs)=	4.50	6.75	5.25
RUNOFF VOLUME	(mm)=	54.28	26.39	40.29
TOTAL RAINFALL	(mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT	=	1.00	0.49	0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.8 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (6040)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (6041):	1.07	0.045	5.25	40.30
+ ID2= 2 (6042):	1.52	0.058	5.25	40.30
ID = 3 (6040):	2.59	0.104	5.25	40.30

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (6040)
3 + 2 = 1

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 3 (6040):	2.59	0.104	5.25	40.30
+ ID2= 2 (6043):	1.18	0.044	5.25	40.29
ID = 1 (6040):	3.77	0.148	5.25	40.30

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB
STANDHYD (5212) | Area (ha)= 0.82
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.57	0.25	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.20	
Length	(m)=	6.00	433.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		25.02	22.52	
over (min)		5.00	110.00	
Storage Coeff. (min)=		0.67 (ii)	107.40 (ii)	
Unit Hyd. Tpeak (min)=		5.00	110.00	
Unit Hyd. peak (cms)=		0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.03	0.01	0.031 (iii)
TIME TO PEAK	(hrs)=	4.50	6.83	5.25
RUNOFF VOLUME	(mm)=	54.28	27.03	40.58
TOTAL RAINFALL	(mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT	=	1.00	0.50	0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB		
STANDHYD (5211)	Area (ha)=	0.42
ID= 1 DT= 5.0 min	Total Imp(%)=	70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.29	0.13	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.20	
Length	(m)=	6.00	220.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		25.02	22.52	
over (min)		5.00	75.00	
Storage Coeff. (min)=		0.67 (ii)	71.77 (ii)	
Unit Hyd. Tpeak (min)=		5.00	75.00	
Unit Hyd. peak (cms)=		0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.01	0.00	0.017 (iii)
TIME TO PEAK	(hrs)=	4.50	6.25	5.25
RUNOFF VOLUME	(mm)=	54.28	27.03	40.56
TOTAL RAINFALL	(mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT	=	1.00	0.50	0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (5210)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (5211):		0.42	0.017	5.25	40.56
+ ID2= 2 (5212):		0.82	0.031	5.25	40.58
ID = 3 (5210):		1.24	0.047	5.25	40.58

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB		
STANDHYD (6142)	Area (ha)=	1.43
ID= 1 DT= 5.0 min	Total Imp(%)=	70.00 Dir. Conn.(%)= 50.00

```
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.00         0.43
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.25
     Length            (m)=       6.00       753.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02        22.52
               over (min)        5.00       140.00
     Storage Coeff.  (min)=       0.67 (ii)  139.80 (ii)
     Unit Hyd. Tpeak (min)=       5.00       140.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.01          0.052 (iii)
     TIME TO PEAK    (hrs)=       4.50         7.42           5.25
     RUNOFF VOLUME    (mm)=      54.28        27.03          40.60
     TOTAL RAINFALL   (mm)=      54.38        54.38          54.38
     RUNOFF COEFFICIENT   =       1.00         0.50           0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  6143)|   Area    (ha)=   0.71
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.50         0.21
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.90
     Length            (m)=       6.00       372.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02        22.52
               over (min)        5.00        65.00
     Storage Coeff.  (min)=       0.67 (ii)   62.72 (ii)
     Unit Hyd. Tpeak (min)=       5.00        65.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.029 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.08           5.25
     RUNOFF VOLUME    (mm)=      54.28        27.03          40.60
     TOTAL RAINFALL   (mm)=      54.38        54.38          54.38
     RUNOFF COEFFICIENT   =       1.00         0.50           0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  6141)|   Area    (ha)=   0.89
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.62         0.27
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.25
     Length            (m)=       6.00       470.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02        22.52
               over (min)        5.00       110.00
     Storage Coeff.  (min)=       0.67 (ii)  105.53 (ii)
     Unit Hyd. Tpeak (min)=       5.00       110.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                      *TOTALS*
```

PEAK FLOW (cms)=	0.03	0.01	0.033 (iii)
TIME TO PEAK (hrs)=	4.50	6.83	5.25
RUNOFF VOLUME (mm)=	54.28	27.03	40.59
TOTAL RAINFALL (mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT =	1.00	0.50	0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (6140)					
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	
ID1= 1 (6141):	0.89	0.033	5.25	40.59	
+ ID2= 2 (6142):	1.43	0.052	5.25	40.60	
ID = 3 (6140):	2.32	0.085	5.25	40.60	

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (6140)					
3 + 2 = 1	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	
ID1= 3 (6140):	2.32	0.085	5.25	40.60	
+ ID2= 2 (6143):	0.71	0.029	5.25	40.60	
ID = 1 (6140):	3.03	0.115	5.25	40.60	

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB STANDHYD (5131) ID= 1 DT= 5.0 min	Area (ha)= 1.29 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00		
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.90	0.39	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	0.70	
Length (m)=	6.00	681.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	25.02	22.52	
over (min)	5.00	100.00	
Storage Coeff. (min)=	0.67 (ii)	96.85 (ii)	
Unit Hyd. Tpeak (min)=	5.00	100.00	
Unit Hyd. peak (cms)=	0.34	0.01	
			TOTALS
PEAK FLOW (cms)=	0.04	0.01	0.049 (iii)
TIME TO PEAK (hrs)=	4.50	6.67	5.25
RUNOFF VOLUME (mm)=	54.28	27.03	40.61
TOTAL RAINFALL (mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT =	1.00	0.50	0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (5132) ID= 1 DT= 5.0 min	Area (ha)= 0.15 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

```
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.10         0.05
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.70
     Length            (m)=       6.00        80.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02        26.43
               over (min)        5.00        30.00
     Storage Coeff.  (min)=       0.67 (ii)   25.62 (ii)
     Unit Hyd. Tpeak (min)=       5.00        30.00
     Unit Hyd. peak  (cms)=       0.34         0.04
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.008 (iii)
     TIME TO PEAK    (hrs)=       4.50         5.42           5.25
     RUNOFF VOLUME    (mm)=      54.28        27.03          40.52
     TOTAL RAINFALL   (mm)=      54.38        54.38          54.38
     RUNOFF COEFFICIENT   =       1.00         0.50           0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  5133)|   Area    (ha)=   0.38
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.27         0.11
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.60
     Length            (m)=       6.00       200.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02        23.83
               over (min)        5.00        50.00
     Storage Coeff.  (min)=       0.67 (ii)   47.88 (ii)
     Unit Hyd. Tpeak (min)=       5.00        50.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.017 (iii)
     TIME TO PEAK    (hrs)=       4.50         5.75           5.25
     RUNOFF VOLUME    (mm)=      54.28        27.03          40.58
     TOTAL RAINFALL   (mm)=      54.38        54.38          54.38
     RUNOFF COEFFICIENT   =       1.00         0.50           0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  5134)|   Area    (ha)=   0.38
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.27         0.11
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.60
     Length            (m)=       6.00       200.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02        23.83
               over (min)        5.00        50.00
     Storage Coeff.  (min)=       0.67 (ii)   47.88 (ii)
     Unit Hyd. Tpeak (min)=       5.00        50.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
```

PEAK FLOW (cms)=	0.01	0.00	0.017 (iii)
TIME TO PEAK (hrs)=	4.50	5.75	5.25
RUNOFF VOLUME (mm)=	54.28	27.03	40.58
TOTAL RAINFALL (mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT =	1.00	0.50	0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (5130)					
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	
ID1= 1 (5131):	1.29	0.049	5.25	40.61	
+ ID2= 2 (5132):	0.15	0.008	5.25	40.52	
ID = 3 (5130):	1.44	0.057	5.25	40.60	

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (5130)					
3 + 2 = 1	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	
ID1= 3 (5130):	1.44	0.057	5.25	40.60	
+ ID2= 2 (5133):	0.38	0.017	5.25	40.58	
ID = 1 (5130):	1.82	0.073	5.25	40.60	

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (5130)					
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	
ID1= 1 (5130):	1.82	0.073	5.25	40.60	
+ ID2= 2 (5134):	0.38	0.017	5.25	40.58	
ID = 3 (5130):	2.20	0.090	5.25	40.59	

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB
STANDHYD (0011) | Area (ha)= 1.13
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=		0.79	0.34	
Dep. Storage (mm)=		0.10	5.00	
Average Slope (%)=		1.50	0.60	
Length (m)=		6.00	596.00	
Mannings n =		0.013	0.250	
Max.Eff.Inten.(mm/hr)=		25.02	17.94	
over (min)		5.00	105.00	
Storage Coeff. (min)=		0.73 (ii)	102.56 (ii)	
Unit Hyd. Tpeak (min)=		5.00	105.00	
Unit Hyd. peak (cms)=		0.34	0.01	
				TOTALS
PEAK FLOW (cms)=		0.04	0.01	0.042 (iii)
TIME TO PEAK (hrs)=		4.50	6.83	5.25
RUNOFF VOLUME (mm)=		54.28	22.03	38.10
TOTAL RAINFALL (mm)=		54.38	54.38	54.38
RUNOFF COEFFICIENT =		1.00	0.41	0.70

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

```
       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  69.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0021)|   Area    (ha)=   0.58
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.41         0.17
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.50         0.60
     Length            (m)=       6.00       304.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02        16.91
               over (min)         5.00        75.00
     Storage Coeff.  (min)=       0.73 (ii)   70.35 (ii)
     Unit Hyd. Tpeak (min)=       5.00        75.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.00          0.022 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.25           5.25
     RUNOFF VOLUME    (mm)=      54.28        20.88          37.51
     TOTAL RAINFALL   (mm)=      54.38        54.38          54.38
     RUNOFF COEFFICIENT   =       1.00         0.38           0.69

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0022)|   Area    (ha)=   0.60
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.42         0.18
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.50         0.60
     Length            (m)=       6.00       314.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02        16.91
               over (min)         5.00        75.00
     Storage Coeff.  (min)=       0.73 (ii)   71.71 (ii)
     Unit Hyd. Tpeak (min)=       5.00        75.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.00          0.023 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.25           5.25
     RUNOFF VOLUME    (mm)=      54.28        20.88          37.51
     TOTAL RAINFALL   (mm)=      54.38        54.38          54.38
     RUNOFF COEFFICIENT   =       1.00         0.38           0.69

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0020)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
```

```
  ID1= 1 (  0021):     0.58   0.022     5.25    37.51
+ ID2= 2 (  0022):     0.60   0.023     5.25    37.51
  ================================================
  ID = 3 (  0020):     1.18   0.046     5.25    37.51

NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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| CALIB            |
| STANDHYD (  3121)|   Area    (ha)=   0.68
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.48         0.20
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         4.50
     Length            (m)=       6.00       355.50
     Mannings n            =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02        20.72
               over (min)        5.00        40.00
     Storage Coeff.  (min)=       0.67 (ii)   39.19 (ii)
     Unit Hyd. Tpeak (min)=       5.00        40.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.030 (iii)
     TIME TO PEAK    (hrs)=       4.50         5.67           5.25
     RUNOFF VOLUME    (mm)=      54.28        22.56          38.39
     TOTAL RAINFALL   (mm)=      54.38        54.38          54.38
     RUNOFF COEFFICIENT   =       1.00         0.41           0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  69.9    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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| CALIB            |
| STANDHYD (  3122)|   Area    (ha)=   0.86
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.60         0.26
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.25
     Length            (m)=       6.00       450.00
     Mannings n            =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02        18.42
               over (min)        5.00       115.00
     Storage Coeff.  (min)=       0.67 (ii)  111.36 (ii)
     Unit Hyd. Tpeak (min)=       5.00       115.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.031 (iii)
     TIME TO PEAK    (hrs)=       4.50         7.00           5.25
     RUNOFF VOLUME    (mm)=      54.28        22.56          38.35
     TOTAL RAINFALL   (mm)=      54.38        54.38          54.38
     RUNOFF COEFFICIENT   =       1.00         0.41           0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  69.9    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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--------------------
| ADD HYD  (  3120)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
```

```
  ID1= 1 (  3121):     0.68   0.030     5.25    38.39
+ ID2= 2 (  3122):     0.86   0.031     5.25    38.35
  ================================================
  ID = 3 (  3120):     1.53   0.062     5.25    38.37

NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

CALIB					
STANDHYD (6201)	Area (ha)= 0.78				
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00			

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.55	0.23	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	2.80	
Length	(m)=	6.00	410.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		25.02	25.81	
over (min)		5.00	45.00	
Storage Coeff. (min)=		0.67 (ii)	44.98 (ii)	
Unit Hyd. Tpeak (min)=		5.00	45.00	
Unit Hyd. peak (cms)=		0.34	0.03	
				TOTALS
PEAK FLOW	(cms)=	0.03	0.01	0.036 (iii)
TIME TO PEAK	(hrs)=	4.50	5.67	5.25
RUNOFF VOLUME	(mm)=	54.28	28.50	41.35
TOTAL RAINFALL	(mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT	=	1.00	0.52	0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 78.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (5221)	Area (ha)= 0.18				
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00			

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.13	0.05	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	1.25	
Length	(m)=	6.00	97.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		25.02	26.43	
over (min)		5.00	25.00	
Storage Coeff. (min)=		0.67 (ii)	24.21 (ii)	
Unit Hyd. Tpeak (min)=		5.00	25.00	
Unit Hyd. peak (cms)=		0.34	0.05	
				TOTALS
PEAK FLOW	(cms)=	0.01	0.00	0.009 (iii)
TIME TO PEAK	(hrs)=	4.50	5.33	5.25
RUNOFF VOLUME	(mm)=	54.28	27.03	40.56
TOTAL RAINFALL	(mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT	=	1.00	0.50	0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (5222)	Area (ha)= 0.74				
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00			

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.52	0.22	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	1.25	
Length	(m)=	6.00	388.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		25.02	22.52	
over (min)		5.00	60.00	
Storage Coeff. (min)=		0.67 (ii)	58.34 (ii)	
Unit Hyd. Tpeak (min)=		5.00	60.00	
Unit Hyd. peak (cms)=		0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.03	0.01	0.031 (iii)
TIME TO PEAK	(hrs)=	4.50	6.00	5.25
RUNOFF VOLUME	(mm)=	54.28	27.03	40.61
TOTAL RAINFALL	(mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT	=	1.00	0.50	0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (5223)	Area (ha)= 0.82
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.57	0.25	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.50	
Length	(m)=	6.00	432.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		25.02	22.52	
over (min)		5.00	85.00	
Storage Coeff. (min)=		0.67 (ii)	81.64 (ii)	
Unit Hyd. Tpeak (min)=		5.00	85.00	
Unit Hyd. peak (cms)=		0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.03	0.01	0.032 (iii)
TIME TO PEAK	(hrs)=	4.50	6.42	5.25
RUNOFF VOLUME	(mm)=	54.28	27.03	40.60
TOTAL RAINFALL	(mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT	=	1.00	0.50	0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (5220)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (5221):		0.18	0.009	5.25	40.56
+ ID2= 2 (5222):		0.74	0.031	5.25	40.61
ID = 3 (5220):		0.92	0.041	5.25	40.60

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (5220)		AREA	QPEAK	TPEAK	R.V.
3 + 2 = 1		(ha)	(cms)	(hrs)	(mm)

```
  ID1= 3 (  5220):     0.92   0.041     5.25    40.60
+ ID2= 2 (  5223):     0.82   0.032     5.25    40.60
  ================================================
  ID = 1 (  5220):     1.74   0.073     5.25    40.60

NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

CALIB					
STANDHYD (5111)	Area (ha)= 0.85				
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00			

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.59	0.25	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	5.67	
Length	(m)=	6.00	449.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		25.02	24.97	
over (min)		5.00	40.00	
Storage Coeff. (min)=		0.67 (ii)	39.04 (ii)	
Unit Hyd. Tpeak (min)=		5.00	40.00	
Unit Hyd. peak (cms)=		0.34	0.03	
				TOTALS
PEAK FLOW	(cms)=	0.03	0.01	0.040 (iii)
TIME TO PEAK	(hrs)=	4.50	5.58	5.25
RUNOFF VOLUME	(mm)=	54.28	27.03	40.63
TOTAL RAINFALL	(mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT	=	1.00	0.50	0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (3181)	Area (ha)= 0.42				
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00			

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.29	0.13	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	2.00	0.30	
Length	(m)=	6.00	220.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		25.02	15.94	
over (min)		5.00	75.00	
Storage Coeff. (min)=		0.67 (ii)	72.95 (ii)	
Unit Hyd. Tpeak (min)=		5.00	75.00	
Unit Hyd. peak (cms)=		0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.01	0.00	0.016 (iii)
TIME TO PEAK	(hrs)=	4.50	6.25	5.25
RUNOFF VOLUME	(mm)=	52.38	19.78	35.98
TOTAL RAINFALL	(mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT	=	0.96	0.36	0.66

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 65.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB				
STANDHYD (3182)	Area (ha)= 0.46			
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00		

407 TWY - NO SWM (12hr AES) - ROU-PET

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.32	0.14	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	2.00	0.30	
Length	(m)=	6.00	243.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)	=	25.02	15.94	
over	(min)	5.00	80.00	
Storage Coeff.	(min)=	0.67 (ii)	77.39 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	80.00	
Unit Hyd. peak	(cms)=	0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.00	0.017 (iii)
TIME TO PEAK	(hrs)=	4.50	6.33	5.25
RUNOFF VOLUME	(mm)=	52.38	19.78	35.98
TOTAL RAINFALL	(mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT	=	0.96	0.36	0.66

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 65.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (3180)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (3181):		0.42	0.016	5.25	35.98
+ ID2= 2 (3182):		0.46	0.017	5.25	35.98
ID = 3 (3180):		0.88	0.034	5.25	35.98

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Civica Infrastructure
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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\e71645d0-9a49-4e25-8e39-ffedcefb4ae7\scenar
Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\e71645d0-9a49-4e25-8e39-ffedcefb4ae7\scenar

DATE: 10/07/2016 TIME: 09:43:17

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 3 **
****

READ STORM	Filename: C:\Users\p002311c\AppData\Local\Temp\db0fe791-7419-44ec-813d-9df9ab04fb68\636e3041
Ptotal= 62.71 mm	Comments: 10yr/12hr

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	3.50	10.66	6.75	4.39	10.00	0.63
0.50	0.63	3.75	10.66	7.00	4.39	10.25	0.63
0.75	0.63	4.00	10.66	7.25	4.39	10.50	0.63
1.00	0.63	4.25	10.66	7.50	2.51	10.75	0.63
1.25	0.63	4.50	28.84	7.75	2.51	11.00	0.63
1.50	0.63	4.75	28.84	8.00	2.51	11.25	0.63
1.75	0.63	5.00	28.84	8.25	2.51	11.50	0.63
2.00	0.63	5.25	28.84	8.50	1.25	11.75	0.63
2.25	0.63	5.50	8.15	8.75	1.25	12.00	0.63
2.50	3.76	5.75	8.15	9.00	1.25	12.25	0.63
2.75	3.76	6.00	8.15	9.25	1.25		
3.00	3.76	6.25	8.15	9.50	0.63		
3.25	3.76	6.50	4.39	9.75	0.63		

CALIB STANDHYD (3141)	Area (ha)= 0.88
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.62	0.26
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	3.57
Length	(m)=	6.00	462.10
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	3.76	6.250	8.15	9.33	0.63
0.167	0.00	3.250	3.76	6.333	4.39	9.42	0.63
0.250	0.00	3.333	10.66	6.417	4.39	9.50	0.63
0.333	0.63	3.417	10.66	6.500	4.39	9.58	0.63
0.417	0.63	3.500	10.66	6.583	4.39	9.67	0.63
0.500	0.63	3.583	10.66	6.667	4.39	9.75	0.63
0.583	0.63	3.667	10.66	6.750	4.39	9.83	0.63
0.667	0.63	3.750	10.66	6.833	4.39	9.92	0.63
0.750	0.63	3.833	10.66	6.917	4.39	10.00	0.63
0.833	0.63	3.917	10.66	7.000	4.39	10.08	0.63
0.917	0.63	4.000	10.66	7.083	4.39	10.17	0.63
1.000	0.63	4.083	10.66	7.167	4.39	10.25	0.63
1.083	0.63	4.167	10.66	7.250	4.39	10.33	0.63
1.167	0.63	4.250	10.66	7.333	2.51	10.42	0.63
1.250	0.63	4.333	28.84	7.417	2.51	10.50	0.63
1.333	0.63	4.417	28.84	7.500	2.51	10.58	0.63
1.417	0.63	4.500	28.84	7.583	2.51	10.67	0.63
1.500	0.63	4.583	28.84	7.667	2.51	10.75	0.63
1.583	0.63	4.667	28.84	7.750	2.51	10.83	0.63
1.667	0.63	4.750	28.84	7.833	2.51	10.92	0.63
1.750	0.63	4.833	28.84	7.917	2.51	11.00	0.63
1.833	0.63	4.917	28.84	8.000	2.51	11.08	0.63
1.917	0.63	5.000	28.84	8.083	2.51	11.17	0.63
2.000	0.63	5.083	28.84	8.167	2.51	11.25	0.63
2.083	0.63	5.167	28.84	8.250	2.51	11.33	0.63
2.167	0.63	5.250	28.84	8.333	1.25	11.42	0.63
2.250	0.63	5.333	8.15	8.417	1.25	11.50	0.63
2.333	3.76	5.417	8.15	8.500	1.25	11.58	0.63
2.417	3.76	5.500	8.15	8.583	1.25	11.67	0.63
2.500	3.76	5.583	8.15	8.667	1.25	11.75	0.63

2.583	3.76	5.667	8.15	8.750	1.25	11.83	0.63
2.667	3.76	5.750	8.15	8.833	1.25	11.92	0.63
2.750	3.76	5.833	8.15	8.917	1.25	12.00	0.63
2.833	3.76	5.917	8.15	9.000	1.25	12.08	0.63
2.917	3.76	6.000	8.15	9.083	1.25	12.17	0.63
3.000	3.76	6.083	8.15	9.167	1.25	12.25	0.63
3.083	3.76	6.167	8.15	9.250	1.25		

Max.Eff.Inten.(mm/hr)=	28.84	22.97	
over (min)	5.00	50.00	
Storage Coeff. (min)=	0.63 (ii)	47.01 (ii)	
Unit Hyd. Tpeak (min)=	5.00	50.00	
Unit Hyd. peak (cms)=	0.34	0.02	
			TOTALS
PEAK FLOW (cms)=	0.04	0.01	0.043 (iii)
TIME TO PEAK (hrs)=	4.50	5.83	5.25
RUNOFF VOLUME (mm)=	62.61	26.45	44.50
TOTAL RAINFALL (mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT =	1.00	0.42	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (3142) | Area (ha)= 0.52
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=		0.36	0.16
Dep. Storage (mm)=		0.10	5.00
Average Slope (%)=		2.00	0.30
Length (m)=		6.00	274.60
Mannings n =		0.013	0.250

Max.Eff.Inten.(mm/hr)=	28.84	21.59	
over (min)	5.00	75.00	
Storage Coeff. (min)=	0.63 (ii)	73.76 (ii)	
Unit Hyd. Tpeak (min)=	5.00	75.00	
Unit Hyd. peak (cms)=	0.34	0.02	
			TOTALS
PEAK FLOW (cms)=	0.02	0.01	0.023 (iii)
TIME TO PEAK (hrs)=	4.50	6.25	5.25
RUNOFF VOLUME (mm)=	62.61	26.45	44.45
TOTAL RAINFALL (mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT =	1.00	0.42	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (3143) | Area (ha)= 1.12
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=		0.78	0.34
Dep. Storage (mm)=		0.10	5.00
Average Slope (%)=		2.00	0.30
Length (m)=		6.00	590.00
Mannings n =		0.013	0.250

Max.Eff.Inten.(mm/hr)=	28.84	21.59
over (min)	5.00	120.00
Storage Coeff. (min)=	0.63 (ii)	116.35 (ii)
Unit Hyd. Tpeak (min)=	5.00	120.00
Unit Hyd. peak (cms)=	0.34	0.01

				TOTALS
PEAK FLOW	(cms)=	0.04	0.01	0.047 (iii)
TIME TO PEAK	(hrs)=	4.50	7.08	5.25
RUNOFF VOLUME	(mm)=	62.61	26.45	44.47
TOTAL RAINFALL	(mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT	=	1.00	0.42	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (3144)	Area (ha)=	0.85	
ID= 1 DT= 5.0 min	Total Imp(%)=	70.00	Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.59	0.25
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	4.35
Length	(m)=	6.00	444.50
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		28.84	23.60
over (min)		5.00	45.00
Storage Coeff. (min)=		0.63 (ii)	42.87 (ii)
Unit Hyd. Tpeak (min)=		5.00	45.00
Unit Hyd. peak (cms)=		0.34	0.03

				TOTALS
PEAK FLOW	(cms)=	0.03	0.01	0.043 (iii)
TIME TO PEAK	(hrs)=	4.50	5.67	5.25
RUNOFF VOLUME	(mm)=	62.61	26.45	44.50
TOTAL RAINFALL	(mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT	=	1.00	0.42	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (3140)					
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (3141):	0.88	0.043	5.25	44.50
+ ID2= 2 (3142):	0.52	0.023	5.25	44.45
ID = 3 (3140):	1.40	0.067	5.25	44.48

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (3140)					
3 + 2 = 1	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 3 (3140):	1.40	0.067	5.25	44.48
+ ID2= 2 (3143):	1.12	0.047	5.25	44.47
ID = 1 (3140):	2.52	0.114	5.25	44.48

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (3140)				
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.

	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (3140):	2.52	0.114	5.25	44.48
+ ID2= 2 (3144):	0.85	0.043	5.25	44.50
ID = 3 (3140):	3.37	0.157	5.25	44.48

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB STANDHYD (6041) ID= 1 DT= 5.0 min	Area (ha)= 1.07 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.75	0.32	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	3.10	
Length	(m)=	6.00	565.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		28.84	28.99	
over (min)		5.00	55.00	
Storage Coeff. (min)=		0.63 (ii)	50.37 (ii)	
Unit Hyd. Tpeak (min)=		5.00	55.00	
Unit Hyd. peak (cms)=		0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.04	0.02	0.054 (iii)
TIME TO PEAK	(hrs)=	4.50	5.83	5.25
RUNOFF VOLUME	(mm)=	62.61	32.90	47.73
TOTAL RAINFALL	(mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT	=	1.00	0.52	0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.8 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (6042) ID= 1 DT= 5.0 min	Area (ha)= 1.52 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	1.06	0.46	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	1.40	
Length	(m)=	6.00	800.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		28.84	27.49	
over (min)		5.00	85.00	
Storage Coeff. (min)=		0.63 (ii)	80.08 (ii)	
Unit Hyd. Tpeak (min)=		5.00	85.00	
Unit Hyd. peak (cms)=		0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.06	0.02	0.069 (iii)
TIME TO PEAK	(hrs)=	4.50	6.42	5.25
RUNOFF VOLUME	(mm)=	62.61	32.90	47.73
TOTAL RAINFALL	(mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT	=	1.00	0.52	0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.8 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (6043) ID= 1 DT= 5.0 min	Area (ha)= 1.18 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

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                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.83         0.35
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.50
     Length            (m)=       6.00       620.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84        27.49
               over (min)         5.00        95.00
     Storage Coeff.  (min)=       0.63 (ii)   93.48 (ii)
     Unit Hyd. Tpeak (min)=       5.00        95.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.01          0.052 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.58           5.25
     RUNOFF VOLUME    (mm)=      62.61        32.90          47.71
     TOTAL RAINFALL   (mm)=      62.71        62.71          62.71
     RUNOFF COEFFICIENT   =       1.00         0.52           0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  6040)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  6041):     1.07   0.054     5.25    47.73
     + ID2= 2 (  6042):     1.52   0.069     5.25    47.73
       ==========================================================
       ID = 3 (  6040):     2.59   0.124     5.25    47.73

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD  (  6040)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  6040):     2.59   0.124     5.25    47.73
     + ID2= 2 (  6043):     1.18   0.052     5.25    47.71
       ==========================================================
       ID = 1 (  6040):     3.77   0.176     5.25    47.72

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  5212)|   Area    (ha)=   0.82
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.57         0.25
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.20
     Length            (m)=       6.00       433.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84        28.17
               over (min)         5.00       100.00
     Storage Coeff.  (min)=       0.63 (ii)   98.22 (ii)
     Unit Hyd. Tpeak (min)=       5.00       100.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.036 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.67           5.25
     RUNOFF VOLUME    (mm)=      62.61        33.63          48.05
     TOTAL RAINFALL   (mm)=      62.71        62.71          62.71
     RUNOFF COEFFICIENT   =       1.00         0.54           0.77
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***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (5211)	Area (ha)= 0.42		
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00	
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.29	0.13	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	0.20	
Length (m)=	6.00	220.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	28.84	28.17	
over (min)	5.00	70.00	
Storage Coeff. (min)=	0.63 (ii)	65.64 (ii)	
Unit Hyd. Tpeak (min)=	5.00	70.00	
Unit Hyd. peak (cms)=	0.34	0.02	
			TOTALS
PEAK FLOW (cms)=	0.02	0.01	0.020 (iii)
TIME TO PEAK (hrs)=	4.42	6.17	5.25
RUNOFF VOLUME (mm)=	62.61	33.63	48.03
TOTAL RAINFALL (mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT =	1.00	0.54	0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (5210)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (5211):	0.42	0.020	5.25	48.03
+ ID2= 2 (5212):	0.82	0.036	5.25	48.05
ID = 3 (5210):	1.24	0.056	5.25	48.05

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB			
STANDHYD (6142)	Area (ha)= 1.43		
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00	
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	1.00	0.43	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	0.25	
Length (m)=	6.00	753.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	28.84	28.17	
over (min)	5.00	130.00	
Storage Coeff. (min)=	0.63 (ii)	127.83 (ii)	
Unit Hyd. Tpeak (min)=	5.00	130.00	
Unit Hyd. peak (cms)=	0.34	0.01	
			TOTALS
PEAK FLOW (cms)=	0.06	0.01	0.061 (iii)
TIME TO PEAK (hrs)=	4.50	7.17	5.25
RUNOFF VOLUME (mm)=	62.61	33.63	48.07
TOTAL RAINFALL (mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT =	1.00	0.54	0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB				
STANDHYD (6143)	Area (ha)=	0.71		
ID= 1 DT= 5.0 min	Total Imp(%)=	70.00	Dir. Conn.(%)=	50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.50	0.21	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.90	
Length	(m)=	6.00	372.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		28.84	28.17	
over (min)		5.00	60.00	
Storage Coeff. (min)=		0.63 (ii)	57.37 (ii)	
Unit Hyd. Tpeak (min)=		5.00	60.00	
Unit Hyd. peak (cms)=		0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.03	0.01	0.035 (iii)
TIME TO PEAK	(hrs)=	4.42	5.92	5.25
RUNOFF VOLUME	(mm)=	62.61	33.63	48.08
TOTAL RAINFALL	(mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT	=	1.00	0.54	0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB				
STANDHYD (6141)	Area (ha)=	0.89		
ID= 1 DT= 5.0 min	Total Imp(%)=	70.00	Dir. Conn.(%)=	50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.62	0.27	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.25	
Length	(m)=	6.00	470.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		28.84	28.17	
over (min)		5.00	100.00	
Storage Coeff. (min)=		0.63 (ii)	96.50 (ii)	
Unit Hyd. Tpeak (min)=		5.00	100.00	
Unit Hyd. peak (cms)=		0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.04	0.01	0.039 (iii)
TIME TO PEAK	(hrs)=	4.50	6.67	5.25
RUNOFF VOLUME	(mm)=	62.61	33.63	48.06
TOTAL RAINFALL	(mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT	=	1.00	0.54	0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (6140)					
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.	

	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (6141):	0.89	0.039	5.25	48.06
+ ID2= 2 (6142):	1.43	0.061	5.25	48.07
ID = 3 (6140):	2.32	0.100	5.25	48.07

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (6140)				
3 + 2 = 1	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 3 (6140):	2.32	0.100	5.25	48.07
+ ID2= 2 (6143):	0.71	0.035	5.25	48.08
ID = 1 (6140):	3.03	0.135	5.25	48.07

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB STANDHYD (5131) ID= 1 DT= 5.0 min	Area (ha)= 1.29 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00		
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.90	0.39	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	0.70	
Length (m)=	6.00	681.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	28.84	28.17	
over (min)	5.00	90.00	
Storage Coeff. (min)=	0.63 (ii)	88.56 (ii)	
Unit Hyd. Tpeak (min)=	5.00	90.00	
Unit Hyd. peak (cms)=	0.34	0.01	
			TOTALS
PEAK FLOW (cms)=	0.05	0.01	0.058 (iii)
TIME TO PEAK (hrs)=	4.50	6.50	5.25
RUNOFF VOLUME (mm)=	62.61	33.63	48.08
TOTAL RAINFALL (mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT =	1.00	0.54	0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (5132) ID= 1 DT= 5.0 min	Area (ha)= 0.15 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00		
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.10	0.05	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	0.70	
Length (m)=	6.00	80.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	28.84	32.59	
over (min)	5.00	25.00	
Storage Coeff. (min)=	0.63 (ii)	23.58 (ii)	
Unit Hyd. Tpeak (min)=	5.00	25.00	
Unit Hyd. peak (cms)=	0.34	0.05	
			TOTALS
PEAK FLOW (cms)=	0.01	0.00	0.009 (iii)
TIME TO PEAK (hrs)=	4.50	5.33	5.25
RUNOFF VOLUME (mm)=	62.61	33.63	48.00
TOTAL RAINFALL (mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT =	1.00	0.54	0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (5133)	Area (ha)= 0.38
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.27	0.11	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.60	
Length	(m)=	6.00	200.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		28.84	30.34	
over (min)		5.00	45.00	
Storage Coeff. (min)=		0.63 (ii)	43.50 (ii)	
Unit Hyd. Tpeak (min)=		5.00	45.00	
Unit Hyd. peak (cms)=		0.34	0.03	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.01	0.020 (iii)
TIME TO PEAK	(hrs)=	4.50	5.67	5.25
RUNOFF VOLUME	(mm)=	62.61	33.63	48.05
TOTAL RAINFALL	(mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT	=	1.00	0.54	0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (5134)	Area (ha)= 0.38
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.27	0.11	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.60	
Length	(m)=	6.00	200.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		28.84	30.34	
over (min)		5.00	45.00	
Storage Coeff. (min)=		0.63 (ii)	43.50 (ii)	
Unit Hyd. Tpeak (min)=		5.00	45.00	
Unit Hyd. peak (cms)=		0.34	0.03	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.01	0.020 (iii)
TIME TO PEAK	(hrs)=	4.50	5.67	5.25
RUNOFF VOLUME	(mm)=	62.61	33.63	48.05
TOTAL RAINFALL	(mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT	=	1.00	0.54	0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (5130)				
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.

	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (5131):	1.29	0.058	5.25	48.08
+ ID2= 2 (5132):	0.15	0.009	5.25	48.00
ID = 3 (5130):	1.44	0.067	5.25	48.08

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (5130)
3 + 2 = 1

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 3 (5130):	1.44	0.067	5.25	48.08
+ ID2= 2 (5133):	0.38	0.020	5.25	48.05
ID = 1 (5130):	1.82	0.088	5.25	48.07

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (5130)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (5130):	1.82	0.088	5.25	48.07
+ ID2= 2 (5134):	0.38	0.020	5.25	48.05
ID = 3 (5130):	2.20	0.108	5.25	48.07

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB
STANDHYD (0011) | Area (ha)= 1.13
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.79	0.34	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	1.50	0.60	
Length	(m)=	6.00	596.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		28.84	22.82	
over (min)		5.00	95.00	
Storage Coeff. (min)=		0.69 (ii)	93.18 (ii)	
Unit Hyd. Tpeak (min)=		5.00	95.00	
Unit Hyd. peak (cms)=		0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.05	0.01	0.049 (iii)
TIME TO PEAK	(hrs)=	4.50	6.58	5.25
RUNOFF VOLUME	(mm)=	62.61	27.81	45.17
TOTAL RAINFALL	(mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT	=	1.00	0.44	0.72

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 69.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0021) | Area (ha)= 0.58
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.41	0.17
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.50	0.60
Length	(m)=	6.00	304.00
Mannings n	=	0.013	0.250

```
     Max.Eff.Inten.(mm/hr)=      28.84        21.59
                 over (min)       5.00        65.00
     Storage Coeff.  (min)=      0.69 (ii)   63.83 (ii)
     Unit Hyd. Tpeak (min)=      5.00        65.00
     Unit Hyd. peak  (cms)=      0.34         0.02
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.02         0.01       0.027 (iii)
     TIME TO PEAK    (hrs)=      4.50         6.08        5.25
     RUNOFF VOLUME    (mm)=     62.61        26.45       44.47
     TOTAL RAINFALL   (mm)=     62.71        62.71       62.71
     RUNOFF COEFFICIENT   =      1.00         0.42        0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0022)|   Area    (ha)=   0.60
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.42         0.18
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.50         0.60
     Length            (m)=       6.00       314.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84        21.59
                 over (min)       5.00        70.00
     Storage Coeff.  (min)=      0.69 (ii)   65.07 (ii)
     Unit Hyd. Tpeak (min)=      5.00        70.00
     Unit Hyd. peak  (cms)=      0.34         0.02
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.02         0.01       0.027 (iii)
     TIME TO PEAK    (hrs)=      4.50         6.17        5.25
     RUNOFF VOLUME    (mm)=     62.61        26.45       44.47
     TOTAL RAINFALL   (mm)=     62.71        62.71       62.71
     RUNOFF COEFFICIENT   =      1.00         0.42        0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0020)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0021):     0.58   0.027     5.25    44.47
      + ID2= 2 (  0022):     0.60   0.027     5.25    44.47
        ================================================
        ID = 3 (  0020):     1.18   0.054     5.25    44.47

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  3121)|   Area    (ha)=   0.68
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.48         0.20
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         4.50
     Length            (m)=       6.00       355.50
     Mannings n           =      0.013        0.250
```

```
     Max.Eff.Inten.(mm/hr)=      28.84        26.68
                 over (min)       5.00        40.00
     Storage Coeff.  (min)=      0.63 (ii)   35.45 (ii)
     Unit Hyd. Tpeak (min)=      5.00        40.00
     Unit Hyd. peak  (cms)=      0.34         0.03
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.03         0.01       0.036 (iii)
     TIME TO PEAK    (hrs)=      4.50         5.58        5.25
     RUNOFF VOLUME    (mm)=     62.61        28.45       45.50
     TOTAL RAINFALL   (mm)=     62.71        62.71       62.71
     RUNOFF COEFFICIENT   =      1.00         0.45        0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  69.9    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  3122)|   Area    (ha)=   0.86
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      0.60         0.26
     Dep. Storage     (mm)=      0.10         5.00
     Average Slope     (%)=      2.00         0.25
     Length            (m)=      6.00       450.00
     Mannings n           =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84        23.39
                 over (min)       5.00       105.00
     Storage Coeff.  (min)=      0.63 (ii)  101.24 (ii)
     Unit Hyd. Tpeak (min)=      5.00       105.00
     Unit Hyd. peak  (cms)=      0.34         0.01
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.03         0.01       0.037 (iii)
     TIME TO PEAK    (hrs)=      4.50         6.75        5.25
     RUNOFF VOLUME    (mm)=     62.61        28.45       45.46
     TOTAL RAINFALL   (mm)=     62.71        62.71       62.71
     RUNOFF COEFFICIENT   =      1.00         0.45        0.72

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  69.9    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  3120)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  3121):     0.68   0.036     5.25    45.50
      + ID2= 2 (  3122):     0.86   0.037     5.25    45.46
        ================================================
        ID = 3 (  3120):     1.53   0.073     5.25    45.48

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  6201)|   Area    (ha)=   0.78
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      0.55         0.23
     Dep. Storage     (mm)=      0.10         5.00
     Average Slope     (%)=      2.00         2.80
     Length            (m)=      6.00       410.00
     Mannings n           =     0.013        0.250
```

```
     Max.Eff.Inten.(mm/hr)=      28.84        31.91
                 over (min)       5.00        45.00
     Storage Coeff.  (min)=      0.63 (ii)   41.34 (ii)
     Unit Hyd. Tpeak (min)=      5.00        45.00
     Unit Hyd. peak  (cms)=      0.34         0.03
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.03         0.01       0.043 (iii)
     TIME TO PEAK    (hrs)=      4.50         5.67        5.25
     RUNOFF VOLUME    (mm)=     62.61        35.31       48.93
     TOTAL RAINFALL   (mm)=     62.71        62.71       62.71
     RUNOFF COEFFICIENT   =      1.00         0.56        0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  78.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  5221)|   Area    (ha)=   0.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      0.13         0.05
     Dep. Storage     (mm)=      0.10         5.00
     Average Slope     (%)=      2.00         1.25
     Length            (m)=      6.00        97.00
     Mannings n           =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84        32.59
                 over (min)       5.00        25.00
     Storage Coeff.  (min)=      0.63 (ii)   22.28 (ii)
     Unit Hyd. Tpeak (min)=      5.00        25.00
     Unit Hyd. peak  (cms)=      0.34         0.05
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.01         0.00       0.011 (iii)
     TIME TO PEAK    (hrs)=      4.50         5.33        5.25
     RUNOFF VOLUME    (mm)=     62.61        33.63       48.05
     TOTAL RAINFALL   (mm)=     62.71        62.71       62.71
     RUNOFF COEFFICIENT   =      1.00         0.54        0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  5222)|   Area    (ha)=   0.74
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      0.52         0.22
     Dep. Storage     (mm)=      0.10         5.00
     Average Slope     (%)=      2.00         1.25
     Length            (m)=      6.00       388.00
     Mannings n           =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84        28.95
                 over (min)       5.00        55.00
     Storage Coeff.  (min)=      0.63 (ii)   52.78 (ii)
     Unit Hyd. Tpeak (min)=      5.00        55.00
     Unit Hyd. peak  (cms)=      0.34         0.02
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.03         0.01       0.038 (iii)
     TIME TO PEAK    (hrs)=      4.50         5.83        5.25
     RUNOFF VOLUME    (mm)=     62.61        33.63       48.08
     TOTAL RAINFALL   (mm)=     62.71        62.71       62.71
     RUNOFF COEFFICIENT   =      1.00         0.54        0.77
```

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (5223) ID= 1 DT= 5.0 min	Area (ha)= 0.82 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00			
		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.57	0.25	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.50	
Length	(m)=	6.00	432.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		28.84	28.17	
over (min)		5.00	75.00	
Storage Coeff. (min)=		0.63 (ii)	74.66 (ii)	
Unit Hyd. Tpeak (min)=		5.00	75.00	
Unit Hyd. peak (cms)=		0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.03	0.01	0.038 (iii)
TIME TO PEAK	(hrs)=	4.50	6.25	5.25
RUNOFF VOLUME	(mm)=	62.61	33.63	48.07
TOTAL RAINFALL	(mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT	=	1.00	0.54	0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (5220) 1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (5221):	0.18	0.011	5.25	48.05
+ ID2= 2 (5222):	0.74	0.038	5.25	48.08
ID = 3 (5220):	0.92	0.049	5.25	48.07

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (5220) 3 + 2 = 1	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 3 (5220):	0.92	0.049	5.25	48.07
+ ID2= 2 (5223):	0.82	0.038	5.25	48.07
ID = 1 (5220):	1.74	0.087	5.25	48.07

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB STANDHYD (5111) ID= 1 DT= 5.0 min	Area (ha)= 0.85 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00			
		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.59	0.25	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	5.67	
Length	(m)=	6.00	449.00	
Mannings n	=	0.013	0.250	

```
     Max.Eff.Inten.(mm/hr)=      28.84        31.54
                 over (min)       5.00        40.00
     Storage Coeff.  (min)=      0.63 (ii)   35.58 (ii)
     Unit Hyd. Tpeak (min)=      5.00        40.00
     Unit Hyd. peak  (cms)=      0.34         0.03
                                                        *TOTALS*
     PEAK FLOW       (cms)=      0.03         0.02         0.048 (iii)
     TIME TO PEAK    (hrs)=      4.50         5.58          5.25
     RUNOFF VOLUME    (mm)=     62.61        33.63         48.10
     TOTAL RAINFALL   (mm)=     62.71        62.71         62.71
     RUNOFF COEFFICIENT   =      1.00         0.54          0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  3181)|   Area    (ha)=   0.42
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.29         0.13
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         0.30
     Length            (m)=       6.00       220.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84        20.42
                 over (min)       5.00        70.00
     Storage Coeff.  (min)=      0.63 (ii)   66.10 (ii)
     Unit Hyd. Tpeak (min)=      5.00        70.00
     Unit Hyd. peak  (cms)=      0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=      0.02         0.00         0.019 (iii)
     TIME TO PEAK    (hrs)=      4.42         6.17          5.25
     RUNOFF VOLUME    (mm)=     60.71        25.15         42.84
     TOTAL RAINFALL   (mm)=     62.71        62.71         62.71
     RUNOFF COEFFICIENT   =      0.97         0.40          0.68

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  65.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  3182)|   Area    (ha)=   0.46
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.32         0.14
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         0.30
     Length            (m)=       6.00       243.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84        20.42
                 over (min)       5.00        75.00
     Storage Coeff.  (min)=      0.63 (ii)   70.12 (ii)
     Unit Hyd. Tpeak (min)=      5.00        75.00
     Unit Hyd. peak  (cms)=      0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=      0.02         0.00         0.021 (iii)
     TIME TO PEAK    (hrs)=      4.50         6.25          5.25
     RUNOFF VOLUME    (mm)=     60.71        25.15         42.84
     TOTAL RAINFALL   (mm)=     62.71        62.71         62.71
     RUNOFF COEFFICIENT   =      0.97         0.40          0.68
```

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 65.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (3180)			AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3			(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (3181):		0.42	0.019	5.25	42.84
	+ ID2= 2 (3182):		0.46	0.021	5.25	42.84
	ID = 3 (3180):		0.88	0.040	5.25	42.84

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
V    V   I    SSSSS  U   U    A    L
V    V   I    SS     U   U   A A   L
 V  V    I     SS    U   U  AAAAA  L
 V  V    I      SS   U   U  A   A  L
  VV     I    SSSSS  UUUUU  A   A  LLLLL

 OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
O   O    T      T    H   H   Y Y   MM MM  O   O
O   O    T      T    H   H    Y    M   M  O   O
 OOO     T      T    H   H    Y    M   M   OOO
```


***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\cd16b019-6731-4c05-8994-2a7660a2bd86\scenar
Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\cd16b019-6731-4c05-8994-2a7660a2bd86\scenar

DATE: 10/07/2016 TIME: 09:43:17

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 4 **
****

READ STORM	Filename: C:\Users\p002311c\AppData\Local\Temp\db0fe791-7419-44ec-813d-9df9ab04fb68\db2f2728
Ptotal= 73.10 mm	Comments: 25yr/12hr

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	3.50	12.43	6.75	5.12	10.00	0.73
0.50	0.73	3.75	12.43	7.00	5.12	10.25	0.73
0.75	0.73	4.00	12.43	7.25	5.12	10.50	0.73
1.00	0.73	4.25	12.43	7.50	2.92	10.75	0.73

1.25	0.73	4.50	33.63	7.75	2.92	11.00	0.73
1.50	0.73	4.75	33.63	8.00	2.92	11.25	0.73
1.75	0.73	5.00	33.63	8.25	2.92	11.50	0.73
2.00	0.73	5.25	33.63	8.50	1.46	11.75	0.73
2.25	0.73	5.50	9.50	8.75	1.46	12.00	0.73
2.50	4.39	5.75	9.50	9.00	1.46	12.25	0.73
2.75	4.39	6.00	9.50	9.25	1.46		
3.00	4.39	6.25	9.50	9.50	0.73		
3.25	4.39	6.50	5.12	9.75	0.73		

CALIB
STANDHYD (3141)
ID= 1 DT= 5.0 min

Area (ha)= 0.88
Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.62	0.26
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	3.57
Length	(m)=	6.00	462.10
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	4.39	6.250	9.50	9.33	0.73
0.167	0.00	3.250	4.39	6.333	5.12	9.42	0.73
0.250	0.00	3.333	12.43	6.417	5.12	9.50	0.73
0.333	0.73	3.417	12.43	6.500	5.12	9.58	0.73
0.417	0.73	3.500	12.43	6.583	5.12	9.67	0.73
0.500	0.73	3.583	12.43	6.667	5.12	9.75	0.73
0.583	0.73	3.667	12.43	6.750	5.12	9.83	0.73
0.667	0.73	3.750	12.43	6.833	5.12	9.92	0.73
0.750	0.73	3.833	12.43	6.917	5.12	10.00	0.73
0.833	0.73	3.917	12.43	7.000	5.12	10.08	0.73
0.917	0.73	4.000	12.43	7.083	5.12	10.17	0.73
1.000	0.73	4.083	12.43	7.167	5.12	10.25	0.73
1.083	0.73	4.167	12.43	7.250	5.12	10.33	0.73
1.167	0.73	4.250	12.43	7.333	2.92	10.42	0.73
1.250	0.73	4.333	33.63	7.417	2.92	10.50	0.73
1.333	0.73	4.417	33.63	7.500	2.92	10.58	0.73
1.417	0.73	4.500	33.63	7.583	2.92	10.67	0.73
1.500	0.73	4.583	33.63	7.667	2.92	10.75	0.73
1.583	0.73	4.667	33.63	7.750	2.92	10.83	0.73
1.667	0.73	4.750	33.63	7.833	2.92	10.92	0.73
1.750	0.73	4.833	33.63	7.917	2.92	11.00	0.73
1.833	0.73	4.917	33.63	8.000	2.92	11.08	0.73
1.917	0.73	5.000	33.63	8.083	2.92	11.17	0.73
2.000	0.73	5.083	33.63	8.167	2.92	11.25	0.73
2.083	0.73	5.167	33.63	8.250	2.92	11.33	0.73
2.167	0.73	5.250	33.63	8.333	1.46	11.42	0.73
2.250	0.73	5.333	9.50	8.417	1.46	11.50	0.73
2.333	4.39	5.417	9.50	8.500	1.46	11.58	0.73
2.417	4.39	5.500	9.50	8.583	1.46	11.67	0.73
2.500	4.39	5.583	9.50	8.667	1.46	11.75	0.73
2.583	4.39	5.667	9.50	8.750	1.46	11.83	0.73
2.667	4.39	5.750	9.50	8.833	1.46	11.92	0.73
2.750	4.39	5.833	9.50	8.917	1.46	12.00	0.73
2.833	4.39	5.917	9.50	9.000	1.46	12.08	0.73
2.917	4.39	6.000	9.50	9.083	1.46	12.17	0.73
3.000	4.39	6.083	9.50	9.167	1.46	12.25	0.73
3.083	4.39	6.167	9.50	9.250	1.46		

Max.Eff.Inten.(mm/hr)=	33.63	30.25		
over (min)	5.00	45.00		
Storage Coeff. (min)=	0.59 (ii)	42.13 (ii)		
Unit Hyd. Tpeak (min)=	5.00	45.00		
Unit Hyd. peak (cms)=	0.34	0.03		
			TOTALS	
PEAK FLOW (cms)=	0.04	0.02	0.053 (iii)	
TIME TO PEAK (hrs)=	4.50	5.67	5.25	
RUNOFF VOLUME (mm)=	73.00	33.85	53.40	
TOTAL RAINFALL (mm)=	73.10	73.10	73.10	
RUNOFF COEFFICIENT =	1.00	0.46	0.73	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (3142)	Area (ha)= 0.52				
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00			
		IMPERVIOUS	PERVIOUS (i)		
Surface Area	(ha)=	0.36	0.16		
Dep. Storage	(mm)=	0.10	5.00		
Average Slope	(%)=	2.00	0.30		
Length	(m)=	6.00	274.60		
Mannings n	=	0.013	0.250		
Max.Eff.Inten.(mm/hr)	=	33.63	27.85		
over (min)		5.00	70.00		
Storage Coeff.	(min)=	0.59 (ii)	66.64 (ii)		
Unit Hyd. Tpeak	(min)=	5.00	70.00		
Unit Hyd. peak	(cms)=	0.34	0.02		
				TOTALS	
PEAK FLOW	(cms)=	0.02	0.01	0.028 (iii)	
TIME TO PEAK	(hrs)=	4.50	6.17	5.25	
RUNOFF VOLUME	(mm)=	73.00	33.85	53.35	
TOTAL RAINFALL	(mm)=	73.10	73.10	73.10	
RUNOFF COEFFICIENT	=	1.00	0.46	0.73	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (3143)	Area (ha)= 1.12				
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00			
		IMPERVIOUS	PERVIOUS (i)		
Surface Area	(ha)=	0.78	0.34		
Dep. Storage	(mm)=	0.10	5.00		
Average Slope	(%)=	2.00	0.30		
Length	(m)=	6.00	590.00		
Mannings n	=	0.013	0.250		
Max.Eff.Inten.(mm/hr)	=	33.63	27.85		
over (min)		5.00	110.00		
Storage Coeff.	(min)=	0.59 (ii)	105.11 (ii)		
Unit Hyd. Tpeak	(min)=	5.00	110.00		
Unit Hyd. peak	(cms)=	0.34	0.01		
				TOTALS	
PEAK FLOW	(cms)=	0.05	0.01	0.056 (iii)	
TIME TO PEAK	(hrs)=	4.50	6.83	5.25	
RUNOFF VOLUME	(mm)=	73.00	33.85	53.38	
TOTAL RAINFALL	(mm)=	73.10	73.10	73.10	
RUNOFF COEFFICIENT	=	1.00	0.46	0.73	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB		
STANDHYD (3144)	Area (ha)=	0.85

|ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.59	0.25
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	4.35
Length	(m)=	6.00	444.50
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		33.63	30.97
over (min)		5.00	40.00
Storage Coeff. (min)=		0.59 (ii)	38.49 (ii)
Unit Hyd. Tpeak (min)=		5.00	40.00
Unit Hyd. peak (cms)=		0.34	0.03

		TOTALS
PEAK FLOW	(cms)=	0.04	0.02	0.052 (iii)
TIME TO PEAK	(hrs)=	4.50	5.58	5.25
RUNOFF VOLUME	(mm)=	73.00	33.85	53.40
TOTAL RAINFALL	(mm)=	73.10	73.10	73.10
RUNOFF COEFFICIENT	=	1.00	0.46	0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (3140)|		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (3141):		0.88	0.053	5.25	53.40
+ ID2= 2 (3142):		0.52	0.028	5.25	53.35
ID = 3 (3140):		1.40	0.081	5.25	53.38

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (3140)|		AREA	QPEAK	TPEAK	R.V.
3 + 2 = 1		(ha)	(cms)	(hrs)	(mm)
ID1= 3 (3140):		1.40	0.081	5.25	53.38
+ ID2= 2 (3143):		1.12	0.056	5.25	53.38
ID = 1 (3140):		2.52	0.137	5.25	53.38

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (3140)|		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (3140):		2.52	0.137	5.25	53.38
+ ID2= 2 (3144):		0.85	0.052	5.25	53.40
ID = 3 (3140):		3.37	0.190	5.25	53.38

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB					
STANDHYD (6041)		Area (ha)= 1.07			
ID= 1 DT= 5.0 min		Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00		

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.75	0.32
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	3.10
Length	(m)=	6.00	565.00

```
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        37.25
               over (min)         5.00        50.00
     Storage Coeff.  (min)=       0.59 (ii)   45.58 (ii)
     Unit Hyd. Tpeak (min)=       5.00        50.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.02          0.067 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.75           5.25
     RUNOFF VOLUME    (mm)=      73.00        41.38          57.16
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       1.00         0.57           0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB            |
| STANDHYD (  6042)|   Area    (ha)=   1.52
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.06         0.46
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         1.40
     Length            (m)=       6.00       800.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        34.78
               over (min)         5.00        75.00
     Storage Coeff.  (min)=       0.59 (ii)   72.91 (ii)
     Unit Hyd. Tpeak (min)=       5.00        75.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.07         0.02          0.084 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.25           5.25
     RUNOFF VOLUME    (mm)=      73.00        41.38          57.16
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       1.00         0.57           0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB            |
| STANDHYD (  6043)|   Area    (ha)=   1.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.83         0.35
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.50
     Length            (m)=       6.00       620.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        34.78
               over (min)         5.00        90.00
     Storage Coeff.  (min)=       0.59 (ii)   85.11 (ii)
     Unit Hyd. Tpeak (min)=       5.00        90.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.06         0.02          0.063 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.50           5.25
     RUNOFF VOLUME    (mm)=      73.00        41.38          57.15
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       1.00         0.57           0.78
```

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.8 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (6040)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (6041):		1.07	0.067	5.25	57.16
+ ID2= 2 (6042):		1.52	0.084	5.25	57.16
ID = 3 (6040):		2.59	0.151	5.25	57.16

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (6040)		AREA	QPEAK	TPEAK	R.V.
3 + 2 = 1		(ha)	(cms)	(hrs)	(mm)
ID1= 3 (6040):		2.59	0.151	5.25	57.16
+ ID2= 2 (6043):		1.18	0.063	5.25	57.15
ID = 1 (6040):		3.77	0.213	5.25	57.16

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB					
STANDHYD (5212)	Area (ha)= 0.82				
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00			
		IMPERVIOUS	PERVIOUS (i)		
Surface Area	(ha)=	0.57	0.25		
Dep. Storage	(mm)=	0.10	5.00		
Average Slope	(%)=	2.00	0.20		
Length	(m)=	6.00	433.00		
Mannings n	=	0.013	0.250		
Max.Eff.Inten.(mm/hr)=		33.63	35.56		
over (min)		5.00	90.00		
Storage Coeff. (min)=		0.59 (ii)	89.50 (ii)		
Unit Hyd. Tpeak (min)=		5.00	90.00		
Unit Hyd. peak (cms)=		0.34	0.01		
				TOTALS	
PEAK FLOW	(cms)=	0.04	0.01	0.044 (iii)	
TIME TO PEAK	(hrs)=	4.42	6.50	5.25	
RUNOFF VOLUME	(mm)=	73.00	42.22	57.55	
TOTAL RAINFALL	(mm)=	73.10	73.10	73.10	
RUNOFF COEFFICIENT	=	1.00	0.58	0.79	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (5211)	Area (ha)= 0.42				
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00			
		IMPERVIOUS	PERVIOUS (i)		
Surface Area	(ha)=	0.29	0.13		
Dep. Storage	(mm)=	0.10	5.00		
Average Slope	(%)=	2.00	0.20		
Length	(m)=	6.00	220.00		

```
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        35.56
               over (min)         5.00        60.00
     Storage Coeff.  (min)=       0.59 (ii)   59.82 (ii)
     Unit Hyd. Tpeak (min)=       5.00        60.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.025 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.92           5.25
     RUNOFF VOLUME    (mm)=      73.00        42.22          57.53
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       1.00         0.58           0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| ADD HYD  (  5210)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  5211):     0.42   0.025     5.25    57.53
     + ID2= 2 (  5212):     0.82   0.044     5.25    57.55
       ================================================
       ID = 3 (  5210):     1.24   0.068     5.25    57.54

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| CALIB            |
| STANDHYD (  6142)|   Area    (ha)=   1.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.00         0.43
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.25
     Length            (m)=       6.00       753.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        35.56
               over (min)         5.00       120.00
     Storage Coeff.  (min)=       0.59 (ii)  116.49 (ii)
     Unit Hyd. Tpeak (min)=       5.00       120.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.07         0.02          0.072 (iii)
     TIME TO PEAK    (hrs)=       4.42         7.00           5.25
     RUNOFF VOLUME    (mm)=      73.00        42.22          57.57
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       1.00         0.58           0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB            |
| STANDHYD (  6143)|   Area    (ha)=   0.71
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.50         0.21
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.90
     Length            (m)=       6.00       372.00
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```
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        36.45
               over (min)         5.00        55.00
     Storage Coeff.  (min)=       0.59 (ii)   51.77 (ii)
     Unit Hyd. Tpeak (min)=       5.00        55.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.043 (iii)
     TIME TO PEAK    (hrs)=       4.50         5.83           5.25
     RUNOFF VOLUME    (mm)=      73.00        42.22          57.57
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       1.00         0.58           0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB            |
| STANDHYD (  6141)|   Area    (ha)=   0.89
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.62         0.27
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.25
     Length            (m)=       6.00       470.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        35.56
               over (min)         5.00        90.00
     Storage Coeff.  (min)=       0.59 (ii)   87.94 (ii)
     Unit Hyd. Tpeak (min)=       5.00        90.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.01          0.047 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.50           5.25
     RUNOFF VOLUME    (mm)=      73.00        42.22          57.55
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       1.00         0.58           0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| ADD HYD  (  6140)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  6141):     0.89   0.047     5.25    57.55
     + ID2= 2 (  6142):     1.43   0.072     5.25    57.57
       ================================================
       ID = 3 (  6140):     2.32   0.120     5.25    57.56

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| ADD HYD  (  6140)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  6140):     2.32   0.120     5.25    57.56
     + ID2= 2 (  6143):     0.71   0.043     5.25    57.57
       ================================================
       ID = 1 (  6140):     3.03   0.163     5.25    57.56
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB					
STANDHYD (5131)	Area (ha)= 1.29				
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00			

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.90	0.39	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.70	
Length	(m)=	6.00	681.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		33.63	35.56	
over (min)		5.00	85.00	
Storage Coeff.	(min)=	0.59 (ii)	80.71 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	85.00	
Unit Hyd. peak	(cms)=	0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.06	0.02	0.070 (iii)
TIME TO PEAK	(hrs)=	4.42	6.42	5.25
RUNOFF VOLUME	(mm)=	73.00	42.22	57.57
TOTAL RAINFALL	(mm)=	73.10	73.10	73.10
RUNOFF COEFFICIENT	=	1.00	0.58	0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (5132)	Area (ha)= 0.15				
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00			

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.10	0.05	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.70	
Length	(m)=	6.00	80.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		33.63	40.51	
over (min)		5.00	25.00	
Storage Coeff.	(min)=	0.59 (ii)	21.63 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	25.00	
Unit Hyd. peak	(cms)=	0.34	0.05	
				TOTALS
PEAK FLOW	(cms)=	0.01	0.00	0.011 (iii)
TIME TO PEAK	(hrs)=	4.50	5.33	5.25
RUNOFF VOLUME	(mm)=	73.00	42.22	57.52
TOTAL RAINFALL	(mm)=	73.10	73.10	73.10
RUNOFF COEFFICIENT	=	1.00	0.58	0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (5133)	Area (ha)= 0.38				
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00			

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.27	0.11
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	0.60
Length	(m)=	6.00	200.00

```
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        38.71
               over (min)         5.00        40.00
     Storage Coeff.  (min)=       0.59 (ii)   39.48 (ii)
     Unit Hyd. Tpeak (min)=       5.00        40.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.025 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.58           5.25
     RUNOFF VOLUME    (mm)=      73.00        42.22          57.55
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       1.00         0.58           0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB              |
| STANDHYD (  5134)|   Area    (ha)=   0.38
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.27         0.11
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.60
     Length            (m)=       6.00       200.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        38.71
               over (min)         5.00        40.00
     Storage Coeff.  (min)=       0.59 (ii)   39.48 (ii)
     Unit Hyd. Tpeak (min)=       5.00        40.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.025 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.58           5.25
     RUNOFF VOLUME    (mm)=      73.00        42.22          57.55
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       1.00         0.58           0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  5130)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  5131):     1.29   0.070     5.25    57.57
     + ID2= 2 (  5132):     0.15   0.011     5.25    57.52
       ================================================
       ID = 3 (  5130):     1.44   0.081     5.25    57.57

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD  (  5130)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  5130):     1.44   0.081     5.25    57.57
     + ID2= 2 (  5133):     0.38   0.025     5.25    57.55
       ================================================
       ID = 1 (  5130):     1.82   0.106     5.25    57.56
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (5130)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (5130):	1.82	0.106	5.25	57.56
+	ID2= 2 (5134):	0.38	0.025	5.25	57.55
	ID = 3 (5130):	2.20	0.131	5.25	57.56

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB
STANDHYD (0011) | Area (ha)= 1.13
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.79	0.34	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	1.50	0.60	
Length	(m)=	6.00	596.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		33.63	29.32	
over (min)		5.00	85.00	
Storage Coeff. (min)=		0.65 (ii)	84.32 (ii)	
Unit Hyd. Tpeak (min)=		5.00	85.00	
Unit Hyd. peak (cms)=		0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.05	0.01	0.059 (iii)
TIME TO PEAK	(hrs)=	4.50	6.42	5.25
RUNOFF VOLUME	(mm)=	73.00	35.46	54.19
TOTAL RAINFALL	(mm)=	73.10	73.10	73.10
RUNOFF COEFFICIENT	=	1.00	0.49	0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 69.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0021) | Area (ha)= 0.58
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.41	0.17	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	1.50	0.60	
Length	(m)=	6.00	304.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		33.63	27.85	
over (min)		5.00	60.00	
Storage Coeff. (min)=		0.65 (ii)	57.67 (ii)	
Unit Hyd. Tpeak (min)=		5.00	60.00	
Unit Hyd. peak (cms)=		0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.03	0.01	0.033 (iii)
TIME TO PEAK	(hrs)=	4.50	6.00	5.25
RUNOFF VOLUME	(mm)=	73.00	33.85	53.37
TOTAL RAINFALL	(mm)=	73.10	73.10	73.10
RUNOFF COEFFICIENT	=	1.00	0.46	0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0022)	Area (ha)=	0.60	
ID= 1 DT= 5.0 min	Total Imp(%)=	70.00	Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.42	0.18	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	1.50	0.60	
Length	(m)=	6.00	314.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		33.63	27.85	
over (min)		5.00	60.00	
Storage Coeff. (min)=		0.65 (ii)	58.79 (ii)	
Unit Hyd. Tpeak (min)=		5.00	60.00	
Unit Hyd. peak (cms)=		0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.03	0.01	0.034 (iii)
TIME TO PEAK	(hrs)=	4.50	6.00	5.25
RUNOFF VOLUME	(mm)=	73.00	33.85	53.37
TOTAL RAINFALL	(mm)=	73.10	73.10	73.10
RUNOFF COEFFICIENT	=	1.00	0.46	0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0020)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0021):	0.58	0.033	5.25	53.37
	+ ID2= 2 (0022):	0.60	0.034	5.25	53.37
	ID = 3 (0020):	1.18	0.066	5.25	53.37

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB			
STANDHYD (3121)	Area (ha)=	0.68	
ID= 1 DT= 5.0 min	Total Imp(%)=	70.00	Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.48	0.20	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	4.50	
Length	(m)=	6.00	355.50	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		33.63	33.85	
over (min)		5.00	35.00	
Storage Coeff. (min)=		0.59 (ii)	32.25 (ii)	
Unit Hyd. Tpeak (min)=		5.00	35.00	
Unit Hyd. peak (cms)=		0.34	0.03	
				TOTALS
PEAK FLOW	(cms)=	0.03	0.01	0.045 (iii)
TIME TO PEAK	(hrs)=	4.42	5.50	5.25
RUNOFF VOLUME	(mm)=	73.00	36.21	54.57
TOTAL RAINFALL	(mm)=	73.10	73.10	73.10
RUNOFF COEFFICIENT	=	1.00	0.50	0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 69.9 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (3122)	Area (ha)= 0.86		
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00	

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.60	0.26	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.25	
Length	(m)=	6.00	450.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		33.63	30.00	
over (min)		5.00	95.00	
Storage Coeff. (min)=		0.59 (ii)	91.68 (ii)	
Unit Hyd. Tpeak (min)=		5.00	95.00	
Unit Hyd. peak (cms)=		0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.04	0.01	0.044 (iii)
TIME TO PEAK	(hrs)=	4.42	6.58	5.25
RUNOFF VOLUME	(mm)=	73.00	36.21	54.54
TOTAL RAINFALL	(mm)=	73.10	73.10	73.10
RUNOFF COEFFICIENT	=	1.00	0.50	0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 69.9 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (3120)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (3121):	0.68	0.045	5.25	54.57
+ ID2= 2 (3122):	0.86	0.044	5.25	54.54
ID = 3 (3120):	1.53	0.089	5.25	54.56

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB			
STANDHYD (6201)	Area (ha)= 0.78		
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00	

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.55	0.23	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	2.80	
Length	(m)=	6.00	410.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		33.63	40.44	
over (min)		5.00	40.00	
Storage Coeff. (min)=		0.59 (ii)	37.62 (ii)	
Unit Hyd. Tpeak (min)=		5.00	40.00	
Unit Hyd. peak (cms)=		0.34	0.03	
				TOTALS
PEAK FLOW	(cms)=	0.04	0.02	0.053 (iii)
TIME TO PEAK	(hrs)=	4.50	5.58	5.25
RUNOFF VOLUME	(mm)=	73.00	44.13	54.54
TOTAL RAINFALL	(mm)=	73.10	73.10	73.10
RUNOFF COEFFICIENT	=	1.00	0.60	0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 78.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (5221)	Area (ha)= 0.18				
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00			

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.13	0.05	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	1.25	
Length	(m)=	6.00	97.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		33.63	41.03	
over (min)		5.00	25.00	
Storage Coeff. (min)=		0.59 (ii)	20.34 (ii)	
Unit Hyd. Tpeak (min)=		5.00	25.00	
Unit Hyd. peak (cms)=		0.34	0.05	
				TOTALS
PEAK FLOW	(cms)=	0.01	0.01	0.013 (iii)
TIME TO PEAK	(hrs)=	4.50	5.33	5.25
RUNOFF VOLUME	(mm)=	73.00	42.22	57.55
TOTAL RAINFALL	(mm)=	73.10	73.10	73.10
RUNOFF COEFFICIENT	=	1.00	0.58	0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (5222)	Area (ha)= 0.74				
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00			

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.52	0.22	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	1.25	
Length	(m)=	6.00	388.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		33.63	37.27	
over (min)		5.00	50.00	
Storage Coeff. (min)=		0.59 (ii)	47.74 (ii)	
Unit Hyd. Tpeak (min)=		5.00	50.00	
Unit Hyd. peak (cms)=		0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.03	0.02	0.046 (iii)
TIME TO PEAK	(hrs)=	4.42	5.75	5.25
RUNOFF VOLUME	(mm)=	73.00	42.22	57.57
TOTAL RAINFALL	(mm)=	73.10	73.10	73.10
RUNOFF COEFFICIENT	=	1.00	0.58	0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (5223)	Area (ha)= 0.82				
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00			

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.57	0.25
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	0.50
Length	(m)=	6.00	432.00

```
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        35.56
               over (min)         5.00        70.00
     Storage Coeff.  (min)=       0.59 (ii)   68.04 (ii)
     Unit Hyd. Tpeak (min)=       5.00        70.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.01          0.046 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.08           5.25
     RUNOFF VOLUME    (mm)=      73.00        42.22          57.56
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       1.00         0.58           0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  5220)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  5221):     0.18   0.013     5.25    57.55
     + ID2= 2 (  5222):     0.74   0.046     5.25    57.57
       ================================================
       ID = 3 (  5220):     0.92   0.060     5.25    57.57

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD  (  5220)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  5220):     0.92   0.060     5.25    57.57
     + ID2= 2 (  5223):     0.82   0.046     5.25    57.56
       ================================================
       ID = 1 (  5220):     1.74   0.106     5.25    57.56

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| CALIB            |
| STANDHYD (  5111)|   Area    (ha)=   0.85
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.59         0.25
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         5.67
     Length            (m)=       6.00       449.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        39.36
               over (min)         5.00        35.00
     Storage Coeff.  (min)=       0.59 (ii)   32.58 (ii)
     Unit Hyd. Tpeak (min)=       5.00        35.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.02          0.059 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.50           5.25
     RUNOFF VOLUME    (mm)=      73.00        42.22          57.59
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       1.00         0.58           0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
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(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (3181)	Area (ha)= 0.42		
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00	

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.29	0.13	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	2.00	0.30	
Length	(m)=	6.00	220.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		33.63	26.44	
over (min)		5.00	60.00	
Storage Coeff. (min)=		0.59 (ii)	59.63 (ii)	
Unit Hyd. Tpeak (min)=		5.00	60.00	
Unit Hyd. peak (cms)=		0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.01	0.023 (iii)
TIME TO PEAK	(hrs)=	4.42	6.00	5.25
RUNOFF VOLUME	(mm)=	71.10	32.29	51.61
TOTAL RAINFALL	(mm)=	73.10	73.10	73.10
RUNOFF COEFFICIENT	=	0.97	0.44	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 65.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (3182)	Area (ha)= 0.46		
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00	

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.32	0.14	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	2.00	0.30	
Length	(m)=	6.00	243.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		33.63	26.44	
over (min)		5.00	65.00	
Storage Coeff. (min)=		0.59 (ii)	63.26 (ii)	
Unit Hyd. Tpeak (min)=		5.00	65.00	
Unit Hyd. peak (cms)=		0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.01	0.025 (iii)
TIME TO PEAK	(hrs)=	4.42	6.08	5.25
RUNOFF VOLUME	(mm)=	71.10	32.29	51.62
TOTAL RAINFALL	(mm)=	73.10	73.10	73.10
RUNOFF COEFFICIENT	=	0.97	0.44	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 65.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (3180)					
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	
ID1= 1 (3181):	0.42	0.023	5.25	51.61	
+ ID2= 2 (3182):	0.46	0.025	5.25	51.62	
ID = 3 (3180):	0.88	0.048	5.25	51.61	

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
```

Developed and Distributed by Civica Infrastructure

***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\4b1372db-22ab-4d67-9aef-e82a65b59a44\scenar
Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\4b1372db-22ab-4d67-9aef-e82a65b59a44\scenar

DATE: 10/07/2016 TIME: 09:43:18

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 5 **
****

READ STORM	Filename: C:\Users\p002311c\AppData\Local\Temp\db0fe791-7419-44ec-813d-9df9ab04fb68\fd0edd7b
Ptotal= 80.82 mm	Comments: 50yr/12hr

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	3.50	13.74	6.75	5.66	10.00	0.81
0.50	0.81	3.75	13.74	7.00	5.66	10.25	0.81
0.75	0.81	4.00	13.74	7.25	5.66	10.50	0.81
1.00	0.81	4.25	13.74	7.50	3.23	10.75	0.81
1.25	0.81	4.50	37.17	7.75	3.23	11.00	0.81
1.50	0.81	4.75	37.17	8.00	3.23	11.25	0.81
1.75	0.81	5.00	37.17	8.25	3.23	11.50	0.81
2.00	0.81	5.25	37.17	8.50	1.62	11.75	0.81
2.25	0.81	5.50	10.50	8.75	1.62	12.00	0.81
2.50	4.85	5.75	10.50	9.00	1.62	12.25	0.81
2.75	4.85	6.00	10.50	9.25	1.62		
3.00	4.85	6.25	10.50	9.50	0.81		
3.25	4.85	6.50	5.66	9.75	0.81		

CALIB STANDHYD (3141) ID= 1 DT= 5.0 min	Area (ha)= 0.88 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.62	0.26

Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	3.57
Length	(m)=	6.00	462.10
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	4.85	6.250	10.50	9.33	0.81
0.167	0.00	3.250	4.85	6.333	5.66	9.42	0.81
0.250	0.00	3.333	13.74	6.417	5.66	9.50	0.81
0.333	0.81	3.417	13.74	6.500	5.66	9.58	0.81
0.417	0.81	3.500	13.74	6.583	5.66	9.67	0.81
0.500	0.81	3.583	13.74	6.667	5.66	9.75	0.81
0.583	0.81	3.667	13.74	6.750	5.66	9.83	0.81
0.667	0.81	3.750	13.74	6.833	5.66	9.92	0.81
0.750	0.81	3.833	13.74	6.917	5.66	10.00	0.81
0.833	0.81	3.917	13.74	7.000	5.66	10.08	0.81
0.917	0.81	4.000	13.74	7.083	5.66	10.17	0.81
1.000	0.81	4.083	13.74	7.167	5.66	10.25	0.81
1.083	0.81	4.167	13.74	7.250	5.66	10.33	0.81
1.167	0.81	4.250	13.74	7.333	3.23	10.42	0.81
1.250	0.81	4.333	37.17	7.417	3.23	10.50	0.81
1.333	0.81	4.417	37.17	7.500	3.23	10.58	0.81
1.417	0.81	4.500	37.17	7.583	3.23	10.67	0.81
1.500	0.81	4.583	37.17	7.667	3.23	10.75	0.81
1.583	0.81	4.667	37.17	7.750	3.23	10.83	0.81
1.667	0.81	4.750	37.17	7.833	3.23	10.92	0.81
1.750	0.81	4.833	37.17	7.917	3.23	11.00	0.81
1.833	0.81	4.917	37.17	8.000	3.23	11.08	0.81
1.917	0.81	5.000	37.17	8.083	3.23	11.17	0.81
2.000	0.81	5.083	37.17	8.167	3.23	11.25	0.81
2.083	0.81	5.167	37.17	8.250	3.23	11.33	0.81
2.167	0.81	5.250	37.17	8.333	1.62	11.42	0.81
2.250	0.81	5.333	10.50	8.417	1.62	11.50	0.81
2.333	4.85	5.417	10.50	8.500	1.62	11.58	0.81
2.417	4.85	5.500	10.50	8.583	1.62	11.67	0.81
2.500	4.85	5.583	10.50	8.667	1.62	11.75	0.81
2.583	4.85	5.667	10.50	8.750	1.62	11.83	0.81
2.667	4.85	5.750	10.50	8.833	1.62	11.92	0.81
2.750	4.85	5.833	10.50	8.917	1.62	12.00	0.81
2.833	4.85	5.917	10.50	9.000	1.62	12.08	0.81
2.917	4.85	6.000	10.50	9.083	1.62	12.17	0.81
3.000	4.85	6.083	10.50	9.167	1.62	12.25	0.81
3.083	4.85	6.167	10.50	9.250	1.62		

Max.Eff.Inten.(mm/hr)=		37.17	36.19	
over (min)		5.00	40.00	
Storage Coeff. (min)=		0.57 (ii)	39.24 (ii)	
Unit Hyd. Tpeak (min)=		5.00	40.00	
Unit Hyd. peak (cms)=		0.34	0.03	
				TOTALS
PEAK FLOW	(cms)=	0.05	0.02	0.061 (iii)
TIME TO PEAK	(hrs)=	4.42	5.58	5.25
RUNOFF VOLUME	(mm)=	80.72	39.61	60.14
TOTAL RAINFALL	(mm)=	80.82	80.82	80.82
RUNOFF COEFFICIENT	=	1.00	0.49	0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (3142)	Area (ha)=	0.52	
ID= 1 DT= 5.0 min	Total Imp(%)=	70.00	Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.36	0.16
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	0.30

Length (m)=	6.00	274.60	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	37.17	32.73	
over (min)	5.00	65.00	
Storage Coeff. (min)=	0.57 (ii)	62.49 (ii)	
Unit Hyd. Tpeak (min)=	5.00	65.00	
Unit Hyd. peak (cms)=	0.34	0.02	
			TOTALS
PEAK FLOW (cms)=	0.03	0.01	0.032 (iii)
TIME TO PEAK (hrs)=	4.42	6.08	5.25
RUNOFF VOLUME (mm)=	80.72	39.61	60.10
TOTAL RAINFALL (mm)=	80.82	80.82	80.82
RUNOFF COEFFICIENT =	1.00	0.49	0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (3143)| Area (ha)= 1.12
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=		0.78	0.34	
Dep. Storage (mm)=		0.10	5.00	
Average Slope (%)=		2.00	0.30	
Length (m)=		6.00	590.00	
Mannings n =		0.013	0.250	
Max.Eff.Inten.(mm/hr)=		37.17	32.73	
over (min)		5.00	100.00	
Storage Coeff. (min)=		0.57 (ii)	98.55 (ii)	
Unit Hyd. Tpeak (min)=		5.00	100.00	
Unit Hyd. peak (cms)=		0.34	0.01	
				TOTALS
PEAK FLOW (cms)=		0.06	0.01	0.063 (iii)
TIME TO PEAK (hrs)=		4.42	6.67	5.25
RUNOFF VOLUME (mm)=		80.72	39.61	60.12
TOTAL RAINFALL (mm)=		80.82	80.82	80.82
RUNOFF COEFFICIENT =		1.00	0.49	0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (3144)| Area (ha)= 0.85
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=		0.59	0.25	
Dep. Storage (mm)=		0.10	5.00	
Average Slope (%)=		2.00	4.35	
Length (m)=		6.00	444.50	
Mannings n =		0.013	0.250	
Max.Eff.Inten.(mm/hr)=		37.17	36.19	
over (min)		5.00	40.00	
Storage Coeff. (min)=		0.57 (ii)	36.17 (ii)	
Unit Hyd. Tpeak (min)=		5.00	40.00	
Unit Hyd. peak (cms)=		0.34	0.03	
				TOTALS
PEAK FLOW (cms)=		0.04	0.02	0.059 (iii)
TIME TO PEAK (hrs)=		4.42	5.58	5.25
RUNOFF VOLUME (mm)=		80.72	39.61	60.14
TOTAL RAINFALL (mm)=		80.82	80.82	80.82

```
     RUNOFF COEFFICIENT   =       1.00         0.49          0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  3140)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  3141):     0.88   0.061     5.25    60.14
     + ID2= 2 (  3142):     0.52   0.032     5.25    60.10
       ================================================
       ID = 3 (  3140):     1.40   0.093     5.25    60.12

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD  (  3140)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  3140):     1.40   0.093     5.25    60.12
     + ID2= 2 (  3143):     1.12   0.063     5.25    60.12
       ================================================
       ID = 1 (  3140):     2.52   0.156     5.25    60.12

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD  (  3140)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  3140):     2.52   0.156     5.25    60.12
     + ID2= 2 (  3144):     0.85   0.059     5.25    60.14
       ================================================
       ID = 3 (  3140):     3.37   0.215     5.25    60.13

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  6041)|   Area    (ha)=   1.07
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.75         0.32
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         3.10
     Length            (m)=       6.00       565.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        43.01
               over (min)         5.00        45.00
     Storage Coeff.  (min)=       0.57 (ii)   43.04 (ii)
     Unit Hyd. Tpeak (min)=       5.00        45.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.06         0.03          0.077 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.67           5.25
     RUNOFF VOLUME    (mm)=      80.72        47.88          64.28
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.59           0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
```

THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (6042)	Area (ha)= 1.52		
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00	

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	1.06	0.46	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	1.40	
Length	(m)=	6.00	800.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		37.17	40.34	
over (min)		5.00	70.00	
Storage Coeff. (min)=		0.57 (ii)	68.72 (ii)	
Unit Hyd. Tpeak (min)=		5.00	70.00	
Unit Hyd. peak (cms)=		0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.08	0.03	0.095 (iii)
TIME TO PEAK	(hrs)=	4.42	6.08	5.25
RUNOFF VOLUME	(mm)=	80.72	47.88	64.27
TOTAL RAINFALL	(mm)=	80.82	80.82	80.82
RUNOFF COEFFICIENT	=	1.00	0.59	0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.8 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (6043)	Area (ha)= 1.18		
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00	

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.83	0.35	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.50	
Length	(m)=	6.00	620.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		37.17	40.34	
over (min)		5.00	85.00	
Storage Coeff. (min)=		0.57 (ii)	80.22 (ii)	
Unit Hyd. Tpeak (min)=		5.00	85.00	
Unit Hyd. peak (cms)=		0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.06	0.02	0.071 (iii)
TIME TO PEAK	(hrs)=	4.42	6.33	5.25
RUNOFF VOLUME	(mm)=	80.72	47.88	64.26
TOTAL RAINFALL	(mm)=	80.82	80.82	80.82
RUNOFF COEFFICIENT	=	1.00	0.59	0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.8 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (6040)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (6041):	1.07	0.077	5.25	64.28
+ ID2= 2 (6042):	1.52	0.095	5.25	64.27
ID = 3 (6040):	2.59	0.172	5.25	64.28

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (6040)		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
3 + 2 = 1	ID1= 3 (6040):	2.59	0.172	5.25	64.28
	+ ID2= 2 (6043):	1.18	0.071	5.25	64.26
	ID = 1 (6040):	3.77	0.243	5.25	64.27

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB STANDHYD (5212) | Area (ha)= 0.82
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.57	0.25	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.20	
Length	(m)=	6.00	433.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		37.17	41.18	
over (min)		5.00	85.00	
Storage Coeff. (min)=		0.57 (ii)	84.41 (ii)	
Unit Hyd. Tpeak (min)=		5.00	85.00	
Unit Hyd. peak (cms)=		0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.04	0.01	0.049 (iii)
TIME TO PEAK	(hrs)=	4.42	6.42	5.25
RUNOFF VOLUME	(mm)=	80.72	48.79	64.70
TOTAL RAINFALL	(mm)=	80.82	80.82	80.82
RUNOFF COEFFICIENT	=	1.00	0.60	0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (5211) | Area (ha)= 0.42
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.29	0.13	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.20	
Length	(m)=	6.00	220.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		37.17	41.18	
over (min)		5.00	60.00	
Storage Coeff. (min)=		0.57 (ii)	56.42 (ii)	
Unit Hyd. Tpeak (min)=		5.00	60.00	
Unit Hyd. peak (cms)=		0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.01	0.028 (iii)
TIME TO PEAK	(hrs)=	4.42	5.92	5.25
RUNOFF VOLUME	(mm)=	80.72	48.79	64.68
TOTAL RAINFALL	(mm)=	80.82	80.82	80.82
RUNOFF COEFFICIENT	=	1.00	0.60	0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (5210)		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
1 + 2 = 3					
ID1= 1 (5211):		0.42	0.028	5.25	64.68
+ ID2= 2 (5212):		0.82	0.049	5.25	64.70
ID = 3 (5210):		1.24	0.077	5.25	64.69

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB STANDHYD (6142) ID= 1 DT= 5.0 min	Area (ha)= 1.43 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	1.00	0.43	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.25	
Length	(m)=	6.00	753.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		37.17	41.18	
over (min)		5.00	110.00	
Storage Coeff. (min)=		0.57 (ii)	109.85 (ii)	
Unit Hyd. Tpeak (min)=		5.00	110.00	
Unit Hyd. peak (cms)=		0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.07	0.02	0.081 (iii)
TIME TO PEAK	(hrs)=	4.42	6.83	5.25
RUNOFF VOLUME	(mm)=	80.72	48.79	64.71
TOTAL RAINFALL	(mm)=	80.82	80.82	80.82
RUNOFF COEFFICIENT	=	1.00	0.60	0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (6143) ID= 1 DT= 5.0 min	Area (ha)= 0.71 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.50	0.21	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.90	
Length	(m)=	6.00	372.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		37.17	43.03	
over (min)		5.00	50.00	
Storage Coeff. (min)=		0.57 (ii)	48.47 (ii)	
Unit Hyd. Tpeak (min)=		5.00	50.00	
Unit Hyd. peak (cms)=		0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.04	0.02	0.050 (iii)
TIME TO PEAK	(hrs)=	4.42	5.75	5.25
RUNOFF VOLUME	(mm)=	80.72	48.79	64.72
TOTAL RAINFALL	(mm)=	80.82	80.82	80.82
RUNOFF COEFFICIENT	=	1.00	0.60	0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (6141)	Area (ha)= 0.89		
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00	

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.62	0.27	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.25	
Length	(m)=	6.00	470.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		37.17	41.18	
over (min)		5.00	85.00	
Storage Coeff. (min)=		0.57 (ii)	82.93 (ii)	
Unit Hyd. Tpeak (min)=		5.00	85.00	
Unit Hyd. peak (cms)=		0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.05	0.02	0.053 (iii)
TIME TO PEAK	(hrs)=	4.42	6.42	5.25
RUNOFF VOLUME	(mm)=	80.72	48.79	64.71
TOTAL RAINFALL	(mm)=	80.82	80.82	80.82
RUNOFF COEFFICIENT	=	1.00	0.60	0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (6140)					
1 + 2 = 3		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (6141):		0.89	0.053	5.25	64.71
+ ID2= 2 (6142):		1.43	0.081	5.25	64.71
ID = 3 (6140):		2.32	0.135	5.25	64.71

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (6140)					
3 + 2 = 1		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
ID1= 3 (6140):		2.32	0.135	5.25	64.71
+ ID2= 2 (6143):		0.71	0.050	5.25	64.72
ID = 1 (6140):		3.03	0.185	5.25	64.71

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB			
STANDHYD (5131)	Area (ha)= 1.29		
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00	

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.90	0.39
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	0.70
Length	(m)=	6.00	681.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		37.17	41.18
over (min)		5.00	80.00
Storage Coeff. (min)=		0.57 (ii)	76.12 (ii)
Unit Hyd. Tpeak (min)=		5.00	80.00

```
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.07         0.02          0.079 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.25           5.25
     RUNOFF VOLUME    (mm)=      80.72        48.79          64.72
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.60           0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  5132)|   Area    (ha)=   0.15
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.10         0.05
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.70
     Length            (m)=       6.00        80.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        47.01
               over (min)         5.00        25.00
     Storage Coeff.  (min)=       0.57 (ii)   20.39 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=       0.34         0.05
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.013 (iii)
     TIME TO PEAK    (hrs)=       4.50         5.33           5.25
     RUNOFF VOLUME    (mm)=      80.72        48.79          64.68
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.60           0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  5133)|   Area    (ha)=   0.38
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.27         0.11
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.60
     Length            (m)=       6.00       200.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        44.57
               over (min)         5.00        40.00
     Storage Coeff.  (min)=       0.57 (ii)   37.32 (ii)
     Unit Hyd. Tpeak (min)=       5.00        40.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.029 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.58           5.25
     RUNOFF VOLUME    (mm)=      80.72        48.79          64.70
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.60           0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
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THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (5134)	Area (ha)= 0.38
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.27	0.11	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.60	
Length	(m)=	6.00	200.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		37.17	44.57	
over (min)		5.00	40.00	
Storage Coeff. (min)=		0.57 (ii)	37.32 (ii)	
Unit Hyd. Tpeak (min)=		5.00	40.00	
Unit Hyd. peak (cms)=		0.34	0.03	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.01	0.029 (iii)
TIME TO PEAK	(hrs)=	4.42	5.58	5.25
RUNOFF VOLUME	(mm)=	80.72	48.79	64.70
TOTAL RAINFALL	(mm)=	80.82	80.82	80.82
RUNOFF COEFFICIENT	=	1.00	0.60	0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (5130)					
1 + 2 = 3		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (5131):		1.29	0.079	5.25	64.72
+ ID2= 2 (5132):		0.15	0.013	5.25	64.68
ID = 3 (5130):		1.44	0.091	5.25	64.72

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (5130)					
3 + 2 = 1		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 3 (5130):		1.44	0.091	5.25	64.72
+ ID2= 2 (5133):		0.38	0.029	5.25	64.70
ID = 1 (5130):		1.82	0.120	5.25	64.72

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (5130)					
1 + 2 = 3		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (5130):		1.82	0.120	5.25	64.72
+ ID2= 2 (5134):		0.38	0.029	5.25	64.70
ID = 3 (5130):		2.20	0.148	5.25	64.71

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB	
STANDHYD (0011)	Area (ha)= 1.13

|ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.79	0.34	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	1.50	0.60	
Length	(m)=	6.00	596.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)	=	37.17	34.36	
over (min)		5.00	80.00	
Storage Coeff.	(min)=	0.62 (ii)	79.15 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	80.00	
Unit Hyd. peak	(cms)=	0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.06	0.02	0.067 (iii)
TIME TO PEAK	(hrs)=	4.50	6.33	5.25
RUNOFF VOLUME	(mm)=	80.72	41.40	61.02
TOTAL RAINFALL	(mm)=	80.82	80.82	80.82
RUNOFF COEFFICIENT	=	1.00	0.51	0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 69.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0021)

Area (ha)= 0.58

|ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.41	0.17	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	1.50	0.60	
Length	(m)=	6.00	304.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)	=	37.17	33.68	
over (min)		5.00	55.00	
Storage Coeff.	(min)=	0.62 (ii)	53.48 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	55.00	
Unit Hyd. peak	(cms)=	0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.03	0.01	0.037 (iii)
TIME TO PEAK	(hrs)=	4.50	5.83	5.25
RUNOFF VOLUME	(mm)=	80.72	39.61	60.11
TOTAL RAINFALL	(mm)=	80.82	80.82	80.82
RUNOFF COEFFICIENT	=	1.00	0.49	0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0022)

Area (ha)= 0.60

|ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.42	0.18
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.50	0.60
Length	(m)=	6.00	314.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)	=	37.17	33.68
over (min)		5.00	55.00
Storage Coeff.	(min)=	0.62 (ii)	54.51 (ii)
Unit Hyd. Tpeak	(min)=	5.00	55.00

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     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.038 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.92           5.25
     RUNOFF VOLUME    (mm)=      80.72        39.61          60.11
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.49           0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| ADD HYD  (  0020)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0021):     0.58   0.037     5.25    60.11
      + ID2= 2 (  0022):     0.60   0.038     5.25    60.11
        ================================================
        ID = 3 (  0020):     1.18   0.076     5.25    60.11

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| CALIB            |
| STANDHYD (  3121)|   Area    (ha)=   0.68
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.48         0.20
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         4.50
     Length            (m)=       6.00       355.50
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        40.03
               over (min)         5.00        35.00
     Storage Coeff.  (min)=       0.57 (ii)   30.17 (ii)
     Unit Hyd. Tpeak (min)=       5.00        35.00
     Unit Hyd. peak  (cms)=       0.34         0.04
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.02          0.051 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.50           5.25
     RUNOFF VOLUME    (mm)=      80.72        42.22          61.44
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.52           0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  69.9    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB            |
| STANDHYD (  3122)|   Area    (ha)=   0.86
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.60         0.26
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.25
     Length            (m)=       6.00       450.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        35.11
               over (min)         5.00        90.00
     Storage Coeff.  (min)=       0.57 (ii)   86.10 (ii)
     Unit Hyd. Tpeak (min)=       5.00        90.00
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     Unit Hyd. peak  (cms)=       0.34         0.01
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.01          0.050 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.50           5.25
     RUNOFF VOLUME    (mm)=      80.72        42.22          61.41
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.52           0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  69.9    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| ADD HYD  (  3120)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  3121):     0.68   0.051     5.25    61.44
      + ID2= 2 (  3122):     0.86   0.050     5.25    61.41
        ================================================
        ID = 3 (  3120):     1.53   0.100     5.25    61.43

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  6201)|   Area    (ha)=   0.78
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.55         0.23
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         2.80
     Length            (m)=       6.00       410.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        47.04
               over (min)         5.00        40.00
     Storage Coeff.  (min)=       0.57 (ii)   35.42 (ii)
     Unit Hyd. Tpeak (min)=       5.00        40.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.02          0.060 (iii)
     TIME TO PEAK    (hrs)=       4.50         5.58           5.25
     RUNOFF VOLUME    (mm)=      80.72        50.86          65.76
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.63           0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  78.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB            |
| STANDHYD (  5221)|   Area    (ha)=   0.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.13         0.05
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         1.25
     Length            (m)=       6.00        97.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        47.01
               over (min)         5.00        20.00
     Storage Coeff.  (min)=       0.57 (ii)   19.27 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
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     Unit Hyd. peak  (cms)=       0.34         0.06
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.01          0.015 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.33           5.25
     RUNOFF VOLUME    (mm)=      80.72        48.79          64.70
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.60           0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  5222)|   Area    (ha)=   0.74
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.52         0.22
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         1.25
     Length            (m)=       6.00       388.00
     Mannings n            =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        43.83
               over (min)         5.00        45.00
     Storage Coeff.  (min)=       0.57 (ii)   44.75 (ii)
     Unit Hyd. Tpeak (min)=       5.00        45.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.02          0.053 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.67           5.25
     RUNOFF VOLUME    (mm)=      80.72        48.79          64.72
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.60           0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  5223)|   Area    (ha)=   0.82
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.57         0.25
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.50
     Length            (m)=       6.00       432.00
     Mannings n            =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        41.18
               over (min)         5.00        65.00
     Storage Coeff.  (min)=       0.57 (ii)   64.17 (ii)
     Unit Hyd. Tpeak (min)=       5.00        65.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.02          0.053 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.00           5.25
     RUNOFF VOLUME    (mm)=      80.72        48.79          64.71
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.60           0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
```

THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (5220)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (5221):		0.18	0.015	5.25	64.70
+ ID2= 2 (5222):		0.74	0.053	5.25	64.72
ID = 3 (5220):		0.92	0.069	5.25	64.72

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (5220)		AREA	QPEAK	TPEAK	R.V.
3 + 2 = 1		(ha)	(cms)	(hrs)	(mm)
ID1= 3 (5220):		0.92	0.069	5.25	64.72
+ ID2= 2 (5223):		0.82	0.053	5.25	64.71
ID = 1 (5220):		1.74	0.121	5.25	64.71

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB STANDHYD (5111) | Area (ha)= 0.85
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.59	0.25	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	5.67	
Length	(m)=	6.00	449.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		37.17	45.25	
over (min)		5.00	35.00	
Storage Coeff. (min)=		0.57 (ii)	30.82 (ii)	
Unit Hyd. Tpeak (min)=		5.00	35.00	
Unit Hyd. peak (cms)=		0.34	0.04	
				TOTALS
PEAK FLOW	(cms)=	0.04	0.02	0.067 (iii)
TIME TO PEAK	(hrs)=	4.42	5.50	5.25
RUNOFF VOLUME	(mm)=	80.72	48.79	64.73
TOTAL RAINFALL	(mm)=	80.82	80.82	80.82
RUNOFF COEFFICIENT	=	1.00	0.60	0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (3181) | Area (ha)= 0.42
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.29	0.13
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	2.00	0.30
Length	(m)=	6.00	220.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		37.17	32.08
over (min)		5.00	60.00
Storage Coeff. (min)=		0.57 (ii)	55.22 (ii)
Unit Hyd. Tpeak (min)=		5.00	60.00

```
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.026 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.92           5.25
     RUNOFF VOLUME    (mm)=      78.82        37.88          58.27
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       0.98         0.47           0.72

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  65.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  3182)|   Area    (ha)=   0.46
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.32         0.14
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         0.30
     Length            (m)=       6.00       243.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        31.15
               over (min)         5.00        60.00
     Storage Coeff.  (min)=       0.57 (ii)   59.26 (ii)
     Unit Hyd. Tpeak (min)=       5.00        60.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.028 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.00           5.25
     RUNOFF VOLUME    (mm)=      78.82        37.88          58.27
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       0.98         0.47           0.72

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  65.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  3180)|
|   1 +  2 =  3    |        AREA    QPEAK    TPEAK     R.V.
--------------------        (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  3181):     0.42   0.026     5.25    58.27
     + ID2= 2 (  3182):     0.46   0.028     5.25    58.27
       ================================================
       ID = 3 (  3180):     0.88   0.055     5.25    58.27

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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================================================================================================================

      V    V   I    SSSSS  U   U    A    L
      V    V   I    SS     U   U   A A   L
       V  V    I     SS    U   U  AAAAA  L
       V  V    I      SS   U   U  A   A  L
        VV     I    SSSSS  UUUUU  A   A  LLLLL

       OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
      O   O    T      T    H   H   Y Y   MM MM  O   O
      O   O    T      T    H   H    Y    M   M  O   O
       OOO     T      T    H   H    Y    M   M   OOO
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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\f87179bc-d020-4381-863d-80b378cc7565\scenar
Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\f87179bc-d020-4381-863d-80b378cc7565\scenar

DATE: 10/07/2016 TIME: 09:43:19

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 6 **
****

READ STORM	Filename: C:\Users\p002311c\AppData\Local\Temp\db0fe791-7419-44ec-813d-9df9ab04fb68\43140fc3
Ptotal= 88.54 mm	Comments: 100yr/12hr

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	3.50	15.05	6.75	6.20	10.00	0.89
0.50	0.89	3.75	15.05	7.00	6.20	10.25	0.89
0.75	0.89	4.00	15.05	7.25	6.20	10.50	0.89
1.00	0.89	4.25	15.05	7.50	3.54	10.75	0.89
1.25	0.89	4.50	40.71	7.75	3.54	11.00	0.89
1.50	0.89	4.75	40.71	8.00	3.54	11.25	0.89
1.75	0.89	5.00	40.71	8.25	3.54	11.50	0.89
2.00	0.89	5.25	40.71	8.50	1.77	11.75	0.89
2.25	0.89	5.50	11.51	8.75	1.77	12.00	0.89
2.50	5.31	5.75	11.51	9.00	1.77	12.25	0.89
2.75	5.31	6.00	11.51	9.25	1.77		
3.00	5.31	6.25	11.51	9.50	0.89		
3.25	5.31	6.50	6.20	9.75	0.89		

CALIB	
STANDHYD (3141)	Area (ha)= 0.88
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.62	0.26
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	3.57
Length	(m)=	6.00	462.10
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	5.31	6.250	11.51	9.33	0.89
0.167	0.00	3.250	5.31	6.333	6.20	9.42	0.89
0.250	0.00	3.333	15.05	6.417	6.20	9.50	0.89
0.333	0.89	3.417	15.05	6.500	6.20	9.58	0.89
0.417	0.89	3.500	15.05	6.583	6.20	9.67	0.89
0.500	0.89	3.583	15.05	6.667	6.20	9.75	0.89
0.583	0.89	3.667	15.05	6.750	6.20	9.83	0.89
0.667	0.89	3.750	15.05	6.833	6.20	9.92	0.89

0.750	0.89	3.833	15.05	6.917	6.20	10.00	0.89
0.833	0.89	3.917	15.05	7.000	6.20	10.08	0.89
0.917	0.89	4.000	15.05	7.083	6.20	10.17	0.89
1.000	0.89	4.083	15.05	7.167	6.20	10.25	0.89
1.083	0.89	4.167	15.05	7.250	6.20	10.33	0.89
1.167	0.89	4.250	15.05	7.333	3.54	10.42	0.89
1.250	0.89	4.333	40.71	7.417	3.54	10.50	0.89
1.333	0.89	4.417	40.71	7.500	3.54	10.58	0.89
1.417	0.89	4.500	40.71	7.583	3.54	10.67	0.89
1.500	0.89	4.583	40.71	7.667	3.54	10.75	0.89
1.583	0.89	4.667	40.71	7.750	3.54	10.83	0.89
1.667	0.89	4.750	40.71	7.833	3.54	10.92	0.89
1.750	0.89	4.833	40.71	7.917	3.54	11.00	0.89
1.833	0.89	4.917	40.71	8.000	3.54	11.08	0.89
1.917	0.89	5.000	40.71	8.083	3.54	11.17	0.89
2.000	0.89	5.083	40.71	8.167	3.54	11.25	0.89
2.083	0.89	5.167	40.71	8.250	3.54	11.33	0.89
2.167	0.89	5.250	40.71	8.333	1.77	11.42	0.89
2.250	0.89	5.333	11.51	8.417	1.77	11.50	0.89
2.333	5.31	5.417	11.51	8.500	1.77	11.58	0.89
2.417	5.31	5.500	11.51	8.583	1.77	11.67	0.89
2.500	5.31	5.583	11.51	8.667	1.77	11.75	0.89
2.583	5.31	5.667	11.51	8.750	1.77	11.83	0.89
2.667	5.31	5.750	11.51	8.833	1.77	11.92	0.89
2.750	5.31	5.833	11.51	8.917	1.77	12.00	0.89
2.833	5.31	5.917	11.51	9.000	1.77	12.08	0.89
2.917	5.31	6.000	11.51	9.083	1.77	12.17	0.89
3.000	5.31	6.083	11.51	9.167	1.77	12.25	0.89
3.083	5.31	6.167	11.51	9.250	1.77		

Max.Eff.Inten.(mm/hr)=	40.71	41.56	
over (min)	5.00	40.00	
Storage Coeff. (min)=	0.55 (ii)	37.14 (ii)	
Unit Hyd. Tpeak (min)=	5.00	40.00	
Unit Hyd. peak (cms)=	0.34	0.03	
			TOTALS
PEAK FLOW (cms)=	0.05	0.02	0.068 (iii)
TIME TO PEAK (hrs)=	4.42	5.58	5.25
RUNOFF VOLUME (mm)=	88.44	45.56	66.98
TOTAL RAINFALL (mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT =	1.00	0.51	0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (3142)	Area (ha)= 0.52		
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00	
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.36	0.16	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	0.30	
Length (m)=	6.00	274.60	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	40.71	37.77	
over (min)	5.00	60.00	
Storage Coeff. (min)=	0.55 (ii)	59.02 (ii)	
Unit Hyd. Tpeak (min)=	5.00	60.00	
Unit Hyd. peak (cms)=	0.34	0.02	
			TOTALS
PEAK FLOW (cms)=	0.03	0.01	0.036 (iii)
TIME TO PEAK (hrs)=	4.42	6.00	5.25
RUNOFF VOLUME (mm)=	88.44	45.56	66.93
TOTAL RAINFALL (mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT =	1.00	0.51	0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB				
STANDHYD (3143)	Area (ha)= 1.12			
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00		
	IMPERVIOUS	PERVIOUS (i)		
Surface Area (ha)=	0.78	0.34		
Dep. Storage (mm)=	0.10	5.00		
Average Slope (%)=	2.00	0.30		
Length (m)=	6.00	590.00		
Mannings n =	0.013	0.250		
Max.Eff.Inten.(mm/hr)=	40.71	37.77		
over (min)	5.00	95.00		
Storage Coeff. (min)=	0.55 (ii)	93.07 (ii)		
Unit Hyd. Tpeak (min)=	5.00	95.00		
Unit Hyd. peak (cms)=	0.34	0.01		
			TOTALS	
PEAK FLOW (cms)=	0.06	0.02	0.070 (iii)	
TIME TO PEAK (hrs)=	4.42	6.58	5.25	
RUNOFF VOLUME (mm)=	88.44	45.56	66.95	
TOTAL RAINFALL (mm)=	88.54	88.54	88.54	
RUNOFF COEFFICIENT =	1.00	0.51	0.76	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB				
STANDHYD (3144)	Area (ha)= 0.85			
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00		
	IMPERVIOUS	PERVIOUS (i)		
Surface Area (ha)=	0.59	0.25		
Dep. Storage (mm)=	0.10	5.00		
Average Slope (%)=	2.00	4.35		
Length (m)=	6.00	444.50		
Mannings n =	0.013	0.250		
Max.Eff.Inten.(mm/hr)=	40.71	42.36		
over (min)	5.00	35.00		
Storage Coeff. (min)=	0.55 (ii)	33.98 (ii)		
Unit Hyd. Tpeak (min)=	5.00	35.00		
Unit Hyd. peak (cms)=	0.34	0.03		
			TOTALS	
PEAK FLOW (cms)=	0.05	0.02	0.067 (iii)	
TIME TO PEAK (hrs)=	4.42	5.50	5.25	
RUNOFF VOLUME (mm)=	88.44	45.56	66.97	
TOTAL RAINFALL (mm)=	88.54	88.54	88.54	
RUNOFF COEFFICIENT =	1.00	0.51	0.76	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (3140)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (3141):	0.88	0.068	5.25	66.98
+ ID2= 2 (3142):	0.52	0.036	5.25	66.93

```
       ID = 3 (  3140):     1.40   0.104     5.25    66.96

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD  (  3140)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  3140):     1.40   0.104     5.25    66.96
     + ID2= 2 (  3143):     1.12   0.070     5.25    66.95
       ================================================
       ID = 1 (  3140):     2.52   0.175     5.25    66.96

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD  (  3140)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  3140):     2.52   0.175     5.25    66.96
     + ID2= 2 (  3144):     0.85   0.067     5.25    66.97
       ================================================
       ID = 3 (  3140):     3.37   0.242     5.25    66.96

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| CALIB            |
| STANDHYD (  6041)|   Area    (ha)=   1.07
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.75         0.32
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         3.10
     Length            (m)=       6.00       565.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        48.86
               over (min)        5.00        45.00
     Storage Coeff.  (min)=       0.55 (ii)   40.91 (ii)
     Unit Hyd. Tpeak (min)=       5.00        45.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.06         0.03          0.086 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.67           5.25
     RUNOFF VOLUME    (mm)=      88.44        54.52          71.46
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       1.00         0.62           0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  6042)|   Area    (ha)=   1.52
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.06         0.46
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         1.40
     Length            (m)=       6.00       800.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        46.01
               over (min)        5.00        70.00
     Storage Coeff.  (min)=       0.55 (ii)   65.20 (ii)
```

```
     Unit Hyd. Tpeak (min)=       5.00        70.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.09         0.03          0.106 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.08           5.25
     RUNOFF VOLUME    (mm)=      88.44        54.53          71.46
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       1.00         0.62           0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  6043)|   Area    (ha)=   1.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.83         0.35
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.50
     Length            (m)=       6.00       620.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        46.01
                 over (min)       5.00        80.00
     Storage Coeff.  (min)=       0.55 (ii)   76.12 (ii)
     Unit Hyd. Tpeak (min)=       5.00        80.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.07         0.02          0.079 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.25           5.25
     RUNOFF VOLUME    (mm)=      88.44        54.52          71.45
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       1.00         0.62           0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  6040)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  6041):     1.07   0.086     5.25    71.46
     + ID2= 2 (  6042):     1.52   0.106     5.25    71.46
       ================================================
       ID = 3 (  6040):     2.59   0.192     5.25    71.46

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD  (  6040)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  6040):     2.59   0.192     5.25    71.46
     + ID2= 2 (  6043):     1.18   0.079     5.25    71.45
       ================================================
       ID = 1 (  6040):     3.77   0.271     5.25    71.46

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| CALIB            |
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| STANDHYD (  5212)|   Area    (ha)=   0.82
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.57         0.25
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.20
     Length            (m)=       6.00       433.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        46.91
               over (min)        5.00        85.00
     Storage Coeff.  (min)=       0.55 (ii)   80.13 (ii)
     Unit Hyd. Tpeak (min)=       5.00        85.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.02          0.055 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.33           5.25
     RUNOFF VOLUME    (mm)=      88.44        55.50          71.92
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       1.00         0.63           0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  5211)|   Area    (ha)=   0.42
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.29         0.13
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.20
     Length            (m)=       6.00       220.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        47.94
               over (min)        5.00        55.00
     Storage Coeff.  (min)=       0.55 (ii)   53.10 (ii)
     Unit Hyd. Tpeak (min)=       5.00        55.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.032 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.83           5.25
     RUNOFF VOLUME    (mm)=      88.44        55.50          71.89
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       1.00         0.63           0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  5210)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  5211):     0.42   0.032     5.25    71.89
     + ID2= 2 (  5212):     0.82   0.055     5.25    71.92
       ================================================
       ID = 3 (  5210):     1.24   0.086     5.25    71.91

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| CALIB            |
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| STANDHYD (6142)| Area (ha)= 1.43
|ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	1.00	0.43
Dep. Storage (mm)=	0.10	5.00
Average Slope (%)=	2.00	0.25
Length (m)=	6.00	753.00
Mannings n =	0.013	0.250
Max.Eff.Inten.(mm/hr)=	40.71	46.91
over (min)	5.00	105.00
Storage Coeff. (min)=	0.55 (ii)	104.28 (ii)
Unit Hyd. Tpeak (min)=	5.00	105.00
Unit Hyd. peak (cms)=	0.34	0.01

		TOTALS
PEAK FLOW (cms)=	0.08	0.02	0.090 (iii)
TIME TO PEAK (hrs)=	4.42	6.75	5.25
RUNOFF VOLUME (mm)=	88.44	55.50	71.93
TOTAL RAINFALL (mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT =	1.00	0.63	0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| STANDHYD (6143)| Area (ha)= 0.71
|ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.50	0.21
Dep. Storage (mm)=	0.10	5.00
Average Slope (%)=	2.00	0.90
Length (m)=	6.00	372.00
Mannings n =	0.013	0.250
Max.Eff.Inten.(mm/hr)=	40.71	48.88
over (min)	5.00	50.00
Storage Coeff. (min)=	0.55 (ii)	46.06 (ii)
Unit Hyd. Tpeak (min)=	5.00	50.00
Unit Hyd. peak (cms)=	0.34	0.02

		TOTALS
PEAK FLOW (cms)=	0.04	0.02	0.056 (iii)
TIME TO PEAK (hrs)=	4.42	5.75	5.25
RUNOFF VOLUME (mm)=	88.44	55.50	71.93
TOTAL RAINFALL (mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT =	1.00	0.63	0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| STANDHYD (6141)| Area (ha)= 0.89
|ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.62	0.27
Dep. Storage (mm)=	0.10	5.00
Average Slope (%)=	2.00	0.25
Length (m)=	6.00	470.00
Mannings n =	0.013	0.250
Max.Eff.Inten.(mm/hr)=	40.71	46.91
over (min)	5.00	80.00
Storage Coeff. (min)=	0.55 (ii)	78.73 (ii)

```
     Unit Hyd. Tpeak (min)=       5.00        80.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.02          0.060 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.25           5.25
     RUNOFF VOLUME    (mm)=      88.44        55.50          71.92
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       1.00         0.63           0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  6140)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  6141):     0.89   0.060     5.25    71.92
     + ID2= 2 (  6142):     1.43   0.090     5.25    71.93
       ================================================
       ID = 3 (  6140):     2.32   0.150     5.25    71.93

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD  (  6140)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  6140):     2.32   0.150     5.25    71.93
     + ID2= 2 (  6143):     0.71   0.056     5.25    71.93
       ================================================
       ID = 1 (  6140):     3.03   0.206     5.25    71.93

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB              |
| STANDHYD (  5131)|   Area    (ha)=   1.29
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.90         0.39
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.70
     Length            (m)=       6.00       681.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        46.91
               over (min)        5.00        75.00
     Storage Coeff.  (min)=       0.55 (ii)   72.26 (ii)
     Unit Hyd. Tpeak (min)=       5.00        75.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.07         0.03          0.088 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.17           5.25
     RUNOFF VOLUME    (mm)=      88.44        55.50          71.94
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       1.00         0.63           0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB              |
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| STANDHYD (5132)| Area (ha)= 0.15
|ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.10	0.05	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	0.70	
Length (m)=	6.00	80.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	40.71	53.05	
over (min)	5.00	20.00	
Storage Coeff. (min)=	0.55 (ii)	19.44 (ii)	
Unit Hyd. Tpeak (min)=	5.00	20.00	
Unit Hyd. peak (cms)=	0.34	0.06	
			TOTALS
PEAK FLOW (cms)=	0.01	0.01	0.014 (iii)
TIME TO PEAK (hrs)=	4.42	5.33	5.25
RUNOFF VOLUME (mm)=	88.44	55.50	71.89
TOTAL RAINFALL (mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT =	1.00	0.63	0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| STANDHYD (5133)| Area (ha)= 0.38
|ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.27	0.11	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	0.60	
Length (m)=	6.00	200.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	40.71	51.22	
over (min)	5.00	40.00	
Storage Coeff. (min)=	0.55 (ii)	35.31 (ii)	
Unit Hyd. Tpeak (min)=	5.00	40.00	
Unit Hyd. peak (cms)=	0.34	0.03	
			TOTALS
PEAK FLOW (cms)=	0.02	0.01	0.032 (iii)
TIME TO PEAK (hrs)=	4.42	5.58	5.25
RUNOFF VOLUME (mm)=	88.44	55.50	71.92
TOTAL RAINFALL (mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT =	1.00	0.63	0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| CALIB |
| STANDHYD (5134)| Area (ha)= 0.38
|ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.27	0.11
Dep. Storage (mm)=	0.10	5.00
Average Slope (%)=	2.00	0.60
Length (m)=	6.00	200.00
Mannings n =	0.013	0.250
Max.Eff.Inten.(mm/hr)=	40.71	51.22
over (min)	5.00	40.00
Storage Coeff. (min)=	0.55 (ii)	35.31 (ii)

```
     Unit Hyd. Tpeak (min)=       5.00         40.00
     Unit Hyd. peak  (cms)=       0.34          0.03
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.02          0.01          0.032 (iii)
     TIME TO PEAK    (hrs)=       4.42          5.58           5.25
     RUNOFF VOLUME    (mm)=      88.44         55.50          71.92
     TOTAL RAINFALL   (mm)=      88.54         88.54          88.54
     RUNOFF COEFFICIENT   =       1.00          0.63           0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  5130)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  5131):     1.29   0.088     5.25    71.94
     + ID2= 2 (  5132):     0.15   0.014     5.25    71.89
       ================================================
       ID = 3 (  5130):     1.44   0.103     5.25    71.93

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD  (  5130)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  5130):     1.44   0.103     5.25    71.93
     + ID2= 2 (  5133):     0.38   0.032     5.25    71.92
       ================================================
       ID = 1 (  5130):     1.82   0.135     5.25    71.93

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD  (  5130)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  5130):     1.82   0.135     5.25    71.93
     + ID2= 2 (  5134):     0.38   0.032     5.25    71.92
       ================================================
       ID = 3 (  5130):     2.20   0.167     5.25    71.93

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0011)|   Area    (ha)=   1.13
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.79          0.34
     Dep. Storage     (mm)=       0.10          5.00
     Average Slope     (%)=       1.50          0.60
     Length            (m)=       6.00        596.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=      40.71         39.56
               over (min)         5.00         75.00
     Storage Coeff.  (min)=       0.60 (ii)    74.83 (ii)
     Unit Hyd. Tpeak (min)=       5.00         75.00
     Unit Hyd. peak  (cms)=       0.34          0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.06          0.02          0.075 (iii)
     TIME TO PEAK    (hrs)=       4.50          6.25           5.25
     RUNOFF VOLUME    (mm)=      88.44         47.51          67.94
     TOTAL RAINFALL   (mm)=      88.54         88.54          88.54
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     RUNOFF COEFFICIENT   =       1.00         0.54           0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  69.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0021)|   Area    (ha)=   0.58
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.41         0.17
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.50         0.60
     Length            (m)=       6.00       304.00
     Mannings n             =    0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        39.79
               over (min)        5.00        55.00
     Storage Coeff.  (min)=       0.60 (ii)   50.04 (ii)
     Unit Hyd. Tpeak (min)=       5.00        55.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.042 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.83           5.25
     RUNOFF VOLUME    (mm)=      88.44        45.56          66.95
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       1.00         0.51           0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0022)|   Area    (ha)=   0.60
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.42         0.18
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.50         0.60
     Length            (m)=       6.00       314.00
     Mannings n             =    0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        38.82
               over (min)        5.00        55.00
     Storage Coeff.  (min)=       0.60 (ii)   51.51 (ii)
     Unit Hyd. Tpeak (min)=       5.00        55.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.043 (iii)
     TIME TO PEAK    (hrs)=       4.50         5.83           5.25
     RUNOFF VOLUME    (mm)=      88.44        45.56          66.95
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       1.00         0.51           0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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ADD HYD (0020)					
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0021):	0.58	0.042	5.25	66.95
+ ID2= 2 (0022):	0.60	0.043	5.25	66.95
ID = 3 (0020):	1.18	0.084	5.25	66.95

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB			
STANDHYD (3121)	Area (ha)= 0.68		
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00	
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.48	0.20	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	4.50	
Length (m)=	6.00	355.50	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	40.71	45.70	
over (min)	5.00	30.00	
Storage Coeff. (min)=	0.55 (ii)	28.63 (ii)	
Unit Hyd. Tpeak (min)=	5.00	30.00	
Unit Hyd. peak (cms)=	0.34	0.04	
			TOTALS
PEAK FLOW (cms)=	0.04	0.02	0.057 (iii)
TIME TO PEAK (hrs)=	4.42	5.42	5.25
RUNOFF VOLUME (mm)=	88.44	48.40	68.40
TOTAL RAINFALL (mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT =	1.00	0.55	0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 69.9 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (3122)	Area (ha)= 0.86		
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00	
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.60	0.26	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	0.25	
Length (m)=	6.00	450.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	40.71	40.38	
over (min)	5.00	85.00	
Storage Coeff. (min)=	0.55 (ii)	81.43 (ii)	
Unit Hyd. Tpeak (min)=	5.00	85.00	
Unit Hyd. peak (cms)=	0.34	0.01	
			TOTALS
PEAK FLOW (cms)=	0.05	0.01	0.055 (iii)
TIME TO PEAK (hrs)=	4.42	6.42	5.25
RUNOFF VOLUME (mm)=	88.44	48.40	68.37
TOTAL RAINFALL (mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT =	1.00	0.55	0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 69.9 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (3120)|	AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (3121):		0.68	0.057	5.25	68.40
+ ID2= 2 (3122):		0.86	0.055	5.25	68.37
ID = 3 (3120):		1.53	0.113	5.25	68.38

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB STANDHYD (6201) | ID= 1 DT= 5.0 min	Area (ha)= 0.78 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00			
		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.55	0.23	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	2.80	
Length	(m)=	6.00	410.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		40.71	53.09	
over (min)		5.00	35.00	
Storage Coeff. (min)=		0.55 (ii)	33.76 (ii)	
Unit Hyd. Tpeak (min)=		5.00	35.00	
Unit Hyd. peak (cms)=		0.34	0.03	
				TOTALS
PEAK FLOW	(cms)=	0.04	0.03	0.068 (iii)
TIME TO PEAK	(hrs)=	4.42	5.50	5.25
RUNOFF VOLUME	(mm)=	88.44	57.71	73.05
TOTAL RAINFALL	(mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT	=	1.00	0.65	0.83

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 78.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (5221) | ID= 1 DT= 5.0 min	Area (ha)= 0.18 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00			
		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.13	0.05	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	1.25	
Length	(m)=	6.00	97.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		40.71	53.05	
over (min)		5.00	20.00	
Storage Coeff. (min)=		0.55 (ii)	18.37 (ii)	
Unit Hyd. Tpeak (min)=		5.00	20.00	
Unit Hyd. peak (cms)=		0.34	0.06	
				TOTALS
PEAK FLOW	(cms)=	0.01	0.01	0.017 (iii)
TIME TO PEAK	(hrs)=	4.42	5.25	5.25
RUNOFF VOLUME	(mm)=	88.44	55.50	71.91
TOTAL RAINFALL	(mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT	=	1.00	0.63	0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB

| STANDHYD (5222)| Area (ha)= 0.74
|ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.52	0.22	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	1.25	
Length (m)=	6.00	388.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	40.71	49.73	
over (min)	5.00	45.00	
Storage Coeff. (min)=	0.55 (ii)	42.56 (ii)	
Unit Hyd. Tpeak (min)=	5.00	45.00	
Unit Hyd. peak (cms)=	0.34	0.03	
			TOTALS
PEAK FLOW (cms)=	0.04	0.02	0.060 (iii)
TIME TO PEAK (hrs)=	4.42	5.67	5.25
RUNOFF VOLUME (mm)=	88.44	55.50	71.94
TOTAL RAINFALL (mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT =	1.00	0.63	0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (5223)	Area (ha)= 0.82
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.57	0.25	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	0.50	
Length (m)=	6.00	432.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	40.71	46.91	
over (min)	5.00	65.00	
Storage Coeff. (min)=	0.55 (ii)	60.92 (ii)	
Unit Hyd. Tpeak (min)=	5.00	65.00	
Unit Hyd. peak (cms)=	0.34	0.02	
			TOTALS
PEAK FLOW (cms)=	0.05	0.02	0.059 (iii)
TIME TO PEAK (hrs)=	4.42	6.00	5.25
RUNOFF VOLUME (mm)=	88.44	55.50	71.93
TOTAL RAINFALL (mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT =	1.00	0.63	0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (5220)					
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (5221):	0.18	0.017	5.25	71.91
+ ID2= 2 (5222):	0.74	0.060	5.25	71.94
ID = 3 (5220):	0.92	0.077	5.25	71.93

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (5220)|	AREA	QPEAK	TPEAK	R.V.
3 + 2 = 1		(ha)	(cms)	(hrs)	(mm)
	ID1= 3 (5220):	0.92	0.077	5.25	71.93
	+ ID2= 2 (5223):	0.82	0.059	5.25	71.93
	ID = 1 (5220):	1.74	0.136	5.25	71.93

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB				
STANDHYD (5111)	Area (ha)= 0.85			
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00		
		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.59	0.25	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	5.67	
Length	(m)=	6.00	449.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		40.71	51.88	
over (min)		5.00	30.00	
Storage Coeff. (min)=		0.55 (ii)	29.19 (ii)	
Unit Hyd. Tpeak (min)=		5.00	30.00	
Unit Hyd. peak (cms)=		0.34	0.04	
				TOTALS
PEAK FLOW	(cms)=	0.05	0.03	0.076 (iii)
TIME TO PEAK	(hrs)=	4.42	5.42	5.25
RUNOFF VOLUME	(mm)=	88.44	55.50	71.95
TOTAL RAINFALL	(mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT	=	1.00	0.63	0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB				
STANDHYD (3181)	Area (ha)= 0.42			
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00		
		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.29	0.13	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	2.00	0.30	
Length	(m)=	6.00	220.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		40.71	37.07	
over (min)		5.00	55.00	
Storage Coeff. (min)=		0.55 (ii)	52.13 (ii)	
Unit Hyd. Tpeak (min)=		5.00	55.00	
Unit Hyd. peak (cms)=		0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.01	0.030 (iii)
TIME TO PEAK	(hrs)=	4.42	5.83	5.25
RUNOFF VOLUME	(mm)=	86.54	43.66	65.02
TOTAL RAINFALL	(mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT	=	0.98	0.49	0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 65.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB

| STANDHYD (3182)| Area (ha)= 0.46
|ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.32	0.14
Dep. Storage (mm)=	2.00	5.00
Average Slope (%)=	2.00	0.30
Length (m)=	6.00	243.00
Mannings n =	0.013	0.250
Max.Eff.Inten.(mm/hr)=	40.71	37.07
over (min)	5.00	60.00
Storage Coeff. (min)=	0.55 (ii)	55.30 (ii)
Unit Hyd. Tpeak (min)=	5.00	60.00
Unit Hyd. peak (cms)=	0.34	0.02

			TOTALS
PEAK FLOW (cms)=	0.03	0.01	0.032 (iii)
TIME TO PEAK (hrs)=	4.42	5.92	5.25
RUNOFF VOLUME (mm)=	86.54	43.66	65.03
TOTAL RAINFALL (mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT =	0.98	0.49	0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 65.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

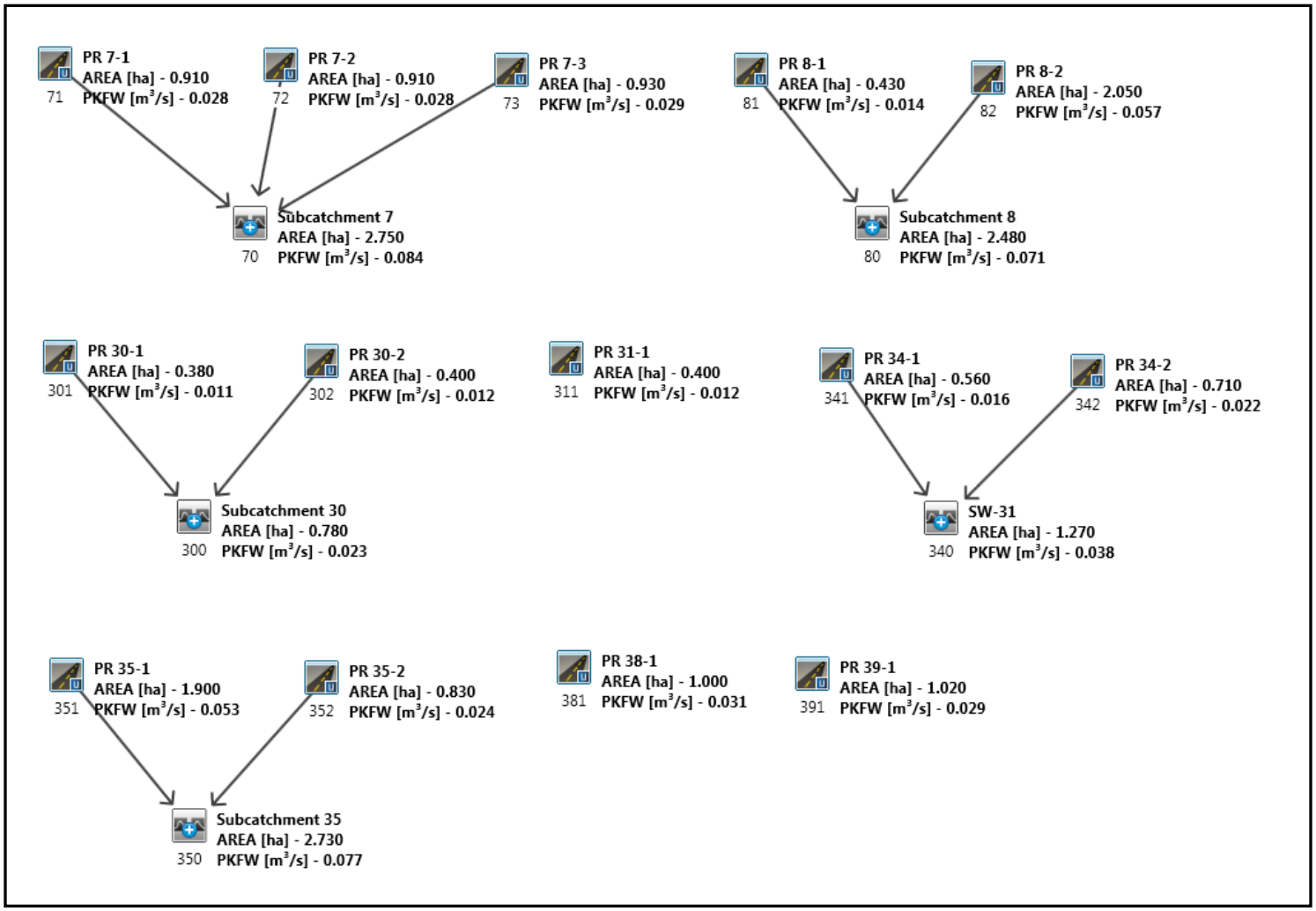
ADD HYD (3180)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (3181):	0.42	0.030	5.25	65.02
+ ID2= 2 (3182):	0.46	0.032	5.25	65.03
ID = 3 (3180):	0.88	0.061	5.25	65.03

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

FINISH

VO2 Modelling Schematic 4.4: 407 TWY Sub-Areas Hydrologic Analysis – Proposed Condition without SWM (Duffins Watershed)



```
       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
```


***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\927d5890-dc60-4ece-b3f1-e08c87151b5d\scenar
Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\927d5890-dc60-4ece-b3f1-e08c87151b5d\scenar

DATE: 10/07/2016 TIME: 09:44:39

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 1 **
****

READ STORM	Filename: C:\Users\p002311c\AppData\Local\Temp\d0c21a2d-292a-4169-bebb-934225b59a3c\015545a3
Ptotal= 42.00 mm	Comments: 2yr/12hr

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	3.50	7.14	6.75	2.94	10.00	0.42
0.50	0.42	3.75	7.14	7.00	2.94	10.25	0.42
0.75	0.42	4.00	7.14	7.25	2.94	10.50	0.42
1.00	0.42	4.25	7.14	7.50	1.68	10.75	0.42
1.25	0.42	4.50	19.32	7.75	1.68	11.00	0.42
1.50	0.42	4.75	19.32	8.00	1.68	11.25	0.42
1.75	0.42	5.00	19.32	8.25	1.68	11.50	0.42
2.00	0.42	5.25	19.32	8.50	0.84	11.75	0.42
2.25	0.42	5.50	5.46	8.75	0.84	12.00	0.42
2.50	2.52	5.75	5.46	9.00	0.84	12.25	0.42
2.75	2.52	6.00	5.46	9.25	0.84		
3.00	2.52	6.25	5.46	9.50	0.42		
3.25	2.52	6.50	2.94	9.75	0.42		

CALIB STANDHYD (0391)	Area (ha)= 1.02
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.71	0.31
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	0.80
Length	(m)=	6.00	535.00

Mannings n = 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	2.52	6.250	5.46	9.33	0.42
0.167	0.00	3.250	2.52	6.333	2.94	9.42	0.42
0.250	0.00	3.333	7.14	6.417	2.94	9.50	0.42
0.333	0.42	3.417	7.14	6.500	2.94	9.58	0.42
0.417	0.42	3.500	7.14	6.583	2.94	9.67	0.42
0.500	0.42	3.583	7.14	6.667	2.94	9.75	0.42
0.583	0.42	3.667	7.14	6.750	2.94	9.83	0.42
0.667	0.42	3.750	7.14	6.833	2.94	9.92	0.42
0.750	0.42	3.833	7.14	6.917	2.94	10.00	0.42
0.833	0.42	3.917	7.14	7.000	2.94	10.08	0.42
0.917	0.42	4.000	7.14	7.083	2.94	10.17	0.42
1.000	0.42	4.083	7.14	7.167	2.94	10.25	0.42
1.083	0.42	4.167	7.14	7.250	2.94	10.33	0.42
1.167	0.42	4.250	7.14	7.333	1.68	10.42	0.42
1.250	0.42	4.333	19.32	7.417	1.68	10.50	0.42
1.333	0.42	4.417	19.32	7.500	1.68	10.58	0.42
1.417	0.42	4.500	19.32	7.583	1.68	10.67	0.42
1.500	0.42	4.583	19.32	7.667	1.68	10.75	0.42
1.583	0.42	4.667	19.32	7.750	1.68	10.83	0.42
1.667	0.42	4.750	19.32	7.833	1.68	10.92	0.42
1.750	0.42	4.833	19.32	7.917	1.68	11.00	0.42
1.833	0.42	4.917	19.32	8.000	1.68	11.08	0.42
1.917	0.42	5.000	19.32	8.083	1.68	11.17	0.42
2.000	0.42	5.083	19.32	8.167	1.68	11.25	0.42
2.083	0.42	5.167	19.32	8.250	1.68	11.33	0.42
2.167	0.42	5.250	19.32	8.333	0.84	11.42	0.42
2.250	0.42	5.333	5.46	8.417	0.84	11.50	0.42
2.333	2.52	5.417	5.46	8.500	0.84	11.58	0.42
2.417	2.52	5.500	5.46	8.583	0.84	11.67	0.42
2.500	2.52	5.583	5.46	8.667	0.84	11.75	0.42
2.583	2.52	5.667	5.46	8.750	0.84	11.83	0.42
2.667	2.52	5.750	5.46	8.833	0.84	11.92	0.42
2.750	2.52	5.833	5.46	8.917	0.84	12.00	0.42
2.833	2.52	5.917	5.46	9.000	0.84	12.08	0.42
2.917	2.52	6.000	5.46	9.083	0.84	12.17	0.42
3.000	2.52	6.083	5.46	9.167	0.84	12.25	0.42
3.083	2.52	6.167	5.46	9.250	0.84		

Max.Eff.Inten.(mm/hr)=	19.32	12.12		
over (min)	5.00	105.00		
Storage Coeff. (min)=	0.74 (ii)	103.18 (ii)		
Unit Hyd. Tpeak (min)=	5.00	105.00		
Unit Hyd. peak (cms)=	0.34	0.01		
			TOTALS	
PEAK FLOW (cms)=	0.03	0.00	0.029 (iii)	
TIME TO PEAK (hrs)=	4.50	6.83	5.25	
RUNOFF VOLUME (mm)=	41.90	15.02	28.40	
TOTAL RAINFALL (mm)=	42.00	42.00	42.00	
RUNOFF COEFFICIENT =	1.00	0.36	0.68	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0081)	Area (ha)= 0.43
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.30	0.13
Dep. Storage (mm)=	0.10	5.00
Average Slope (%)=	2.00	3.00
Length (m)=	6.00	225.00
Mannings n =	0.013	0.250

Max.Eff.Inten.(mm/hr)=	19.32	14.25		
over (min)	5.00	40.00		
Storage Coeff. (min)=	0.74 (ii)	39.14 (ii)		
Unit Hyd. Tpeak (min)=	5.00	40.00		
Unit Hyd. peak (cms)=	0.34	0.03		
				TOTALS
PEAK FLOW (cms)=	0.01	0.00		0.014 (iii)
TIME TO PEAK (hrs)=	4.50	5.67		5.25
RUNOFF VOLUME (mm)=	41.90	15.48		28.63
TOTAL RAINFALL (mm)=	42.00	42.00		42.00
RUNOFF COEFFICIENT =	1.00	0.37		0.68

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0082)	Area (ha)=	2.05	
ID= 1 DT= 5.0 min	Total Imp(%)=	70.00	Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.43	0.62
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	1.40
Length	(m)=	6.00	1080.00
Mannings n	=	0.013	0.250

Max.Eff.Inten.(mm/hr)=	19.32	12.52		
over (min)	5.00	135.00		
Storage Coeff. (min)=	0.74 (ii)	131.02 (ii)		
Unit Hyd. Tpeak (min)=	5.00	135.00		
Unit Hyd. peak (cms)=	0.34	0.01		
				TOTALS
PEAK FLOW (cms)=	0.06	0.01		0.057 (iii)
TIME TO PEAK (hrs)=	4.50	7.33		5.25
RUNOFF VOLUME (mm)=	41.90	15.48		28.65
TOTAL RAINFALL (mm)=	42.00	42.00		42.00
RUNOFF COEFFICIENT =	1.00	0.37		0.68

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0080)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0081):		0.43	0.014	5.25	28.63
+ ID2= 2 (0082):		2.05	0.057	5.25	28.65
ID = 3 (0080):		2.48	0.071	5.25	28.65

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB			
STANDHYD (0071)	Area (ha)=	0.91	
ID= 1 DT= 5.0 min	Total Imp(%)=	70.00	Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.64	0.27
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	2.10
Length	(m)=	6.00	480.60
Mannings n	=	0.013	0.250

Max.Eff.Inten.(mm/hr)=	19.32	14.31	
over (min)	5.00	70.00	
Storage Coeff. (min)=	0.74 (ii)	68.02 (ii)	
Unit Hyd. Tpeak (min)=	5.00	70.00	
Unit Hyd. peak (cms)=	0.34	0.02	
			TOTALS
PEAK FLOW (cms)=	0.02	0.01	0.028 (iii)
TIME TO PEAK (hrs)=	4.50	6.17	5.25
RUNOFF VOLUME (mm)=	41.90	17.46	29.63
TOTAL RAINFALL (mm)=	42.00	42.00	42.00
RUNOFF COEFFICIENT =	1.00	0.42	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB		
STANDHYD (0072)	Area (ha)=	0.91
ID= 1 DT= 5.0 min	Total Imp(%)=	70.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.64	0.27
Dep. Storage (mm)=	0.10	5.00
Average Slope (%)=	2.00	2.10
Length (m)=	6.00	480.60
Mannings n =	0.013	0.250

Max.Eff.Inten.(mm/hr)=	19.32	14.31	
over (min)	5.00	70.00	
Storage Coeff. (min)=	0.74 (ii)	68.02 (ii)	
Unit Hyd. Tpeak (min)=	5.00	70.00	
Unit Hyd. peak (cms)=	0.34	0.02	
			TOTALS
PEAK FLOW (cms)=	0.02	0.01	0.028 (iii)
TIME TO PEAK (hrs)=	4.50	6.17	5.25
RUNOFF VOLUME (mm)=	41.90	17.46	29.63
TOTAL RAINFALL (mm)=	42.00	42.00	42.00
RUNOFF COEFFICIENT =	1.00	0.42	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB		
STANDHYD (0073)	Area (ha)=	0.93
ID= 1 DT= 5.0 min	Total Imp(%)=	70.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.65	0.28
Dep. Storage (mm)=	0.10	5.00
Average Slope (%)=	2.00	3.07
Length (m)=	6.00	490.00
Mannings n =	0.013	0.250

Max.Eff.Inten.(mm/hr)=	19.32	14.31	
over (min)	5.00	65.00	
Storage Coeff. (min)=	0.74 (ii)	61.48 (ii)	
Unit Hyd. Tpeak (min)=	5.00	65.00	
Unit Hyd. peak (cms)=	0.34	0.02	
			TOTALS
PEAK FLOW (cms)=	0.02	0.01	0.029 (iii)
TIME TO PEAK (hrs)=	4.50	6.08	5.25
RUNOFF VOLUME (mm)=	41.90	17.46	29.64
TOTAL RAINFALL (mm)=	42.00	42.00	42.00
RUNOFF COEFFICIENT =	1.00	0.42	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

```
       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0070)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0071):     0.91   0.028     5.25    29.63
      + ID2= 2 (  0072):     0.91   0.028     5.25    29.63
        ==================================================
        ID = 3 (  0070):     1.82   0.055     5.25    29.63

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD  (  0070)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 3 (  0070):     1.82   0.055     5.25    29.63
      + ID2= 2 (  0073):     0.93   0.029     5.25    29.64
        ==================================================
        ID = 1 (  0070):     2.75   0.084     5.25    29.64

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0301)|   Area    (ha)=   0.38
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.27         0.11
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.52
     Length            (m)=       6.00       200.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        12.12
               over (min)         5.00        70.00
     Storage Coeff.  (min)=       0.74 (ii)   65.34 (ii)
     Unit Hyd. Tpeak (min)=       5.00        70.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.011 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.17          5.25
     RUNOFF VOLUME    (mm)=      41.90        15.02         28.36
     TOTAL RAINFALL   (mm)=      42.00        42.00         42.00
     RUNOFF COEFFICIENT   =       1.00         0.36          0.68

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0302)|   Area    (ha)=   0.40
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.28         0.12
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.52
     Length            (m)=       6.00       211.60
     Mannings n           =      0.013        0.250
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```
     Max.Eff.Inten.(mm/hr)=      19.32        12.12
               over (min)        5.00        70.00
     Storage Coeff.  (min)=       0.74 (ii)   67.56 (ii)
     Unit Hyd. Tpeak (min)=       5.00        70.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.012 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.17           5.25
     RUNOFF VOLUME    (mm)=      41.90        15.02          28.37
     TOTAL RAINFALL   (mm)=      42.00        42.00          42.00
     RUNOFF COEFFICIENT   =       1.00         0.36           0.68

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0300)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0301):     0.38   0.011     5.25    28.36
      + ID2= 2 (  0302):     0.40   0.012     5.25    28.37
        ================================================
        ID = 3 (  0300):     0.78   0.023     5.25    28.36

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0311)|   Area    (ha)=   0.40
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.28         0.12
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.50
     Length            (m)=       6.00       208.40
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        12.52
               over (min)        5.00        70.00
     Storage Coeff.  (min)=       0.74 (ii)   66.86 (ii)
     Unit Hyd. Tpeak (min)=       5.00        70.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.012 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.17           5.25
     RUNOFF VOLUME    (mm)=      41.90        15.48          28.60
     TOTAL RAINFALL   (mm)=      42.00        42.00          42.00
     RUNOFF COEFFICIENT   =       1.00         0.37           0.68

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0341)|   Area    (ha)=   0.56
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.39         0.17
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.50
     Length            (m)=       6.00       295.30
     Mannings n           =      0.013        0.250
```

Max.Eff.Inten.(mm/hr)=	19.32	12.12		
over (min)	5.00	85.00		
Storage Coeff. (min)=	0.74 (ii)	83.32 (ii)		
Unit Hyd. Tpeak (min)=	5.00	85.00		
Unit Hyd. peak (cms)=	0.34	0.01		
			TOTALS	
PEAK FLOW (cms)=	0.02	0.00	0.016 (iii)	
TIME TO PEAK (hrs)=	4.50	6.50	5.25	
RUNOFF VOLUME (mm)=	41.90	15.02	28.38	
TOTAL RAINFALL (mm)=	42.00	42.00	42.00	
RUNOFF COEFFICIENT =	1.00	0.36	0.68	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0342)	Area (ha)=	0.71	
ID= 1 DT= 5.0 min	Total Imp(%)=	70.00	Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.50	0.21
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	2.80
Length	(m)=	6.00	372.90
Mannings n	=	0.013	0.250

Max.Eff.Inten.(mm/hr)=	19.32	12.12		
over (min)	5.00	60.00		
Storage Coeff. (min)=	0.74 (ii)	57.39 (ii)		
Unit Hyd. Tpeak (min)=	5.00	60.00		
Unit Hyd. peak (cms)=	0.34	0.02		
			TOTALS	
PEAK FLOW (cms)=	0.02	0.00	0.022 (iii)	
TIME TO PEAK (hrs)=	4.50	6.00	5.25	
RUNOFF VOLUME (mm)=	41.90	15.02	28.41	
TOTAL RAINFALL (mm)=	42.00	42.00	42.00	
RUNOFF COEFFICIENT =	1.00	0.36	0.68	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0340)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0341):	0.56	0.016	5.25	28.38
+ ID2= 2 (0342):	0.71	0.022	5.25	28.41
ID = 3 (0340):	1.27	0.038	5.25	28.40

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB			
STANDHYD (0351)	Area (ha)=	1.90	
ID= 1 DT= 5.0 min	Total Imp(%)=	70.00	Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.33	0.57
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	1.70
Length	(m)=	6.00	1001.80
Mannings n	=	0.013	0.250

Max.Eff.Inten.(mm/hr)=	19.32	12.12		
over (min)	5.00	120.00		
Storage Coeff. (min)=	0.74 (ii)	119.79 (ii)		
Unit Hyd. Tpeak (min)=	5.00	120.00		
Unit Hyd. peak (cms)=	0.34	0.01		
			TOTALS	
PEAK FLOW (cms)=	0.05	0.01	0.053 (iii)	
TIME TO PEAK (hrs)=	4.50	7.08	5.25	
RUNOFF VOLUME (mm)=	41.90	15.02	28.42	
TOTAL RAINFALL (mm)=	42.00	42.00	42.00	
RUNOFF COEFFICIENT =	1.00	0.36	0.68	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0352) | Area (ha)= 0.83
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=		0.58	0.25
Dep. Storage (mm)=		0.10	5.00
Average Slope (%)=		2.00	1.60
Length (m)=		6.00	435.40
Mannings n =		0.013	0.250

Max.Eff.Inten.(mm/hr)=	19.32	12.12		
over (min)	5.00	75.00		
Storage Coeff. (min)=	0.74 (ii)	74.28 (ii)		
Unit Hyd. Tpeak (min)=	5.00	75.00		
Unit Hyd. peak (cms)=	0.34	0.02		
			TOTALS	
PEAK FLOW (cms)=	0.02	0.00	0.024 (iii)	
TIME TO PEAK (hrs)=	4.50	6.33	5.25	
RUNOFF VOLUME (mm)=	41.90	15.02	28.41	
TOTAL RAINFALL (mm)=	42.00	42.00	42.00	
RUNOFF COEFFICIENT =	1.00	0.36	0.68	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0350)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0351):	1.90	0.053	5.25	28.42
+ ID2= 2 (0352):	0.83	0.024	5.25	28.41
ID = 3 (0350):	2.73	0.077	5.25	28.42

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB
STANDHYD (0381) | Area (ha)= 1.00
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=		0.70	0.30
Dep. Storage (mm)=		0.10	5.00
Average Slope (%)=		2.00	4.95
Length (m)=		6.00	524.60
Mannings n =		0.013	0.250

```
                                    407 TWY - NO SWM (12hr AES) - DUF
     Max.Eff.Inten.(mm/hr)=      19.32        14.33
               over (min)         5.00        60.00
     Storage Coeff.  (min)=       0.74 (ii)   55.54 (ii)
     Unit Hyd. Tpeak (min)=       5.00        60.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.031 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.00           5.25
     RUNOFF VOLUME    (mm)=      41.90        16.94          29.39
     TOTAL RAINFALL   (mm)=      42.00        42.00          42.00
     RUNOFF COEFFICIENT   =       1.00         0.40           0.70

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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================================================================================================================

       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

  Output  filename:
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0\scenar
  Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\f9d2a5f5-ac33-4c6b-a24b-2511ea8ba24
0\scenar


DATE: 10/07/2016                          TIME: 09:44:40

USER:


COMMENTS: _____________________________________________________________


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  ***************************
  ** SIMULATION NUMBER:   2 **
  ***************************


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|    READ STORM    |    Filename: C:\Users\p002311c\AppD
|                  |              ata\Local\Temp\
|                  |              d0c21a2d-292a-4169-bebb-934225b59a3c\4233047f
| Ptotal= 54.38 mm |    Comments: 5yr/12hr
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.25    0.00 |  3.50    9.25 |  6.75    3.81 | 10.00    0.54
                0.50    0.54 |  3.75    9.25 |  7.00    3.81 | 10.25    0.54
                0.75    0.54 |  4.00    9.25 |  7.25    3.81 | 10.50    0.54
                1.00    0.54 |  4.25    9.25 |  7.50    2.18 | 10.75    0.54
                1.25    0.54 |  4.50   25.02 |  7.75    2.18 | 11.00    0.54
```

1.50	0.54	4.75	25.02	8.00	2.18	11.25	0.54
1.75	0.54	5.00	25.02	8.25	2.18	11.50	0.54
2.00	0.54	5.25	25.02	8.50	1.09	11.75	0.54
2.25	0.54	5.50	7.07	8.75	1.09	12.00	0.54
2.50	3.26	5.75	7.07	9.00	1.09	12.25	0.54
2.75	3.26	6.00	7.07	9.25	1.09		
3.00	3.26	6.25	7.07	9.50	0.54		
3.25	3.26	6.50	3.81	9.75	0.54		

CALIB	
STANDHYD (0391)	Area (ha)= 1.02
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.71	0.31
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	0.80
Length	(m)=	6.00	535.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	3.26	6.250	7.07	9.33	0.54
0.167	0.00	3.250	3.26	6.333	3.81	9.42	0.54
0.250	0.00	3.333	9.25	6.417	3.81	9.50	0.54
0.333	0.54	3.417	9.25	6.500	3.81	9.58	0.54
0.417	0.54	3.500	9.25	6.583	3.81	9.67	0.54
0.500	0.54	3.583	9.25	6.667	3.81	9.75	0.54
0.583	0.54	3.667	9.25	6.750	3.81	9.83	0.54
0.667	0.54	3.750	9.25	6.833	3.81	9.92	0.54
0.750	0.54	3.833	9.25	6.917	3.81	10.00	0.54
0.833	0.54	3.917	9.25	7.000	3.81	10.08	0.54
0.917	0.54	4.000	9.25	7.083	3.81	10.17	0.54
1.000	0.54	4.083	9.25	7.167	3.81	10.25	0.54
1.083	0.54	4.167	9.25	7.250	3.81	10.33	0.54
1.167	0.54	4.250	9.25	7.333	2.18	10.42	0.54
1.250	0.54	4.333	25.02	7.417	2.18	10.50	0.54
1.333	0.54	4.417	25.02	7.500	2.18	10.58	0.54
1.417	0.54	4.500	25.02	7.583	2.18	10.67	0.54
1.500	0.54	4.583	25.02	7.667	2.18	10.75	0.54
1.583	0.54	4.667	25.02	7.750	2.18	10.83	0.54
1.667	0.54	4.750	25.02	7.833	2.18	10.92	0.54
1.750	0.54	4.833	25.02	7.917	2.18	11.00	0.54
1.833	0.54	4.917	25.02	8.000	2.18	11.08	0.54
1.917	0.54	5.000	25.02	8.083	2.18	11.17	0.54
2.000	0.54	5.083	25.02	8.167	2.18	11.25	0.54
2.083	0.54	5.167	25.02	8.250	2.18	11.33	0.54
2.167	0.54	5.250	25.02	8.333	1.09	11.42	0.54
2.250	0.54	5.333	7.07	8.417	1.09	11.50	0.54
2.333	3.26	5.417	7.07	8.500	1.09	11.58	0.54
2.417	3.26	5.500	7.07	8.583	1.09	11.67	0.54
2.500	3.26	5.583	7.07	8.667	1.09	11.75	0.54
2.583	3.26	5.667	7.07	8.750	1.09	11.83	0.54
2.667	3.26	5.750	7.07	8.833	1.09	11.92	0.54
2.750	3.26	5.833	7.07	8.917	1.09	12.00	0.54
2.833	3.26	5.917	7.07	9.000	1.09	12.08	0.54
2.917	3.26	6.000	7.07	9.083	1.09	12.17	0.54
3.000	3.26	6.083	7.07	9.167	1.09	12.25	0.54
3.083	3.26	6.167	7.07	9.250	1.09		

Max.Eff.Inten.(mm/hr)=		25.02	19.03	
over (min)		5.00	90.00	
Storage Coeff. (min)=		0.67 (ii)	86.18 (ii)	
Unit Hyd. Tpeak (min)=		5.00	90.00	
Unit Hyd. peak (cms)=		0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.04	0.01	0.039 (iii)
TIME TO PEAK	(hrs)=	4.50	6.50	5.25
RUNOFF VOLUME	(mm)=	54.28	23.23	38.71
TOTAL RAINFALL	(mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT	=	1.00	0.43	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (0081)	Area (ha)= 0.43
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.30	0.13	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	3.00	
Length	(m)=	6.00	225.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		25.02	22.47	
over (min)		5.00	35.00	
Storage Coeff. (min)=		0.67 (ii)	32.68 (ii)	
Unit Hyd. Tpeak (min)=		5.00	35.00	
Unit Hyd. peak (cms)=		0.34	0.03	
				TOTALS
PEAK FLOW	(cms)=	0.01	0.01	0.020 (iii)
TIME TO PEAK	(hrs)=	4.50	5.50	5.25
RUNOFF VOLUME	(mm)=	54.28	23.86	39.03
TOTAL RAINFALL	(mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT	=	1.00	0.44	0.72

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (0082)	Area (ha)= 2.05
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	1.43	0.62	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	1.40	
Length	(m)=	6.00	1080.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		25.02	19.60	
over (min)		5.00	110.00	
Storage Coeff. (min)=		0.67 (ii)	109.57 (ii)	
Unit Hyd. Tpeak (min)=		5.00	110.00	
Unit Hyd. peak (cms)=		0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.07	0.01	0.076 (iii)
TIME TO PEAK	(hrs)=	4.50	6.92	5.25
RUNOFF VOLUME	(mm)=	54.28	23.86	39.04
TOTAL RAINFALL	(mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT	=	1.00	0.44	0.72

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0080)					
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.	

	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0081):	0.43	0.020	5.25	39.03
+ ID2= 2 (0082):	2.05	0.076	5.25	39.04
ID = 3 (0080):	2.48	0.096	5.25	39.04

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB STANDHYD (0071)	Area (ha)= 0.91
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.64	0.27	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	2.10	
Length	(m)=	6.00	480.60	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		25.02	22.06	
over (min)		5.00	60.00	
Storage Coeff. (min)=		0.67 (ii)	57.26 (ii)	
Unit Hyd. Tpeak (min)=		5.00	60.00	
Unit Hyd. peak (cms)=		0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.03	0.01	0.038 (iii)
TIME TO PEAK	(hrs)=	4.50	6.00	5.25
RUNOFF VOLUME	(mm)=	54.28	26.53	40.37
TOTAL RAINFALL	(mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT	=	1.00	0.49	0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (0072)	Area (ha)= 0.91
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.64	0.27	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	2.10	
Length	(m)=	6.00	480.60	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		25.02	22.06	
over (min)		5.00	60.00	
Storage Coeff. (min)=		0.67 (ii)	57.26 (ii)	
Unit Hyd. Tpeak (min)=		5.00	60.00	
Unit Hyd. peak (cms)=		0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.03	0.01	0.038 (iii)
TIME TO PEAK	(hrs)=	4.50	6.00	5.25
RUNOFF VOLUME	(mm)=	54.28	26.53	40.37
TOTAL RAINFALL	(mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT	=	1.00	0.49	0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (0073)	Area (ha)= 0.93
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

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                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.65         0.28
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         3.07
     Length            (m)=       6.00       490.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02        23.36
               over (min)         5.00        55.00
     Storage Coeff.  (min)=       0.67 (ii)   50.59 (ii)
     Unit Hyd. Tpeak (min)=       5.00        55.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.040 (iii)
     TIME TO PEAK    (hrs)=       4.50         5.83           5.25
     RUNOFF VOLUME    (mm)=      54.28        26.53          40.37
     TOTAL RAINFALL   (mm)=      54.38        54.38          54.38
     RUNOFF COEFFICIENT   =       1.00         0.49           0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| ADD HYD  (  0070)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0071):     0.91   0.038     5.25    40.37
     + ID2= 2 (  0072):     0.91   0.038     5.25    40.37
       ================================================
       ID = 3 (  0070):     1.82   0.077     5.25    40.37

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD  (  0070)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0070):     1.82   0.077     5.25    40.37
     + ID2= 2 (  0073):     0.93   0.040     5.25    40.37
       ================================================
       ID = 1 (  0070):     2.75   0.117     5.25    40.37

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0301)|   Area    (ha)=   0.38
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.27         0.11
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.52
     Length            (m)=       6.00       200.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02        19.66
               over (min)         5.00        55.00
     Storage Coeff.  (min)=       0.67 (ii)   53.89 (ii)
     Unit Hyd. Tpeak (min)=       5.00        55.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.016 (iii)
     TIME TO PEAK    (hrs)=       4.50         5.92           5.25
     RUNOFF VOLUME    (mm)=      54.28        23.23          38.68
     TOTAL RAINFALL   (mm)=      54.38        54.38          54.38
     RUNOFF COEFFICIENT   =       1.00         0.43           0.71
```

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (0302)	Area (ha)= 0.40				
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00			
		IMPERVIOUS	PERVIOUS (i)		
Surface Area	(ha)=	0.28	0.12		
Dep. Storage	(mm)=	0.10	5.00		
Average Slope	(%)=	2.00	0.52		
Length	(m)=	6.00	211.60		
Mannings n	=	0.013	0.250		
Max.Eff.Inten.(mm/hr)=		25.02	19.03		
over (min)		5.00	60.00		
Storage Coeff.	(min)=	0.67 (ii)	56.45 (ii)		
Unit Hyd. Tpeak	(min)=	5.00	60.00		
Unit Hyd. peak	(cms)=	0.34	0.02		
				TOTALS	
PEAK FLOW	(cms)=	0.01	0.00	0.016 (iii)	
TIME TO PEAK	(hrs)=	4.50	6.00	5.25	
RUNOFF VOLUME	(mm)=	54.28	23.23	38.67	
TOTAL RAINFALL	(mm)=	54.38	54.38	54.38	
RUNOFF COEFFICIENT	=	1.00	0.43	0.71	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0300)		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0301):		0.38	0.016	5.25	38.68
+ ID2= 2 (0302):		0.40	0.016	5.25	38.67
ID = 3 (0300):		0.78	0.032	5.25	38.67

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB					
STANDHYD (0311)	Area (ha)= 0.40				
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00			
		IMPERVIOUS	PERVIOUS (i)		
Surface Area	(ha)=	0.28	0.12		
Dep. Storage	(mm)=	0.10	5.00		
Average Slope	(%)=	2.00	0.50		
Length	(m)=	6.00	208.40		
Mannings n	=	0.013	0.250		
Max.Eff.Inten.(mm/hr)=		25.02	20.24		
over (min)		5.00	60.00		
Storage Coeff.	(min)=	0.67 (ii)	55.23 (ii)		
Unit Hyd. Tpeak	(min)=	5.00	60.00		
Unit Hyd. peak	(cms)=	0.34	0.02		
				TOTALS	
PEAK FLOW	(cms)=	0.01	0.00	0.017 (iii)	
TIME TO PEAK	(hrs)=	4.50	6.00	5.25	
RUNOFF VOLUME	(mm)=	54.28	23.86	38.99	
TOTAL RAINFALL	(mm)=	54.38	54.38	54.38	
RUNOFF COEFFICIENT	=	1.00	0.44	0.72	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB				
STANDHYD (0341)	Area (ha)=	0.56		
ID= 1 DT= 5.0 min	Total Imp(%)=	70.00	Dir. Conn.(%)=	50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.39	0.17	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.50	
Length	(m)=	6.00	295.30	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		25.02	19.03	
over (min)		5.00	70.00	
Storage Coeff. (min)=		0.67 (ii)	69.60 (ii)	
Unit Hyd. Tpeak (min)=		5.00	70.00	
Unit Hyd. peak (cms)=		0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.01	0.022 (iii)
TIME TO PEAK	(hrs)=	4.50	6.17	5.25
RUNOFF VOLUME	(mm)=	54.28	23.23	38.69
TOTAL RAINFALL	(mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT	=	1.00	0.43	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB				
STANDHYD (0342)	Area (ha)=	0.71		
ID= 1 DT= 5.0 min	Total Imp(%)=	70.00	Dir. Conn.(%)=	50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.50	0.21	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	2.80	
Length	(m)=	6.00	372.90	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		25.02	20.26	
over (min)		5.00	50.00	
Storage Coeff. (min)=		0.67 (ii)	46.79 (ii)	
Unit Hyd. Tpeak (min)=		5.00	50.00	
Unit Hyd. peak (cms)=		0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.01	0.030 (iii)
TIME TO PEAK	(hrs)=	4.50	5.83	5.25
RUNOFF VOLUME	(mm)=	54.28	23.23	38.72
TOTAL RAINFALL	(mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT	=	1.00	0.43	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0340)					
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.	

	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0341):	0.56	0.022	5.25	38.69
+ ID2= 2 (0342):	0.71	0.030	5.25	38.72
ID = 3 (0340):	1.27	0.053	5.25	38.70

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB STANDHYD (0351)	Area (ha)= 1.90
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	1.33	0.57	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	1.70	
Length	(m)=	6.00	1001.80	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		25.02	19.03	
over (min)		5.00	105.00	
Storage Coeff. (min)=		0.67 (ii)	100.05 (ii)	
Unit Hyd. Tpeak (min)=		5.00	105.00	
Unit Hyd. peak (cms)=		0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.07	0.01	0.071 (iii)
TIME TO PEAK	(hrs)=	4.50	6.75	5.25
RUNOFF VOLUME	(mm)=	54.28	23.23	38.73
TOTAL RAINFALL	(mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT	=	1.00	0.43	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (0352)	Area (ha)= 0.83
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.58	0.25	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	1.60	
Length	(m)=	6.00	435.40	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		25.02	19.03	
over (min)		5.00	65.00	
Storage Coeff. (min)=		0.67 (ii)	62.05 (ii)	
Unit Hyd. Tpeak (min)=		5.00	65.00	
Unit Hyd. peak (cms)=		0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.03	0.01	0.033 (iii)
TIME TO PEAK	(hrs)=	4.50	6.08	5.25
RUNOFF VOLUME	(mm)=	54.28	23.23	38.71
TOTAL RAINFALL	(mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT	=	1.00	0.43	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0350)				
1 + 2 = 3	AREA	QPEAK	TPEAK	R.V.

	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0351):	1.90	0.071	5.25	38.73
+ ID2= 2 (0352):	0.83	0.033	5.25	38.71
ID = 3 (0350):	2.73	0.104	5.25	38.72

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB	
STANDHYD (0381)	Area (ha)= 1.00
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.70	0.30	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	4.95	
Length	(m)=	6.00	524.60	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		25.02	22.70	
over (min)		5.00	50.00	
Storage Coeff. (min)=		0.67 (ii)	46.25 (ii)	
Unit Hyd. Tpeak (min)=		5.00	50.00	
Unit Hyd. peak (cms)=		0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.03	0.01	0.044 (iii)
TIME TO PEAK	(hrs)=	4.50	5.75	5.25
RUNOFF VOLUME	(mm)=	54.28	25.84	40.03
TOTAL RAINFALL	(mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT	=	1.00	0.48	0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
V    V   I    SSSSS  U   U    A    L
V    V   I    SS     U   U   A A   L
 V  V    I     SS    U   U  AAAAA  L
 V  V    I      SS   U   U  A   A  L
  VV     I    SSSSS  UUUUU  A   A  LLLLL

 OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
O   O    T      T    H   H   Y Y   MM MM  O   O
O   O    T      T    H   H    Y    M   M  O   O
 OOO     T      T    H   H    Y    M   M   OOO
```


***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\98bb7f54-06ff-4b58-8945-ef92e8b70bf0\scenar
Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\98bb7f54-06ff-4b58-8945-ef92e8b70bf0\scenar

DATE: 10/07/2016 TIME: 09:44:40

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 3 **
****

READ STORM	Filename: C:\Users\p002311c\AppData\Local\Temp\d0c21a2d-292a-4169-bebb-934225b59a3c\c2317b21
Ptotal= 62.71 mm	Comments: 10yr/12hr

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	3.50	10.66	6.75	4.39	10.00	0.63
0.50	0.63	3.75	10.66	7.00	4.39	10.25	0.63
0.75	0.63	4.00	10.66	7.25	4.39	10.50	0.63
1.00	0.63	4.25	10.66	7.50	2.51	10.75	0.63
1.25	0.63	4.50	28.84	7.75	2.51	11.00	0.63
1.50	0.63	4.75	28.84	8.00	2.51	11.25	0.63
1.75	0.63	5.00	28.84	8.25	2.51	11.50	0.63
2.00	0.63	5.25	28.84	8.50	1.25	11.75	0.63
2.25	0.63	5.50	8.15	8.75	1.25	12.00	0.63
2.50	3.76	5.75	8.15	9.00	1.25	12.25	0.63
2.75	3.76	6.00	8.15	9.25	1.25		
3.00	3.76	6.25	8.15	9.50	0.63		
3.25	3.76	6.50	4.39	9.75	0.63		

CALIB STANDHYD (0391) ID= 1 DT= 5.0 min	Area (ha)= 1.02 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.71	0.31
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	0.80
Length	(m)=	6.00	535.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	3.76	6.250	8.15	9.33	0.63
0.167	0.00	3.250	3.76	6.333	4.39	9.42	0.63
0.250	0.00	3.333	10.66	6.417	4.39	9.50	0.63
0.333	0.63	3.417	10.66	6.500	4.39	9.58	0.63
0.417	0.63	3.500	10.66	6.583	4.39	9.67	0.63
0.500	0.63	3.583	10.66	6.667	4.39	9.75	0.63
0.583	0.63	3.667	10.66	6.750	4.39	9.83	0.63
0.667	0.63	3.750	10.66	6.833	4.39	9.92	0.63
0.750	0.63	3.833	10.66	6.917	4.39	10.00	0.63
0.833	0.63	3.917	10.66	7.000	4.39	10.08	0.63
0.917	0.63	4.000	10.66	7.083	4.39	10.17	0.63
1.000	0.63	4.083	10.66	7.167	4.39	10.25	0.63
1.083	0.63	4.167	10.66	7.250	4.39	10.33	0.63
1.167	0.63	4.250	10.66	7.333	2.51	10.42	0.63
1.250	0.63	4.333	28.84	7.417	2.51	10.50	0.63
1.333	0.63	4.417	28.84	7.500	2.51	10.58	0.63
1.417	0.63	4.500	28.84	7.583	2.51	10.67	0.63
1.500	0.63	4.583	28.84	7.667	2.51	10.75	0.63
1.583	0.63	4.667	28.84	7.750	2.51	10.83	0.63
1.667	0.63	4.750	28.84	7.833	2.51	10.92	0.63
1.750	0.63	4.833	28.84	7.917	2.51	11.00	0.63
1.833	0.63	4.917	28.84	8.000	2.51	11.08	0.63
1.917	0.63	5.000	28.84	8.083	2.51	11.17	0.63
2.000	0.63	5.083	28.84	8.167	2.51	11.25	0.63
2.083	0.63	5.167	28.84	8.250	2.51	11.33	0.63
2.167	0.63	5.250	28.84	8.333	1.25	11.42	0.63
2.250	0.63	5.333	8.15	8.417	1.25	11.50	0.63
2.333	3.76	5.417	8.15	8.500	1.25	11.58	0.63
2.417	3.76	5.500	8.15	8.583	1.25	11.67	0.63

2.500	3.76	5.583	8.15	8.667	1.25	11.75	0.63
2.583	3.76	5.667	8.15	8.750	1.25	11.83	0.63
2.667	3.76	5.750	8.15	8.833	1.25	11.92	0.63
2.750	3.76	5.833	8.15	8.917	1.25	12.00	0.63
2.833	3.76	5.917	8.15	9.000	1.25	12.08	0.63
2.917	3.76	6.000	8.15	9.083	1.25	12.17	0.63
3.000	3.76	6.083	8.15	9.167	1.25	12.25	0.63
3.083	3.76	6.167	8.15	9.250	1.25		

Max.Eff.Inten.(mm/hr)=	28.84	24.11	
over (min)	5.00	80.00	
Storage Coeff. (min)=	0.63 (ii)	78.42 (ii)	
Unit Hyd. Tpeak (min)=	5.00	80.00	
Unit Hyd. peak (cms)=	0.34	0.01	
			TOTALS
PEAK FLOW (cms)=	0.04	0.01	0.046 (iii)
TIME TO PEAK (hrs)=	4.50	6.33	5.25
RUNOFF VOLUME (mm)=	62.61	29.23	45.88
TOTAL RAINFALL (mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT =	1.00	0.47	0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0081)	Area (ha)= 0.43
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.30	0.13
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	3.00
Length	(m)=	6.00	225.00
Mannings n	=	0.013	0.250

Max.Eff.Inten.(mm/hr)=	28.84	28.67	
over (min)	5.00	30.00	
Storage Coeff. (min)=	0.63 (ii)	29.67 (ii)	
Unit Hyd. Tpeak (min)=	5.00	30.00	
Unit Hyd. peak (cms)=	0.34	0.04	
			TOTALS
PEAK FLOW (cms)=	0.02	0.01	0.024 (iii)
TIME TO PEAK (hrs)=	4.50	5.42	5.25
RUNOFF VOLUME (mm)=	62.61	29.97	46.25
TOTAL RAINFALL (mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT =	1.00	0.48	0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0082)	Area (ha)= 2.05
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.43	0.62
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	1.40
Length	(m)=	6.00	1080.00
Mannings n	=	0.013	0.250

Max.Eff.Inten.(mm/hr)=	28.84	24.78	
over (min)	5.00	100.00	
Storage Coeff. (min)=	0.63 (ii)	99.78 (ii)	
Unit Hyd. Tpeak (min)=	5.00	100.00	

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     Unit Hyd. peak  (cms)=       0.34         0.01
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.08         0.02          0.089 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.67           5.25
     RUNOFF VOLUME    (mm)=      62.61        29.97          46.26
     TOTAL RAINFALL   (mm)=      62.71        62.71          62.71
     RUNOFF COEFFICIENT   =       1.00         0.48           0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0080)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0081):     0.43   0.024     5.25    46.25
      + ID2= 2 (  0082):     2.05   0.089     5.25    46.26
        ================================================
        ID = 3 (  0080):     2.48   0.114     5.25    46.26

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0071)|   Area    (ha)=   0.91
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.64         0.27
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         2.10
     Length            (m)=       6.00       480.60
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84        28.42
               over (min)         5.00        55.00
     Storage Coeff.  (min)=       0.63 (ii)   51.76 (ii)
     Unit Hyd. Tpeak (min)=       5.00        55.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.01          0.046 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.83           5.25
     RUNOFF VOLUME    (mm)=      62.61        33.06          47.80
     TOTAL RAINFALL   (mm)=      62.71        62.71          62.71
     RUNOFF COEFFICIENT   =       1.00         0.53           0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0072)|   Area    (ha)=   0.91
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.64         0.27
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         2.10
     Length            (m)=       6.00       480.60
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84        28.42
               over (min)         5.00        55.00
     Storage Coeff.  (min)=       0.63 (ii)   51.76 (ii)
     Unit Hyd. Tpeak (min)=       5.00        55.00
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```
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.01          0.046 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.83           5.25
     RUNOFF VOLUME    (mm)=      62.61        33.06          47.80
     TOTAL RAINFALL   (mm)=      62.71        62.71          62.71
     RUNOFF COEFFICIENT   =       1.00         0.53           0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0073)|   Area    (ha)=   0.93
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.65         0.28
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         3.07
     Length            (m)=       6.00       490.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84        29.14
               over (min)         5.00        50.00
     Storage Coeff.  (min)=       0.63 (ii)   46.33 (ii)
     Unit Hyd. Tpeak (min)=       5.00        50.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.01          0.049 (iii)
     TIME TO PEAK    (hrs)=       4.50         5.75           5.25
     RUNOFF VOLUME    (mm)=      62.61        33.06          47.81
     TOTAL RAINFALL   (mm)=      62.71        62.71          62.71
     RUNOFF COEFFICIENT   =       1.00         0.53           0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0070)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0071):     0.91   0.046     5.25    47.80
     + ID2= 2 (  0072):     0.91   0.046     5.25    47.80
       ==========================================================
       ID = 3 (  0070):     1.82   0.093     5.25    47.80

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD  (  0070)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0070):     1.82   0.093     5.25    47.80
     + ID2= 2 (  0073):     0.93   0.049     5.25    47.81
       ==========================================================
       ID = 1 (  0070):     2.75   0.141     5.25    47.80

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| CALIB            |
| STANDHYD (  0301)|   Area    (ha)=   0.38
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|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.27         0.11
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.52
     Length            (m)=       6.00       200.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84        25.56
                 over (min)       5.00        50.00
     Storage Coeff.  (min)=       0.63 (ii)   48.56 (ii)
     Unit Hyd. Tpeak (min)=       5.00        50.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.019 (iii)
     TIME TO PEAK    (hrs)=       4.50         5.75           5.25
     RUNOFF VOLUME    (mm)=      62.61        29.23          45.85
     TOTAL RAINFALL   (mm)=      62.71        62.71          62.71
     RUNOFF COEFFICIENT   =       1.00         0.47           0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0302)|   Area    (ha)=   0.40
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.28         0.12
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.52
     Length            (m)=       6.00       211.60
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84        25.56
                 over (min)       5.00        55.00
     Storage Coeff.  (min)=       0.63 (ii)   50.20 (ii)
     Unit Hyd. Tpeak (min)=       5.00        55.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.020 (iii)
     TIME TO PEAK    (hrs)=       4.50         5.83           5.25
     RUNOFF VOLUME    (mm)=      62.61        29.23          45.85
     TOTAL RAINFALL   (mm)=      62.71        62.71          62.71
     RUNOFF COEFFICIENT   =       1.00         0.47           0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0300)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0301):     0.38   0.019     5.25    45.85
      + ID2= 2 (  0302):     0.40   0.020     5.25    45.85
        ================================================
        ID = 3 (  0300):     0.78   0.039     5.25    45.85

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0311)|   Area    (ha)=   0.40
```

|ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.28	0.12	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	0.50	
Length (m)=	6.00	208.40	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	28.84	26.24	
over (min)	5.00	50.00	
Storage Coeff. (min)=	0.63 (ii)	49.81 (ii)	
Unit Hyd. Tpeak (min)=	5.00	50.00	
Unit Hyd. peak (cms)=	0.34	0.02	
			TOTALS
PEAK FLOW (cms)=	0.02	0.01	0.020 (iii)
TIME TO PEAK (hrs)=	4.50	5.83	5.25
RUNOFF VOLUME (mm)=	62.61	29.97	46.21
TOTAL RAINFALL (mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT =	1.00	0.48	0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0341)

Area (ha)= 0.56

|ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.39	0.17	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	0.50	
Length (m)=	6.00	295.30	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	28.84	24.11	
over (min)	5.00	65.00	
Storage Coeff. (min)=	0.63 (ii)	63.34 (ii)	
Unit Hyd. Tpeak (min)=	5.00	65.00	
Unit Hyd. peak (cms)=	0.34	0.02	
			TOTALS
PEAK FLOW (cms)=	0.02	0.01	0.026 (iii)
TIME TO PEAK (hrs)=	4.50	6.08	5.25
RUNOFF VOLUME (mm)=	62.61	29.23	45.86
TOTAL RAINFALL (mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT =	1.00	0.47	0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0342)

Area (ha)= 0.71

|ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.50	0.21
Dep. Storage (mm)=	0.10	5.00
Average Slope (%)=	2.00	2.80
Length (m)=	6.00	372.90
Mannings n =	0.013	0.250
Max.Eff.Inten.(mm/hr)=	28.84	26.21
over (min)	5.00	45.00
Storage Coeff. (min)=	0.63 (ii)	42.23 (ii)
Unit Hyd. Tpeak (min)=	5.00	45.00

```
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.037 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.67           5.25
     RUNOFF VOLUME    (mm)=      62.61        29.23          45.88
     TOTAL RAINFALL   (mm)=      62.71        62.71          62.71
     RUNOFF COEFFICIENT   =       1.00         0.47           0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0340)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0341):     0.56   0.026     5.25    45.86
      + ID2= 2 (  0342):     0.71   0.037     5.25    45.88
        ================================================
        ID = 3 (  0340):     1.27   0.063     5.25    45.87

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0351)|   Area    (ha)=   1.90
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.33         0.57
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         1.70
     Length            (m)=       6.00      1001.80
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84        24.11
               over (min)         5.00        95.00
     Storage Coeff.  (min)=       0.63 (ii)   91.03 (ii)
     Unit Hyd. Tpeak (min)=       5.00        95.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.08         0.02          0.083 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.58           5.25
     RUNOFF VOLUME    (mm)=      62.61        29.23          45.90
     TOTAL RAINFALL   (mm)=      62.71        62.71          62.71
     RUNOFF COEFFICIENT   =       1.00         0.47           0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0352)|   Area    (ha)=   0.83
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.58         0.25
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         1.60
     Length            (m)=       6.00       435.40
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84        24.11
               over (min)         5.00        60.00
     Storage Coeff.  (min)=       0.63 (ii)   56.47 (ii)
     Unit Hyd. Tpeak (min)=       5.00        60.00
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```
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.040 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.00           5.25
     RUNOFF VOLUME    (mm)=      62.61        29.23          45.88
     TOTAL RAINFALL   (mm)=      62.71        62.71          62.71
     RUNOFF COEFFICIENT   =       1.00         0.47           0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0350)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0351):     1.90   0.083     5.25    45.90
      + ID2= 2 (  0352):     0.83   0.040     5.25    45.88
        ================================================
        ID = 3 (  0350):     2.73   0.123     5.25    45.89

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| CALIB            |
| STANDHYD (  0381)|   Area    (ha)=   1.00
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.70         0.30
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         4.95
     Length            (m)=       6.00       524.60
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84        29.06
               over (min)         5.00        45.00
     Storage Coeff.  (min)=       0.63 (ii)   41.93 (ii)
     Unit Hyd. Tpeak (min)=       5.00        45.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.02          0.053 (iii)
     TIME TO PEAK    (hrs)=       4.50         5.67           5.25
     RUNOFF VOLUME    (mm)=      62.61        32.26          47.41
     TOTAL RAINFALL   (mm)=      62.71        62.71          62.71
     RUNOFF COEFFICIENT   =       1.00         0.51           0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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================================================================================================================

       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
Developed and Distributed by Civica Infrastructure
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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\cbda26d8-447e-474b-8b00-ee3fbc3c1aab\scenar
Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\cbda26d8-447e-474b-8b00-ee3fbc3c1aab\scenar

DATE: 10/07/2016 TIME: 09:44:41

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 4 **
****

READ STORM	Filename: C:\Users\p002311c\AppData\Local\Temp\d0c21a2d-292a-4169-bebb-934225b59a3c\f7b7daf8
Ptotal= 73.10 mm	Comments: 25yr/12hr

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	3.50	12.43	6.75	5.12	10.00	0.73
0.50	0.73	3.75	12.43	7.00	5.12	10.25	0.73
0.75	0.73	4.00	12.43	7.25	5.12	10.50	0.73
1.00	0.73	4.25	12.43	7.50	2.92	10.75	0.73
1.25	0.73	4.50	33.63	7.75	2.92	11.00	0.73
1.50	0.73	4.75	33.63	8.00	2.92	11.25	0.73
1.75	0.73	5.00	33.63	8.25	2.92	11.50	0.73
2.00	0.73	5.25	33.63	8.50	1.46	11.75	0.73
2.25	0.73	5.50	9.50	8.75	1.46	12.00	0.73
2.50	4.39	5.75	9.50	9.00	1.46	12.25	0.73
2.75	4.39	6.00	9.50	9.25	1.46		
3.00	4.39	6.25	9.50	9.50	0.73		
3.25	4.39	6.50	5.12	9.75	0.73		

CALIB	
STANDHYD (0391)	Area (ha)= 1.02
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.71	0.31
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	0.80
Length	(m)=	6.00	535.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	4.39	6.250	9.50	9.33	0.73
0.167	0.00	3.250	4.39	6.333	5.12	9.42	0.73
0.250	0.00	3.333	12.43	6.417	5.12	9.50	0.73
0.333	0.73	3.417	12.43	6.500	5.12	9.58	0.73
0.417	0.73	3.500	12.43	6.583	5.12	9.67	0.73
0.500	0.73	3.583	12.43	6.667	5.12	9.75	0.73
0.583	0.73	3.667	12.43	6.750	5.12	9.83	0.73
0.667	0.73	3.750	12.43	6.833	5.12	9.92	0.73

0.750	0.73	3.833	12.43	6.917	5.12	10.00	0.73
0.833	0.73	3.917	12.43	7.000	5.12	10.08	0.73
0.917	0.73	4.000	12.43	7.083	5.12	10.17	0.73
1.000	0.73	4.083	12.43	7.167	5.12	10.25	0.73
1.083	0.73	4.167	12.43	7.250	5.12	10.33	0.73
1.167	0.73	4.250	12.43	7.333	2.92	10.42	0.73
1.250	0.73	4.333	33.63	7.417	2.92	10.50	0.73
1.333	0.73	4.417	33.63	7.500	2.92	10.58	0.73
1.417	0.73	4.500	33.63	7.583	2.92	10.67	0.73
1.500	0.73	4.583	33.63	7.667	2.92	10.75	0.73
1.583	0.73	4.667	33.63	7.750	2.92	10.83	0.73
1.667	0.73	4.750	33.63	7.833	2.92	10.92	0.73
1.750	0.73	4.833	33.63	7.917	2.92	11.00	0.73
1.833	0.73	4.917	33.63	8.000	2.92	11.08	0.73
1.917	0.73	5.000	33.63	8.083	2.92	11.17	0.73
2.000	0.73	5.083	33.63	8.167	2.92	11.25	0.73
2.083	0.73	5.167	33.63	8.250	2.92	11.33	0.73
2.167	0.73	5.250	33.63	8.333	1.46	11.42	0.73
2.250	0.73	5.333	9.50	8.417	1.46	11.50	0.73
2.333	4.39	5.417	9.50	8.500	1.46	11.58	0.73
2.417	4.39	5.500	9.50	8.583	1.46	11.67	0.73
2.500	4.39	5.583	9.50	8.667	1.46	11.75	0.73
2.583	4.39	5.667	9.50	8.750	1.46	11.83	0.73
2.667	4.39	5.750	9.50	8.833	1.46	11.92	0.73
2.750	4.39	5.833	9.50	8.917	1.46	12.00	0.73
2.833	4.39	5.917	9.50	9.000	1.46	12.08	0.73
2.917	4.39	6.000	9.50	9.083	1.46	12.17	0.73
3.000	4.39	6.083	9.50	9.167	1.46	12.25	0.73
3.083	4.39	6.167	9.50	9.250	1.46		

Max.Eff.Inten.(mm/hr)=	33.63	30.85	
over (min)	5.00	75.00	
Storage Coeff. (min)=	0.59 (ii)	71.08 (ii)	
Unit Hyd. Tpeak (min)=	5.00	75.00	
Unit Hyd. peak (cms)=	0.34	0.02	
			TOTALS
PEAK FLOW (cms)=	0.05	0.01	0.055 (iii)
TIME TO PEAK (hrs)=	4.50	6.25	5.25
RUNOFF VOLUME (mm)=	73.00	37.13	55.02
TOTAL RAINFALL (mm)=	73.10	73.10	73.10
RUNOFF COEFFICIENT =	1.00	0.51	0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0081)	Area (ha)= 0.43		
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00	
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.30	0.13	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	3.00	
Length (m)=	6.00	225.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	33.63	36.13	
over (min)	5.00	30.00	
Storage Coeff. (min)=	0.59 (ii)	27.06 (ii)	
Unit Hyd. Tpeak (min)=	5.00	30.00	
Unit Hyd. peak (cms)=	0.34	0.04	
			TOTALS
PEAK FLOW (cms)=	0.02	0.01	0.030 (iii)
TIME TO PEAK (hrs)=	4.42	5.42	5.25
RUNOFF VOLUME (mm)=	73.00	37.98	55.45
TOTAL RAINFALL (mm)=	73.10	73.10	73.10
RUNOFF COEFFICIENT =	1.00	0.52	0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (0082)	Area (ha)= 2.05				
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00			

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	1.43	0.62	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	1.40	
Length	(m)=	6.00	1080.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		33.63	31.64	
over (min)		5.00	95.00	
Storage Coeff. (min)=		0.59 (ii)	90.52 (ii)	
Unit Hyd. Tpeak (min)=		5.00	95.00	
Unit Hyd. peak (cms)=		0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.10	0.03	0.106 (iii)
TIME TO PEAK	(hrs)=	4.42	6.58	5.25
RUNOFF VOLUME	(mm)=	73.00	37.98	55.47
TOTAL RAINFALL	(mm)=	73.10	73.10	73.10
RUNOFF COEFFICIENT	=	1.00	0.52	0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0080)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0081):	0.43	0.030	5.25	55.45
	+ ID2= 2 (0082):	2.05	0.106	5.25	55.47
	ID = 3 (0080):	2.48	0.136	5.25	55.47

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB					
STANDHYD (0071)	Area (ha)= 0.91				
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00			

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.64	0.27	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	2.10	
Length	(m)=	6.00	480.60	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		33.63	36.66	
over (min)		5.00	50.00	
Storage Coeff. (min)=		0.59 (ii)	46.77 (ii)	
Unit Hyd. Tpeak (min)=		5.00	50.00	
Unit Hyd. peak (cms)=		0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.04	0.02	0.057 (iii)
TIME TO PEAK	(hrs)=	4.42	5.75	5.25
RUNOFF VOLUME	(mm)=	73.00	41.56	57.25
TOTAL RAINFALL	(mm)=	73.10	73.10	73.10
RUNOFF COEFFICIENT	=	1.00	0.57	0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (0072) ID= 1 DT= 5.0 min	Area (ha)= 0.91 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.64	0.27	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	2.10	
Length	(m)=	6.00	480.60	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		33.63	36.66	
over (min)		5.00	50.00	
Storage Coeff. (min)=		0.59 (ii)	46.77 (ii)	
Unit Hyd. Tpeak (min)=		5.00	50.00	
Unit Hyd. peak (cms)=		0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.04	0.02	0.057 (iii)
TIME TO PEAK	(hrs)=	4.42	5.75	5.25
RUNOFF VOLUME	(mm)=	73.00	41.56	57.25
TOTAL RAINFALL	(mm)=	73.10	73.10	73.10
RUNOFF COEFFICIENT	=	1.00	0.57	0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (0073) ID= 1 DT= 5.0 min	Area (ha)= 0.93 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.65	0.28	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	3.07	
Length	(m)=	6.00	490.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		33.63	37.42	
over (min)		5.00	45.00	
Storage Coeff. (min)=		0.59 (ii)	41.94 (ii)	
Unit Hyd. Tpeak (min)=		5.00	45.00	
Unit Hyd. peak (cms)=		0.34	0.03	
				TOTALS
PEAK FLOW	(cms)=	0.04	0.02	0.060 (iii)
TIME TO PEAK	(hrs)=	4.42	5.67	5.25
RUNOFF VOLUME	(mm)=	73.00	41.56	57.26
TOTAL RAINFALL	(mm)=	73.10	73.10	73.10
RUNOFF COEFFICIENT	=	1.00	0.57	0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0070) 1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0071):	0.91	0.057	5.25	57.25
+ ID2= 2 (0072):	0.91	0.057	5.25	57.25

```
       ID = 3 (  0070):     1.82   0.114     5.25    57.25

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD  (  0070)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0070):     1.82   0.114     5.25    57.25
     + ID2= 2 (  0073):     0.93   0.060     5.25    57.26
       ================================================
       ID = 1 (  0070):     2.75   0.173     5.25    57.25

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0301)|   Area    (ha)=   0.38
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.27         0.11
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.52
     Length            (m)=       6.00       200.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        33.31
                 over (min)       5.00        45.00
     Storage Coeff.  (min)=       0.59 (ii)   43.70 (ii)
     Unit Hyd. Tpeak (min)=       5.00        45.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.023 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.67          5.25
     RUNOFF VOLUME    (mm)=      73.00        37.13         55.00
     TOTAL RAINFALL   (mm)=      73.10        73.10         73.10
     RUNOFF COEFFICIENT   =       1.00         0.51          0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0302)|   Area    (ha)=   0.40
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.28         0.12
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.52
     Length            (m)=       6.00       211.60
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        33.31
                 over (min)       5.00        50.00
     Storage Coeff.  (min)=       0.59 (ii)   45.18 (ii)
     Unit Hyd. Tpeak (min)=       5.00        50.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.024 (iii)
     TIME TO PEAK    (hrs)=       4.50         5.75          5.25
     RUNOFF VOLUME    (mm)=      73.00        37.13         55.00
     TOTAL RAINFALL   (mm)=      73.10        73.10         73.10
     RUNOFF COEFFICIENT   =       1.00         0.51          0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
```

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0300)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0301):		0.38	0.023	5.25	55.00
+ ID2= 2 (0302):		0.40	0.024	5.25	55.00
ID = 3 (0300):		0.78	0.048	5.25	55.00

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB					
STANDHYD (0311)	Area (ha)= 0.40				
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00			
		IMPERVIOUS	PERVIOUS (i)		
Surface Area	(ha)=	0.28	0.12		
Dep. Storage	(mm)=	0.10	5.00		
Average Slope	(%)=	2.00	0.50		
Length	(m)=	6.00	208.40		
Mannings n	=	0.013	0.250		
Max.Eff.Inten.(mm/hr)	=	33.63	34.11		
over (min)		5.00	45.00		
Storage Coeff.	(min)=	0.59 (ii)	44.88 (ii)		
Unit Hyd. Tpeak	(min)=	5.00	45.00		
Unit Hyd. peak	(cms)=	0.34	0.03		
				TOTALS	
PEAK FLOW	(cms)=	0.02	0.01	0.025 (iii)	
TIME TO PEAK	(hrs)=	4.50	5.67	5.25	
RUNOFF VOLUME	(mm)=	73.00	37.99	55.43	
TOTAL RAINFALL	(mm)=	73.10	73.10	73.10	
RUNOFF COEFFICIENT	=	1.00	0.52	0.76	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (0341)	Area (ha)= 0.56				
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00			
		IMPERVIOUS	PERVIOUS (i)		
Surface Area	(ha)=	0.39	0.17		
Dep. Storage	(mm)=	0.10	5.00		
Average Slope	(%)=	2.00	0.50		
Length	(m)=	6.00	295.30		
Mannings n	=	0.013	0.250		
Max.Eff.Inten.(mm/hr)	=	33.63	30.85		
over (min)		5.00	60.00		
Storage Coeff.	(min)=	0.59 (ii)	57.41 (ii)		
Unit Hyd. Tpeak	(min)=	5.00	60.00		
Unit Hyd. peak	(cms)=	0.34	0.02		
				TOTALS	
PEAK FLOW	(cms)=	0.03	0.01	0.032 (iii)	
TIME TO PEAK	(hrs)=	4.42	5.92	5.25	
RUNOFF VOLUME	(mm)=	73.00	37.13	55.00	
TOTAL RAINFALL	(mm)=	73.10	73.10	73.10	
RUNOFF COEFFICIENT	=	1.00	0.51	0.75	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (0342)	Area (ha)= 0.71				
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00			
	IMPERVIOUS	PERVIOUS (i)			
Surface Area (ha)=	0.50	0.21			
Dep. Storage (mm)=	0.10	5.00			
Average Slope (%)=	2.00	2.80			
Length (m)=	6.00	372.90			
Mannings n =	0.013	0.250			
Max.Eff.Inten.(mm/hr)=	33.63	34.03			
over (min)	5.00	40.00			
Storage Coeff. (min)=	0.59 (ii)	38.07 (ii)			
Unit Hyd. Tpeak (min)=	5.00	40.00			
Unit Hyd. peak (cms)=	0.34	0.03			
			TOTALS		
PEAK FLOW (cms)=	0.03	0.01	0.045 (iii)		
TIME TO PEAK (hrs)=	4.50	5.58	5.25		
RUNOFF VOLUME (mm)=	73.00	37.13	55.03		
TOTAL RAINFALL (mm)=	73.10	73.10	73.10		
RUNOFF COEFFICIENT =	1.00	0.51	0.75		

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0340)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0341):		0.56	0.032	5.25	55.00
+ ID2= 2 (0342):		0.71	0.045	5.25	55.03
ID = 3 (0340):		1.27	0.077	5.25	55.02

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB					
STANDHYD (0351)	Area (ha)= 1.90				
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00			
	IMPERVIOUS	PERVIOUS (i)			
Surface Area (ha)=	1.33	0.57			
Dep. Storage (mm)=	0.10	5.00			
Average Slope (%)=	2.00	1.70			
Length (m)=	6.00	1001.80			
Mannings n =	0.013	0.250			
Max.Eff.Inten.(mm/hr)=	33.63	30.85			
over (min)	5.00	85.00			
Storage Coeff. (min)=	0.59 (ii)	82.51 (ii)			
Unit Hyd. Tpeak (min)=	5.00	85.00			
Unit Hyd. peak (cms)=	0.34	0.01			
			TOTALS		
PEAK FLOW (cms)=	0.09	0.03	0.100 (iii)		
TIME TO PEAK (hrs)=	4.50	6.42	5.25		
RUNOFF VOLUME (mm)=	73.00	37.13	55.04		
TOTAL RAINFALL (mm)=	73.10	73.10	73.10		
RUNOFF COEFFICIENT =	1.00	0.51	0.75		

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (0352)	Area (ha)= 0.83				
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00			
	IMPERVIOUS	PERVIOUS (i)			
Surface Area (ha)=	0.58	0.25			
Dep. Storage (mm)=	0.10	5.00			
Average Slope (%)=	2.00	1.60			
Length (m)=	6.00	435.40			
Mannings n =	0.013	0.250			
Max.Eff.Inten.(mm/hr)=	33.63	32.55			
over (min)	5.00	55.00			
Storage Coeff. (min)=	0.59 (ii)	50.12 (ii)			
Unit Hyd. Tpeak (min)=	5.00	55.00			
Unit Hyd. peak (cms)=	0.34	0.02			
			TOTALS		
PEAK FLOW (cms)=	0.04	0.01	0.049 (iii)		
TIME TO PEAK (hrs)=	4.42	5.83	5.25		
RUNOFF VOLUME (mm)=	73.00	37.13	55.03		
TOTAL RAINFALL (mm)=	73.10	73.10	73.10		
RUNOFF COEFFICIENT =	1.00	0.51	0.75		

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0350)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0351):		1.90	0.100	5.25	55.04
+ ID2= 2 (0352):		0.83	0.049	5.25	55.03
ID = 3 (0350):		2.73	0.149	5.25	55.04

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB					
STANDHYD (0381)	Area (ha)= 1.00				
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00			
	IMPERVIOUS	PERVIOUS (i)			
Surface Area (ha)=	0.70	0.30			
Dep. Storage (mm)=	0.10	5.00			
Average Slope (%)=	2.00	4.95			
Length (m)=	6.00	524.60			
Mannings n =	0.013	0.250			
Max.Eff.Inten.(mm/hr)=	33.63	37.28			
over (min)	5.00	40.00			
Storage Coeff. (min)=	0.59 (ii)	37.97 (ii)			
Unit Hyd. Tpeak (min)=	5.00	40.00			
Unit Hyd. peak (cms)=	0.34	0.03			
			TOTALS		
PEAK FLOW (cms)=	0.05	0.02	0.066 (iii)		
TIME TO PEAK (hrs)=	4.42	5.58	5.25		
RUNOFF VOLUME (mm)=	73.00	40.64	56.80		
TOTAL RAINFALL (mm)=	73.10	73.10	73.10		
RUNOFF COEFFICIENT =	1.00	0.56	0.78		

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
```

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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\2f403635-a99e-4475-a267-db2d2ada7e2a\scenar
Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\2f403635-a99e-4475-a267-db2d2ada7e2a\scenar

DATE: 10/07/2016 TIME: 09:44:41

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 5 **
****

READ STORM	Filename: C:\Users\p002311c\AppData\Local\Temp\d0c21a2d-292a-4169-bebb-934225b59a3c\290aae49
Ptotal= 80.82 mm	Comments: 50yr/12hr

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	3.50	13.74	6.75	5.66	10.00	0.81
0.50	0.81	3.75	13.74	7.00	5.66	10.25	0.81
0.75	0.81	4.00	13.74	7.25	5.66	10.50	0.81
1.00	0.81	4.25	13.74	7.50	3.23	10.75	0.81
1.25	0.81	4.50	37.17	7.75	3.23	11.00	0.81
1.50	0.81	4.75	37.17	8.00	3.23	11.25	0.81
1.75	0.81	5.00	37.17	8.25	3.23	11.50	0.81
2.00	0.81	5.25	37.17	8.50	1.62	11.75	0.81
2.25	0.81	5.50	10.50	8.75	1.62	12.00	0.81
2.50	4.85	5.75	10.50	9.00	1.62	12.25	0.81
2.75	4.85	6.00	10.50	9.25	1.62		
3.00	4.85	6.25	10.50	9.50	0.81		
3.25	4.85	6.50	5.66	9.75	0.81		

CALIB STANDHYD (0391)	Area (ha)= 1.02
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

407 TWY - NO SWM (12hr AES) - DUF

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.71	0.31
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	0.80
Length	(m)=	6.00	535.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	4.85	6.250	10.50	9.33	0.81
0.167	0.00	3.250	4.85	6.333	5.66	9.42	0.81
0.250	0.00	3.333	13.74	6.417	5.66	9.50	0.81
0.333	0.81	3.417	13.74	6.500	5.66	9.58	0.81
0.417	0.81	3.500	13.74	6.583	5.66	9.67	0.81
0.500	0.81	3.583	13.74	6.667	5.66	9.75	0.81
0.583	0.81	3.667	13.74	6.750	5.66	9.83	0.81
0.667	0.81	3.750	13.74	6.833	5.66	9.92	0.81
0.750	0.81	3.833	13.74	6.917	5.66	10.00	0.81
0.833	0.81	3.917	13.74	7.000	5.66	10.08	0.81
0.917	0.81	4.000	13.74	7.083	5.66	10.17	0.81
1.000	0.81	4.083	13.74	7.167	5.66	10.25	0.81
1.083	0.81	4.167	13.74	7.250	5.66	10.33	0.81
1.167	0.81	4.250	13.74	7.333	3.23	10.42	0.81
1.250	0.81	4.333	37.17	7.417	3.23	10.50	0.81
1.333	0.81	4.417	37.17	7.500	3.23	10.58	0.81
1.417	0.81	4.500	37.17	7.583	3.23	10.67	0.81
1.500	0.81	4.583	37.17	7.667	3.23	10.75	0.81
1.583	0.81	4.667	37.17	7.750	3.23	10.83	0.81
1.667	0.81	4.750	37.17	7.833	3.23	10.92	0.81
1.750	0.81	4.833	37.17	7.917	3.23	11.00	0.81
1.833	0.81	4.917	37.17	8.000	3.23	11.08	0.81
1.917	0.81	5.000	37.17	8.083	3.23	11.17	0.81
2.000	0.81	5.083	37.17	8.167	3.23	11.25	0.81
2.083	0.81	5.167	37.17	8.250	3.23	11.33	0.81
2.167	0.81	5.250	37.17	8.333	1.62	11.42	0.81
2.250	0.81	5.333	10.50	8.417	1.62	11.50	0.81
2.333	4.85	5.417	10.50	8.500	1.62	11.58	0.81
2.417	4.85	5.500	10.50	8.583	1.62	11.67	0.81
2.500	4.85	5.583	10.50	8.667	1.62	11.75	0.81
2.583	4.85	5.667	10.50	8.750	1.62	11.83	0.81
2.667	4.85	5.750	10.50	8.833	1.62	11.92	0.81
2.750	4.85	5.833	10.50	8.917	1.62	12.00	0.81
2.833	4.85	5.917	10.50	9.000	1.62	12.08	0.81
2.917	4.85	6.000	10.50	9.083	1.62	12.17	0.81
3.000	4.85	6.083	10.50	9.167	1.62	12.25	0.81
3.083	4.85	6.167	10.50	9.250	1.62		

				TOTALS
Max.Eff.Inten.(mm/hr)=		37.17	36.05	
	over (min)	5.00	70.00	
Storage Coeff. (min)=		0.57 (ii)	66.80 (ii)	
Unit Hyd. Tpeak (min)=		5.00	70.00	
Unit Hyd. peak (cms)=		0.34	0.02	
PEAK FLOW	(cms)=	0.05	0.02	0.063 (iii)
TIME TO PEAK	(hrs)=	4.42	6.17	5.25
RUNOFF VOLUME	(mm)=	80.72	43.24	61.94
TOTAL RAINFALL	(mm)=	80.82	80.82	80.82
RUNOFF COEFFICIENT	=	1.00	0.53	0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0081)
ID= 1 DT= 5.0 min

Area (ha)= 0.43
Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.30	0.13

Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	3.00	
Length (m)=	6.00	225.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	37.17	42.44	
over (min)	5.00	30.00	
Storage Coeff. (min)=	0.57 (ii)	25.39 (ii)	
Unit Hyd. Tpeak (min)=	5.00	30.00	
Unit Hyd. peak (cms)=	0.34	0.04	
			TOTALS
PEAK FLOW (cms)=	0.02	0.01	0.034 (iii)
TIME TO PEAK (hrs)=	4.42	5.42	5.25
RUNOFF VOLUME (mm)=	80.72	44.18	62.42
TOTAL RAINFALL (mm)=	80.82	80.82	80.82
RUNOFF COEFFICIENT =	1.00	0.55	0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0082) | Area (ha)= 2.05
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=		1.43	0.62	
Dep. Storage (mm)=		0.10	5.00	
Average Slope (%)=		2.00	1.40	
Length (m)=		6.00	1080.00	
Mannings n =		0.013	0.250	
Max.Eff.Inten.(mm/hr)=		37.17	36.91	
over (min)		5.00	90.00	
Storage Coeff. (min)=		0.57 (ii)	85.11 (ii)	
Unit Hyd. Tpeak (min)=		5.00	90.00	
Unit Hyd. peak (cms)=		0.34	0.01	
				TOTALS
PEAK FLOW (cms)=		0.11	0.03	0.120 (iii)
TIME TO PEAK (hrs)=		4.42	6.50	5.25
RUNOFF VOLUME (mm)=		80.72	44.18	62.43
TOTAL RAINFALL (mm)=		80.82	80.82	80.82
RUNOFF COEFFICIENT =		1.00	0.55	0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0080)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0081):	0.43	0.034	5.25	62.42
+ ID2= 2 (0082):	2.05	0.120	5.25	62.43
ID = 3 (0080):	2.48	0.153	5.25	62.42

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB
STANDHYD (0071) | Area (ha)= 0.91
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=		0.64	0.27

Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	2.10	
Length (m)=	6.00	480.60	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	37.17	43.19	
over (min)	5.00	45.00	
Storage Coeff. (min)=	0.57 (ii)	43.82 (ii)	
Unit Hyd. Tpeak (min)=	5.00	45.00	
Unit Hyd. peak (cms)=	0.34	0.03	
			TOTALS
PEAK FLOW (cms)=	0.05	0.02	0.065 (iii)
TIME TO PEAK (hrs)=	4.42	5.67	5.25
RUNOFF VOLUME (mm)=	80.72	48.08	64.37
TOTAL RAINFALL (mm)=	80.82	80.82	80.82
RUNOFF COEFFICIENT =	1.00	0.59	0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0072) | Area (ha)= 0.91
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=		0.64	0.27	
Dep. Storage (mm)=		0.10	5.00	
Average Slope (%)=		2.00	2.10	
Length (m)=		6.00	480.60	
Mannings n =		0.013	0.250	
Max.Eff.Inten.(mm/hr)=		37.17	43.19	
over (min)		5.00	45.00	
Storage Coeff. (min)=		0.57 (ii)	43.82 (ii)	
Unit Hyd. Tpeak (min)=		5.00	45.00	
Unit Hyd. peak (cms)=		0.34	0.03	
				TOTALS
PEAK FLOW (cms)=		0.05	0.02	0.065 (iii)
TIME TO PEAK (hrs)=		4.42	5.67	5.25
RUNOFF VOLUME (mm)=		80.72	48.08	64.37
TOTAL RAINFALL (mm)=		80.82	80.82	80.82
RUNOFF COEFFICIENT =		1.00	0.59	0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0073) | Area (ha)= 0.93
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=		0.65	0.28	
Dep. Storage (mm)=		0.10	5.00	
Average Slope (%)=		2.00	3.07	
Length (m)=		6.00	490.00	
Mannings n =		0.013	0.250	
Max.Eff.Inten.(mm/hr)=		37.17	43.94	
over (min)		5.00	40.00	
Storage Coeff. (min)=		0.57 (ii)	39.35 (ii)	
Unit Hyd. Tpeak (min)=		5.00	40.00	
Unit Hyd. peak (cms)=		0.34	0.03	
				TOTALS
PEAK FLOW (cms)=		0.05	0.02	0.069 (iii)
TIME TO PEAK (hrs)=		4.42	5.58	5.25

RUNOFF VOLUME (mm)=	80.72	48.08	64.38
TOTAL RAINFALL (mm)=	80.82	80.82	80.82
RUNOFF COEFFICIENT =	1.00	0.59	0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0070)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0071):	0.91	0.065	5.25	64.37
	+ ID2= 2 (0072):	0.91	0.065	5.25	64.37
	ID = 3 (0070):	1.82	0.131	5.25	64.37

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0070)		AREA	QPEAK	TPEAK	R.V.
3 + 2 = 1		(ha)	(cms)	(hrs)	(mm)
	ID1= 3 (0070):	1.82	0.131	5.25	64.37
	+ ID2= 2 (0073):	0.93	0.069	5.25	64.38
	ID = 1 (0070):	2.75	0.200	5.25	64.38

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB				
STANDHYD (0301)	Area (ha)= 0.38			
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00		
		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.27	0.11	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.52	
Length	(m)=	6.00	200.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		37.17	38.76	
over (min)		5.00	45.00	
Storage Coeff. (min)=		0.57 (ii)	41.14 (ii)	
Unit Hyd. Tpeak (min)=		5.00	45.00	
Unit Hyd. peak (cms)=		0.34	0.03	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.01	0.027 (iii)
TIME TO PEAK	(hrs)=	4.42	5.67	5.25
RUNOFF VOLUME	(mm)=	80.72	43.24	61.92
TOTAL RAINFALL	(mm)=	80.82	80.82	80.82
RUNOFF COEFFICIENT	=	1.00	0.53	0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB				
STANDHYD (0302)	Area (ha)= 0.40			
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00		
		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.28	0.12	

Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	0.52	
Length (m)=	6.00	211.60	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	37.17	38.76	
over (min)	5.00	45.00	
Storage Coeff. (min)=	0.57 (ii)	42.54 (ii)	
Unit Hyd. Tpeak (min)=	5.00	45.00	
Unit Hyd. peak (cms)=	0.34	0.03	
			TOTALS
PEAK FLOW (cms)=	0.02	0.01	0.028 (iii)
TIME TO PEAK (hrs)=	4.42	5.67	5.25
RUNOFF VOLUME (mm)=	80.72	43.24	61.91
TOTAL RAINFALL (mm)=	80.82	80.82	80.82
RUNOFF COEFFICIENT =	1.00	0.53	0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0300)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0301):		0.38	0.027	5.25	61.92
+ ID2= 2 (0302):		0.40	0.028	5.25	61.91
ID = 3 (0300):		0.78	0.054	5.25	61.91

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB STANDHYD (0311) ID= 1 DT= 5.0 min	Area (ha)= 0.40	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=		0.28	0.12	
Dep. Storage (mm)=		0.10	5.00	
Average Slope (%)=		2.00	0.50	
Length (m)=		6.00	208.40	
Mannings n =		0.013	0.250	
Max.Eff.Inten.(mm/hr)=		37.17	39.63	
over (min)		5.00	45.00	
Storage Coeff. (min)=		0.57 (ii)	42.28 (ii)	
Unit Hyd. Tpeak (min)=		5.00	45.00	
Unit Hyd. peak (cms)=		0.34	0.03	
				TOTALS
PEAK FLOW (cms)=		0.02	0.01	0.028 (iii)
TIME TO PEAK (hrs)=		4.42	5.67	5.25
RUNOFF VOLUME (mm)=		80.72	44.18	62.38
TOTAL RAINFALL (mm)=		80.82	80.82	80.82
RUNOFF COEFFICIENT =		1.00	0.55	0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (0341) ID= 1 DT= 5.0 min	Area (ha)= 0.56	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=		0.39	0.17

```
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.50
     Length            (m)=       6.00       295.30
     Mannings n            =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        37.02
                 over (min)       5.00        55.00
     Storage Coeff.  (min)=       0.57 (ii)   53.39 (ii)
     Unit Hyd. Tpeak (min)=       5.00        55.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.037 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.83           5.25
     RUNOFF VOLUME    (mm)=      80.72        43.24          61.92
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.53           0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB            |
| STANDHYD (  0342)|   Area    (ha)=   0.71
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.50         0.21
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         2.80
     Length            (m)=       6.00       372.90
     Mannings n            =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        39.54
                 over (min)       5.00        40.00
     Storage Coeff.  (min)=       0.57 (ii)   35.87 (ii)
     Unit Hyd. Tpeak (min)=       5.00        40.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.02          0.051 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.58           5.25
     RUNOFF VOLUME    (mm)=      80.72        43.24          61.95
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.53           0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| ADD HYD  (  0340)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0341):     0.56   0.037     5.25    61.92
     + ID2= 2 (  0342):     0.71   0.051     5.25    61.95
       ================================================
       ID = 3 (  0340):     1.27   0.088     5.25    61.93

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| CALIB            |
| STANDHYD (  0351)|   Area    (ha)=   1.90
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.33         0.57
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     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         1.70
     Length            (m)=       6.00      1001.80
     Mannings n            =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        36.05
                 over (min)       5.00        80.00
     Storage Coeff.  (min)=       0.57 (ii)   77.54 (ii)
     Unit Hyd. Tpeak (min)=       5.00        80.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.10         0.03          0.113 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.33           5.25
     RUNOFF VOLUME    (mm)=      80.72        43.24          61.96
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.53           0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB            |
| STANDHYD (  0352)|   Area    (ha)=   0.83
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.58         0.25
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         1.60
     Length            (m)=       6.00       435.40
     Mannings n            =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        37.92
                 over (min)       5.00        50.00
     Storage Coeff.  (min)=       0.57 (ii)   47.16 (ii)
     Unit Hyd. Tpeak (min)=       5.00        50.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.02          0.056 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.75           5.25
     RUNOFF VOLUME    (mm)=      80.72        43.24          61.94
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.53           0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| ADD HYD  (  0350)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0351):     1.90   0.113     5.25    61.96
      + ID2= 2 (  0352):     0.83   0.056     5.25    61.94
        ================================================
        ID = 3 (  0350):     2.73   0.169     5.25    61.95

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| CALIB            |
| STANDHYD (  0381)|   Area    (ha)=   1.00
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.70         0.30
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                                      407 TWY - NO SWM (12hr AES) - DUF
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         4.95
     Length            (m)=       6.00       524.60
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        43.04
               over (min)         5.00        40.00
     Storage Coeff.  (min)=       0.57 (ii)   35.86 (ii)
     Unit Hyd. Tpeak (min)=       5.00        40.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.03          0.074 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.58           5.25
     RUNOFF VOLUME    (mm)=      80.72        47.08          63.88
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.58           0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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================================================================================================================

       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

  Output  filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\69719b59-897a-43ea-8242-fe8151191c7
f\scenar
  Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\69719b59-897a-43ea-8242-fe8151191c7
f\scenar


DATE: 10/07/2016                          TIME: 09:44:42

USER:


COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------------------------------------------
  ****************************
  ** SIMULATION NUMBER:   6 **
  ****************************


--------------------
|    READ STORM    |    Filename: C:\Users\p002311c\AppD
|                  |              ata\Local\Temp\
|                  |              d0c21a2d-292a-4169-bebb-934225b59a3c\8e4b9fd6
| Ptotal= 88.54 mm |    Comments: 100yr/12hr
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
```

0.25	0.00	3.50	15.05	6.75	6.20	10.00	0.89
0.50	0.89	3.75	15.05	7.00	6.20	10.25	0.89
0.75	0.89	4.00	15.05	7.25	6.20	10.50	0.89
1.00	0.89	4.25	15.05	7.50	3.54	10.75	0.89
1.25	0.89	4.50	40.71	7.75	3.54	11.00	0.89
1.50	0.89	4.75	40.71	8.00	3.54	11.25	0.89
1.75	0.89	5.00	40.71	8.25	3.54	11.50	0.89
2.00	0.89	5.25	40.71	8.50	1.77	11.75	0.89
2.25	0.89	5.50	11.51	8.75	1.77	12.00	0.89
2.50	5.31	5.75	11.51	9.00	1.77	12.25	0.89
2.75	5.31	6.00	11.51	9.25	1.77		
3.00	5.31	6.25	11.51	9.50	0.89		
3.25	5.31	6.50	6.20	9.75	0.89		

CALIB	
STANDHYD (0391)	Area (ha)= 1.02
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.71	0.31
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	0.80
Length	(m)=	6.00	535.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	5.31	6.250	11.51	9.33	0.89
0.167	0.00	3.250	5.31	6.333	6.20	9.42	0.89
0.250	0.00	3.333	15.05	6.417	6.20	9.50	0.89
0.333	0.89	3.417	15.05	6.500	6.20	9.58	0.89
0.417	0.89	3.500	15.05	6.583	6.20	9.67	0.89
0.500	0.89	3.583	15.05	6.667	6.20	9.75	0.89
0.583	0.89	3.667	15.05	6.750	6.20	9.83	0.89
0.667	0.89	3.750	15.05	6.833	6.20	9.92	0.89
0.750	0.89	3.833	15.05	6.917	6.20	10.00	0.89
0.833	0.89	3.917	15.05	7.000	6.20	10.08	0.89
0.917	0.89	4.000	15.05	7.083	6.20	10.17	0.89
1.000	0.89	4.083	15.05	7.167	6.20	10.25	0.89
1.083	0.89	4.167	15.05	7.250	6.20	10.33	0.89
1.167	0.89	4.250	15.05	7.333	3.54	10.42	0.89
1.250	0.89	4.333	40.71	7.417	3.54	10.50	0.89
1.333	0.89	4.417	40.71	7.500	3.54	10.58	0.89
1.417	0.89	4.500	40.71	7.583	3.54	10.67	0.89
1.500	0.89	4.583	40.71	7.667	3.54	10.75	0.89
1.583	0.89	4.667	40.71	7.750	3.54	10.83	0.89
1.667	0.89	4.750	40.71	7.833	3.54	10.92	0.89
1.750	0.89	4.833	40.71	7.917	3.54	11.00	0.89
1.833	0.89	4.917	40.71	8.000	3.54	11.08	0.89
1.917	0.89	5.000	40.71	8.083	3.54	11.17	0.89
2.000	0.89	5.083	40.71	8.167	3.54	11.25	0.89
2.083	0.89	5.167	40.71	8.250	3.54	11.33	0.89
2.167	0.89	5.250	40.71	8.333	1.77	11.42	0.89
2.250	0.89	5.333	11.51	8.417	1.77	11.50	0.89
2.333	5.31	5.417	11.51	8.500	1.77	11.58	0.89
2.417	5.31	5.500	11.51	8.583	1.77	11.67	0.89
2.500	5.31	5.583	11.51	8.667	1.77	11.75	0.89
2.583	5.31	5.667	11.51	8.750	1.77	11.83	0.89
2.667	5.31	5.750	11.51	8.833	1.77	11.92	0.89
2.750	5.31	5.833	11.51	8.917	1.77	12.00	0.89
2.833	5.31	5.917	11.51	9.000	1.77	12.08	0.89
2.917	5.31	6.000	11.51	9.083	1.77	12.17	0.89
3.000	5.31	6.083	11.51	9.167	1.77	12.25	0.89
3.083	5.31	6.167	11.51	9.250	1.77		

Max.Eff.Inten.(mm/hr)=		40.71	41.39	
over (min)		5.00	65.00	
Storage Coeff. (min)=		0.55 (ii)	63.22 (ii)	
Unit Hyd. Tpeak (min)=		5.00	65.00	
Unit Hyd. peak (cms)=		0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.06	0.02	0.071 (iii)

TIME TO PEAK (hrs)=	4.42	6.00	5.25
RUNOFF VOLUME (mm)=	88.44	49.51	68.94
TOTAL RAINFALL (mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT =	1.00	0.56	0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB		
STANDHYD (0081)	Area (ha)= 0.43	
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.30	0.13	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	3.00	
Length (m)=	6.00	225.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	40.71	48.26	
over (min)	5.00	25.00	
Storage Coeff. (min)=	0.55 (ii)	24.13 (ii)	
Unit Hyd. Tpeak (min)=	5.00	25.00	
Unit Hyd. peak (cms)=	0.34	0.05	
			TOTALS
PEAK FLOW (cms)=	0.02	0.01	0.038 (iii)
TIME TO PEAK (hrs)=	4.42	5.33	5.25
RUNOFF VOLUME (mm)=	88.44	50.53	69.45
TOTAL RAINFALL (mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT =	1.00	0.57	0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB		
STANDHYD (0082)	Area (ha)= 2.05	
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	1.43	0.62	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	1.40	
Length (m)=	6.00	1080.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	40.71	42.33	
over (min)	5.00	85.00	
Storage Coeff. (min)=	0.55 (ii)	80.59 (ii)	
Unit Hyd. Tpeak (min)=	5.00	85.00	
Unit Hyd. peak (cms)=	0.34	0.01	
			TOTALS
PEAK FLOW (cms)=	0.12	0.04	0.134 (iii)
TIME TO PEAK (hrs)=	4.42	6.42	5.25
RUNOFF VOLUME (mm)=	88.44	50.53	69.46
TOTAL RAINFALL (mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT =	1.00	0.57	0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0080)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0081):     0.43   0.038     5.25    69.45
      + ID2= 2 (  0082):     2.05   0.134     5.25    69.46
        ================================================
        ID = 3 (  0080):     2.48   0.172     5.25    69.46

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------
| CALIB            |
| STANDHYD (  0071)|   Area    (ha)=   0.91
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.64         0.27
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         2.10
     Length            (m)=       6.00       480.60
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        49.06
                 over (min)       5.00        45.00
     Storage Coeff.  (min)=       0.55 (ii)   41.65 (ii)
     Unit Hyd. Tpeak (min)=       5.00        45.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.03          0.073 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.67           5.25
     RUNOFF VOLUME    (mm)=      88.44        54.74          71.57
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       1.00         0.62           0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------
| CALIB            |
| STANDHYD (  0072)|   Area    (ha)=   0.91
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.64         0.27
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         2.10
     Length            (m)=       6.00       480.60
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        49.06
                 over (min)       5.00        45.00
     Storage Coeff.  (min)=       0.55 (ii)   41.65 (ii)
     Unit Hyd. Tpeak (min)=       5.00        45.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.03          0.073 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.67           5.25
     RUNOFF VOLUME    (mm)=      88.44        54.74          71.57
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       1.00         0.62           0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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--------------------
| CALIB            |
| STANDHYD (  0073)|   Area    (ha)=   0.93
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.65         0.28
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         3.07
     Length            (m)=       6.00       490.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        49.85
               over (min)        5.00        40.00
     Storage Coeff.  (min)=       0.55 (ii)   37.42 (ii)
     Unit Hyd. Tpeak (min)=       5.00        40.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.03          0.077 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.58           5.25
     RUNOFF VOLUME    (mm)=      88.44        54.74          71.57
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       1.00         0.62           0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0070)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0071):     0.91   0.073     5.25    71.57
     + ID2= 2 (  0072):     0.91   0.073     5.25    71.57
       ==================================================
       ID = 3 (  0070):     1.82   0.146     5.25    71.57

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0070)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 (  0070):     1.82   0.146     5.25    71.57
     + ID2= 2 (  0073):     0.93   0.077     5.25    71.57
       ==================================================
       ID = 1 (  0070):     2.75   0.223     5.25    71.57

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0301)|   Area    (ha)=   0.38
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.27         0.11
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.52
     Length            (m)=       6.00       200.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        45.17
               over (min)        5.00        40.00
     Storage Coeff.  (min)=       0.55 (ii)   38.71 (ii)
     Unit Hyd. Tpeak (min)=       5.00        40.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.030 (iii)
```

```
     TIME TO PEAK    (hrs)=       4.42         5.58          5.25
     RUNOFF VOLUME    (mm)=      88.44        49.51         68.91
     TOTAL RAINFALL   (mm)=      88.54        88.54         88.54
     RUNOFF COEFFICIENT   =       1.00         0.56          0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0302)|   Area    (ha)=   0.40
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.28         0.12
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.52
     Length            (m)=       6.00       211.60
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        45.17
                 over (min)       5.00        45.00
     Storage Coeff.  (min)=       0.55 (ii)   40.02 (ii)
     Unit Hyd. Tpeak (min)=       5.00        45.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.031 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.67          5.25
     RUNOFF VOLUME    (mm)=      88.44        49.51         68.92
     TOTAL RAINFALL   (mm)=      88.54        88.54         88.54
     RUNOFF COEFFICIENT   =       1.00         0.56          0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0300)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0301):     0.38   0.030     5.25    68.91
     + ID2= 2 (  0302):     0.40   0.031     5.25    68.92
       ================================================
       ID = 3 (  0300):     0.78   0.061     5.25    68.92

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0311)|   Area    (ha)=   0.40
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.28         0.12
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.50
     Length            (m)=       6.00       208.40
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        46.10
                 over (min)       5.00        40.00
     Storage Coeff.  (min)=       0.55 (ii)   39.81 (ii)
     Unit Hyd. Tpeak (min)=       5.00        40.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.032 (iii)
```

TIME TO PEAK (hrs)=	4.42	5.58	5.25
RUNOFF VOLUME (mm)=	88.44	50.53	69.43
TOTAL RAINFALL (mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT =	1.00	0.57	0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0341) | Area (ha)= 0.56
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.39	0.17	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	0.50	
Length (m)=	6.00	295.30	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	40.71	43.43	
over (min)	5.00	55.00	
Storage Coeff. (min)=	0.55 (ii)	50.11 (ii)	
Unit Hyd. Tpeak (min)=	5.00	55.00	
Unit Hyd. peak (cms)=	0.34	0.02	
			TOTALS
PEAK FLOW (cms)=	0.03	0.01	0.041 (iii)
TIME TO PEAK (hrs)=	4.42	5.83	5.25
RUNOFF VOLUME (mm)=	88.44	49.51	68.92
TOTAL RAINFALL (mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT =	1.00	0.56	0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0342) | Area (ha)= 0.71
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.50	0.21	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	2.80	
Length (m)=	6.00	372.90	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	40.71	45.96	
over (min)	5.00	35.00	
Storage Coeff. (min)=	0.55 (ii)	33.79 (ii)	
Unit Hyd. Tpeak (min)=	5.00	35.00	
Unit Hyd. peak (cms)=	0.34	0.03	
			TOTALS
PEAK FLOW (cms)=	0.04	0.02	0.058 (iii)
TIME TO PEAK (hrs)=	4.42	5.50	5.25
RUNOFF VOLUME (mm)=	88.44	49.51	68.95
TOTAL RAINFALL (mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT =	1.00	0.56	0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
--------------------
| ADD HYD  (  0340)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0341):     0.56   0.041     5.25    68.92
      + ID2= 2 (  0342):     0.71   0.058     5.25    68.95
        ================================================
        ID = 3 (  0340):     1.27   0.099     5.25    68.94

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------
| CALIB            |
| STANDHYD (  0351)|   Area    (ha)=   1.90
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.33         0.57
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         1.70
     Length            (m)=       6.00      1001.80
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        41.39
                 over (min)       5.00        75.00
     Storage Coeff.  (min)=       0.55 (ii)   73.38 (ii)
     Unit Hyd. Tpeak (min)=       5.00        75.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.11         0.04        0.127 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.25         5.25
     RUNOFF VOLUME    (mm)=      88.44        49.51        68.95
     TOTAL RAINFALL   (mm)=      88.54        88.54        88.54
     RUNOFF COEFFICIENT   =       1.00         0.56         0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------
| CALIB            |
| STANDHYD (  0352)|   Area    (ha)=   0.83
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.58         0.25
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         1.60
     Length            (m)=       6.00       435.40
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        44.33
                 over (min)       5.00        45.00
     Storage Coeff.  (min)=       0.55 (ii)   44.32 (ii)
     Unit Hyd. Tpeak (min)=       5.00        45.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.02        0.064 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.67         5.25
     RUNOFF VOLUME    (mm)=      88.44        49.51        68.94
     TOTAL RAINFALL   (mm)=      88.54        88.54        88.54
     RUNOFF COEFFICIENT   =       1.00         0.56         0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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--------------------
| ADD HYD  (  0350)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0351):     1.90   0.127     5.25    68.95
     + ID2= 2 (  0352):     0.83   0.064     5.25    68.94
       ================================================
       ID = 3 (  0350):     2.73   0.190     5.25    68.95

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------
| CALIB            |
| STANDHYD (  0381)|   Area    (ha)=   1.00
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.70         0.30
    Dep. Storage     (mm)=       0.10         5.00
    Average Slope     (%)=       2.00         4.95
    Length            (m)=       6.00       524.60
    Mannings n           =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=      40.71        49.64
              over (min)         5.00        35.00
    Storage Coeff.  (min)=       0.55 (ii)   33.89 (ii)
    Unit Hyd. Tpeak (min)=       5.00        35.00
    Unit Hyd. peak  (cms)=       0.34         0.03
                                                      *TOTALS*
    PEAK FLOW       (cms)=       0.06         0.03          0.085 (iii)
    TIME TO PEAK    (hrs)=       4.42         5.50           5.25
    RUNOFF VOLUME    (mm)=      88.44        53.67          71.03
    TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
    RUNOFF COEFFICIENT   =       1.00         0.61           0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

 FINISH
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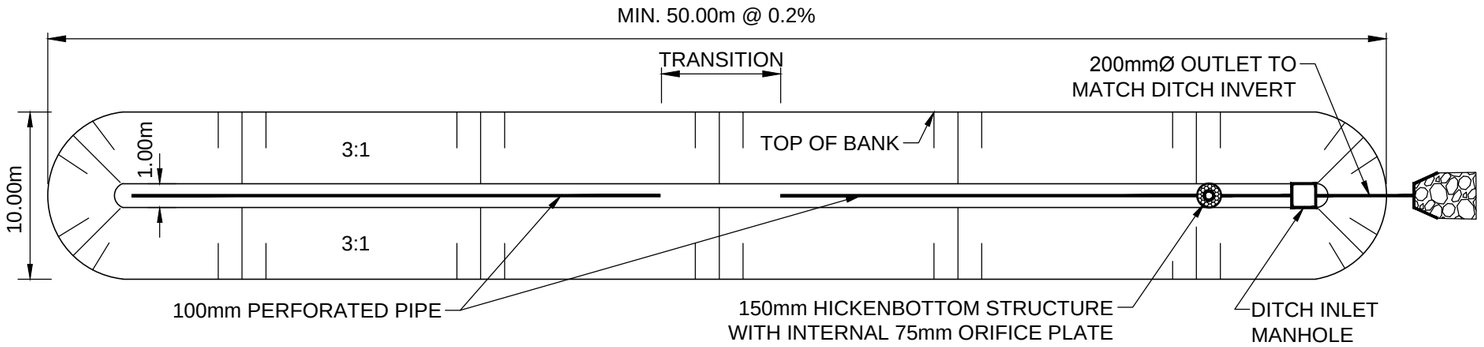
HYDROLOGIC ANALYSIS

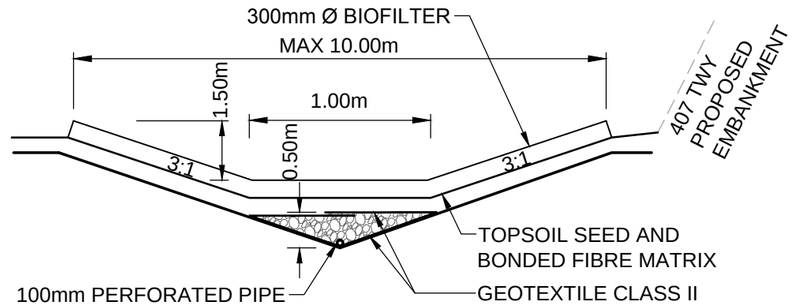
POST-DEVELOPMENT CONDITION WITH SWM

SK3: ENHANCED SWALE DETAILS



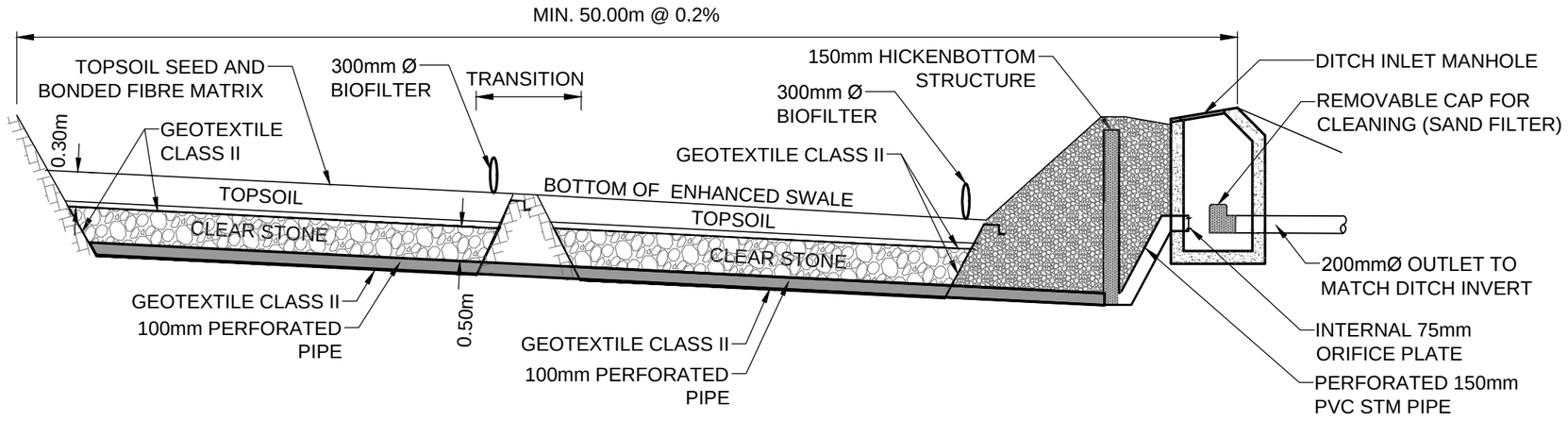
ENHANCE SWALE PLAN VIEW

N.T.S.



TYPICAL CROSS SECTION FOR ENHANCE SWALE / DRY POND

N.T.S.



TYPICAL LONGITUDINAL PROFILE FOR ENHANCE SWALE / DRY POND

N.T.S.

Table 4.5: Proposed 407 TWY Sub-Areas Drainage Strategy

Watershed	Enhance Swale ID	TWY Sub-Area ID	Station (m) From	Station (m) To	Area (ha)	Length segment (m)	10-yr 12hr AES (m3/s)	25mm 4hr CHI (m3/s)	Rd Slope (%)	Ultimate Discharge/Notes	Quantity Control Criteria
Rouge	**ES-1(a)/ES-1(b)**	314-1	0+463.30	0+925.40	0.88	462.1	0.008	0.003	3.57%	to 407 ETR existing ditch - check surface to determine pt of discharge	
		314-2	1+200.00	0+925.40	0.52	274.6			0.30%		
	ES-2 (a &b)	314-3	1+790.00	1+200.00	1.12	590.00	0.006	0.002		to 407 ETR ditch, north side	EX 314-TWY
	ES-3	314-4	2+234.50	1+790.00	0.84	444.50	0.009	0.003	4.35%	to 407 ETR ditch, north side (WC#5?)	
	ES-4	312-1	2+234.50	2+590.00	0.68	355.5	0.007	0.003	4.50%	to WC#11	
	ES-5	312-2	2+590.00	3+040.00	0.86	450.0	0.008	0.003		to WC#12	EX 312-TWY
	ES-6	614-1	3+040.00	3+510.00	0.89	470.0	0.009	0.003	0.25%	pump to Markham roadside ditch	
	ES-7	614-2	3+510.00	4+263.30	1.43	753.3	0.009	0.003		pump to Markham roadside ditch	EX 614-TWY
		614-3	4+634.90	4+263.30	0.71	371.60			0.90%		
	ES-8	604-1	4+634.90	5+200.00	1.07	565.1	0.007	0.002	3.12%	to WC#13 check road profile, how wide is the creek valley? False grade west side of 604-1 to direct to the creek	EX 604-TWY
	ES-9	604-2	6+000.00	5+200.00	1.52	800.00	0.009	0.003	1.44%	to WC#13, false grade roadside ditch to re-direct flows from twy to WC13	
	SW-10	604-3	6+620.00	6+000.00	1.18	620.00			0.50%	*to Ninth Ln SWM pond*	*provided in the pond; this is a conveyance swale only*
	ES-11	620-1	7+030.00	6+620.00	0.78	410.00	0.009	0.003	2.80%	to WC#15a	EX 620-TWY
	ES-12	521-1	7+250.00	7+030.00	0.42	220.00	0.004	0.002		to 407 ETR pond LR1 North side of the twy (Pond LR-1-bottom of pond@ 184.7; quantity level@ 185.5	EX 521-TWY
	ES-13	521-2	7+683.00	7+250.00	0.82	433.00	0.008	0.003	0.15%	to 407 ETR pond LR1 North side of the twy	
	ES-14	522-1	7+683.00	7+780.00	0.18	97.00	0.002	0.001		to WC 15C	EX 522-TWY
	SW-15	522-2	7+780.00	8+168.00	0.74	388.00			1.25%	pump to Donald Cousens Pond	
	SW-16	522-3	8+600.00	8+168.00	0.82	432.00			0.50%		
	ES-17	511-1	9+049.00	8+600.00	0.85	449.00	0.010	0.004	5.67%	to wc 16	EX 511-TWY*
	ES-18	513-1	9+049.00	9+730.00	1.29	681.00	0.008	0.003	0.72%	to WC 18	
	ES-19	513-2	9+810.00	9+730.00	0.15	80.00	0.002	0.001		to pond LR-5; pond to be re-graded to suite proposed twy profile (bottom elev=191; quantity= 192.2m)	
	ES-20	513-3	10+010.00	9+810.00	0.38	200.00	0.004	0.002	0.65%	to wc 19	EX 513-TWY*
	ES-21	513-4	10+210.00	10+010.00	0.38	200.00	0.004	0.002		to wc 20	
Petticoat	**ES-22a&b**	1-1	10+806.00	10+210.00	1.13	596.00	0.007	0.002		to wc 20a	EX 1-TWY**
	SW-23	2-1	10+806.00	11+110.10	0.58	304.1			1.55%	pumping required	2-1**
		2-2	11+424.40	11+110.10	0.60	314.30			0.85%		
Duffins	**ES-24**	7-1	11+424.40	11+905.00	0.91	480.6	0.006	0.002	2.10%	to existing pond-no info	Sub-catchment 7 - Unit Rates**
	ES-25a	7-2	11+905.00	12+385.60	0.91	480.6	0.009	0.003		to wc 28 & 29	
	ES-25b	7-3	12+875.00	12+385.00	0.93	490.00			3.07%		
	ES-26	8-1	13+100.00	12+875.00	0.43	225.00	0.005	0.002		to wc 30	Sub-catchment 8 - Unit Rates**
	ES-27 (+multiple)	8-2	14+180.00	13+100.00	2.05	1080.00	0.009	0.003	1.40%	to 407 etr pond WD2; bottom elev=196.4; PWL = 196.9	
	ES-28	30-1	14+380.00	14+180.00	0.38	200.00	0.004	0.001		to creek within subwatershed 30	Sub-catchment 30 - Unit Rates**
	ES-29	30-2	14+591.60	14+380.00	0.40	211.60	0.004	0.002	0.52%	to WC#35	
	ES-30	31-1	14+591.60	14+800.00	0.40	208.4	0.004	0.002		to WC#36	Sub-catchment 31 - Unit Rates**
	SW-31	34-1	14+800.00	15+095.30	0.56	295.3			0.50%	to Whites St Pond	*provided in the pond; this is a conveyance swale only*
		34-2	15+468.20	15+095.30	0.71	372.90			2.80%		
	ES-32	35-1	15+468.20	16+470.00	1.90	1001.8	0.008	0.003	1.70%	to 407 etr pond G1 inlet; quantity elev= 209.5m	Sub-catchment 35 - Unit Rates**
	ES-33	35-2	16+905.40	16+470.00	0.83	435.40	0.009	0.003	1.60%	to WC 41	
	ES-34	38-1	16+905.40	17+430.00	1.00	524.6	0.006	0.002	4.95%	to WC#43	Sub-catchment 38 - Unit Rates**
	ES-35	39-1	17+430.00	17+965.00	1.02	535.0	0.006	0.002	0.82%	to WC#44	Sub-catchment 39 - Unit Rates**

* Refer to Table 3.5 in Appendix B
** Refer to Table 3.7 in Appendix B
*** Refer to Table 3.9 in Appendix B

Table 4.6 - Stage-Discharge for Enhanced Swales (Typical)

Enhanced Swale (Typical Section) - Trapezoidal

Height of Swale (y) =	1.5	m
Bed width (b) =	1	m
Side Slope of Swale (z) =	3	
Top width (B)=	10	m
Cross Sectional Area (A) =	8.25	m2
Length =	50	m
Volume =	412.5	m3
Orifice Diameter =	0.075	m

Orifice Discharge

$$Q = C_d A\sqrt{2gH}$$

Q		Discharge	(m^3/s)
C_d	0.63	Discharge Coefficien	-
A	Varies	Area of Orifice	(m^2)
g	9.81	Gravitational Consta	(m/s^2)
H	Varies	Hydraulic Head	(m)

Outlet Type 1 (75mm Orifice)

Stage (m)	Area (m^2)	Cross-section Volume (m^3)	Controlled Discharge Rate (m3/s)
0.00	0.00	0.00	--
1.5	8.25	412.50	0.015

Table 4.7: Enhanced Swales - Quantity Control Strategy (Rouge)

Swale ID Contributing Area ID Drainage Area *VO2 ID*		ES-1 314-1, 314-2 A (ha) = 1.40 *701*		ES-2 314-3 A (ha) = 1.12 702		ES-3 314-4 A (ha) = 0.85 703		Total Q post
12 hr AES	*Allowable Q to 314*	Storage Required	Release Rate	Storage Required	Release Rate	Storage Required	Release Rate	to 314
	(m3/s)	(m3)	(m3/s)	(m3)	(m3/s)	(m3)	(m3/s)	*(m3/s)*
2-yr	*0.027*	280	0.005	207	0.004	145	0.005	0.014
100-yr	*0.096*	700	0.013	531	0.01	365	0.013	0.036

Swale ID Contributing Area ID Drainage Area *VO2 ID*		ES-4 312-1 A (ha) = 0.68 *704*		ES-5 312-2 A (ha) = 0.86 705		Total Q post
12 hr AES	*Allowable Q to 312*	Storage Required	Release Rate	Storage Required	Release Rate	to 312
	(m3/s)	(m3)	(m3/s)	(m3)	(m3/s)	*(m3/s)*
2-yr	*0.010*	121	0.004	133	0.005	0.009
100-yr	*0.040*	302	0.011	345	0.013	0.024

Swale ID Contributing Area ID Drainage Area *VO2 ID*		ES-6 614-1 A (ha) = 0.89 *706*		ES-7 614-2,614-3 A (ha) = 2.14 *707*		Total Q post
12 hr AES	*Allowable Q to 614*	Storage Required	Release Rate	Storage Required	Release Rate	to 614
	(m3/s)	(m3)	(m3/s)	(m3)	(m3/s)	*(m3/s)*
2-yr	*0.029*	146	0.005	470	0.006	0.011
100-yr	*0.099*	381	0.014	1186	0.014	0.028

Swale ID Contributing Area ID Drainage Area *VO2 ID*		ES-8 604-1 A (ha) = 1.07 *708*		ES-9 604-2 A (ha) = 1.52 709		Total Q post
12 hr AES	*Allowable Q to 604*	Storage Required	Release Rate	Storage Required	Release Rate	to 604
	(m3/s)	(m3)	*(m3/s)*	(m3)	*(m3/s)*	*(m3/s)*
2-yr	*0.068*	231	0.004	315	0.006	0.01
100-yr	*0.235*	575	0.01	794	0.014	0.024

Swale ID Contributing Area ID Drainage Area *VO2 ID*		ES-11 620-1 A (ha) = 0.78 *711*		Total Q post
12 hr AES	*Allowable Q to 620*	Storage Required	Release Rate	to 620
	(m3/s)	(m3)	*(m3/s)*	*(m3/s)*
2-yr	*0.014*	147	0.005	0.005
100-yr	*0.051*	369	0.013	0.013

Swale ID Contributing Area ID Drainage Area *VO2 ID*		ES-12 521-1 A (ha) = 0.42 *712*		ES-13 521-2 A (ha) = 0.82 713		Total Q post
12 hr AES	*Allowable Q to 521*	Storage Required	Release Rate	Storage Required	Release Rate	to 521
	(m3/s)	(m3)	*(m3/s)*	(m3)	*(m3/s)*	*(m3/s)*
2-yr	*0.024*	74	0.003	134	0.005	0.008
100-yr	*0.081*	189	0.007	349	0.013	0.02

Swale ID Contributing Area ID Drainage Area *VO2 ID*		ES-14 522-1 A (ha) = 0.18 *714*		Total Q post
12 hr AES	*Allowable Q to 522*	Storage Required	Release Rate	to 522
	(m3/s)	(m3)	*(m3/s)*	*(m3/s)*
2-yr	*0.013*	35	0.001	0.001
100-yr	*0.047*	85	0.003	0.003

Swale ID Contributing Area ID Drainage Area *VO2 ID*		ES-17 511-1 A (ha) = 0.85 *717*		Total Q post
12 hr AES	*Allowable Q to 511*	Storage Required	Release Rate	to 511
	(m3/s)	(m3)	*(m3/s)*	*(m3/s)*
2-yr	*0.013*	160	0.006	0.006
100-yr	*0.050*	398	0.014	0.014

Swale ID Contributing Area ID Drainage Area *VO2 ID*		ES-18 513-1 A (ha) = 1.29 *718*		ES-19 513-2 A (ha) = 0.15 719		ES-20 513-3 A (ha) = 0.38 720		ES-21 513-4 A (ha) = 0.38 721		Total Q post
12 hr AES	*Allowable Q to 314*	Storage Required	Release Rate	Storage Required	Release Rate	Storage Req'd	Release Rate	Storage Req'd	Release Rate	to 314
	(m3/s)	(m3)	(m3/s)	(m3)	(m3/s)	(m3)	(m3/s)	(m3)	(m3/s)	*(m3/s)*
2-yr	*0.013*	265	0.005	29	0.001	70	0.003	70	0.003	0.012
100-yr	*0.047*	673	0.012	71	0.003	176	0.006	176	0.006	0.027

Table 4.8: Enhanced Swales - Quantity Control Strategy (Petticoat Watershed)

Swale ID Contributing Area ID Drainage Area *VO2 ID*		ES-22 1-1 A (ha) = 1.13 *722*		Total Q post
12 hr AES	*Allowable Q to 1*	Storage Required	Release Rate	to 1
	(m3/s)	(m3)	*(m3/s)*	*(m3/s)*
2-yr	*0.007*	218	0.004	0.004
100-yr	*0.025*	555	0.01	0.01

Table 4.9: Enhanced Swales - Quantity Control Strategy (Duffins Watershed)

Swale ID Contributing Area ID Drainage Area *VO2 ID*		ES-24 7-1 A (ha) = 0.91 *724*		ES-25 7-2,7-3 A (ha) = 1.84 725		Total Q post
12 hr AES	*Allowable Q to 7*	Storage Required	Release Rate	Storage Required	Release Rate	to 7
	(m3/s)	(m3)	(m3/s)	(m3)	(m3/s)	*(m3/s)*
2-yr	*0.012*	197	0.004	431	0.005	0.009
100-yr	*0.042*	490	0.009	1060	0.013	0.022

Swale ID Contributing Area ID Drainage Area *VO2 ID*		ES-26 8-1 A (ha) = 0.43 *726*		ES-27 8-2 A (ha) = 2.05 727		Total Q post
12 hr AES	*Allowable Q to 8*	Storage Required	Release Rate	Storage Required	Release Rate	to 8
	(m3/s)	(m3)	(m3/s)	(m3)	(m3/s)	*(m3/s)*
2-yr	*0.005*	79	0.003	437	0.005	0.008
100-yr	*0.019*	195	0.007	1107	0.013	0.020

Swale ID Contributing Area ID Drainage Area *VO2 ID*		ES-28 30-1 A (ha) = 0.38 *728*		ES-29 30-2 A (ha) = 0.4 729		Total Q post
12 hr AES	*Allowable Q to 30*	Storage Required	Release Rate	Storage Required	Release Rate	to 30
	(m3/s)	(m3)	(m3/s)	(m3)	(m3/s)	*(m3/s)*
2-yr	*0.005*	66	0.002	69	0.003	0.005
100-yr	*0.017*	168	0.006	176	0.006	0.012

Swale ID Contributing Area ID Drainage Area *VO2 ID*		ES-30 31-1 A (ha) = 0.40 *730*		Total Q post
12 hr AES	*Allowable Q to 31*	Storage Required	Release Rate	to 31
	(m3/s)	(m3)	(m3/s)	*(m3/s)*
2-yr	*0.002*	70	0.003	0.003
100-yr	*0.007*	178	0.006	0.006

Swale ID Contributing Area ID Drainage Area *VO2 ID*		ES-32 35-1 A (ha) = 1.90 *732*		ES-33 35-2 A (ha) = 0.83 733		Total Q post
12 hr AES	*Allowable Q to 35*	Storage Required	Release Rate	Storage Required	Release Rate	to 35
	(m3/s)	(m3)	(m3/s)	(m3)	(m3/s)	*(m3/s)*
2-yr	*0.006*	406	0.005	142	0.005	0.01
100-yr	*0.021*	1026	0.012	363	0.013	0.025

Swale ID Contributing Area ID Drainage Area *VO2 ID*		ES-34 38-1 A (ha) = 1.00 *734*		Total Q post
12 hr AES	*Allowable Q to 38*	Storage Required	Release Rate	to 38
	(m3/s)	(m3)	(m3/s)	*(m3/s)*
2-yr	*0.004*	217	0.004	0.004
100-yr	*0.016*	537	0.01	0.010

Swale ID Contributing Area ID Drainage Area *VO2 ID*		ES-35 39-1 A (ha) = 1.02 *735*		Total Q post
12 hr AES	*Allowable Q to 39*	Storage Required	Release Rate	to 39
	(m3/s)	(m3)	(m3/s)	*(m3/s)*
2-yr	*0.001*	204	0.004	0.004
100-yr	*0.005*	515	0.009	0.009

GENERAL DESCRIPTION

Enhanced grass swales are vegetated open channels designed to convey, treat and attenuate stormwater runoff (also referred to as enhanced vegetated swales). Check dams and vegetation in the swale slows the water to allow sedimentation, filtration through the root zone and soil matrix, evapotranspiration, and infiltration into the underlying native soil. Simple grass channels or ditches have long been used for stormwater conveyance, particularly for roadway drainage. Enhanced grass swales incorporate design features such as modified geometry and check dams that improve the contaminant removal and runoff reduction functions of simple grass channel and roadside ditch designs.

Where development density, topography and depth to water table permit, enhanced grass swales are a preferred alternative to both curb and gutter and storm drains as a stormwater conveyance system. When incorporated into a site design, they can reduce impervious cover, accent the natural landscape, and provide aesthetic benefits.

DESIGN GUIDANCE

GEOMETRY AND SITE LAYOUT

- Shape: Should be designed with a trapezoidal or parabolic cross section. Trapezoidal swales will generally evolve into parabolic swales over time, so the initial trapezoidal cross-section design should be checked for capacity and conveyance assuming it is a parabolic cross-section. Swale length between culverts should be 5 metres or greater.
- Bottom Width: Should be designed with a bottom width between 0.75 and 3.0 metres. Should allow for shallow flows and adequate water quality treatment, while preventing flows from concentrating and creating gullies.
- Longitudinal Slope: Slopes should be between 0.5% and 4%. Check dams should be incorporated on slopes greater than 3%.
- Length: When used to convey and treat road runoff, the length simply parallels the road, and therefore should be equal to, or greater than the contributing roadway length.
- Flow Depth: A maximum flow depth of 100 mm is recommended during a 4 hour, 25 mm Chicago storm event.
- Side Slopes: Should be as flat as possible to aid in providing pretreatment for lateral incoming flows and to maximize the swale filtering surface. Steeper side slopes are likely to have erosion gullying from incoming lateral flows. A maximum slope of 2.5:1 (H:V) is recommended and a 4:1 slope is preferred where space permits.

PRE-TREATMENT

A pea gravel diaphragm located along the top of each bank can be used to provide pretreatment of any runoff entering the swale laterally along its length. Vegetated filter strips or mild side slopes (3:1) also provide pretreatment for any lateral sheet flow entering the swale. Sedimentation forebays at inlets to the swale are also a pretreatment option.

CONVEYANCE AND OVERFLOW

Grass swales must be designed for a maximum velocity of 0.5 m/s or less for the 4 hour 25 mm Chicago storm event. The swale should also convey the locally required design storm (usually the 10 year storm) at non-erosive velocities.

SOIL AMENDMENTS

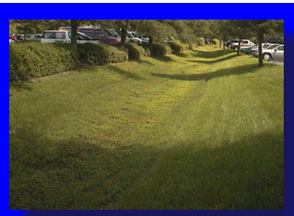
If soils along the location of the swale are highly compacted, or of such low fertility that vegetation cannot become established, they should be tilled to a depth of 300 mm and amended with compost to achieve an organic content of 8 to 15% by weight or 30 to 40% by volume.


Source: Delaware Department of Transportation

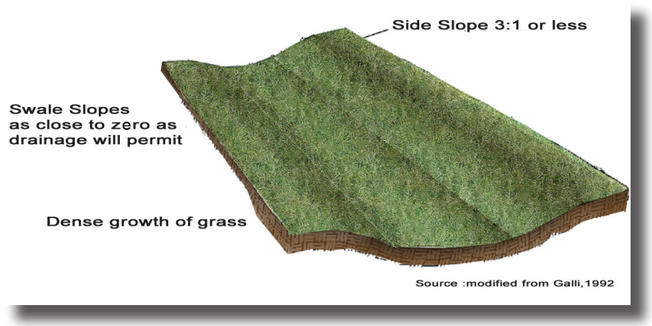
Source: Seattle Public Utilities


Source: Thomas Engineering

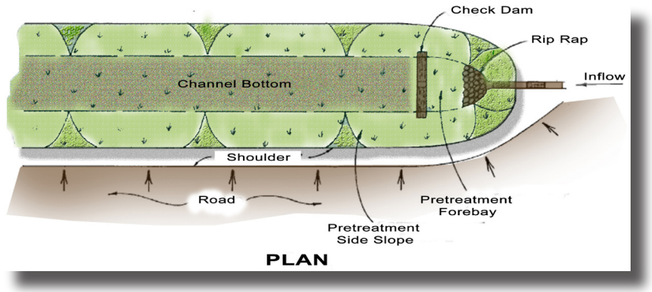

Source: Sue Donaldson

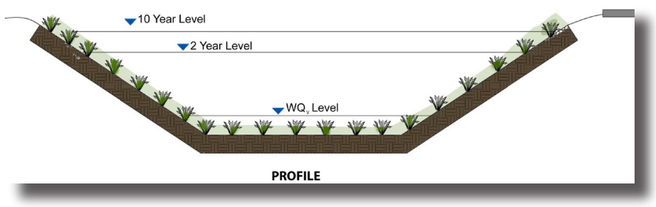



Source: CWP



PLAN VIEW OF A GRASS SWALE





PLAN AND PROFILE VIEWS

ABILITY TO MEET SWM OBJECTIVES

BMP	Water Balance Benefit	Water Quality Improvement	Stream Channel Erosion Control Benefit
Enhanced Grass Swale	Partial - depends on soil infiltration rate	Yes, if design velocity is 0.5 m/s or less for a 4 hour, 25 mm Chicago storm	Partial - depends on soil infiltration rate

GENERAL SPECIFICATIONS

Component	Specification	Quantity
Check Dams	Constructed of a non-erosive material such as suitably sized aggregate, wood, gabions, riprap, or concrete. All check dams should be underlain with geotextile filter fabric. Wood used for check dams should consist of pressure treated logs or timbers, or water-resistant tree species such as cedar, hemlock, swamp oak or locust.	Spacing should be based on the longitudinal slope and desired ponding volume.
Gravel Diaphragm	Washed stone between 3 and 10 mm in diameter.	Minimum of 300 mm wide and 600 mm deep.

CONSTRUCTION CONSIDERATIONS

Grass swales should be clearly marked before site work begins to avoid disturbance during construction. No vehicular traffic, except that specifically used to construct the facility, should be allowed within the swale site. Any accumulation of sediment that does occur within the swale must be removed during the final stages of grading to achieve the design cross-section. Final grading and planting should not occur until the adjoining areas draining into the swale are stabilized. Flow should not be diverted into the swale until the banks are stabilized.

Preferably, the swale should be planted in the spring so that the vegetation can become established with minimal irrigation. Installation of erosion control matting or blanketing to stabilize soil during establishment of vegetation is highly recommended. If sod is used, it should be placed with staggered ends and secured by rolling the sod. This helps to prevent gullies.

OPERATION AND MAINTENANCE

Generally, routine maintenance will be the same as for any other landscaped area; weeding, pruning, and litter removal. Grassed swales should be mown at least twice yearly to maintain grass height between 75 and 150 mm. The lightest possible mowing equipment should be used to prevent soil compaction. Routine roadside ditch maintenance practices such as scraping and re-grading should be avoided. Regular watering may be required during the first two years until vegetation is established. Routine inspection is very important to ensure that dense vegetation cover is maintained and inlets and pretreatment devices are free of debris.

For the first two years following construction the swale should be inspected at least quarterly and after every major storm event (> 25 mm). Subsequently, inspections should be conducted in the spring and fall of each year and after major storm events. Inspect for vegetation density (at least 80% coverage), damage by foot or vehicular traffic, accumulation of debris, trash and sediment, and structural damage to pretreatment devices.

Trash and debris should be removed from pretreatment devices and the surface of the swale at least twice annually. Other maintenance activities include weeding, replacing dead vegetation, repairing eroded areas, dethatching and aerating as needed. Remove accumulated sediment on the swale surface when dry and exceeding 25 mm depth.

SITE CONSIDERATIONS

Available Space
Grass swales usually consume about 5 to 15% of their contributing drainage area. A width of at least 2 metres is needed.

Site Topography
Site topography constrains the application of grass swales. Longitudinal slopes between 0.5 and 6% are allowable. This prevents ponding while providing residence time and preventing erosion. On slopes steeper than 3%, check dams should be used.

Drainage Area & Runoff Volume
The conveyance capacity should match the drainage area. Sheet flow to the grass swale is preferable. If drainage areas are greater than 2 hectares, high discharge through the swale may not allow for filtering and infiltration, and may create erosive conditions. Typical ratios of impervious drainage area to treatment facility area range from 5:1 to 10:1.

Soil
Grass swales can be applied on sites with any type of soils.

Pollution Hot Spot Runoff
To protect groundwater from possible contamination, source areas where land uses or human activities have the potential to generate highly contaminated runoff (e.g., vehicle fueling, servicing and demolition areas, outdoor storage and handling areas for hazardous materials and some heavy industry sites) should not be treated by grass swales.

Proximity to Underground Utilities
Utilities running parallel to the grass swale should be offset from the centerline of the swale. Underground utilities below the bottom of the swale are not a problem.

Water Table
The bottom of the swale should be separated from the seasonally high water table or top of bedrock elevation by at least one (1) metre.

Setback from Buildings
Should be located a minimum of four (4) metres from building foundations to prevent water damage.

CVC/TRCA LOW IMPACT DEVELOPMENT
PLANNING AND DESIGN GUIDE - FACT SHEET

ENHANCED GRASS SWALES

TORONTO AND REGION Conservation for The Living City

CVC CREDIT VALLEY CONSERVATION

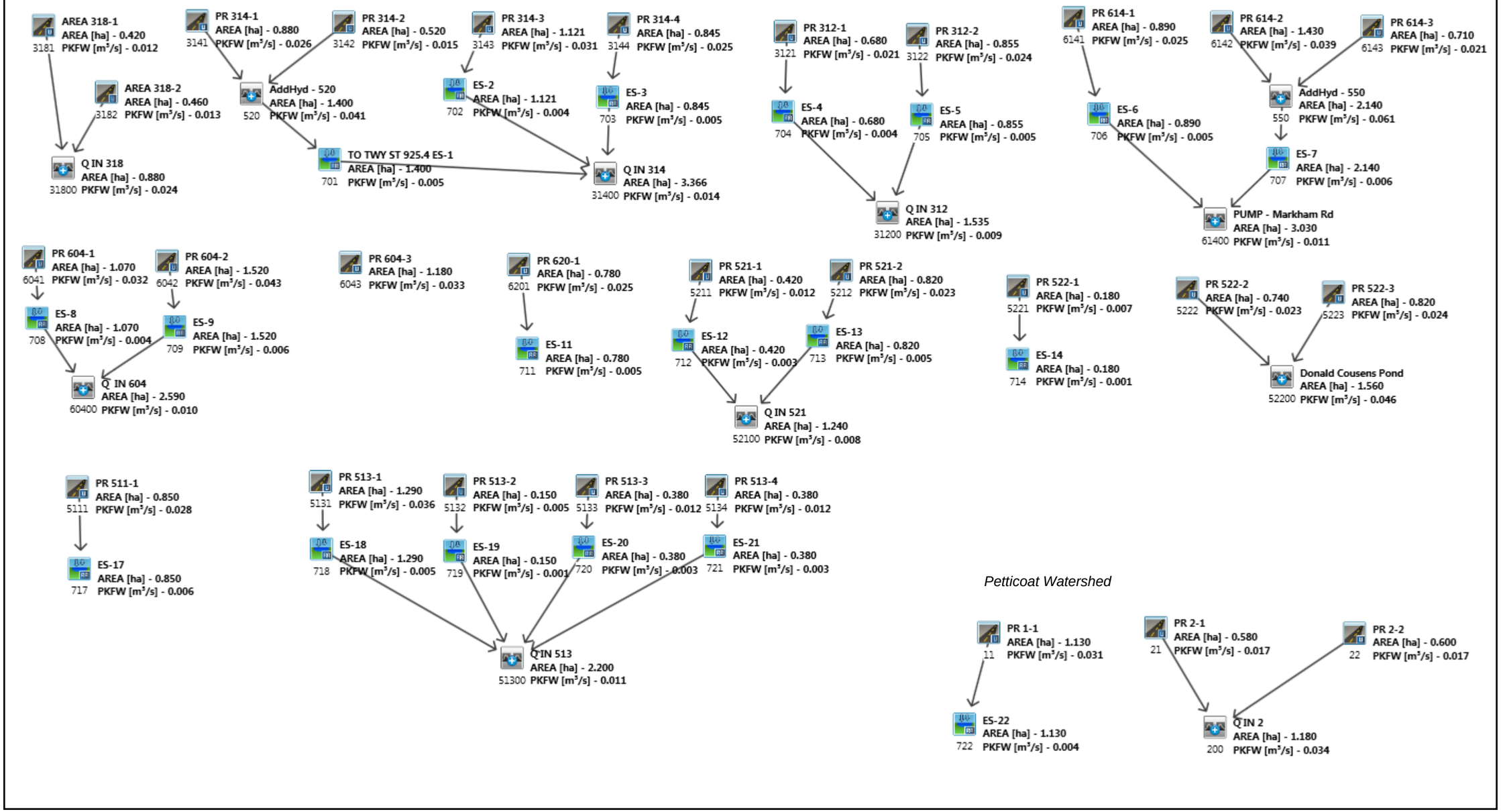
FOR FURTHER DETAILS SEE SECTION 4.8 OF THE CVC/TRCA LID SWM GUIDE

25mm 4hr Chicago Event

Mannings' Equation			Trapezoidal-SHAPE CHANNEL	
Flow Depth (m) =	0.020			
Side Slope Ratio (H:V) =	3.0	/1	Top width	1.12
Bed Width (m)=	1.00		Hyd. Rad, 'R'	
Area (m^2)=	0.021		0.01882	m
Wetted Perimeter (m)=	1.126	m	Friction Slope Sf	
Slope (%) =	0.20		0.0020	m/m
Manning 'n' =	0.025		Velocity	
Channel Capacity, Q =	0.003	m3/sec	0.127	m/s

VO2 Modelling Schematic 4.5: 407 TWY Sub-Areas Hydrologic Analysis – Proposed Condition with SWM (Rouge and Petticoat Watershed)

Rouge Watershed



Petticoat Watershed

```
       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
```


***** D E T A I L E D O U T P U T *****

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DATE: 10/07/2016 TIME: 09:43:49

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 1 **
****

READ STORM	Filename: C:\Users\p002311c\AppData\Local\Temp\6647f5f5-a8d6-436e-b676-fc6c608e06b0\9240ca00
Ptotal= 42.00 mm	Comments: 2yr/12hr

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	3.50	7.14	6.75	2.94	10.00	0.42
0.50	0.42	3.75	7.14	7.00	2.94	10.25	0.42
0.75	0.42	4.00	7.14	7.25	2.94	10.50	0.42
1.00	0.42	4.25	7.14	7.50	1.68	10.75	0.42
1.25	0.42	4.50	19.32	7.75	1.68	11.00	0.42
1.50	0.42	4.75	19.32	8.00	1.68	11.25	0.42
1.75	0.42	5.00	19.32	8.25	1.68	11.50	0.42
2.00	0.42	5.25	19.32	8.50	0.84	11.75	0.42
2.25	0.42	5.50	5.46	8.75	0.84	12.00	0.42
2.50	2.52	5.75	5.46	9.00	0.84	12.25	0.42
2.75	2.52	6.00	5.46	9.25	0.84		
3.00	2.52	6.25	5.46	9.50	0.42		
3.25	2.52	6.50	2.94	9.75	0.42		

CALIB	
STANDHYD (3141)	Area (ha)= 0.88
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.62	0.26
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	3.57
Length	(m)=	6.00	462.10

Mannings n = 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	2.52	6.250	5.46	9.33	0.42
0.167	0.00	3.250	2.52	6.333	2.94	9.42	0.42
0.250	0.00	3.333	7.14	6.417	2.94	9.50	0.42
0.333	0.42	3.417	7.14	6.500	2.94	9.58	0.42
0.417	0.42	3.500	7.14	6.583	2.94	9.67	0.42
0.500	0.42	3.583	7.14	6.667	2.94	9.75	0.42
0.583	0.42	3.667	7.14	6.750	2.94	9.83	0.42
0.667	0.42	3.750	7.14	6.833	2.94	9.92	0.42
0.750	0.42	3.833	7.14	6.917	2.94	10.00	0.42
0.833	0.42	3.917	7.14	7.000	2.94	10.08	0.42
0.917	0.42	4.000	7.14	7.083	2.94	10.17	0.42
1.000	0.42	4.083	7.14	7.167	2.94	10.25	0.42
1.083	0.42	4.167	7.14	7.250	2.94	10.33	0.42
1.167	0.42	4.250	7.14	7.333	1.68	10.42	0.42
1.250	0.42	4.333	19.32	7.417	1.68	10.50	0.42
1.333	0.42	4.417	19.32	7.500	1.68	10.58	0.42
1.417	0.42	4.500	19.32	7.583	1.68	10.67	0.42
1.500	0.42	4.583	19.32	7.667	1.68	10.75	0.42
1.583	0.42	4.667	19.32	7.750	1.68	10.83	0.42
1.667	0.42	4.750	19.32	7.833	1.68	10.92	0.42
1.750	0.42	4.833	19.32	7.917	1.68	11.00	0.42
1.833	0.42	4.917	19.32	8.000	1.68	11.08	0.42
1.917	0.42	5.000	19.32	8.083	1.68	11.17	0.42
2.000	0.42	5.083	19.32	8.167	1.68	11.25	0.42
2.083	0.42	5.167	19.32	8.250	1.68	11.33	0.42
2.167	0.42	5.250	19.32	8.333	0.84	11.42	0.42
2.250	0.42	5.333	5.46	8.417	0.84	11.50	0.42
2.333	2.52	5.417	5.46	8.500	0.84	11.58	0.42
2.417	2.52	5.500	5.46	8.583	0.84	11.67	0.42
2.500	2.52	5.583	5.46	8.667	0.84	11.75	0.42
2.583	2.52	5.667	5.46	8.750	0.84	11.83	0.42
2.667	2.52	5.750	5.46	8.833	0.84	11.92	0.42
2.750	2.52	5.833	5.46	8.917	0.84	12.00	0.42
2.833	2.52	5.917	5.46	9.000	0.84	12.08	0.42
2.917	2.52	6.000	5.46	9.083	0.84	12.17	0.42
3.000	2.52	6.083	5.46	9.167	0.84	12.25	0.42
3.083	2.52	6.167	5.46	9.250	0.84		

Max.Eff.Inten.(mm/hr)=	19.32	10.63		
over (min)	5.00	65.00		
Storage Coeff. (min)=	0.74 (ii)	63.86 (ii)		
Unit Hyd. Tpeak (min)=	5.00	65.00		
Unit Hyd. peak (cms)=	0.34	0.02		
			TOTALS	
PEAK FLOW (cms)=	0.02	0.00	0.026 (iii)	
TIME TO PEAK (hrs)=	4.50	6.08	5.25	
RUNOFF VOLUME (mm)=	41.90	13.33	27.58	
TOTAL RAINFALL (mm)=	42.00	42.00	42.00	
RUNOFF COEFFICIENT =	1.00	0.32	0.66	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB		
STANDHYD (3142)	Area (ha)=	0.52
ID= 1 DT= 5.0 min	Total Imp(%)=	70.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.36	0.16
Dep. Storage (mm)=	0.10	5.00
Average Slope (%)=	2.00	0.30
Length (m)=	6.00	274.60
Mannings n =	0.013	0.250

```
     Max.Eff.Inten.(mm/hr)=      19.32        10.63
               over (min)         5.00       100.00
     Storage Coeff.  (min)=       0.74 (ii)   97.83 (ii)
     Unit Hyd. Tpeak (min)=       5.00       100.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.015 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.75          5.25
     RUNOFF VOLUME    (mm)=      41.90        13.33         27.51
     TOTAL RAINFALL   (mm)=      42.00        42.00         42.00
     RUNOFF COEFFICIENT   =       1.00         0.32          0.66

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0520)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  3141):     0.88   0.026     5.25    27.58
      + ID2= 2 (  3142):     0.52   0.015     5.25    27.51
        ================================================
        ID = 3 (  0520):     1.40   0.041     5.25    27.55

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0701)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0825

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0520)      1.400      0.041      5.25      27.55
   OUTFLOW: ID= 1 (  0701)      1.400      0.005      8.50      26.56

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 12.47
                  TIME SHIFT OF PEAK FLOW         (min)=195.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0280

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  3143)|   Area    (ha)=   1.12
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.78         0.34
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.30
     Length            (m)=       6.00       590.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        10.63
               over (min)         5.00       155.00
     Storage Coeff.  (min)=       0.74 (ii)  154.37 (ii)
     Unit Hyd. Tpeak (min)=       5.00       155.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.00          0.031 (iii)
     TIME TO PEAK    (hrs)=       4.50         7.75          5.25
     RUNOFF VOLUME    (mm)=      41.90        13.33         27.54
     TOTAL RAINFALL   (mm)=      42.00        42.00         42.00
     RUNOFF COEFFICIENT   =       1.00         0.32          0.66

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  67.0    Ia = Dep. Storage  (Above)
```

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0702)					
IN= 2---> OUT= 1					
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)	
	0.0000	0.0000	0.0150	0.0825	

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (3143)	1.121	0.031	5.25	27.54
OUTFLOW: ID= 1 (0702)	1.121	0.004	9.33	26.30

PEAK FLOW REDUCTION [Qout/Qin](%)= 12.24
TIME SHIFT OF PEAK FLOW (min)=245.00
MAXIMUM STORAGE USED (ha.m.)= 0.0207

CALIB		
STANDHYD (3144)	Area (ha)= 0.85	
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.59	0.25	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	4.35	
Length	(m)=	6.00	444.50	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		19.32	10.63	
over (min)		5.00	60.00	
Storage Coeff.	(min)=	0.74 (ii)	58.85 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	60.00	
Unit Hyd. peak	(cms)=	0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.00	0.025 (iii)
TIME TO PEAK	(hrs)=	4.50	6.00	5.25
RUNOFF VOLUME	(mm)=	41.90	13.33	27.58
TOTAL RAINFALL	(mm)=	42.00	42.00	42.00
RUNOFF COEFFICIENT	=	1.00	0.32	0.66

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0703)					
IN= 2---> OUT= 1					
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)	
	0.0000	0.0000	0.0150	0.0413	

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (3144)	0.845	0.025	5.25	27.58
OUTFLOW: ID= 1 (0703)	0.845	0.005	7.33	26.75

PEAK FLOW REDUCTION [Qout/Qin](%)= 20.68
TIME SHIFT OF PEAK FLOW (min)=125.00
MAXIMUM STORAGE USED (ha.m.)= 0.0145

ADD HYD (31400)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0701):	1.40	0.005	8.50	26.56
+ ID2= 2 (0702):	1.12	0.004	9.33	26.30

```
       ================================================
       ID = 3 ( 31400):     2.52   0.009     9.00    26.44

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD  ( 31400)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 ( 31400):     2.52   0.009     9.00    26.44
     + ID2= 2 (  0703):     0.85   0.005     7.33    26.75
       ================================================
       ID = 1 ( 31400):     3.37   0.014     8.25    26.52

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  6041)|   Area    (ha)=   1.07
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.75         0.32
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         3.10
     Length            (m)=       6.00       565.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        14.21
               over (min)        5.00        70.00
     Storage Coeff.  (min)=       0.74 (ii)   66.88 (ii)
     Unit Hyd. Tpeak (min)=       5.00        70.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.032 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.17           5.25
     RUNOFF VOLUME    (mm)=      41.90        17.35          29.59
     TOTAL RAINFALL   (mm)=      42.00        42.00          42.00
     RUNOFF COEFFICIENT   =       1.00         0.41           0.70

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0708)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0825

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  6041)      1.070      0.032      5.25      29.59
   OUTFLOW: ID= 1 (  0708)      1.070      0.004      8.67      28.29

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 12.93
                  TIME SHIFT OF PEAK FLOW         (min)=205.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0231

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  6042)|   Area    (ha)=   1.52
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.06         0.46
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         1.40
     Length            (m)=       6.00       800.00
```

```
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        14.21
               over (min)         5.00       105.00
     Storage Coeff.  (min)=       0.74 (ii)  104.17 (ii)
     Unit Hyd. Tpeak (min)=       5.00       105.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.01          0.043 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.83          5.25
     RUNOFF VOLUME    (mm)=      41.90        17.35         29.59
     TOTAL RAINFALL   (mm)=      42.00        42.00         42.00
     RUNOFF COEFFICIENT   =       1.00         0.41          0.70

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0709)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0825

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  6042)      1.520      0.043      5.25      29.59
   OUTFLOW: ID= 1 (  0709)      1.520      0.006      9.25      28.67

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 13.20
                  TIME SHIFT OF PEAK FLOW         (min)=240.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0315

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--------------------
| ADD HYD  ( 60400)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0708):     1.07   0.004     8.67    28.29
     + ID2= 2 (  0709):     1.52   0.006     9.25    28.67
       ================================================
       ID = 3 ( 60400):     2.59   0.010     9.17    28.51

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  5212)|   Area    (ha)=   0.82
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.57         0.25
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.20
     Length            (m)=       6.00       433.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        14.65
               over (min)         5.00       130.00
     Storage Coeff.  (min)=       0.74 (ii)  127.49 (ii)
     Unit Hyd. Tpeak (min)=       5.00       130.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.00          0.023 (iii)
     TIME TO PEAK    (hrs)=       4.50         7.25          5.25
     RUNOFF VOLUME    (mm)=      41.90        17.83         29.78
     TOTAL RAINFALL   (mm)=      42.00        42.00         42.00
     RUNOFF COEFFICIENT   =       1.00         0.42          0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
```

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0713)				
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0150	0.0413

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (5212)	0.820	0.023	5.25	29.78
OUTFLOW: ID= 1 (0713)	0.820	0.005	8.25	28.94

PEAK FLOW REDUCTION [Qout/Qin](%)= 21.27
TIME SHIFT OF PEAK FLOW (min)=180.00
MAXIMUM STORAGE USED (ha.m.)= 0.0134

CALIB	
STANDHYD (5211)	Area (ha)= 0.42
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.29	0.13	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.20	
Length	(m)=	6.00	220.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		19.32	14.65	
over (min)		5.00	90.00	
Storage Coeff. (min)=		0.74 (ii)	85.17 (ii)	
Unit Hyd. Tpeak (min)=		5.00	90.00	
Unit Hyd. peak (cms)=		0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.01	0.00	0.012 (iii)
TIME TO PEAK	(hrs)=	4.50	6.50	5.25
RUNOFF VOLUME	(mm)=	41.90	17.83	29.75
TOTAL RAINFALL	(mm)=	42.00	42.00	42.00
RUNOFF COEFFICIENT	=	1.00	0.42	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0712)				
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0150	0.0413

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (5211)	0.420	0.012	5.25	29.75
OUTFLOW: ID= 1 (0712)	0.420	0.003	8.17	28.11

PEAK FLOW REDUCTION [Qout/Qin](%)= 21.81
TIME SHIFT OF PEAK FLOW (min)=175.00
MAXIMUM STORAGE USED (ha.m.)= 0.0074

ADD HYD (52100)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)

```
       ID1= 1 (  0712):     0.42   0.003     8.17    28.11
     + ID2= 2 (  0713):     0.82   0.005     8.25    28.94
       ================================================
       ID = 3 ( 52100):     1.24   0.008     8.25    28.65

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  5131)|   Area    (ha)=   1.29
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.90         0.39
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.70
     Length            (m)=       6.00       681.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        14.65
               over (min)         5.00       115.00
     Storage Coeff.  (min)=       0.74 (ii)  114.95 (ii)
     Unit Hyd. Tpeak (min)=       5.00       115.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.036 (iii)
     TIME TO PEAK    (hrs)=       4.50         7.00           5.25
     RUNOFF VOLUME    (mm)=      41.90        17.83          29.82
     TOTAL RAINFALL   (mm)=      42.00        42.00          42.00
     RUNOFF COEFFICIENT   =       1.00         0.42           0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0718)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0825

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  5131)      1.290      0.036      5.25      29.82
   OUTFLOW: ID= 1 (  0718)      1.290      0.005      9.33      28.74

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 13.23
                  TIME SHIFT OF PEAK FLOW         (min)=245.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0265

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--------------------
| CALIB            |
| STANDHYD (  5132)|   Area    (ha)=   0.15
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.10         0.05
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.70
     Length            (m)=       6.00        80.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        17.32
               over (min)         5.00        35.00
     Storage Coeff.  (min)=       0.74 (ii)   30.29 (ii)
     Unit Hyd. Tpeak (min)=       5.00        35.00
     Unit Hyd. peak  (cms)=       0.34         0.04
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.00         0.00          0.005 (iii)
     TIME TO PEAK    (hrs)=       4.50         5.50           5.25
     RUNOFF VOLUME    (mm)=      41.90        17.83          29.76
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     TOTAL RAINFALL   (mm)=      42.00        42.00          42.00
     RUNOFF COEFFICIENT   =       1.00         0.42           0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0719)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  5132)      0.150      0.005      5.25      29.76
   OUTFLOW: ID= 1 (  0719)      0.150      0.001      7.25      25.14

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 19.40
                  TIME SHIFT OF PEAK FLOW         (min)=120.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0029

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--------------------
| CALIB            |
| STANDHYD (  5133)|   Area    (ha)=   0.38
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.27         0.11
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.60
     Length            (m)=       6.00       200.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        14.65
               over (min)         5.00        60.00
     Storage Coeff.  (min)=       0.74 (ii)   58.09 (ii)
     Unit Hyd. Tpeak (min)=       5.00        60.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.012 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.00           5.25
     RUNOFF VOLUME    (mm)=      41.90        17.83          29.77
     TOTAL RAINFALL   (mm)=      42.00        42.00          42.00
     RUNOFF COEFFICIENT   =       1.00         0.42           0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0720)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  5133)      0.380      0.012      5.25      29.77
   OUTFLOW: ID= 1 (  0720)      0.380      0.003      7.50      27.95

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 21.25
                  TIME SHIFT OF PEAK FLOW         (min)=135.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0070

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--------------------
| CALIB            |
| STANDHYD (  5134)|   Area    (ha)=   0.38
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.27         0.11
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.60
     Length            (m)=       6.00       200.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        14.65
               over (min)         5.00        60.00
     Storage Coeff.  (min)=       0.74 (ii)   58.09 (ii)
     Unit Hyd. Tpeak (min)=       5.00        60.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.012 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.00           5.25
     RUNOFF VOLUME    (mm)=      41.90        17.83          29.77
     TOTAL RAINFALL   (mm)=      42.00        42.00          42.00
     RUNOFF COEFFICIENT   =       1.00         0.42           0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0721)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  5134)      0.380      0.012      5.25      29.77
   OUTFLOW: ID= 1 (  0721)      0.380      0.003      7.50      27.95

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 21.25
                  TIME SHIFT OF PEAK FLOW         (min)=135.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0070

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--------------------
| ADD HYD  ( 51300)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0718):     1.29   0.005     9.33    28.74
     + ID2= 2 (  0719):     0.15   0.001     7.25    25.14
       ==================================================
       ID = 3 ( 51300):     1.44   0.006     8.92    28.36

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD  ( 51300)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 ( 51300):     1.44   0.006     8.92    28.36
     + ID2= 2 (  0720):     0.38   0.003     7.50    27.95
       ==================================================
       ID = 1 ( 51300):     1.82   0.008     8.33    28.27

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD  ( 51300)|
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1 + 2 = 3		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
	ID1= 1 (51300):	1.82	0.008	8.33	28.27
	+ ID2= 2 (0721):	0.38	0.003	7.50	27.95
	ID = 3 (51300):	2.20	0.011	8.25	28.22

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB
STANDHYD (0011) | Area (ha)= 1.13
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.79	0.34	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	1.50	0.60	
Length	(m)=	6.00	596.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		19.32	11.35	
over (min)		5.00	125.00	
Storage Coeff.	(min)=	0.81 (ii)	123.12 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	125.00	
Unit Hyd. peak	(cms)=	0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.03	0.00	0.031 (iii)
TIME TO PEAK	(hrs)=	4.50	7.17	5.25
RUNOFF VOLUME	(mm)=	41.90	14.15	27.96
TOTAL RAINFALL	(mm)=	42.00	42.00	42.00
RUNOFF COEFFICIENT	=	1.00	0.34	0.67

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 69.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0722)
IN= 2---> OUT= 1
DT= 5.0 min

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0150	0.0825

		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0011)		1.130	0.031	5.25	27.96
OUTFLOW: ID= 1 (0722)		1.130	0.004	9.25	26.73

PEAK FLOW REDUCTION [Qout/Qin](%)= 12.62
TIME SHIFT OF PEAK FLOW (min)=240.00
MAXIMUM STORAGE USED (ha.m.)= 0.0218

CALIB
STANDHYD (0021) | Area (ha)= 0.58
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.41	0.17	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	1.50	0.60	
Length	(m)=	6.00	304.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		19.32	10.63	
over (min)		5.00	85.00	
Storage Coeff.	(min)=	0.81 (ii)	84.63 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	85.00	
Unit Hyd. peak	(cms)=	0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.00	0.017 (iii)

```
     TIME TO PEAK    (hrs)=       4.50         6.50          5.25
     RUNOFF VOLUME    (mm)=      41.90        13.33         27.54
     TOTAL RAINFALL   (mm)=      42.00        42.00         42.00
     RUNOFF COEFFICIENT   =       1.00         0.32          0.66

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0022)|   Area    (ha)=   0.60
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.42         0.18
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.50         0.60
     Length            (m)=       6.00       314.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        10.63
                 over (min)       5.00        90.00
     Storage Coeff.  (min)=       0.81 (ii)   86.28 (ii)
     Unit Hyd. Tpeak (min)=       5.00        90.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.00          0.017 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.58          5.25
     RUNOFF VOLUME    (mm)=      41.90        13.33         27.54
     TOTAL RAINFALL   (mm)=      42.00        42.00         42.00
     RUNOFF COEFFICIENT   =       1.00         0.32          0.66

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0200)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0021):     0.58   0.017     5.25    27.54
     + ID2= 2 (  0022):     0.60   0.017     5.25    27.54
       ================================================
       ID = 3 (  0200):     1.18   0.034     5.25    27.54

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  3121)|   Area    (ha)=   0.68
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.48         0.20
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         4.50
     Length            (m)=       6.00       355.50
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        12.55
                 over (min)       5.00        50.00
     Storage Coeff.  (min)=       0.74 (ii)   47.82 (ii)
     Unit Hyd. Tpeak (min)=       5.00        50.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.00          0.021 (iii)
```

```
     TIME TO PEAK    (hrs)=       4.50         5.83          5.25
     RUNOFF VOLUME    (mm)=      41.90        14.54         28.18
     TOTAL RAINFALL   (mm)=      42.00        42.00         42.00
     RUNOFF COEFFICIENT   =       1.00         0.35          0.67

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  69.9    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0704)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  3121)      0.680      0.021      5.25      28.18
   OUTFLOW: ID= 1 (  0704)      0.680      0.004      7.33      27.16

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 20.44
                  TIME SHIFT OF PEAK FLOW         (min)=125.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0121

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--------------------
| CALIB            |
| STANDHYD (  3122)|   Area    (ha)=   0.86
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.60         0.26
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.25
     Length            (m)=       6.00       450.00
     Mannings n             =    0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        11.69
               over (min)         5.00       135.00
     Storage Coeff.  (min)=       0.74 (ii)  133.55 (ii)
     Unit Hyd. Tpeak (min)=       5.00       135.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.00          0.024 (iii)
     TIME TO PEAK    (hrs)=       4.50         7.33          5.25
     RUNOFF VOLUME    (mm)=      41.90        14.54         28.13
     TOTAL RAINFALL   (mm)=      42.00        42.00         42.00
     RUNOFF COEFFICIENT   =       1.00         0.35          0.67

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  69.9    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0705)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  3122)      0.855      0.024      5.25      28.13
   OUTFLOW: ID= 1 (  0705)      0.855      0.005      8.25      27.32

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 20.45
                  TIME SHIFT OF PEAK FLOW         (min)=180.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0133
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| ADD HYD  ( 31200)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0704):     0.68   0.004     7.33    27.16
     + ID2= 2 (  0705):     0.86   0.005     8.25    27.32
       ================================================
       ID = 3 ( 31200):     1.53   0.009     7.33    27.25

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  6043)|   Area    (ha)=   1.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.83         0.35
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.50
     Length            (m)=       6.00       620.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        14.21
               over (min)        5.00       125.00
     Storage Coeff.  (min)=       0.74 (ii)  121.63 (ii)
     Unit Hyd. Tpeak (min)=       5.00       125.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.033 (iii)
     TIME TO PEAK    (hrs)=       4.50         7.17           5.25
     RUNOFF VOLUME    (mm)=      41.90        17.35          29.57
     TOTAL RAINFALL   (mm)=      42.00        42.00          42.00
     RUNOFF COEFFICIENT   =       1.00         0.41           0.70

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  6201)|   Area    (ha)=   0.78
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.55         0.23
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         2.80
     Length            (m)=       6.00       410.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        16.22
               over (min)        5.00        55.00
     Storage Coeff.  (min)=       0.74 (ii)   54.11 (ii)
     Unit Hyd. Tpeak (min)=       5.00        55.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.025 (iii)
     TIME TO PEAK    (hrs)=       4.50         5.92           5.25
     RUNOFF VOLUME    (mm)=      41.90        18.95          30.39
     TOTAL RAINFALL   (mm)=      42.00        42.00          42.00
     RUNOFF COEFFICIENT   =       1.00         0.45           0.72

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  78.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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--------------------
| RESERVOIR(  0711)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  6201)      0.780     0.025      5.25      30.39
   OUTFLOW: ID= 1 (  0711)      0.780     0.005      7.42      29.50

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 21.12
                  TIME SHIFT OF PEAK FLOW         (min)=130.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0147

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--------------------
| CALIB            |
| STANDHYD (  5222)|   Area    (ha)=   0.74
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.52         0.22
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         1.25
     Length            (m)=       6.00       388.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        14.65
               over (min)        5.00        70.00
     Storage Coeff.  (min)=       0.74 (ii)   69.22 (ii)
     Unit Hyd. Tpeak (min)=       5.00        70.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.023 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.17           5.25
     RUNOFF VOLUME    (mm)=      41.90        17.83          29.81
     TOTAL RAINFALL   (mm)=      42.00        42.00          42.00
     RUNOFF COEFFICIENT   =       1.00         0.42           0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  5223)|   Area    (ha)=   0.82
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.57         0.25
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.50
     Length            (m)=       6.00       432.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        14.65
               over (min)        5.00       100.00
     Storage Coeff.  (min)=       0.74 (ii)   96.89 (ii)
     Unit Hyd. Tpeak (min)=       5.00       100.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.00          0.024 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.67           5.25
     RUNOFF VOLUME    (mm)=      41.90        17.83          29.80
     TOTAL RAINFALL   (mm)=      42.00        42.00          42.00
     RUNOFF COEFFICIENT   =       1.00         0.42           0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
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```
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

ADD HYD (52200)		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
1 + 2 = 3	ID1= 1 (5222):	0.74	0.023	5.25	29.81
	+ ID2= 2 (5223):	0.82	0.024	5.25	29.80
	ID = 3 (52200):	1.56	0.046	5.25	29.81

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB STANDHYD (5221) | Area (ha)= 0.18
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.13	0.05	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	1.25	
Length	(m)=	6.00	97.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		19.32	17.32	
over (min)		5.00	30.00	
Storage Coeff. (min)=		0.74 (ii)	28.62 (ii)	
Unit Hyd. Tpeak (min)=		5.00	30.00	
Unit Hyd. peak (cms)=		0.34	0.04	
				TOTALS
PEAK FLOW	(cms)=	0.00	0.00	0.007 (iii)
TIME TO PEAK	(hrs)=	4.50	5.50	5.25
RUNOFF VOLUME	(mm)=	41.90	17.83	29.77
TOTAL RAINFALL	(mm)=	42.00	42.00	42.00
RUNOFF COEFFICIENT	=	1.00	0.42	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

```
       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

RESERVOIR(0714) | IN= 2---> OUT= 1 | DT= 5.0 min

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0150	0.0413

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (5221)	0.180	0.007	5.25	29.77
OUTFLOW: ID= 1 (0714)	0.180	0.001	7.25	25.90

```
                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 19.07
                  TIME SHIFT OF PEAK FLOW         (min)=120.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0035
```

CALIB STANDHYD (5111) | Area (ha)= 0.85
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.59	0.25
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	5.67
Length	(m)=	6.00	449.00

```
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        15.64
               over (min)        5.00        50.00
     Storage Coeff.  (min)=       0.74 (ii)   47.01 (ii)
     Unit Hyd. Tpeak (min)=       5.00        50.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.028 (iii)
     TIME TO PEAK    (hrs)=       4.50         5.83          5.25
     RUNOFF VOLUME    (mm)=      41.90        17.83         29.83
     TOTAL RAINFALL   (mm)=      42.00        42.00         42.00
     RUNOFF COEFFICIENT   =       1.00         0.42          0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0717)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0413

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  5111)      0.850      0.028      5.25      29.83
   OUTFLOW: ID= 1 (  0717)      0.850      0.006      7.33      29.02

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 20.70
                  TIME SHIFT OF PEAK FLOW         (min)=125.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0160

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--------------------
| CALIB            |
| STANDHYD (  3181)|   Area    (ha)=   0.42
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.29         0.13
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         0.30
     Length            (m)=       6.00       462.10
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32         9.96
               over (min)        5.00       140.00
     Storage Coeff.  (min)=       0.74 (ii)  136.91 (ii)
     Unit Hyd. Tpeak (min)=       5.00       140.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.012 (iii)
     TIME TO PEAK    (hrs)=       4.50         7.42          5.25
     RUNOFF VOLUME    (mm)=      40.00        12.56         26.10
     TOTAL RAINFALL   (mm)=      42.00        42.00         42.00
     RUNOFF COEFFICIENT   =       0.95         0.30          0.62

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  65.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  3182)|   Area    (ha)=   0.46
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
```

Surface Area	(ha)=	0.32	0.14	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	2.00	0.30	
Length	(m)=	6.00	462.10	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)	=	19.32	9.96	
over (min)		5.00	140.00	
Storage Coeff.	(min)=	0.74 (ii)	136.91 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	140.00	
Unit Hyd. peak	(cms)=	0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.01	0.00	0.013 (iii)
TIME TO PEAK	(hrs)=	4.50	7.42	5.25
RUNOFF VOLUME	(mm)=	40.00	12.56	26.11
TOTAL RAINFALL	(mm)=	42.00	42.00	42.00
RUNOFF COEFFICIENT	=	0.95	0.30	0.62

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 65.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (31800)		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
1 + 2 = 3	ID1= 1 (3181):	0.42	0.012	5.25	26.10
	+ ID2= 2 (3182):	0.46	0.013	5.25	26.11
	ID = 3 (31800):	0.88	0.024	5.25	26.11

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB					
STANDHYD (6142)	Area (ha)=	1.43			
ID= 1 DT= 5.0 min	Total Imp(%)=	70.00	Dir. Conn.(%)=	50.00	
		IMPERVIOUS	PERVIOUS (i)		
Surface Area	(ha)=	1.00	0.43		
Dep. Storage	(mm)=	0.10	5.00		
Average Slope	(%)=	2.00	0.25		
Length	(m)=	6.00	753.00		
Mannings n	=	0.013	0.250		
Max.Eff.Inten.(mm/hr)	=	19.32	14.65		
over (min)		5.00	170.00		
Storage Coeff.	(min)=	0.74 (ii)	165.96 (ii)		
Unit Hyd. Tpeak	(min)=	5.00	170.00		
Unit Hyd. peak	(cms)=	0.34	0.01		
				TOTALS	
PEAK FLOW	(cms)=	0.04	0.01	0.039 (iii)	
TIME TO PEAK	(hrs)=	4.50	7.92	5.25	
RUNOFF VOLUME	(mm)=	41.90	17.83	29.80	
TOTAL RAINFALL	(mm)=	42.00	42.00	42.00	
RUNOFF COEFFICIENT	=	1.00	0.42	0.71	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (6143)	Area (ha)=	0.71			
ID= 1 DT= 5.0 min	Total Imp(%)=	70.00	Dir. Conn.(%)=	50.00	
		IMPERVIOUS	PERVIOUS (i)		

Surface Area	(ha)=	0.50	0.21	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.90	
Length	(m)=	6.00	372.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)	=	19.32	14.65	
over (min)		5.00	75.00	
Storage Coeff.	(min)=	0.74 (ii)	74.43 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	75.00	
Unit Hyd. peak	(cms)=	0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.00	0.021 (iii)
TIME TO PEAK	(hrs)=	4.50	6.25	5.25
RUNOFF VOLUME	(mm)=	41.90	17.83	29.81
TOTAL RAINFALL	(mm)=	42.00	42.00	42.00
RUNOFF COEFFICIENT	=	1.00	0.42	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0550)		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
1 + 2 = 3	ID1= 1 (6142):	1.43	0.039	5.25	29.80
	+ ID2= 2 (6143):	0.71	0.021	5.25	29.81
	ID = 3 (0550):	2.14	0.061	5.25	29.80

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0707)	OUTFLOW	STORAGE	OUTFLOW	STORAGE
IN= 2---> OUT= 1	(cms)	(ha.m.)	(cms)	(ha.m.)
DT= 5.0 min	0.0000	0.0000	0.0150	0.1238

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0550)	2.140	0.061	5.25	29.80
OUTFLOW: ID= 1 (0707)	2.140	0.006	10.67	28.83

PEAK FLOW REDUCTION [Qout/Qin](%)= 9.39
TIME SHIFT OF PEAK FLOW (min)=325.00
MAXIMUM STORAGE USED (ha.m.)= 0.0470

CALIB					
STANDHYD (6141)	Area (ha)= 0.89				
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00			
		IMPERVIOUS	PERVIOUS (i)		
Surface Area	(ha)=	0.62	0.27		
Dep. Storage	(mm)=	0.10	5.00		
Average Slope	(%)=	2.00	0.25		
Length	(m)=	6.00	470.00		
Mannings n	=	0.013	0.250		
Max.Eff.Inten.(mm/hr)	=	19.32	14.65		
over (min)		5.00	130.00		
Storage Coeff.	(min)=	0.74 (ii)	125.26 (ii)		
Unit Hyd. Tpeak	(min)=	5.00	130.00		
Unit Hyd. peak	(cms)=	0.34	0.01		
				TOTALS	
PEAK FLOW	(cms)=	0.02	0.00	0.025 (iii)	
TIME TO PEAK	(hrs)=	4.50	7.25	5.25	
RUNOFF VOLUME	(mm)=	41.90	17.83	29.79	
TOTAL RAINFALL	(mm)=	42.00	42.00	42.00	

```
     RUNOFF COEFFICIENT   =       1.00         0.42          0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0706)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  6141)      0.890      0.025      5.25      29.79
   OUTFLOW: ID= 1 (  0706)      0.890      0.005      8.25      29.00

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 21.30
                  TIME SHIFT OF PEAK FLOW         (min)=180.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0146

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--------------------
| ADD HYD  ( 61400)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0706):     0.89   0.005     8.25    29.00
     + ID2= 2 (  0707):     2.14   0.006    10.67    28.83
       ================================================
       ID = 3 ( 61400):     3.03   0.011     9.17    28.88

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
================================================================================================================================

       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

  Output  filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\fbb6c874-d906-4699-8ea2-c3c9c94b9c4
9\scenar
  Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\fbb6c874-d906-4699-8ea2-c3c9c94b9c4
9\scenar


DATE: 10/07/2016                          TIME: 09:43:50

USER:


COMMENTS: _____________________________________________________________
```

****
** SIMULATION NUMBER: 2 **
****

READ STORM	Filename: C:\Users\p002311c\AppData\Local\Temp\6647f5f5-a8d6-436e-b676-fc6c608e06b0\1b7b6b69
Ptotal= 54.38 mm	Comments: 5yr/12hr

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	3.50	9.25	6.75	3.81	10.00	0.54
0.50	0.54	3.75	9.25	7.00	3.81	10.25	0.54
0.75	0.54	4.00	9.25	7.25	3.81	10.50	0.54
1.00	0.54	4.25	9.25	7.50	2.18	10.75	0.54
1.25	0.54	4.50	25.02	7.75	2.18	11.00	0.54
1.50	0.54	4.75	25.02	8.00	2.18	11.25	0.54
1.75	0.54	5.00	25.02	8.25	2.18	11.50	0.54
2.00	0.54	5.25	25.02	8.50	1.09	11.75	0.54
2.25	0.54	5.50	7.07	8.75	1.09	12.00	0.54
2.50	3.26	5.75	7.07	9.00	1.09	12.25	0.54
2.75	3.26	6.00	7.07	9.25	1.09		
3.00	3.26	6.25	7.07	9.50	0.54		
3.25	3.26	6.50	3.81	9.75	0.54		

CALIB STANDHYD (3141) ID= 1 DT= 5.0 min	Area (ha)= 0.88 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.62	0.26
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	3.57
Length	(m)=	6.00	462.10
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	3.26	6.250	7.07	9.33	0.54
0.167	0.00	3.250	3.26	6.333	3.81	9.42	0.54
0.250	0.00	3.333	9.25	6.417	3.81	9.50	0.54
0.333	0.54	3.417	9.25	6.500	3.81	9.58	0.54
0.417	0.54	3.500	9.25	6.583	3.81	9.67	0.54
0.500	0.54	3.583	9.25	6.667	3.81	9.75	0.54
0.583	0.54	3.667	9.25	6.750	3.81	9.83	0.54
0.667	0.54	3.750	9.25	6.833	3.81	9.92	0.54
0.750	0.54	3.833	9.25	6.917	3.81	10.00	0.54
0.833	0.54	3.917	9.25	7.000	3.81	10.08	0.54
0.917	0.54	4.000	9.25	7.083	3.81	10.17	0.54
1.000	0.54	4.083	9.25	7.167	3.81	10.25	0.54
1.083	0.54	4.167	9.25	7.250	3.81	10.33	0.54
1.167	0.54	4.250	9.25	7.333	2.18	10.42	0.54
1.250	0.54	4.333	25.02	7.417	2.18	10.50	0.54
1.333	0.54	4.417	25.02	7.500	2.18	10.58	0.54
1.417	0.54	4.500	25.02	7.583	2.18	10.67	0.54
1.500	0.54	4.583	25.02	7.667	2.18	10.75	0.54
1.583	0.54	4.667	25.02	7.750	2.18	10.83	0.54
1.667	0.54	4.750	25.02	7.833	2.18	10.92	0.54
1.750	0.54	4.833	25.02	7.917	2.18	11.00	0.54
1.833	0.54	4.917	25.02	8.000	2.18	11.08	0.54
1.917	0.54	5.000	25.02	8.083	2.18	11.17	0.54
2.000	0.54	5.083	25.02	8.167	2.18	11.25	0.54
2.083	0.54	5.167	25.02	8.250	2.18	11.33	0.54
2.167	0.54	5.250	25.02	8.333	1.09	11.42	0.54
2.250	0.54	5.333	7.07	8.417	1.09	11.50	0.54
2.333	3.26	5.417	7.07	8.500	1.09	11.58	0.54
2.417	3.26	5.500	7.07	8.583	1.09	11.67	0.54
2.500	3.26	5.583	7.07	8.667	1.09	11.75	0.54

2.583	3.26	5.667	7.07	8.750	1.09	11.83	0.54
2.667	3.26	5.750	7.07	8.833	1.09	11.92	0.54
2.750	3.26	5.833	7.07	8.917	1.09	12.00	0.54
2.833	3.26	5.917	7.07	9.000	1.09	12.08	0.54
2.917	3.26	6.000	7.07	9.083	1.09	12.17	0.54
3.000	3.26	6.083	7.07	9.167	1.09	12.25	0.54
3.083	3.26	6.167	7.07	9.250	1.09		

Max.Eff.Inten.(mm/hr)=	25.02	17.50	
over (min)	5.00	55.00	
Storage Coeff. (min)=	0.67 (ii)	52.37 (ii)	
Unit Hyd. Tpeak (min)=	5.00	55.00	
Unit Hyd. peak (cms)=	0.34	0.02	
			TOTALS
PEAK FLOW (cms)=	0.03	0.01	0.036 (iii)
TIME TO PEAK (hrs)=	4.50	5.92	5.25
RUNOFF VOLUME (mm)=	54.28	20.88	37.54
TOTAL RAINFALL (mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT =	1.00	0.38	0.69

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (3142)	Area (ha)= 0.52
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=		0.36	0.16
Dep. Storage (mm)=		0.10	5.00
Average Slope (%)=		2.00	0.30
Length (m)=		6.00	274.60
Mannings n =		0.013	0.250
Max.Eff.Inten.(mm/hr)=		25.02	16.91
over (min)		5.00	85.00
Storage Coeff. (min)=		0.67 (ii)	81.30 (ii)
Unit Hyd. Tpeak (min)=		5.00	85.00
Unit Hyd. peak (cms)=		0.34	0.01
			TOTALS
PEAK FLOW (cms)=		0.02	0.00 0.020 (iii)
TIME TO PEAK (hrs)=		4.50	6.42 5.25
RUNOFF VOLUME (mm)=		54.28	20.88 37.49
TOTAL RAINFALL (mm)=		54.38	54.38 54.38
RUNOFF COEFFICIENT =		1.00	0.38 0.69

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0520)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (3141):		0.88	0.036	5.25	37.54
+ ID2= 2 (3142):		0.52	0.020	5.25	37.49
ID = 3 (0520):		1.40	0.056	5.25	37.52

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0701)					
IN= 2---> OUT= 1					
DT= 5.0 min	OUTFLOW	STORAGE	OUTFLOW	STORAGE	

```
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0825

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0520)      1.400      0.056      5.25      37.52
   OUTFLOW: ID= 1 (  0701)      1.400      0.007      8.42      36.53

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 12.57
                  TIME SHIFT OF PEAK FLOW         (min)=190.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0385

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--------------------
| CALIB            |
| STANDHYD (  3143)|   Area    (ha)=   1.12
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.78         0.34
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.30
     Length            (m)=       6.00       590.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02        16.91
               over (min)         5.00       130.00
     Storage Coeff.  (min)=       0.67 (ii)  128.26 (ii)
     Unit Hyd. Tpeak (min)=       5.00       130.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.01          0.040 (iii)
     TIME TO PEAK    (hrs)=       4.50         7.25          5.25
     RUNOFF VOLUME    (mm)=      54.28        20.88         37.51
     TOTAL RAINFALL   (mm)=      54.38        54.38         54.38
     RUNOFF COEFFICIENT   =       1.00         0.38          0.69

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0702)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0825

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  3143)      1.121      0.040      5.25      37.51
   OUTFLOW: ID= 1 (  0702)      1.121      0.005      9.33      36.27

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 12.88
                  TIME SHIFT OF PEAK FLOW         (min)=245.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0287

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--------------------
| CALIB            |
| STANDHYD (  3144)|   Area    (ha)=   0.85
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.59         0.25
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         4.35
     Length            (m)=       6.00       444.50
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02        18.06
               over (min)         5.00        50.00
     Storage Coeff.  (min)=       0.67 (ii)   47.68 (ii)
     Unit Hyd. Tpeak (min)=       5.00        50.00
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     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.035 (iii)
     TIME TO PEAK    (hrs)=       4.50         5.83           5.25
     RUNOFF VOLUME    (mm)=      54.28        20.88          37.55
     TOTAL RAINFALL   (mm)=      54.38        54.38          54.38
     RUNOFF COEFFICIENT   =       1.00         0.38           0.69

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0703)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  3144)      0.845      0.035      5.25      37.55
   OUTFLOW: ID= 1 (  0703)      0.845      0.007      7.33      36.72

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 20.57
                  TIME SHIFT OF PEAK FLOW         (min)=125.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0200

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--------------------
| ADD HYD  ( 31400)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0701):     1.40   0.007     8.42    36.53
     + ID2= 2 (  0702):     1.12   0.005     9.33    36.27
       ================================================
       ID = 3 ( 31400):     2.52   0.012     9.00    36.41

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD  ( 31400)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 ( 31400):     2.52   0.012     9.00    36.41
     + ID2= 2 (  0703):     0.85   0.007     7.33    36.72
       ================================================
       ID = 1 ( 31400):     3.37   0.019     8.25    36.49

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  6041)|   Area    (ha)=   1.07
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.75         0.32
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         3.10
     Length            (m)=       6.00       565.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02        22.60
                 over (min)       5.00        60.00
     Storage Coeff.  (min)=       0.67 (ii)   55.61 (ii)
     Unit Hyd. Tpeak (min)=       5.00        60.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.01          0.045 (iii)
```

TIME TO PEAK (hrs)=	4.50	6.00	5.25
RUNOFF VOLUME (mm)=	54.28	26.39	40.30
TOTAL RAINFALL (mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT =	1.00	0.49	0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.8 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0708)				
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0150	0.0825

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (6041)	1.070	0.045	5.25	40.30
OUTFLOW: ID= 1 (0708)	1.070	0.006	8.50	39.00

PEAK FLOW REDUCTION [Qout/Qin](%)= 12.83
TIME SHIFT OF PEAK FLOW (min)=195.00
MAXIMUM STORAGE USED (ha.m.)= 0.0319

CALIB		
STANDHYD (6042)	Area (ha)= 1.52	
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	1.06	0.46	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	1.40	
Length (m)=	6.00	800.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	25.02	21.93	
over (min)	5.00	90.00	
Storage Coeff. (min)=	0.67 (ii)	87.64 (ii)	
Unit Hyd. Tpeak (min)=	5.00	90.00	
Unit Hyd. peak (cms)=	0.34	0.01	
			TOTALS
PEAK FLOW (cms)=	0.05	0.01	0.058 (iii)
TIME TO PEAK (hrs)=	4.50	6.50	5.25
RUNOFF VOLUME (mm)=	54.28	26.39	40.30
TOTAL RAINFALL (mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT =	1.00	0.49	0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.8 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0709)				
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0150	0.0825

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (6042)	1.520	0.058	5.25	40.30
OUTFLOW: ID= 1 (0709)	1.520	0.008	9.25	39.38

PEAK FLOW REDUCTION [Qout/Qin](%)= 13.57
TIME SHIFT OF PEAK FLOW (min)=240.00
MAXIMUM STORAGE USED (ha.m.)= 0.0436

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--------------------
| ADD HYD  ( 60400)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0708):     1.07   0.006     8.50    39.00
     + ID2= 2 (  0709):     1.52   0.008     9.25    39.38
       ================================================
       ID = 3 ( 60400):     2.59   0.014     9.00    39.22

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------
| CALIB            |
| STANDHYD (  5212)|   Area    (ha)=   0.82
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.57         0.25
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.20
     Length            (m)=       6.00       433.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02        22.52
               over (min)        5.00       110.00
     Storage Coeff.  (min)=       0.67 (ii)  107.40 (ii)
     Unit Hyd. Tpeak (min)=       5.00       110.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.031 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.83           5.25
     RUNOFF VOLUME    (mm)=      54.28        27.03          40.58
     TOTAL RAINFALL   (mm)=      54.38        54.38          54.38
     RUNOFF COEFFICIENT   =       1.00         0.50           0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------
| RESERVOIR(  0713)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  5212)      0.820      0.031      5.25       40.58
   OUTFLOW: ID= 1 (  0713)      0.820      0.007      8.33       39.74

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 22.29
                  TIME SHIFT OF PEAK FLOW         (min)=185.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0188

--------------------
| CALIB            |
| STANDHYD (  5211)|   Area    (ha)=   0.42
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.29         0.13
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.20
     Length            (m)=       6.00       220.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02        22.52
               over (min)        5.00        75.00
```

```
     Storage Coeff.  (min)=       0.67 (ii)   71.77 (ii)
     Unit Hyd. Tpeak (min)=       5.00        75.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.017 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.25           5.25
     RUNOFF VOLUME    (mm)=      54.28        27.03          40.56
     TOTAL RAINFALL   (mm)=      54.38        54.38          54.38
     RUNOFF COEFFICIENT   =       1.00         0.50           0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0712)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  5211)      0.420      0.017      5.25       40.56
   OUTFLOW: ID= 1 (  0712)      0.420      0.004      8.00       38.90

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 22.18
                  TIME SHIFT OF PEAK FLOW         (min)=165.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0103

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--------------------
| ADD HYD  ( 52100)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0712):     0.42   0.004     8.00    38.90
     + ID2= 2 (  0713):     0.82   0.007     8.33    39.74
       ================================================
       ID = 3 ( 52100):     1.24   0.011     8.25    39.45

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  5131)|   Area    (ha)=   1.29
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.90         0.39
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.70
     Length            (m)=       6.00       681.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02        22.52
               over (min)        5.00       100.00
     Storage Coeff.  (min)=       0.67 (ii)   96.85 (ii)
     Unit Hyd. Tpeak (min)=       5.00       100.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.01          0.049 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.67           5.25
     RUNOFF VOLUME    (mm)=      54.28        27.03          40.61
     TOTAL RAINFALL   (mm)=      54.38        54.38          54.38
     RUNOFF COEFFICIENT   =       1.00         0.50           0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
```

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0718)					
IN= 2---> OUT= 1					
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)		OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000		0.0150	0.0825

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (5131)	1.290	0.049	5.25	40.61
OUTFLOW: ID= 1 (0718)	1.290	0.007	9.33	39.53

PEAK FLOW REDUCTION [Qout/Qin](%)= 13.70
TIME SHIFT OF PEAK FLOW (min)=245.00
MAXIMUM STORAGE USED (ha.m.)= 0.0369

CALIB	
STANDHYD (5132)	Area (ha)= 0.15
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.10	0.05	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.70	
Length	(m)=	6.00	80.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		25.02	26.43	
over (min)		5.00	30.00	
Storage Coeff. (min)=		0.67 (ii)	25.62 (ii)	
Unit Hyd. Tpeak (min)=		5.00	30.00	
Unit Hyd. peak (cms)=		0.34	0.04	
				TOTALS
PEAK FLOW	(cms)=	0.01	0.00	0.008 (iii)
TIME TO PEAK	(hrs)=	4.50	5.42	5.25
RUNOFF VOLUME	(mm)=	54.28	27.03	40.52
TOTAL RAINFALL	(mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT	=	1.00	0.50	0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0719)					
IN= 2---> OUT= 1					
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)		OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000		0.0150	0.0413

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (5132)	0.150	0.008	5.25	40.52
OUTFLOW: ID= 1 (0719)	0.150	0.001	7.25	35.91

PEAK FLOW REDUCTION [Qout/Qin](%)= 18.89
TIME SHIFT OF PEAK FLOW (min)=120.00
MAXIMUM STORAGE USED (ha.m.)= 0.0040

CALIB	
STANDHYD (5133)	Area (ha)= 0.38
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.27	0.11
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	0.60

Length (m)=	6.00	200.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	25.02	23.83	
over (min)	5.00	50.00	
Storage Coeff. (min)=	0.67 (ii)	47.88 (ii)	
Unit Hyd. Tpeak (min)=	5.00	50.00	
Unit Hyd. peak (cms)=	0.34	0.02	
			TOTALS
PEAK FLOW (cms)=	0.01	0.00	0.017 (iii)
TIME TO PEAK (hrs)=	4.50	5.75	5.25
RUNOFF VOLUME (mm)=	54.28	27.03	40.58
TOTAL RAINFALL (mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT =	1.00	0.50	0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0720)					
IN= 2---> OUT= 1					
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)		OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000		0.0150	0.0413

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (5133)	0.380	0.017	5.25	40.58
OUTFLOW: ID= 1 (0720)	0.380	0.004	7.33	38.75

PEAK FLOW REDUCTION [Qout/Qin](%)= 20.91
TIME SHIFT OF PEAK FLOW (min)=125.00
MAXIMUM STORAGE USED (ha.m.)= 0.0097

CALIB	
STANDHYD (5134)	Area (ha)= 0.38
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.27	0.11
Dep. Storage (mm)=	0.10	5.00
Average Slope (%)=	2.00	0.60
Length (m)=	6.00	200.00
Mannings n =	0.013	0.250
Max.Eff.Inten.(mm/hr)=	25.02	23.83
over (min)	5.00	50.00
Storage Coeff. (min)=	0.67 (ii)	47.88 (ii)
Unit Hyd. Tpeak (min)=	5.00	50.00
Unit Hyd. peak (cms)=	0.34	0.02

			TOTALS
PEAK FLOW (cms)=	0.01	0.00	0.017 (iii)
TIME TO PEAK (hrs)=	4.50	5.75	5.25
RUNOFF VOLUME (mm)=	54.28	27.03	40.58
TOTAL RAINFALL (mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT =	1.00	0.50	0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0721)					
IN= 2---> OUT= 1					
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)		OUTFLOW (cms)	STORAGE (ha.m.)

0.0000 0.0000 | 0.0150 0.0413

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (5134)	0.380	0.017	5.25	40.58
OUTFLOW: ID= 1 (0721)	0.380	0.004	7.33	38.75

PEAK FLOW REDUCTION [Qout/Qin](%)= 20.91
TIME SHIFT OF PEAK FLOW (min)=125.00
MAXIMUM STORAGE USED (ha.m.)= 0.0097

ADD HYD (51300)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0718):	1.29	0.007	9.33	39.53
+ ID2= 2 (0719):	0.15	0.001	7.25	35.91
ID = 3 (51300):	1.44	0.008	8.83	39.15

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (51300)
3 + 2 = 1

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 3 (51300):	1.44	0.008	8.83	39.15
+ ID2= 2 (0720):	0.38	0.004	7.33	38.75
ID = 1 (51300):	1.82	0.011	8.33	39.07

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (51300)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (51300):	1.82	0.011	8.33	39.07
+ ID2= 2 (0721):	0.38	0.004	7.33	38.75
ID = 3 (51300):	2.20	0.015	8.25	39.02

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB
STANDHYD (0011) | Area (ha)= 1.13
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.79	0.34	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	1.50	0.60	
Length (m)=	6.00	596.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	25.02	17.94	
over (min)	5.00	105.00	
Storage Coeff. (min)=	0.73 (ii)	102.56 (ii)	
Unit Hyd. Tpeak (min)=	5.00	105.00	
Unit Hyd. peak (cms)=	0.34	0.01	
			TOTALS
PEAK FLOW (cms)=	0.04	0.01	0.042 (iii)
TIME TO PEAK (hrs)=	4.50	6.83	5.25
RUNOFF VOLUME (mm)=	54.28	22.03	38.10
TOTAL RAINFALL (mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT =	1.00	0.41	0.70

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 69.0 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0722)					
IN= 2---> OUT= 1					
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)		OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000		0.0150	0.0825

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0011)	1.130	0.042	5.25	38.10
OUTFLOW: ID= 1 (0722)	1.130	0.005	9.25	36.87

PEAK FLOW REDUCTION [Qout/Qin](%)= 13.15
TIME SHIFT OF PEAK FLOW (min)=240.00
MAXIMUM STORAGE USED (ha.m.)= 0.0302

CALIB				
STANDHYD (0021)	Area (ha)= 0.58			
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00		
	IMPERVIOUS	PERVIOUS (i)		
Surface Area (ha)=	0.41	0.17		
Dep. Storage (mm)=	0.10	5.00		
Average Slope (%)=	1.50	0.60		
Length (m)=	6.00	304.00		
Mannings n =	0.013	0.250		
Max.Eff.Inten.(mm/hr)=	25.02	16.91		
over (min)	5.00	75.00		
Storage Coeff. (min)=	0.73 (ii)	70.35 (ii)		
Unit Hyd. Tpeak (min)=	5.00	75.00		
Unit Hyd. peak (cms)=	0.34	0.02		
			TOTALS	
PEAK FLOW (cms)=	0.02	0.00	0.022 (iii)	
TIME TO PEAK (hrs)=	4.50	6.25	5.25	
RUNOFF VOLUME (mm)=	54.28	20.88	37.51	
TOTAL RAINFALL (mm)=	54.38	54.38	54.38	
RUNOFF COEFFICIENT =	1.00	0.38	0.69	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB				
STANDHYD (0022)	Area (ha)= 0.60			
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00		
	IMPERVIOUS	PERVIOUS (i)		
Surface Area (ha)=	0.42	0.18		
Dep. Storage (mm)=	0.10	5.00		
Average Slope (%)=	1.50	0.60		
Length (m)=	6.00	314.00		
Mannings n =	0.013	0.250		
Max.Eff.Inten.(mm/hr)=	25.02	16.91		
over (min)	5.00	75.00		
Storage Coeff. (min)=	0.73 (ii)	71.71 (ii)		
Unit Hyd. Tpeak (min)=	5.00	75.00		
Unit Hyd. peak (cms)=	0.34	0.02		
			TOTALS	
PEAK FLOW (cms)=	0.02	0.00	0.023 (iii)	
TIME TO PEAK (hrs)=	4.50	6.25	5.25	
RUNOFF VOLUME (mm)=	54.28	20.88	37.51	
TOTAL RAINFALL (mm)=	54.38	54.38	54.38	
RUNOFF COEFFICIENT =	1.00	0.38	0.69	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0200)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0021):	0.58	0.022	5.25	37.51
	+ ID2= 2 (0022):	0.60	0.023	5.25	37.51
	ID = 3 (0200):	1.18	0.046	5.25	37.51

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB STANDHYD (3121) ID= 1 DT= 5.0 min	Area (ha)= 0.68 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00	IMPERVIOUS	PERVIOUS (i)	
	Surface Area (ha)=	0.48	0.20	
	Dep. Storage (mm)=	0.10	5.00	
	Average Slope (%)=	2.00	4.50	
	Length (m)=	6.00	355.50	
	Mannings n =	0.013	0.250	
	Max.Eff.Inten.(mm/hr)=	25.02	20.72	
	over (min)	5.00	40.00	
	Storage Coeff. (min)=	0.67 (ii)	39.19 (ii)	
	Unit Hyd. Tpeak (min)=	5.00	40.00	
	Unit Hyd. peak (cms)=	0.34	0.03	
				TOTALS
	PEAK FLOW (cms)=	0.02	0.01	0.030 (iii)
	TIME TO PEAK (hrs)=	4.50	5.67	5.25
	RUNOFF VOLUME (mm)=	54.28	22.56	38.39
	TOTAL RAINFALL (mm)=	54.38	54.38	54.38
	RUNOFF COEFFICIENT =	1.00	0.41	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 69.9 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0704) IN= 2---> OUT= 1 DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0150	0.0413

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (3121)	0.680	0.030	5.25	38.39
OUTFLOW: ID= 1 (0704)	0.680	0.006	7.33	37.37

PEAK FLOW REDUCTION [Qout/Qin](%)= 20.01
TIME SHIFT OF PEAK FLOW (min)=125.00
MAXIMUM STORAGE USED (ha.m.)= 0.0167

CALIB STANDHYD (3122) ID= 1 DT= 5.0 min	Area (ha)= 0.86 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00	IMPERVIOUS	PERVIOUS (i)
	Surface Area (ha)=	0.60	0.26

Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.25	
Length	(m)=	6.00	450.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		25.02	18.42	
over (min)		5.00	115.00	
Storage Coeff.	(min)=	0.67 (ii)	111.36 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	115.00	
Unit Hyd. peak	(cms)=	0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.03	0.01	0.031 (iii)
TIME TO PEAK	(hrs)=	4.50	7.00	5.25
RUNOFF VOLUME	(mm)=	54.28	22.56	38.35
TOTAL RAINFALL	(mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT	=	1.00	0.41	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 69.9 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0705)				
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0150	0.0413

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (3122)	0.855	0.031	5.25	38.35
OUTFLOW: ID= 1 (0705)	0.855	0.007	8.25	37.54

PEAK FLOW REDUCTION [Qout/Qin](%)= 21.47
TIME SHIFT OF PEAK FLOW (min)=180.00
MAXIMUM STORAGE USED (ha.m.)= 0.0185

ADD HYD (31200)					
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0704):	0.68	0.006	7.33	37.37
+ ID2= 2 (0705):	0.86	0.007	8.25	37.54
ID = 3 (31200):	1.53	0.013	7.58	37.46

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB				
STANDHYD (6043)	Area (ha)= 1.18			
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00		
	IMPERVIOUS	PERVIOUS (i)		
Surface Area	(ha)= 0.83	0.35		
Dep. Storage	(mm)= 0.10	5.00		
Average Slope	(%)= 2.00	0.50		
Length	(m)= 6.00	620.00		
Mannings n	= 0.013	0.250		
Max.Eff.Inten.(mm/hr)=	25.02	21.93		
over (min)	5.00	105.00		
Storage Coeff.	(min)= 0.67 (ii)	102.32 (ii)		
Unit Hyd. Tpeak	(min)= 5.00	105.00		
Unit Hyd. peak	(cms)= 0.34	0.01		
			TOTALS	
PEAK FLOW	(cms)= 0.04	0.01	0.044 (iii)	
TIME TO PEAK	(hrs)= 4.50	6.75	5.25	
RUNOFF VOLUME	(mm)= 54.28	26.39	40.29	
TOTAL RAINFALL	(mm)= 54.38	54.38	54.38	
RUNOFF COEFFICIENT	= 1.00	0.49	0.74	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.8 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (6201)	Area (ha)= 0.78		
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00	
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.55	0.23	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	2.80	
Length (m)=	6.00	410.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	25.02	25.81	
over (min)	5.00	45.00	
Storage Coeff. (min)=	0.67 (ii)	44.98 (ii)	
Unit Hyd. Tpeak (min)=	5.00	45.00	
Unit Hyd. peak (cms)=	0.34	0.03	
			TOTALS
PEAK FLOW (cms)=	0.03	0.01	0.036 (iii)
TIME TO PEAK (hrs)=	4.50	5.67	5.25
RUNOFF VOLUME (mm)=	54.28	28.50	41.35
TOTAL RAINFALL (mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT =	1.00	0.52	0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 78.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0711)					
IN= 2---> OUT= 1					
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)		OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000		0.0150	0.0413

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (6201)	0.780	0.036	5.25	41.35
OUTFLOW: ID= 1 (0711)	0.780	0.007	7.33	40.47

PEAK FLOW REDUCTION [Qout/Qin](%)= 20.64
TIME SHIFT OF PEAK FLOW (min)=125.00
MAXIMUM STORAGE USED (ha.m.)= 0.0204

CALIB			
STANDHYD (5222)	Area (ha)= 0.74		
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00	
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.52	0.22	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	1.25	
Length (m)=	6.00	388.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	25.02	22.52	
over (min)	5.00	60.00	
Storage Coeff. (min)=	0.67 (ii)	58.34 (ii)	
Unit Hyd. Tpeak (min)=	5.00	60.00	
Unit Hyd. peak (cms)=	0.34	0.02	
			TOTALS
PEAK FLOW (cms)=	0.03	0.01	0.031 (iii)

```
     TIME TO PEAK    (hrs)=       4.50         6.00          5.25
     RUNOFF VOLUME    (mm)=      54.28        27.03         40.61
     TOTAL RAINFALL   (mm)=      54.38        54.38         54.38
     RUNOFF COEFFICIENT   =       1.00         0.50          0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB            |
| STANDHYD (  5223)|   Area    (ha)=   0.82
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.57         0.25
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.50
     Length            (m)=       6.00       432.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02        22.52
                 over (min)       5.00        85.00
     Storage Coeff.  (min)=       0.67 (ii)   81.64 (ii)
     Unit Hyd. Tpeak (min)=       5.00        85.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.032 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.42          5.25
     RUNOFF VOLUME    (mm)=      54.28        27.03         40.60
     TOTAL RAINFALL   (mm)=      54.38        54.38         54.38
     RUNOFF COEFFICIENT   =       1.00         0.50          0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| ADD HYD  ( 52200)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  5222):     0.74   0.031     5.25    40.61
     + ID2= 2 (  5223):     0.82   0.032     5.25    40.60
       ================================================
       ID = 3 ( 52200):     1.56   0.063     5.25    40.60

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| CALIB            |
| STANDHYD (  5221)|   Area    (ha)=   0.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.13         0.05
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         1.25
     Length            (m)=       6.00        97.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02        26.43
                 over (min)       5.00        25.00
     Storage Coeff.  (min)=       0.67 (ii)   24.21 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=       0.34         0.05
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.009 (iii)
```

```
     TIME TO PEAK    (hrs)=       4.50         5.33          5.25
     RUNOFF VOLUME    (mm)=      54.28        27.03         40.56
     TOTAL RAINFALL   (mm)=      54.38        54.38         54.38
     RUNOFF COEFFICIENT   =       1.00         0.50          0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| RESERVOIR(  0714)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0413

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  5221)      0.180      0.009      5.25      40.56
   OUTFLOW: ID= 1 (  0714)      0.180      0.002      7.25      36.68

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 18.56
                  TIME SHIFT OF PEAK FLOW         (min)=120.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0048

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--------------------
| CALIB            |
| STANDHYD (  5111)|   Area    (ha)=   0.85
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.59         0.25
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         5.67
     Length            (m)=       6.00       449.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02        24.97
               over (min)         5.00        40.00
     Storage Coeff.  (min)=       0.67 (ii)   39.04 (ii)
     Unit Hyd. Tpeak (min)=       5.00        40.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.040 (iii)
     TIME TO PEAK    (hrs)=       4.50         5.58          5.25
     RUNOFF VOLUME    (mm)=      54.28        27.03         40.63
     TOTAL RAINFALL   (mm)=      54.38        54.38         54.38
     RUNOFF COEFFICIENT   =       1.00         0.50          0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| RESERVOIR(  0717)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0413

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  5111)      0.850      0.040      5.25      40.63
   OUTFLOW: ID= 1 (  0717)      0.850      0.008      7.33      39.81

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 20.12
                  TIME SHIFT OF PEAK FLOW         (min)=125.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0221
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| CALIB            |
| STANDHYD (  3181)|   Area    (ha)=   0.42
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.29         0.13
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         0.30
     Length            (m)=       6.00       462.10
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02        15.94
               over (min)        5.00       115.00
     Storage Coeff.  (min)=       0.67 (ii)  113.49 (ii)
     Unit Hyd. Tpeak (min)=       5.00       115.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.015 (iii)
     TIME TO PEAK    (hrs)=       4.50         7.00          5.25
     RUNOFF VOLUME    (mm)=      52.38        19.78         35.93
     TOTAL RAINFALL   (mm)=      54.38        54.38         54.38
     RUNOFF COEFFICIENT   =       0.96         0.36          0.66

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  65.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  3182)|   Area    (ha)=   0.46
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.32         0.14
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         0.30
     Length            (m)=       6.00       462.10
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02        15.94
               over (min)        5.00       115.00
     Storage Coeff.  (min)=       0.67 (ii)  113.49 (ii)
     Unit Hyd. Tpeak (min)=       5.00       115.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.00          0.017 (iii)
     TIME TO PEAK    (hrs)=       4.50         7.00          5.25
     RUNOFF VOLUME    (mm)=      52.38        19.78         35.94
     TOTAL RAINFALL   (mm)=      54.38        54.38         54.38
     RUNOFF COEFFICIENT   =       0.96         0.36          0.66

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  65.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  ( 31800)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  3181):     0.42   0.015     5.25    35.93
      + ID2= 2 (  3182):     0.46   0.017     5.25    35.94
        ================================================
        ID = 3 ( 31800):     0.88   0.032     5.25    35.94

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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| CALIB            |
| STANDHYD (  6142)|   Area    (ha)=   1.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.00         0.43
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.25
     Length            (m)=       6.00       753.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02        22.52
               over (min)        5.00       140.00
     Storage Coeff.  (min)=       0.67 (ii)  139.80 (ii)
     Unit Hyd. Tpeak (min)=       5.00       140.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.01          0.052 (iii)
     TIME TO PEAK    (hrs)=       4.50         7.42           5.25
     RUNOFF VOLUME    (mm)=      54.28        27.03          40.60
     TOTAL RAINFALL   (mm)=      54.38        54.38          54.38
     RUNOFF COEFFICIENT   =       1.00         0.50           0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  6143)|   Area    (ha)=   0.71
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.50         0.21
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.90
     Length            (m)=       6.00       372.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02        22.52
               over (min)        5.00        65.00
     Storage Coeff.  (min)=       0.67 (ii)   62.72 (ii)
     Unit Hyd. Tpeak (min)=       5.00        65.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.029 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.08           5.25
     RUNOFF VOLUME    (mm)=      54.28        27.03          40.60
     TOTAL RAINFALL   (mm)=      54.38        54.38          54.38
     RUNOFF COEFFICIENT   =       1.00         0.50           0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0550)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  6142):     1.43   0.052     5.25    40.60
     + ID2= 2 (  6143):     0.71   0.029     5.25    40.60
       ================================================
       ID = 3 (  0550):     2.14   0.081     5.25    40.60

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

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--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0707)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.1238

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0550)      2.140      0.081      5.25      40.60
   OUTFLOW: ID= 1 (  0707)      2.140      0.008     10.42      39.62

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  9.70
                  TIME SHIFT OF PEAK FLOW         (min)=310.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0651

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  6141)|   Area    (ha)=   0.89
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.62         0.27
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.25
     Length            (m)=       6.00       470.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02        22.52
               over (min)        5.00       110.00
     Storage Coeff.  (min)=       0.67 (ii)  105.53 (ii)
     Unit Hyd. Tpeak (min)=       5.00       110.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.033 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.83           5.25
     RUNOFF VOLUME    (mm)=      54.28        27.03          40.59
     TOTAL RAINFALL   (mm)=      54.38        54.38          54.38
     RUNOFF COEFFICIENT   =       1.00         0.50           0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0706)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  6141)      0.890      0.033      5.25      40.59
   OUTFLOW: ID= 1 (  0706)      0.890      0.007      8.33      39.81

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 22.32
                  TIME SHIFT OF PEAK FLOW         (min)=185.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0204

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--------------------
| ADD HYD  ( 61400)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0706):     0.89   0.007     8.33    39.81
     + ID2= 2 (  0707):     2.14   0.008    10.42    39.62
       ================================================
       ID = 3 ( 61400):     3.03   0.015     9.08    39.68
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
```

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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\dca946d8-fa18-4ac0-a689-fd52cf9ef58e\scenar
Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\dca946d8-fa18-4ac0-a689-fd52cf9ef58e\scenar

DATE: 10/07/2016 TIME: 09:43:51

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 3 **
****

READ STORM	Filename: C:\Users\p002311c\AppData\Local\Temp\6647f5f5-a8d6-436e-b676-fc6c608e06b0\636e3041
Ptotal= 62.71 mm	Comments: 10yr/12hr

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	3.50	10.66	6.75	4.39	10.00	0.63
0.50	0.63	3.75	10.66	7.00	4.39	10.25	0.63
0.75	0.63	4.00	10.66	7.25	4.39	10.50	0.63
1.00	0.63	4.25	10.66	7.50	2.51	10.75	0.63
1.25	0.63	4.50	28.84	7.75	2.51	11.00	0.63
1.50	0.63	4.75	28.84	8.00	2.51	11.25	0.63
1.75	0.63	5.00	28.84	8.25	2.51	11.50	0.63
2.00	0.63	5.25	28.84	8.50	1.25	11.75	0.63
2.25	0.63	5.50	8.15	8.75	1.25	12.00	0.63
2.50	3.76	5.75	8.15	9.00	1.25	12.25	0.63
2.75	3.76	6.00	8.15	9.25	1.25		
3.00	3.76	6.25	8.15	9.50	0.63		
3.25	3.76	6.50	4.39	9.75	0.63		

CALIB STANDHYD (3141)	Area (ha)= 0.88
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.62	0.26

Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	3.57
Length	(m)=	6.00	462.10
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	3.76	6.250	8.15	9.33	0.63
0.167	0.00	3.250	3.76	6.333	4.39	9.42	0.63
0.250	0.00	3.333	10.66	6.417	4.39	9.50	0.63
0.333	0.63	3.417	10.66	6.500	4.39	9.58	0.63
0.417	0.63	3.500	10.66	6.583	4.39	9.67	0.63
0.500	0.63	3.583	10.66	6.667	4.39	9.75	0.63
0.583	0.63	3.667	10.66	6.750	4.39	9.83	0.63
0.667	0.63	3.750	10.66	6.833	4.39	9.92	0.63
0.750	0.63	3.833	10.66	6.917	4.39	10.00	0.63
0.833	0.63	3.917	10.66	7.000	4.39	10.08	0.63
0.917	0.63	4.000	10.66	7.083	4.39	10.17	0.63
1.000	0.63	4.083	10.66	7.167	4.39	10.25	0.63
1.083	0.63	4.167	10.66	7.250	4.39	10.33	0.63
1.167	0.63	4.250	10.66	7.333	2.51	10.42	0.63
1.250	0.63	4.333	28.84	7.417	2.51	10.50	0.63
1.333	0.63	4.417	28.84	7.500	2.51	10.58	0.63
1.417	0.63	4.500	28.84	7.583	2.51	10.67	0.63
1.500	0.63	4.583	28.84	7.667	2.51	10.75	0.63
1.583	0.63	4.667	28.84	7.750	2.51	10.83	0.63
1.667	0.63	4.750	28.84	7.833	2.51	10.92	0.63
1.750	0.63	4.833	28.84	7.917	2.51	11.00	0.63
1.833	0.63	4.917	28.84	8.000	2.51	11.08	0.63
1.917	0.63	5.000	28.84	8.083	2.51	11.17	0.63
2.000	0.63	5.083	28.84	8.167	2.51	11.25	0.63
2.083	0.63	5.167	28.84	8.250	2.51	11.33	0.63
2.167	0.63	5.250	28.84	8.333	1.25	11.42	0.63
2.250	0.63	5.333	8.15	8.417	1.25	11.50	0.63
2.333	3.76	5.417	8.15	8.500	1.25	11.58	0.63
2.417	3.76	5.500	8.15	8.583	1.25	11.67	0.63
2.500	3.76	5.583	8.15	8.667	1.25	11.75	0.63
2.583	3.76	5.667	8.15	8.750	1.25	11.83	0.63
2.667	3.76	5.750	8.15	8.833	1.25	11.92	0.63
2.750	3.76	5.833	8.15	8.917	1.25	12.00	0.63
2.833	3.76	5.917	8.15	9.000	1.25	12.08	0.63
2.917	3.76	6.000	8.15	9.083	1.25	12.17	0.63
3.000	3.76	6.083	8.15	9.167	1.25	12.25	0.63
3.083	3.76	6.167	8.15	9.250	1.25		

Max.Eff.Inten.(mm/hr)=		28.84	22.97	
over (min)		5.00	50.00	
Storage Coeff. (min)=		0.63 (ii)	47.01 (ii)	
Unit Hyd. Tpeak (min)=		5.00	50.00	
Unit Hyd. peak (cms)=		0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.04	0.01	0.043 (iii)
TIME TO PEAK	(hrs)=	4.50	5.83	5.25
RUNOFF VOLUME	(mm)=	62.61	26.45	44.50
TOTAL RAINFALL	(mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT	=	1.00	0.42	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (3142)	Area (ha)=	0.52	
ID= 1 DT= 5.0 min	Total Imp(%)=	70.00	Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.36	0.16
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	0.30

Length	(m)=	6.00	274.60	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		28.84	21.59	
over (min)		5.00	75.00	
Storage Coeff. (min)=		0.63 (ii)	73.76 (ii)	
Unit Hyd. Tpeak (min)=		5.00	75.00	
Unit Hyd. peak (cms)=		0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.01	0.023 (iii)
TIME TO PEAK	(hrs)=	4.50	6.25	5.25
RUNOFF VOLUME	(mm)=	62.61	26.45	44.45
TOTAL RAINFALL	(mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT	=	1.00	0.42	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0520)		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (3141):		0.88	0.043	5.25	44.50
+ ID2= 2 (3142):		0.52	0.023	5.25	44.45
ID = 3 (0520):		1.40	0.067	5.25	44.48

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0701)		OUTFLOW	STORAGE	OUTFLOW	STORAGE
IN= 2---> OUT= 1		(cms)	(ha.m.)	(cms)	(ha.m.)
DT= 5.0 min		0.0000	0.0000	0.0150	0.0825

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0520)	1.400	0.067	5.25	44.48
OUTFLOW: ID= 1 (0701)	1.400	0.008	8.33	43.49

PEAK FLOW REDUCTION [Qout/Qin](%)= 12.52
TIME SHIFT OF PEAK FLOW (min)=185.00
MAXIMUM STORAGE USED (ha.m.)= 0.0459

CALIB			
STANDHYD (3143)	Area (ha)=	1.12	
ID= 1 DT= 5.0 min	Total Imp(%)=	70.00	Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.78	0.34	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.30	
Length	(m)=	6.00	590.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		28.84	21.59	
over (min)		5.00	120.00	
Storage Coeff. (min)=		0.63 (ii)	116.35 (ii)	
Unit Hyd. Tpeak (min)=		5.00	120.00	
Unit Hyd. peak (cms)=		0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.04	0.01	0.047 (iii)
TIME TO PEAK	(hrs)=	4.50	7.08	5.25
RUNOFF VOLUME	(mm)=	62.61	26.45	44.47
TOTAL RAINFALL	(mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT	=	1.00	0.42	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

```
       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0702)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0825

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  3143)      1.121      0.047      5.25      44.47
   OUTFLOW: ID= 1 (  0702)      1.121      0.006      9.33      43.23

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 13.20
                  TIME SHIFT OF PEAK FLOW         (min)=245.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0343

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--------------------
| CALIB            |
| STANDHYD (  3144)|   Area    (ha)=   0.85
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.59         0.25
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         4.35
     Length            (m)=       6.00       444.50
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84        23.60
               over (min)         5.00        45.00
     Storage Coeff.  (min)=       0.63 (ii)   42.87 (ii)
     Unit Hyd. Tpeak (min)=       5.00        45.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.043 (iii)
     TIME TO PEAK    (hrs)=       4.50         5.67           5.25
     RUNOFF VOLUME    (mm)=      62.61        26.45          44.50
     TOTAL RAINFALL   (mm)=      62.71        62.71          62.71
     RUNOFF COEFFICIENT   =       1.00         0.42           0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0703)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  3144)      0.845      0.043      5.25      44.50
   OUTFLOW: ID= 1 (  0703)      0.845      0.009      7.33      43.68

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 20.37
                  TIME SHIFT OF PEAK FLOW         (min)=125.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0239

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--------------------
| ADD HYD  ( 31400)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
```

	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0701):	1.40	0.008	8.33	43.49
+ ID2= 2 (0702):	1.12	0.006	9.33	43.23
ID = 3 (31400):	2.52	0.015	8.92	43.37

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (31400)				
3 + 2 = 1	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
ID1= 3 (31400):	2.52	0.015	8.92	43.37
+ ID2= 2 (0703):	0.85	0.009	7.33	43.68
ID = 1 (31400):	3.37	0.023	8.25	43.45

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB STANDHYD (6041) ID= 1 DT= 5.0 min	Area (ha)= 1.07 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00		
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.75	0.32	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	3.10	
Length (m)=	6.00	565.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	28.84	28.99	
over (min)	5.00	55.00	
Storage Coeff. (min)=	0.63 (ii)	50.37 (ii)	
Unit Hyd. Tpeak (min)=	5.00	55.00	
Unit Hyd. peak (cms)=	0.34	0.02	
			TOTALS
PEAK FLOW (cms)=	0.04	0.02	0.054 (iii)
TIME TO PEAK (hrs)=	4.50	5.83	5.25
RUNOFF VOLUME (mm)=	62.61	32.90	47.73
TOTAL RAINFALL (mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT =	1.00	0.52	0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.8 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0708) IN= 2---> OUT= 1 DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0150	0.0825

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (6041)	1.070	0.054	5.25	47.73
OUTFLOW: ID= 1 (0708)	1.070	0.007	8.33	46.42

PEAK FLOW REDUCTION [Qout/Qin](%)= 12.67
TIME SHIFT OF PEAK FLOW (min)=185.00
MAXIMUM STORAGE USED (ha.m.)= 0.0380

CALIB STANDHYD (6042) ID= 1 DT= 5.0 min	Area (ha)= 1.52 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00		
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	1.06	0.46	

Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	1.40	
Length	(m)=	6.00	800.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		28.84	27.49	
over (min)		5.00	85.00	
Storage Coeff.	(min)=	0.63 (ii)	80.08 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	85.00	
Unit Hyd. peak	(cms)=	0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.06	0.02	0.069 (iii)
TIME TO PEAK	(hrs)=	4.50	6.42	5.25
RUNOFF VOLUME	(mm)=	62.61	32.90	47.73
TOTAL RAINFALL	(mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT	=	1.00	0.52	0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.8 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0709)				
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0150	0.0825

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (6042)	1.520	0.069	5.25	47.73
OUTFLOW: ID= 1 (0709)	1.520	0.009	9.25	46.81

PEAK FLOW REDUCTION [Qout/Qin](%)= 13.69
TIME SHIFT OF PEAK FLOW (min)=240.00
MAXIMUM STORAGE USED (ha.m.)= 0.0520

ADD HYD (60400)					
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0708):	1.07	0.007	8.33	46.42
+ ID2= 2 (0709):	1.52	0.009	9.25	46.81
ID = 3 (60400):	2.59	0.016	8.83	46.65

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB				
STANDHYD (5212)	Area (ha)= 0.82			
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00		
	IMPERVIOUS	PERVIOUS (i)		
Surface Area	(ha)= 0.57	0.25		
Dep. Storage	(mm)= 0.10	5.00		
Average Slope	(%)= 2.00	0.20		
Length	(m)= 6.00	433.00		
Mannings n	= 0.013	0.250		
Max.Eff.Inten.(mm/hr)=	28.84	28.17		
over (min)	5.00	100.00		
Storage Coeff.	(min)= 0.63 (ii)	98.22 (ii)		
Unit Hyd. Tpeak	(min)= 5.00	100.00		
Unit Hyd. peak	(cms)= 0.34	0.01		
			TOTALS	
PEAK FLOW	(cms)= 0.03	0.01	0.036 (iii)	
TIME TO PEAK	(hrs)= 4.50	6.67	5.25	
RUNOFF VOLUME	(mm)= 62.61	33.63	48.05	
TOTAL RAINFALL	(mm)= 62.71	62.71	62.71	
RUNOFF COEFFICIENT	= 1.00	0.54	0.77	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0713)						
IN= 2---> OUT= 1						
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)		OUTFLOW (cms)	STORAGE (ha.m.)	
	0.0000	0.0000		0.0150	0.0413	

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (5212)	0.820	0.036	5.25	48.05
OUTFLOW: ID= 1 (0713)	0.820	0.008	8.25	47.21

PEAK FLOW REDUCTION [Qout/Qin](%)= 22.70
TIME SHIFT OF PEAK FLOW (min)=180.00
MAXIMUM STORAGE USED (ha.m.)= 0.0226

CALIB			
STANDHYD (5211)		Area (ha)= 0.42	
ID= 1 DT= 5.0 min		Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.29	0.13	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.20	
Length	(m)=	6.00	220.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		28.84	28.17	
over (min)		5.00	70.00	
Storage Coeff.	(min)=	0.63 (ii)	65.64 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	70.00	
Unit Hyd. peak	(cms)=	0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.01	0.020 (iii)
TIME TO PEAK	(hrs)=	4.42	6.17	5.25
RUNOFF VOLUME	(mm)=	62.61	33.63	48.03
TOTAL RAINFALL	(mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT	=	1.00	0.54	0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0712)						
IN= 2---> OUT= 1						
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)		OUTFLOW (cms)	STORAGE (ha.m.)	
	0.0000	0.0000		0.0150	0.0413	

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (5211)	0.420	0.020	5.25	48.03
OUTFLOW: ID= 1 (0712)	0.420	0.004	7.92	46.37

PEAK FLOW REDUCTION [Qout/Qin](%)= 22.25
TIME SHIFT OF PEAK FLOW (min)=160.00
MAXIMUM STORAGE USED (ha.m.)= 0.0123

```
| ADD HYD  ( 52100)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
-------------------           (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0712):     0.42   0.004     7.92    46.37
     + ID2= 2 (  0713):     0.82   0.008     8.25    47.21
       ================================================
       ID = 3 ( 52100):     1.24   0.013     8.25    46.93

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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-------------------
| CALIB            |
| STANDHYD (  5131)|   Area    (ha)=   1.29
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
-------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.90         0.39
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.70
     Length            (m)=       6.00       681.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84        28.17
               over (min)        5.00        90.00
     Storage Coeff.  (min)=       0.63 (ii)   88.56 (ii)
     Unit Hyd. Tpeak (min)=       5.00        90.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.01          0.058 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.50           5.25
     RUNOFF VOLUME    (mm)=      62.61        33.63          48.08
     TOTAL RAINFALL   (mm)=      62.71        62.71          62.71
     RUNOFF COEFFICIENT   =       1.00         0.54           0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-------------------
| RESERVOIR(  0718)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0825

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  5131)      1.290      0.058      5.25      48.08
   OUTFLOW: ID= 1 (  0718)      1.290      0.008      9.25      47.00

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 13.82
                  TIME SHIFT OF PEAK FLOW         (min)=240.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0441

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-------------------
| CALIB            |
| STANDHYD (  5132)|   Area    (ha)=   0.15
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
-------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.10         0.05
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.70
     Length            (m)=       6.00        80.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84        32.59
               over (min)        5.00        25.00
     Storage Coeff.  (min)=       0.63 (ii)   23.58 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=       0.34         0.05
                                                        *TOTALS*
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     PEAK FLOW       (cms)=       0.01         0.00          0.009 (iii)
     TIME TO PEAK    (hrs)=       4.50         5.33           5.25
     RUNOFF VOLUME    (mm)=      62.61        33.63          48.00
     TOTAL RAINFALL   (mm)=      62.71        62.71          62.71
     RUNOFF COEFFICIENT   =       1.00         0.54           0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0719)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  5132)      0.150      0.009      5.25       48.00
   OUTFLOW: ID= 1 (  0719)      0.150      0.002      7.25       43.37

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 18.51
                  TIME SHIFT OF PEAK FLOW         (min)=120.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0047

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--------------------
| CALIB            |
| STANDHYD (  5133)|   Area    (ha)=   0.38
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.27         0.11
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.60
     Length            (m)=       6.00       200.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84        30.34
               over (min)        5.00        45.00
     Storage Coeff.  (min)=       0.63 (ii)   43.50 (ii)
     Unit Hyd. Tpeak (min)=       5.00        45.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.020 (iii)
     TIME TO PEAK    (hrs)=       4.50         5.67           5.25
     RUNOFF VOLUME    (mm)=      62.61        33.63          48.05
     TOTAL RAINFALL   (mm)=      62.71        62.71          62.71
     RUNOFF COEFFICIENT   =       1.00         0.54           0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0720)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  5133)      0.380      0.020      5.25       48.05
   OUTFLOW: ID= 1 (  0720)      0.380      0.004      7.33       46.22

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 20.61
                  TIME SHIFT OF PEAK FLOW         (min)=125.00
```

MAXIMUM STORAGE USED (ha.m.)= 0.0116

CALIB STANDHYD (5134) ID= 1 DT= 5.0 min	Area (ha)= 0.38 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.27	0.11	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.60	
Length	(m)=	6.00	200.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)	=	28.84	30.34	
over (min)		5.00	45.00	
Storage Coeff.	(min)=	0.63 (ii)	43.50 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	45.00	
Unit Hyd. peak	(cms)=	0.34	0.03	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.01	0.020 (iii)
TIME TO PEAK	(hrs)=	4.50	5.67	5.25
RUNOFF VOLUME	(mm)=	62.61	33.63	48.05
TOTAL RAINFALL	(mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT	=	1.00	0.54	0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0721) IN= 2---> OUT= 1 DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0150	0.0413

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (5134)	0.380	0.020	5.25	48.05
OUTFLOW: ID= 1 (0721)	0.380	0.004	7.33	46.22

PEAK FLOW REDUCTION [Qout/Qin](%)= 20.61
TIME SHIFT OF PEAK FLOW (min)=125.00
MAXIMUM STORAGE USED (ha.m.)= 0.0116

ADD HYD (51300) 1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0718):	1.29	0.008	9.25	47.00
+ ID2= 2 (0719):	0.15	0.002	7.25	43.37
ID = 3 (51300):	1.44	0.010	8.75	46.62

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (51300) 3 + 2 = 1	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 3 (51300):	1.44	0.010	8.75	46.62
+ ID2= 2 (0720):	0.38	0.004	7.33	46.22
ID = 1 (51300):	1.82	0.014	8.25	46.54

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD  ( 51300)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 ( 51300):     1.82   0.014     8.25    46.54
      + ID2= 2 (  0721):     0.38   0.004     7.33    46.22
        ================================================
        ID = 3 ( 51300):     2.20   0.018     8.25    46.48

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| CALIB            |
| STANDHYD (  0011)|   Area    (ha)=   1.13
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.79         0.34
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.50         0.60
     Length            (m)=       6.00       596.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84        22.82
               over (min)         5.00        95.00
     Storage Coeff.  (min)=       0.69 (ii)   93.18 (ii)
     Unit Hyd. Tpeak (min)=       5.00        95.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.01          0.049 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.58           5.25
     RUNOFF VOLUME    (mm)=      62.61        27.81          45.17
     TOTAL RAINFALL   (mm)=      62.71        62.71          62.71
     RUNOFF COEFFICIENT   =       1.00         0.44           0.72

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  69.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0722)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0825

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0011)     1.130      0.049      5.25      45.17
   OUTFLOW: ID= 1 (  0722)     1.130      0.007      9.25      43.93

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 13.35
                  TIME SHIFT OF PEAK FLOW         (min)=240.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0361

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--------------------
| CALIB            |
| STANDHYD (  0021)|   Area    (ha)=   0.58
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.41         0.17
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.50         0.60
     Length            (m)=       6.00       304.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84        21.59
               over (min)         5.00        65.00
     Storage Coeff.  (min)=       0.69 (ii)   63.83 (ii)
     Unit Hyd. Tpeak (min)=       5.00        65.00
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     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.027 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.08           5.25
     RUNOFF VOLUME    (mm)=      62.61        26.45          44.47
     TOTAL RAINFALL   (mm)=      62.71        62.71          62.71
     RUNOFF COEFFICIENT   =       1.00         0.42           0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0022)|   Area    (ha)=   0.60
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.42         0.18
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.50         0.60
     Length            (m)=       6.00       314.00
     Mannings n            =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84        21.59
               over (min)         5.00        70.00
     Storage Coeff.  (min)=       0.69 (ii)   65.07 (ii)
     Unit Hyd. Tpeak (min)=       5.00        70.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.027 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.17           5.25
     RUNOFF VOLUME    (mm)=      62.61        26.45          44.47
     TOTAL RAINFALL   (mm)=      62.71        62.71          62.71
     RUNOFF COEFFICIENT   =       1.00         0.42           0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| ADD HYD  (  0200)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0021):     0.58   0.027     5.25    44.47
     + ID2= 2 (  0022):     0.60   0.027     5.25    44.47
       ================================================
       ID = 3 (  0200):     1.18   0.054     5.25    44.47

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  3121)|   Area    (ha)=   0.68
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.48         0.20
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         4.50
     Length            (m)=       6.00       355.50
     Mannings n            =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84        26.68
               over (min)         5.00        40.00
     Storage Coeff.  (min)=       0.63 (ii)   35.45 (ii)
     Unit Hyd. Tpeak (min)=       5.00        40.00
```

```
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.036 (iii)
     TIME TO PEAK    (hrs)=       4.50         5.58           5.25
     RUNOFF VOLUME    (mm)=      62.61        28.45          45.50
     TOTAL RAINFALL   (mm)=      62.71        62.71          62.71
     RUNOFF COEFFICIENT   =       1.00         0.45           0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  69.9    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0704)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  3121)      0.680      0.036      5.25      45.50
   OUTFLOW: ID= 1 (  0704)      0.680      0.007      7.25      44.47

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 19.93
                  TIME SHIFT OF PEAK FLOW         (min)=120.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0199

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  3122)|   Area    (ha)=   0.86
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.60         0.26
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.25
     Length            (m)=       6.00       450.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84        23.39
               over (min)         5.00       105.00
     Storage Coeff.  (min)=       0.63 (ii)  101.24 (ii)
     Unit Hyd. Tpeak (min)=       5.00       105.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.037 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.75           5.25
     RUNOFF VOLUME    (mm)=      62.61        28.45          45.46
     TOTAL RAINFALL   (mm)=      62.71        62.71          62.71
     RUNOFF COEFFICIENT   =       1.00         0.45           0.72

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  69.9    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0705)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  3122)      0.855      0.037      5.25      45.46
   OUTFLOW: ID= 1 (  0705)      0.855      0.008      8.25      44.65
```

PEAK FLOW REDUCTION [Qout/Qin](%)= 21.96
TIME SHIFT OF PEAK FLOW (min)=180.00
MAXIMUM STORAGE USED (ha.m.)= 0.0222

ADD HYD (31200)		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
1 + 2 = 3	ID1= 1 (0704):	0.68	0.007	7.25	44.47
	+ ID2= 2 (0705):	0.86	0.008	8.25	44.65
	ID = 3 (31200):	1.53	0.015	7.67	44.57

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB STANDHYD (6043) ID= 1 DT= 5.0 min	Area (ha)= 1.18 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00	IMPERVIOUS	PERVIOUS (i)	
	Surface Area (ha)=	0.83	0.35	
	Dep. Storage (mm)=	0.10	5.00	
	Average Slope (%)=	2.00	0.50	
	Length (m)=	6.00	620.00	
	Mannings n =	0.013	0.250	
	Max.Eff.Inten.(mm/hr)=	28.84	27.49	
	over (min)	5.00	95.00	
	Storage Coeff. (min)=	0.63 (ii)	93.48 (ii)	
	Unit Hyd. Tpeak (min)=	5.00	95.00	
	Unit Hyd. peak (cms)=	0.34	0.01	
				TOTALS
	PEAK FLOW (cms)=	0.05	0.01	0.052 (iii)
	TIME TO PEAK (hrs)=	4.50	6.58	5.25
	RUNOFF VOLUME (mm)=	62.61	32.90	47.71
	TOTAL RAINFALL (mm)=	62.71	62.71	62.71
	RUNOFF COEFFICIENT =	1.00	0.52	0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.8 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (6201) ID= 1 DT= 5.0 min	Area (ha)= 0.78 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00	IMPERVIOUS	PERVIOUS (i)	
	Surface Area (ha)=	0.55	0.23	
	Dep. Storage (mm)=	0.10	5.00	
	Average Slope (%)=	2.00	2.80	
	Length (m)=	6.00	410.00	
	Mannings n =	0.013	0.250	
	Max.Eff.Inten.(mm/hr)=	28.84	31.91	
	over (min)	5.00	45.00	
	Storage Coeff. (min)=	0.63 (ii)	41.34 (ii)	
	Unit Hyd. Tpeak (min)=	5.00	45.00	
	Unit Hyd. peak (cms)=	0.34	0.03	
				TOTALS
	PEAK FLOW (cms)=	0.03	0.01	0.043 (iii)
	TIME TO PEAK (hrs)=	4.50	5.67	5.25
	RUNOFF VOLUME (mm)=	62.61	35.31	48.93
	TOTAL RAINFALL (mm)=	62.71	62.71	62.71
	RUNOFF COEFFICIENT =	1.00	0.56	0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 78.7 Ia = Dep. Storage (Above)

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0711)					
IN= 2---> OUT= 1					
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)		OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000		0.0150	0.0413

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (6201)	0.780	0.043	5.25	48.93
OUTFLOW: ID= 1 (0711)	0.780	0.009	7.33	48.04

PEAK FLOW REDUCTION [Qout/Qin](%)= 20.57
TIME SHIFT OF PEAK FLOW (min)=125.00
MAXIMUM STORAGE USED (ha.m.)= 0.0243

CALIB			
STANDHYD (5222)	Area (ha)= 0.74		
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00	

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.52	0.22	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	1.25	
Length	(m)=	6.00	388.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		28.84	28.95	
over (min)		5.00	55.00	
Storage Coeff.	(min)=	0.63 (ii)	52.78 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	55.00	
Unit Hyd. peak	(cms)=	0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.03	0.01	0.038 (iii)
TIME TO PEAK	(hrs)=	4.50	5.83	5.25
RUNOFF VOLUME	(mm)=	62.61	33.63	48.08
TOTAL RAINFALL	(mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT	=	1.00	0.54	0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (5223)	Area (ha)= 0.82		
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00	

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.57	0.25	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.50	
Length	(m)=	6.00	432.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		28.84	28.17	
over (min)		5.00	75.00	
Storage Coeff.	(min)=	0.63 (ii)	74.66 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	75.00	
Unit Hyd. peak	(cms)=	0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.03	0.01	0.038 (iii)
TIME TO PEAK	(hrs)=	4.50	6.25	5.25
RUNOFF VOLUME	(mm)=	62.61	33.63	48.07
TOTAL RAINFALL	(mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT	=	1.00	0.54	0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (52200)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (5222):	0.74	0.038	5.25	48.08
	+ ID2= 2 (5223):	0.82	0.038	5.25	48.07
	ID = 3 (52200):	1.56	0.076	5.25	48.08

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB STANDHYD (5221) ID= 1 DT= 5.0 min	Area (ha)= 0.18 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00			
		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.13	0.05	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	1.25	
Length	(m)=	6.00	97.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)	=	28.84	32.59	
over (min)		5.00	25.00	
Storage Coeff.	(min)=	0.63 (ii)	22.28 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	25.00	
Unit Hyd. peak	(cms)=	0.34	0.05	
				TOTALS
PEAK FLOW	(cms)=	0.01	0.00	0.011 (iii)
TIME TO PEAK	(hrs)=	4.50	5.33	5.25
RUNOFF VOLUME	(mm)=	62.61	33.63	48.05
TOTAL RAINFALL	(mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT	=	1.00	0.54	0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0714) IN= 2---> OUT= 1 DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0150	0.0413

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (5221)	0.180	0.011	5.25	48.05
OUTFLOW: ID= 1 (0714)	0.180	0.002	7.25	44.19

PEAK FLOW REDUCTION [Qout/Qin](%)= 18.42
TIME SHIFT OF PEAK FLOW (min)=120.00
MAXIMUM STORAGE USED (ha.m.)= 0.0057

CALIB STANDHYD (5111) ID= 1 DT= 5.0 min	Area (ha)= 0.85 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00			
		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.59	0.25	

Dep. Storage (mm)=	0.10	5.00		
Average Slope (%)=	2.00	5.67		
Length (m)=	6.00	449.00		
Mannings n =	0.013	0.250		
Max.Eff.Inten.(mm/hr)=	28.84	31.54		
over (min)	5.00	40.00		
Storage Coeff. (min)=	0.63 (ii)	35.58 (ii)		
Unit Hyd. Tpeak (min)=	5.00	40.00		
Unit Hyd. peak (cms)=	0.34	0.03		
				TOTALS
PEAK FLOW (cms)=	0.03	0.02		0.048 (iii)
TIME TO PEAK (hrs)=	4.50	5.58		5.25
RUNOFF VOLUME (mm)=	62.61	33.63		48.10
TOTAL RAINFALL (mm)=	62.71	62.71		62.71
RUNOFF COEFFICIENT =	1.00	0.54		0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0717)				
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0150	0.0413

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (5111)	0.850	0.048	5.25	48.10
OUTFLOW: ID= 1 (0717)	0.850	0.010	7.33	47.28

PEAK FLOW REDUCTION [Qout/Qin](%)= 20.00
TIME SHIFT OF PEAK FLOW (min)=125.00
MAXIMUM STORAGE USED (ha.m.)= 0.0263

CALIB				
STANDHYD (3181)	Area (ha)= 0.42			
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00		
	IMPERVIOUS	PERVIOUS (i)		
Surface Area (ha)=	0.29	0.13		
Dep. Storage (mm)=	2.00	5.00		
Average Slope (%)=	2.00	0.30		
Length (m)=	6.00	462.10		
Mannings n =	0.013	0.250		
Max.Eff.Inten.(mm/hr)=	28.84	20.42		
over (min)	5.00	105.00		
Storage Coeff. (min)=	0.63 (ii)	102.82 (ii)		
Unit Hyd. Tpeak (min)=	5.00	105.00		
Unit Hyd. peak (cms)=	0.34	0.01		
				TOTALS
PEAK FLOW (cms)=	0.02	0.00		0.018 (iii)
TIME TO PEAK (hrs)=	4.42	6.83		5.25
RUNOFF VOLUME (mm)=	60.71	25.15		42.79
TOTAL RAINFALL (mm)=	62.71	62.71		62.71
RUNOFF COEFFICIENT =	0.97	0.40		0.68

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 65.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB		
STANDHYD (3182)	Area (ha)=	0.46

|ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.32	0.14	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	2.00	0.30	
Length	(m)=	6.00	462.10	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		28.84	20.42	
over (min)		5.00	105.00	
Storage Coeff.	(min)=	0.63 (ii)	102.82 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	105.00	
Unit Hyd. peak	(cms)=	0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.00	0.020 (iii)
TIME TO PEAK	(hrs)=	4.50	6.83	5.25
RUNOFF VOLUME	(mm)=	60.71	25.15	42.81
TOTAL RAINFALL	(mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT	=	0.97	0.40	0.68

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 65.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (31800)|	AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (3181):		0.42	0.018	5.25	42.79
+ ID2= 2 (3182):		0.46	0.020	5.25	42.81
ID = 3 (31800):		0.88	0.037	5.25	42.80

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB	
STANDHYD (6142)|	Area (ha)= 1.43
ID= 1 DT= 5.0 min		Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	1.00	0.43	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.25	
Length	(m)=	6.00	753.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		28.84	28.17	
over (min)		5.00	130.00	
Storage Coeff.	(min)=	0.63 (ii)	127.83 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	130.00	
Unit Hyd. peak	(cms)=	0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.06	0.01	0.061 (iii)
TIME TO PEAK	(hrs)=	4.50	7.17	5.25
RUNOFF VOLUME	(mm)=	62.61	33.63	48.07
TOTAL RAINFALL	(mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT	=	1.00	0.54	0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (6143)|	Area (ha)= 0.71

```
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.50         0.21
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.90
     Length            (m)=       6.00       372.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=      28.84        28.17
                 over (min)       5.00        60.00
     Storage Coeff.  (min)=       0.63 (ii)   57.37 (ii)
     Unit Hyd. Tpeak (min)=       5.00        60.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.035 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.92           5.25
     RUNOFF VOLUME    (mm)=      62.61        33.63          48.08
     TOTAL RAINFALL   (mm)=      62.71        62.71          62.71
     RUNOFF COEFFICIENT   =       1.00         0.54           0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| ADD HYD  (  0550)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  6142):     1.43   0.061     5.25    48.07
      + ID2= 2 (  6143):     0.71   0.035     5.25    48.08
        ==========================================================
        ID = 3 (  0550):     2.14   0.096     5.25    48.07

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| RESERVOIR(  0707)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.1238

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0550)      2.140      0.096      5.25      48.07
   OUTFLOW: ID= 1 (  0707)      2.140      0.009     10.25      47.10

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  9.80
                  TIME SHIFT OF PEAK FLOW         (min)=300.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0777

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  6141)|   Area    (ha)=   0.89
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.62         0.27
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.25
     Length            (m)=       6.00       470.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=      28.84        28.17
                 over (min)       5.00       100.00
     Storage Coeff.  (min)=       0.63 (ii)   96.50 (ii)
     Unit Hyd. Tpeak (min)=       5.00       100.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.01          0.039 (iii)
```

```
     TIME TO PEAK    (hrs)=       4.50         6.67          5.25
     RUNOFF VOLUME    (mm)=      62.61        33.63         48.06
     TOTAL RAINFALL   (mm)=      62.71        62.71         62.71
     RUNOFF COEFFICIENT   =       1.00         0.54          0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0706)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  6141)      0.890      0.039      5.25      48.06
   OUTFLOW: ID= 1 (  0706)      0.890      0.009      8.25      47.28

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 22.73
                  TIME SHIFT OF PEAK FLOW         (min)=180.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0246

--------------------------------------------------------------------------------

--------------------
| ADD HYD  ( 61400)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0706):     0.89   0.009     8.25    47.28
     + ID2= 2 (  0707):     2.14   0.009    10.25    47.10
       ================================================
       ID = 3 ( 61400):     3.03   0.018     9.00    47.15

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
================================================================================================================

       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

  Output  filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\9efae526-76f9-4e21-9e74-199efcd472d
b\scenar
  Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\9efae526-76f9-4e21-9e74-199efcd472d
b\scenar


DATE: 10/07/2016                          TIME: 09:43:53

USER:
```

COMMENTS: _____

**** SIMULATION NUMBER: 4 ****

READ STORM	Filename: C:\Users\p002311c\AppData\Local\Temp\6647f5f5-a8d6-436e-b676-fc6c608e06b0\db2f2728
Ptotal= 73.10 mm	Comments: 25yr/12hr

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	3.50	12.43	6.75	5.12	10.00	0.73
0.50	0.73	3.75	12.43	7.00	5.12	10.25	0.73
0.75	0.73	4.00	12.43	7.25	5.12	10.50	0.73
1.00	0.73	4.25	12.43	7.50	2.92	10.75	0.73
1.25	0.73	4.50	33.63	7.75	2.92	11.00	0.73
1.50	0.73	4.75	33.63	8.00	2.92	11.25	0.73
1.75	0.73	5.00	33.63	8.25	2.92	11.50	0.73
2.00	0.73	5.25	33.63	8.50	1.46	11.75	0.73
2.25	0.73	5.50	9.50	8.75	1.46	12.00	0.73
2.50	4.39	5.75	9.50	9.00	1.46	12.25	0.73
2.75	4.39	6.00	9.50	9.25	1.46		
3.00	4.39	6.25	9.50	9.50	0.73		
3.25	4.39	6.50	5.12	9.75	0.73		

CALIB STANDHYD (3141)	Area (ha)= 0.88
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.62	0.26
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	3.57
Length	(m)=	6.00	462.10
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	4.39	6.250	9.50	9.33	0.73
0.167	0.00	3.250	4.39	6.333	5.12	9.42	0.73
0.250	0.00	3.333	12.43	6.417	5.12	9.50	0.73
0.333	0.73	3.417	12.43	6.500	5.12	9.58	0.73
0.417	0.73	3.500	12.43	6.583	5.12	9.67	0.73
0.500	0.73	3.583	12.43	6.667	5.12	9.75	0.73
0.583	0.73	3.667	12.43	6.750	5.12	9.83	0.73
0.667	0.73	3.750	12.43	6.833	5.12	9.92	0.73
0.750	0.73	3.833	12.43	6.917	5.12	10.00	0.73
0.833	0.73	3.917	12.43	7.000	5.12	10.08	0.73
0.917	0.73	4.000	12.43	7.083	5.12	10.17	0.73
1.000	0.73	4.083	12.43	7.167	5.12	10.25	0.73
1.083	0.73	4.167	12.43	7.250	5.12	10.33	0.73
1.167	0.73	4.250	12.43	7.333	2.92	10.42	0.73
1.250	0.73	4.333	33.63	7.417	2.92	10.50	0.73
1.333	0.73	4.417	33.63	7.500	2.92	10.58	0.73
1.417	0.73	4.500	33.63	7.583	2.92	10.67	0.73
1.500	0.73	4.583	33.63	7.667	2.92	10.75	0.73
1.583	0.73	4.667	33.63	7.750	2.92	10.83	0.73
1.667	0.73	4.750	33.63	7.833	2.92	10.92	0.73
1.750	0.73	4.833	33.63	7.917	2.92	11.00	0.73
1.833	0.73	4.917	33.63	8.000	2.92	11.08	0.73
1.917	0.73	5.000	33.63	8.083	2.92	11.17	0.73
2.000	0.73	5.083	33.63	8.167	2.92	11.25	0.73
2.083	0.73	5.167	33.63	8.250	2.92	11.33	0.73
2.167	0.73	5.250	33.63	8.333	1.46	11.42	0.73
2.250	0.73	5.333	9.50	8.417	1.46	11.50	0.73

2.333	4.39	5.417	9.50	8.500	1.46	11.58	0.73
2.417	4.39	5.500	9.50	8.583	1.46	11.67	0.73
2.500	4.39	5.583	9.50	8.667	1.46	11.75	0.73
2.583	4.39	5.667	9.50	8.750	1.46	11.83	0.73
2.667	4.39	5.750	9.50	8.833	1.46	11.92	0.73
2.750	4.39	5.833	9.50	8.917	1.46	12.00	0.73
2.833	4.39	5.917	9.50	9.000	1.46	12.08	0.73
2.917	4.39	6.000	9.50	9.083	1.46	12.17	0.73
3.000	4.39	6.083	9.50	9.167	1.46	12.25	0.73
3.083	4.39	6.167	9.50	9.250	1.46		

Max.Eff.Inten.(mm/hr)=	33.63	30.25	
over (min)	5.00	45.00	
Storage Coeff. (min)=	0.59 (ii)	42.13 (ii)	
Unit Hyd. Tpeak (min)=	5.00	45.00	
Unit Hyd. peak (cms)=	0.34	0.03	
			TOTALS
PEAK FLOW (cms)=	0.04	0.02	0.053 (iii)
TIME TO PEAK (hrs)=	4.50	5.67	5.25
RUNOFF VOLUME (mm)=	73.00	33.85	53.40
TOTAL RAINFALL (mm)=	73.10	73.10	73.10
RUNOFF COEFFICIENT =	1.00	0.46	0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (3142)	Area (ha)= 0.52
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.36	0.16	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	0.30	
Length (m)=	6.00	274.60	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	33.63	27.85	
over (min)	5.00	70.00	
Storage Coeff. (min)=	0.59 (ii)	66.64 (ii)	
Unit Hyd. Tpeak (min)=	5.00	70.00	
Unit Hyd. peak (cms)=	0.34	0.02	
			TOTALS
PEAK FLOW (cms)=	0.02	0.01	0.028 (iii)
TIME TO PEAK (hrs)=	4.50	6.17	5.25
RUNOFF VOLUME (mm)=	73.00	33.85	53.35
TOTAL RAINFALL (mm)=	73.10	73.10	73.10
RUNOFF COEFFICIENT =	1.00	0.46	0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0520)					
1 + 2 = 3		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (3141):		0.88	0.053	5.25	53.40
+ ID2= 2 (3142):		0.52	0.028	5.25	53.35
ID = 3 (0520):		1.40	0.081	5.25	53.38

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
| RESERVOIR(  0701)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0825

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0520)     1.400      0.081      5.25      53.38
   OUTFLOW: ID= 1 (  0701)     1.400      0.010      8.33      52.38

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 12.41
                  TIME SHIFT OF PEAK FLOW         (min)=185.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0555

--------------------------------------------------------------------------------
-------------------
| CALIB           |
| STANDHYD (  3143)|   Area    (ha)=   1.12
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
-------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.78         0.34
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.30
     Length            (m)=       6.00       590.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        27.85
               over (min)         5.00       110.00
     Storage Coeff.  (min)=       0.59 (ii)  105.11 (ii)
     Unit Hyd. Tpeak (min)=       5.00       110.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.01          0.056 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.83           5.25
     RUNOFF VOLUME    (mm)=      73.00        33.85          53.38
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       1.00         0.46           0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-------------------
| RESERVOIR(  0702)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0825

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  3143)     1.121      0.056      5.25      53.38
   OUTFLOW: ID= 1 (  0702)     1.121      0.008      9.33      52.13

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 13.50
                  TIME SHIFT OF PEAK FLOW         (min)=245.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0417

--------------------------------------------------------------------------------
-------------------
| CALIB           |
| STANDHYD (  3144)|   Area    (ha)=   0.85
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
-------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.59         0.25
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         4.35
     Length            (m)=       6.00       444.50
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        30.97
```

```
                over (min)        5.00         40.00
     Storage Coeff.  (min)=       0.59 (ii)    38.49 (ii)
     Unit Hyd. Tpeak (min)=       5.00         40.00
     Unit Hyd. peak  (cms)=       0.34          0.03
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.04          0.02          0.052 (iii)
     TIME TO PEAK    (hrs)=       4.50          5.58           5.25
     RUNOFF VOLUME    (mm)=      73.00         33.85          53.40
     TOTAL RAINFALL   (mm)=      73.10         73.10          73.10
     RUNOFF COEFFICIENT   =       1.00          0.46           0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0703)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  3144)      0.845      0.052      5.25      53.40
   OUTFLOW: ID= 1 (  0703)      0.845      0.010      7.33      52.58

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 20.07
                  TIME SHIFT OF PEAK FLOW         (min)=125.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0289

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--------------------
| ADD HYD  ( 31400)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0701):     1.40   0.010     8.33    52.38
     + ID2= 2 (  0702):     1.12   0.008     9.33    52.13
       ================================================
       ID = 3 ( 31400):     2.52   0.018     8.83    52.27

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD  ( 31400)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 ( 31400):     2.52   0.018     8.83    52.27
     + ID2= 2 (  0703):     0.85   0.010     7.33    52.58
       ================================================
       ID = 1 ( 31400):     3.37   0.028     8.25    52.35

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  6041)|   Area    (ha)=   1.07
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.75         0.32
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         3.10
     Length            (m)=       6.00       565.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        37.25
                over (min)        5.00        50.00
     Storage Coeff.  (min)=       0.59 (ii)   45.58 (ii)
     Unit Hyd. Tpeak (min)=       5.00        50.00
```

```
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.02          0.067 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.75           5.25
     RUNOFF VOLUME    (mm)=      73.00        41.38          57.16
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       1.00         0.57           0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0708)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0825

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  6041)      1.070      0.067      5.25      57.16
   OUTFLOW: ID= 1 (  0708)      1.070      0.008      8.33      55.86

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 12.44
                  TIME SHIFT OF PEAK FLOW         (min)=185.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0458

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--------------------
| CALIB            |
| STANDHYD (  6042)|   Area    (ha)=   1.52
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.06         0.46
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         1.40
     Length            (m)=       6.00       800.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        34.78
               over (min)         5.00        75.00
     Storage Coeff.  (min)=       0.59 (ii)   72.91 (ii)
     Unit Hyd. Tpeak (min)=       5.00        75.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.07         0.02          0.084 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.25           5.25
     RUNOFF VOLUME    (mm)=      73.00        41.38          57.16
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       1.00         0.57           0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0709)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0825

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  6042)      1.520      0.084      5.25      57.16
   OUTFLOW: ID= 1 (  0709)      1.520      0.011      9.00      56.24
```

PEAK FLOW REDUCTION [Qout/Qin](%)= 13.64
TIME SHIFT OF PEAK FLOW (min)=225.00
MAXIMUM STORAGE USED (ha.m.)= 0.0629

ADD HYD (60400)		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
1 + 2 = 3	ID1= 1 (0708):	1.07	0.008	8.33	55.86
	+ ID2= 2 (0709):	1.52	0.011	9.00	56.24
	ID = 3 (60400):	2.59	0.020	8.67	56.09

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB STANDHYD (5212) ID= 1 DT= 5.0 min	Area (ha)= 0.82 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00	IMPERVIOUS	PERVIOUS (i)	
	Surface Area (ha)=	0.57	0.25	
	Dep. Storage (mm)=	0.10	5.00	
	Average Slope (%)=	2.00	0.20	
	Length (m)=	6.00	433.00	
	Mannings n =	0.013	0.250	
	Max.Eff.Inten.(mm/hr)=	33.63	35.56	
	over (min)	5.00	90.00	
	Storage Coeff. (min)=	0.59 (ii)	89.50 (ii)	
	Unit Hyd. Tpeak (min)=	5.00	90.00	
	Unit Hyd. peak (cms)=	0.34	0.01	
				TOTALS
	PEAK FLOW (cms)=	0.04	0.01	0.044 (iii)
	TIME TO PEAK (hrs)=	4.42	6.50	5.25
	RUNOFF VOLUME (mm)=	73.00	42.22	57.55
	TOTAL RAINFALL (mm)=	73.10	73.10	73.10
	RUNOFF COEFFICIENT =	1.00	0.58	0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0713) IN= 2---> OUT= 1 DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0150	0.0413

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (5212)	0.820	0.044	5.25	57.55
OUTFLOW: ID= 1 (0713)	0.820	0.010	8.25	56.70

PEAK FLOW REDUCTION [Qout/Qin](%)= 22.99
TIME SHIFT OF PEAK FLOW (min)=180.00
MAXIMUM STORAGE USED (ha.m.)= 0.0275

CALIB STANDHYD (5211) ID= 1 DT= 5.0 min	Area (ha)= 0.42 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00	IMPERVIOUS	PERVIOUS (i)
	Surface Area (ha)=	0.29	0.13
	Dep. Storage (mm)=	0.10	5.00
	Average Slope (%)=	2.00	0.20
	Length (m)=	6.00	220.00
	Mannings n =	0.013	0.250

```
     Max.Eff.Inten.(mm/hr)=      33.63        35.56
               over (min)         5.00        60.00
     Storage Coeff.  (min)=       0.59 (ii)   59.82 (ii)
     Unit Hyd. Tpeak (min)=       5.00        60.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.025 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.92           5.25
     RUNOFF VOLUME    (mm)=      73.00        42.22          57.53
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       1.00         0.58           0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0712)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  5211)      0.420      0.025      5.25      57.53
   OUTFLOW: ID= 1 (  0712)      0.420      0.005      7.75      55.87

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 21.91
                  TIME SHIFT OF PEAK FLOW         (min)=150.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0149

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--------------------
| ADD HYD  ( 52100)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0712):     0.42   0.005     7.75    55.87
     + ID2= 2 (  0713):     0.82   0.010     8.25    56.70
       ================================================
       ID = 3 ( 52100):     1.24   0.015     8.17    56.42

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  5131)|   Area    (ha)=   1.29
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.90         0.39
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.70
     Length            (m)=       6.00       681.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        35.56
               over (min)         5.00        85.00
     Storage Coeff.  (min)=       0.59 (ii)   80.71 (ii)
     Unit Hyd. Tpeak (min)=       5.00        85.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.06         0.02          0.070 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.42           5.25
     RUNOFF VOLUME    (mm)=      73.00        42.22          57.57
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       1.00         0.58           0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
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           CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0718)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0825

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  5131)      1.290      0.070      5.25      57.57
   OUTFLOW: ID= 1 (  0718)      1.290      0.010      9.25      56.49

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 13.92
                  TIME SHIFT OF PEAK FLOW         (min)=240.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0533

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--------------------
| CALIB            |
| STANDHYD (  5132)|   Area    (ha)=   0.15
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.10         0.05
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.70
     Length            (m)=       6.00        80.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        40.51
               over (min)         5.00        25.00
     Storage Coeff.  (min)=       0.59 (ii)   21.63 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=       0.34         0.05
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.011 (iii)
     TIME TO PEAK    (hrs)=       4.50         5.33          5.25
     RUNOFF VOLUME    (mm)=      73.00        42.22         57.52
     TOTAL RAINFALL   (mm)=      73.10        73.10         73.10
     RUNOFF COEFFICIENT   =       1.00         0.58          0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0719)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  5132)      0.150      0.011      5.25      57.52
   OUTFLOW: ID= 1 (  0719)      0.150      0.002      7.17      52.91

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 18.37
                  TIME SHIFT OF PEAK FLOW         (min)=115.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0056

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--------------------
| CALIB            |
| STANDHYD (  5133)|   Area    (ha)=   0.38
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
```

Surface Area (ha)=	0.27	0.11		
Dep. Storage (mm)=	0.10	5.00		
Average Slope (%)=	2.00	0.60		
Length (m)=	6.00	200.00		
Mannings n =	0.013	0.250		
Max.Eff.Inten.(mm/hr)=	33.63	38.71		
over (min)	5.00	40.00		
Storage Coeff. (min)=	0.59 (ii)	39.48 (ii)		
Unit Hyd. Tpeak (min)=	5.00	40.00		
Unit Hyd. peak (cms)=	0.34	0.03		
			TOTALS	
PEAK FLOW (cms)=	0.02	0.01	0.025 (iii)	
TIME TO PEAK (hrs)=	4.42	5.58	5.25	
RUNOFF VOLUME (mm)=	73.00	42.22	57.55	
TOTAL RAINFALL (mm)=	73.10	73.10	73.10	
RUNOFF COEFFICIENT =	1.00	0.58	0.79	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0720)				
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0150	0.0413

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (5133)	0.380	0.025	5.25	57.55
OUTFLOW: ID= 1 (0720)	0.380	0.005	7.33	55.72

PEAK FLOW REDUCTION [Qout/Qin](%)= 20.23
TIME SHIFT OF PEAK FLOW (min)=125.00
MAXIMUM STORAGE USED (ha.m.)= 0.0140

CALIB	
STANDHYD (5134)	Area (ha)= 0.38
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.27	0.11		
Dep. Storage (mm)=	0.10	5.00		
Average Slope (%)=	2.00	0.60		
Length (m)=	6.00	200.00		
Mannings n =	0.013	0.250		
Max.Eff.Inten.(mm/hr)=	33.63	38.71		
over (min)	5.00	40.00		
Storage Coeff. (min)=	0.59 (ii)	39.48 (ii)		
Unit Hyd. Tpeak (min)=	5.00	40.00		
Unit Hyd. peak (cms)=	0.34	0.03		
			TOTALS	
PEAK FLOW (cms)=	0.02	0.01	0.025 (iii)	
TIME TO PEAK (hrs)=	4.42	5.58	5.25	
RUNOFF VOLUME (mm)=	73.00	42.22	57.55	
TOTAL RAINFALL (mm)=	73.10	73.10	73.10	
RUNOFF COEFFICIENT =	1.00	0.58	0.79	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0721)

IN= 2---> OUT= 1					
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)	
	0.0000	0.0000	0.0150	0.0413	

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (5134)	0.380	0.025	5.25	57.55
OUTFLOW: ID= 1 (0721)	0.380	0.005	7.33	55.72

PEAK FLOW REDUCTION [Qout/Qin](%)= 20.23
TIME SHIFT OF PEAK FLOW (min)=125.00
MAXIMUM STORAGE USED (ha.m.)= 0.0140

ADD HYD (51300)					
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	
ID1= 1 (0718):	1.29	0.010	9.25	56.49	
+ ID2= 2 (0719):	0.15	0.002	7.17	52.91	
ID = 3 (51300):	1.44	0.012	8.67	56.12	

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (51300)					
3 + 2 = 1	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	
ID1= 3 (51300):	1.44	0.012	8.67	56.12	
+ ID2= 2 (0720):	0.38	0.005	7.33	55.72	
ID = 1 (51300):	1.82	0.016	8.25	56.04	

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (51300)					
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	
ID1= 1 (51300):	1.82	0.016	8.25	56.04	
+ ID2= 2 (0721):	0.38	0.005	7.33	55.72	
ID = 3 (51300):	2.20	0.021	8.08	55.98	

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB		
STANDHYD (0011)	Area (ha)= 1.13	
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.79	0.34	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	1.50	0.60	
Length (m)=	6.00	596.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	33.63	29.32	
over (min)	5.00	85.00	
Storage Coeff. (min)=	0.65 (ii)	84.32 (ii)	
Unit Hyd. Tpeak (min)=	5.00	85.00	
Unit Hyd. peak (cms)=	0.34	0.01	
			TOTALS
PEAK FLOW (cms)=	0.05	0.01	0.059 (iii)
TIME TO PEAK (hrs)=	4.50	6.42	5.25
RUNOFF VOLUME (mm)=	73.00	35.46	54.19
TOTAL RAINFALL (mm)=	73.10	73.10	73.10
RUNOFF COEFFICIENT =	1.00	0.49	0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

```
       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  69.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0722)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0825

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0011)      1.130      0.059      5.25      54.19
   OUTFLOW: ID= 1 (  0722)      1.130      0.008      9.25      52.96

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 13.48
                  TIME SHIFT OF PEAK FLOW         (min)=240.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0438

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0021)|   Area    (ha)=   0.58
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.41         0.17
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.50         0.60
     Length            (m)=       6.00       304.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        27.85
               over (min)         5.00        60.00
     Storage Coeff.  (min)=       0.65 (ii)   57.67 (ii)
     Unit Hyd. Tpeak (min)=       5.00        60.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.033 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.00           5.25
     RUNOFF VOLUME    (mm)=      73.00        33.85          53.37
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       1.00         0.46           0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0022)|   Area    (ha)=   0.60
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.42         0.18
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.50         0.60
     Length            (m)=       6.00       314.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        27.85
               over (min)         5.00        60.00
     Storage Coeff.  (min)=       0.65 (ii)   58.79 (ii)
     Unit Hyd. Tpeak (min)=       5.00        60.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.034 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.00           5.25
     RUNOFF VOLUME    (mm)=      73.00        33.85          53.37
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     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       1.00         0.46           0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0200)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0021):     0.58   0.033     5.25    53.37
     + ID2= 2 (  0022):     0.60   0.034     5.25    53.37
       ================================================
       ID = 3 (  0200):     1.18   0.066     5.25    53.37

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  3121)|   Area    (ha)=   0.68
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.48         0.20
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         4.50
     Length            (m)=       6.00       355.50
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        33.85
               over (min)         5.00        35.00
     Storage Coeff.  (min)=       0.59 (ii)   32.25 (ii)
     Unit Hyd. Tpeak (min)=       5.00        35.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.045 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.50           5.25
     RUNOFF VOLUME    (mm)=      73.00        36.21          54.57
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       1.00         0.50           0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  69.9    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0704)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  3121)     0.680      0.045      5.25      54.57
   OUTFLOW: ID= 1 (  0704)     0.680      0.009      7.25      53.56

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 19.56
                  TIME SHIFT OF PEAK FLOW         (min)=120.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0240

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  3122)|   Area    (ha)=   0.86
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
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--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.60         0.26
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.25
     Length            (m)=       6.00       450.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        30.00
               over (min)         5.00        95.00
     Storage Coeff.  (min)=       0.59 (ii)   91.68 (ii)
     Unit Hyd. Tpeak (min)=       5.00        95.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.01          0.044 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.58           5.25
     RUNOFF VOLUME    (mm)=      73.00        36.21          54.54
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       1.00         0.50           0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  69.9    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0705)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  3122)      0.855      0.044      5.25      54.54
   OUTFLOW: ID= 1 (  0705)      0.855      0.010      8.25      53.74

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 22.37
                  TIME SHIFT OF PEAK FLOW         (min)=180.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0271

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--------------------
| ADD HYD  ( 31200)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0704):     0.68   0.009     7.25    53.56
      + ID2= 2 (  0705):     0.86   0.010     8.25    53.74
        ================================================
        ID = 3 ( 31200):     1.53   0.018     7.58    53.66

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  6043)|   Area    (ha)=   1.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.83         0.35
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.50
     Length            (m)=       6.00       620.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        34.78
               over (min)         5.00        90.00
     Storage Coeff.  (min)=       0.59 (ii)   85.11 (ii)
     Unit Hyd. Tpeak (min)=       5.00        90.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.06         0.02          0.063 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.50           5.25
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     RUNOFF VOLUME    (mm)=      73.00        41.38          57.15
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       1.00         0.57           0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  6201)|   Area    (ha)=   0.78
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.55         0.23
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         2.80
     Length            (m)=       6.00       410.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        40.44
               over (min)        5.00        40.00
     Storage Coeff.  (min)=       0.59 (ii)   37.62 (ii)
     Unit Hyd. Tpeak (min)=       5.00        40.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.02           0.053 (iii)
     TIME TO PEAK    (hrs)=       4.50         5.58           5.25
     RUNOFF VOLUME    (mm)=      73.00        44.13          58.54
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       1.00         0.60           0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  78.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0711)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  6201)      0.780      0.053      5.25      58.54
   OUTFLOW: ID= 1 (  0711)      0.780      0.011      7.33      57.65

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 20.15
                  TIME SHIFT OF PEAK FLOW         (min)=125.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0293

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--------------------
| CALIB            |
| STANDHYD (  5222)|   Area    (ha)=   0.74
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.52         0.22
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         1.25
     Length            (m)=       6.00       388.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        37.27
               over (min)        5.00        50.00
     Storage Coeff.  (min)=       0.59 (ii)   47.74 (ii)
     Unit Hyd. Tpeak (min)=       5.00        50.00
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     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.02          0.046 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.75           5.25
     RUNOFF VOLUME    (mm)=      73.00        42.22          57.57
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       1.00         0.58           0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  5223)|   Area    (ha)=   0.82
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.57         0.25
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.50
     Length            (m)=       6.00       432.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        35.56
               over (min)         5.00        70.00
     Storage Coeff.  (min)=       0.59 (ii)   68.04 (ii)
     Unit Hyd. Tpeak (min)=       5.00        70.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.01          0.046 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.08           5.25
     RUNOFF VOLUME    (mm)=      73.00        42.22          57.56
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       1.00         0.58           0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  ( 52200)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  5222):     0.74   0.046     5.25    57.57
     + ID2= 2 (  5223):     0.82   0.046     5.25    57.56
       ================================================
       ID = 3 ( 52200):     1.56   0.093     5.25    57.57

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  5221)|   Area    (ha)=   0.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.13         0.05
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         1.25
     Length            (m)=       6.00        97.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        41.03
               over (min)         5.00        25.00
     Storage Coeff.  (min)=       0.59 (ii)   20.34 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
```

```
     Unit Hyd. peak  (cms)=       0.34         0.05
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.01          0.013 (iii)
     TIME TO PEAK    (hrs)=       4.50         5.33           5.25
     RUNOFF VOLUME    (mm)=      73.00        42.22          57.55
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       1.00         0.58           0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0714)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  5221)      0.180      0.013      5.25      57.55
   OUTFLOW: ID= 1 (  0714)      0.180      0.002      7.17      53.71

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 18.27
                  TIME SHIFT OF PEAK FLOW         (min)=115.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0068

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--------------------
| CALIB            |
| STANDHYD (  5111)|   Area    (ha)=   0.85
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.59         0.25
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         5.67
     Length            (m)=       6.00       449.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        39.36
               over (min)         5.00        35.00
     Storage Coeff.  (min)=       0.59 (ii)   32.58 (ii)
     Unit Hyd. Tpeak (min)=       5.00        35.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.02          0.059 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.50           5.25
     RUNOFF VOLUME    (mm)=      73.00        42.22          57.59
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       1.00         0.58           0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0717)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  5111)      0.850      0.059      5.25      57.59
   OUTFLOW: ID= 1 (  0717)      0.850      0.012      7.25      56.77
```

PEAK FLOW REDUCTION [Qout/Qin](%)= 19.59
TIME SHIFT OF PEAK FLOW (min)=120.00
MAXIMUM STORAGE USED (ha.m.)= 0.0317

CALIB STANDHYD (3181)	Area (ha)= 0.42
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.29	0.13	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	2.00	0.30	
Length	(m)=	6.00	462.10	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		33.63	26.44	
over (min)		5.00	95.00	
Storage Coeff. (min)=		0.59 (ii)	92.75 (ii)	
Unit Hyd. Tpeak (min)=		5.00	95.00	
Unit Hyd. peak (cms)=		0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.00	0.021 (iii)
TIME TO PEAK	(hrs)=	4.42	6.58	5.25
RUNOFF VOLUME	(mm)=	71.10	32.29	51.58
TOTAL RAINFALL	(mm)=	73.10	73.10	73.10
RUNOFF COEFFICIENT	=	0.97	0.44	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 65.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (3182)	Area (ha)= 0.46
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.32	0.14	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	2.00	0.30	
Length	(m)=	6.00	462.10	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		33.63	26.44	
over (min)		5.00	95.00	
Storage Coeff. (min)=		0.59 (ii)	92.75 (ii)	
Unit Hyd. Tpeak (min)=		5.00	95.00	
Unit Hyd. peak (cms)=		0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.00	0.023 (iii)
TIME TO PEAK	(hrs)=	4.42	6.58	5.25
RUNOFF VOLUME	(mm)=	71.10	32.29	51.59
TOTAL RAINFALL	(mm)=	73.10	73.10	73.10
RUNOFF COEFFICIENT	=	0.97	0.44	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 65.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (31800)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (3181):	0.42	0.021	5.25	51.58
	+ ID2= 2 (3182):	0.46	0.023	5.25	51.59

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       ID = 3 ( 31800):     0.88   0.045     5.25    51.58

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  6142)|   Area    (ha)=   1.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.00         0.43
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.25
     Length            (m)=       6.00       753.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        35.56
               over (min)         5.00       120.00
     Storage Coeff.  (min)=       0.59 (ii)  116.49 (ii)
     Unit Hyd. Tpeak (min)=       5.00       120.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.07         0.02          0.072 (iii)
     TIME TO PEAK    (hrs)=       4.42         7.00           5.25
     RUNOFF VOLUME    (mm)=      73.00        42.22          57.57
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       1.00         0.58           0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  6143)|   Area    (ha)=   0.71
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.50         0.21
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.90
     Length            (m)=       6.00       372.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        36.45
               over (min)         5.00        55.00
     Storage Coeff.  (min)=       0.59 (ii)   51.77 (ii)
     Unit Hyd. Tpeak (min)=       5.00        55.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.043 (iii)
     TIME TO PEAK    (hrs)=       4.50         5.83           5.25
     RUNOFF VOLUME    (mm)=      73.00        42.22          57.57
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       1.00         0.58           0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0550)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  6142):     1.43   0.072     5.25    57.57
     + ID2= 2 (  6143):     0.71   0.043     5.25    57.57
       ==================================================
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```
       ID = 3 (  0550):     2.14   0.116     5.25    57.57

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| RESERVOIR(  0707)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.1238

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0550)      2.140      0.116      5.25      57.57
   OUTFLOW: ID= 1 (  0707)      2.140      0.011     10.08      56.59

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  9.85
                  TIME SHIFT OF PEAK FLOW         (min)=290.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0939

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--------------------
| CALIB            |
| STANDHYD (  6141)|   Area    (ha)=   0.89
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.62         0.27
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.25
     Length            (m)=       6.00       470.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        35.56
               over (min)         5.00        90.00
     Storage Coeff.  (min)=       0.59 (ii)   87.94 (ii)
     Unit Hyd. Tpeak (min)=       5.00        90.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.01          0.047 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.50          5.25
     RUNOFF VOLUME    (mm)=      73.00        42.22         57.55
     TOTAL RAINFALL   (mm)=      73.10        73.10         73.10
     RUNOFF COEFFICIENT   =       1.00         0.58          0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0706)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  6141)      0.890      0.047      5.25      57.55
   OUTFLOW: ID= 1 (  0706)      0.890      0.011      8.25      56.78

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 23.01
                  TIME SHIFT OF PEAK FLOW         (min)=180.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0299

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--------------------
| ADD HYD  ( 61400)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0706):     0.89   0.011     8.25    56.78
     + ID2= 2 (  0707):     2.14   0.011    10.08    56.59
```

ID = 3 (61400): 3.03 0.022 8.83 56.64

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
```

Developed and Distributed by Civica Infrastructure

***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\acfcc7c7-ba3d-4faa-a148-c042e531e79c\scenar
Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\acfcc7c7-ba3d-4faa-a148-c042e531e79c\scenar

DATE: 10/07/2016 TIME: 09:43:54

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 5 **
****

READ STORM	Filename: C:\Users\p002311c\AppData\Local\Temp\6647f5f5-a8d6-436e-b676-fc6c608e06b0\fd0edd7b
Ptotal= 80.82 mm	Comments: 50yr/12hr

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	3.50	13.74	6.75	5.66	10.00	0.81
0.50	0.81	3.75	13.74	7.00	5.66	10.25	0.81
0.75	0.81	4.00	13.74	7.25	5.66	10.50	0.81
1.00	0.81	4.25	13.74	7.50	3.23	10.75	0.81
1.25	0.81	4.50	37.17	7.75	3.23	11.00	0.81
1.50	0.81	4.75	37.17	8.00	3.23	11.25	0.81
1.75	0.81	5.00	37.17	8.25	3.23	11.50	0.81
2.00	0.81	5.25	37.17	8.50	1.62	11.75	0.81
2.25	0.81	5.50	10.50	8.75	1.62	12.00	0.81
2.50	4.85	5.75	10.50	9.00	1.62	12.25	0.81
2.75	4.85	6.00	10.50	9.25	1.62		
3.00	4.85	6.25	10.50	9.50	0.81		
3.25	4.85	6.50	5.66	9.75	0.81		

CALIB STANDHYD (3141)	Area (ha)= 0.88	
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.62	0.26
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	3.57
Length	(m)=	6.00	462.10
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	4.85	6.250	10.50	9.33	0.81
0.167	0.00	3.250	4.85	6.333	5.66	9.42	0.81
0.250	0.00	3.333	13.74	6.417	5.66	9.50	0.81
0.333	0.81	3.417	13.74	6.500	5.66	9.58	0.81
0.417	0.81	3.500	13.74	6.583	5.66	9.67	0.81
0.500	0.81	3.583	13.74	6.667	5.66	9.75	0.81
0.583	0.81	3.667	13.74	6.750	5.66	9.83	0.81
0.667	0.81	3.750	13.74	6.833	5.66	9.92	0.81
0.750	0.81	3.833	13.74	6.917	5.66	10.00	0.81
0.833	0.81	3.917	13.74	7.000	5.66	10.08	0.81
0.917	0.81	4.000	13.74	7.083	5.66	10.17	0.81
1.000	0.81	4.083	13.74	7.167	5.66	10.25	0.81
1.083	0.81	4.167	13.74	7.250	5.66	10.33	0.81
1.167	0.81	4.250	13.74	7.333	3.23	10.42	0.81
1.250	0.81	4.333	37.17	7.417	3.23	10.50	0.81
1.333	0.81	4.417	37.17	7.500	3.23	10.58	0.81
1.417	0.81	4.500	37.17	7.583	3.23	10.67	0.81
1.500	0.81	4.583	37.17	7.667	3.23	10.75	0.81
1.583	0.81	4.667	37.17	7.750	3.23	10.83	0.81
1.667	0.81	4.750	37.17	7.833	3.23	10.92	0.81
1.750	0.81	4.833	37.17	7.917	3.23	11.00	0.81
1.833	0.81	4.917	37.17	8.000	3.23	11.08	0.81
1.917	0.81	5.000	37.17	8.083	3.23	11.17	0.81
2.000	0.81	5.083	37.17	8.167	3.23	11.25	0.81
2.083	0.81	5.167	37.17	8.250	3.23	11.33	0.81
2.167	0.81	5.250	37.17	8.333	1.62	11.42	0.81
2.250	0.81	5.333	10.50	8.417	1.62	11.50	0.81
2.333	4.85	5.417	10.50	8.500	1.62	11.58	0.81
2.417	4.85	5.500	10.50	8.583	1.62	11.67	0.81
2.500	4.85	5.583	10.50	8.667	1.62	11.75	0.81
2.583	4.85	5.667	10.50	8.750	1.62	11.83	0.81
2.667	4.85	5.750	10.50	8.833	1.62	11.92	0.81
2.750	4.85	5.833	10.50	8.917	1.62	12.00	0.81
2.833	4.85	5.917	10.50	9.000	1.62	12.08	0.81
2.917	4.85	6.000	10.50	9.083	1.62	12.17	0.81
3.000	4.85	6.083	10.50	9.167	1.62	12.25	0.81
3.083	4.85	6.167	10.50	9.250	1.62		

				TOTALS
Max.Eff.Inten.(mm/hr)=		37.17	36.19	
	over (min)	5.00	40.00	
Storage Coeff.	(min)=	0.57 (ii)	39.24 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	40.00	
Unit Hyd. peak	(cms)=	0.34	0.03	
PEAK FLOW	(cms)=	0.05	0.02	0.061 (iii)
TIME TO PEAK	(hrs)=	4.42	5.58	5.25
RUNOFF VOLUME	(mm)=	80.72	39.61	60.14
TOTAL RAINFALL	(mm)=	80.82	80.82	80.82
RUNOFF COEFFICIENT	=	1.00	0.49	0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB		
STANDHYD (3142)	Area (ha)=	0.52
ID= 1 DT= 5.0 min	Total Imp(%)=	70.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)

```
     Surface Area     (ha)=       0.36         0.16
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.30
     Length            (m)=       6.00       274.60
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        32.73
               over (min)        5.00        65.00
     Storage Coeff.  (min)=       0.57 (ii)   62.49 (ii)
     Unit Hyd. Tpeak (min)=       5.00        65.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.032 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.08           5.25
     RUNOFF VOLUME    (mm)=      80.72        39.61          60.10
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.49           0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0520)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  3141):     0.88   0.061     5.25    60.14
     + ID2= 2 (  3142):     0.52   0.032     5.25    60.10
       ================================================
       ID = 3 (  0520):     1.40   0.093     5.25    60.12

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0701)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0825

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0520)      1.400      0.093      5.25      60.12
   OUTFLOW: ID= 1 (  0701)      1.400      0.011      8.33      59.13

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 12.26
                  TIME SHIFT OF PEAK FLOW         (min)=185.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0627

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  3143)|   Area    (ha)=   1.12
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.78         0.34
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.30
     Length            (m)=       6.00       590.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        32.73
               over (min)        5.00       100.00
     Storage Coeff.  (min)=       0.57 (ii)   98.55 (ii)
     Unit Hyd. Tpeak (min)=       5.00       100.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.06         0.01          0.063 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.67           5.25
     RUNOFF VOLUME    (mm)=      80.72        39.61          60.12
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
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     RUNOFF COEFFICIENT   =       1.00         0.49          0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0702)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0825

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  3143)      1.121     0.063      5.25       60.12
   OUTFLOW: ID= 1 (  0702)      1.121     0.009      9.33       58.87

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 13.63
                  TIME SHIFT OF PEAK FLOW         (min)=245.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0474

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--------------------
| CALIB            |
| STANDHYD (  3144)|   Area    (ha)=   0.85
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.59         0.25
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         4.35
     Length            (m)=       6.00       444.50
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        36.19
               over (min)        5.00        40.00
     Storage Coeff.  (min)=       0.57 (ii)   36.17 (ii)
     Unit Hyd. Tpeak (min)=       5.00        40.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.02          0.059 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.58           5.25
     RUNOFF VOLUME    (mm)=      80.72        39.61          60.14
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.49           0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0703)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  3144)      0.845     0.059      5.25       60.14
   OUTFLOW: ID= 1 (  0703)      0.845     0.012      7.33       59.32

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 20.00
                  TIME SHIFT OF PEAK FLOW         (min)=125.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0326

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--------------------
| ADD HYD  ( 31400)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0701):     1.40   0.011     8.33    59.13
     + ID2= 2 (  0702):     1.12   0.009     9.33    58.87
       ================================================
       ID = 3 ( 31400):     2.52   0.020     8.75    59.02

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD  ( 31400)|
|   3 +  2 =  1    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 ( 31400):     2.52   0.020     8.75    59.02
     + ID2= 2 (  0703):     0.85   0.012     7.33    59.32
       ================================================
       ID = 1 ( 31400):     3.37   0.031     8.25    59.09

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  6041)|   Area    (ha)=   1.07
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.75         0.32
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         3.10
     Length            (m)=       6.00       565.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        43.01
               over (min)         5.00        45.00
     Storage Coeff.  (min)=       0.57 (ii)   43.04 (ii)
     Unit Hyd. Tpeak (min)=       5.00        45.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.06         0.03          0.077 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.67           5.25
     RUNOFF VOLUME    (mm)=      80.72        47.88          64.28
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.59           0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0708)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0825

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  6041)     1.070      0.077      5.25      64.28
   OUTFLOW: ID= 1 (  0708)     1.070      0.009      8.33      62.98

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 12.20
                  TIME SHIFT OF PEAK FLOW         (min)=185.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0516

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  6042)|   Area    (ha)=   1.52
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
```

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--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.06         0.46
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         1.40
     Length            (m)=       6.00       800.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        40.34
               over (min)         5.00        70.00
     Storage Coeff.  (min)=       0.57 (ii)   68.72 (ii)
     Unit Hyd. Tpeak (min)=       5.00        70.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.08         0.03          0.095 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.08           5.25
     RUNOFF VOLUME    (mm)=      80.72        47.88          64.27
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.59           0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0709)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0825

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  6042)      1.520      0.095      5.25      64.27
   OUTFLOW: ID= 1 (  0709)      1.520      0.013      8.92      63.35

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 13.57
                  TIME SHIFT OF PEAK FLOW         (min)=220.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0712

--------------------------------------------------------------------------------

--------------------
| ADD HYD  ( 60400)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0708):     1.07   0.009     8.33    62.98
      + ID2= 2 (  0709):     1.52   0.013     8.92    63.35
        ==========================================
        ID = 3 ( 60400):     2.59   0.022     8.58    63.20

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  5212)|   Area    (ha)=   0.82
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.57         0.25
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.20
     Length            (m)=       6.00       433.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        41.18
               over (min)         5.00        85.00
     Storage Coeff.  (min)=       0.57 (ii)   84.41 (ii)
     Unit Hyd. Tpeak (min)=       5.00        85.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.01          0.049 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.42           5.25
```

```
     RUNOFF VOLUME    (mm)=      80.72        48.79          64.70
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.60           0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0713)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  5212)      0.820      0.049      5.25      64.70
   OUTFLOW: ID= 1 (  0713)      0.820      0.011      8.25      63.85

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 23.11
                  TIME SHIFT OF PEAK FLOW         (min)=180.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0312

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  5211)|   Area    (ha)=   0.42
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.29         0.13
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.20
     Length            (m)=       6.00       220.00
     Mannings n             =    0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        41.18
               over (min)         5.00        60.00
     Storage Coeff.  (min)=       0.57 (ii)   56.42 (ii)
     Unit Hyd. Tpeak (min)=       5.00        60.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.028 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.92           5.25
     RUNOFF VOLUME    (mm)=      80.72        48.79          64.68
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.60           0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0712)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  5211)      0.420      0.028      5.25      64.68
   OUTFLOW: ID= 1 (  0712)      0.420      0.006      7.67      63.03

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 21.94
                  TIME SHIFT OF PEAK FLOW         (min)=145.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0168
```

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--------------------
| ADD HYD  ( 52100)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0712):     0.42   0.006     7.67    63.03
      + ID2= 2 (  0713):     0.82   0.011     8.25    63.85
        ================================================
        ID = 3 ( 52100):     1.24   0.017     8.17    63.57

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------
| CALIB            |
| STANDHYD (  5131)|   Area    (ha)=   1.29
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.90          0.39
     Dep. Storage     (mm)=       0.10          5.00
     Average Slope     (%)=       2.00          0.70
     Length            (m)=       6.00        681.00
     Mannings n             =     0.013         0.250

     Max.Eff.Inten.(mm/hr)=      37.17         41.18
                over (min)        5.00         80.00
     Storage Coeff.  (min)=       0.57 (ii)    76.12 (ii)
     Unit Hyd. Tpeak (min)=       5.00         80.00
     Unit Hyd. peak  (cms)=       0.34          0.01
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.07          0.02          0.079 (iii)
     TIME TO PEAK    (hrs)=       4.42          6.25           5.25
     RUNOFF VOLUME    (mm)=      80.72         48.79          64.72
     TOTAL RAINFALL   (mm)=      80.82         80.82          80.82
     RUNOFF COEFFICIENT   =       1.00          0.60           0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------
| RESERVOIR(  0718)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0825

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  5131)      1.290      0.079      5.25      64.72
   OUTFLOW: ID= 1 (  0718)      1.290      0.011      9.17      63.64

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 13.91
                  TIME SHIFT OF PEAK FLOW         (min)=235.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0602

--------------------
| CALIB            |
| STANDHYD (  5132)|   Area    (ha)=   0.15
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.10          0.05
     Dep. Storage     (mm)=       0.10          5.00
     Average Slope     (%)=       2.00          0.70
     Length            (m)=       6.00         80.00
     Mannings n             =     0.013         0.250

     Max.Eff.Inten.(mm/hr)=      37.17         47.01
                over (min)        5.00         25.00
     Storage Coeff.  (min)=       0.57 (ii)    20.39 (ii)
```

```
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=       0.34         0.05
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.013 (iii)
     TIME TO PEAK    (hrs)=       4.50         5.33          5.25
     RUNOFF VOLUME    (mm)=      80.72        48.79         64.68
     TOTAL RAINFALL   (mm)=      80.82        80.82         80.82
     RUNOFF COEFFICIENT   =       1.00         0.60          0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0719)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  5132)      0.150      0.013      5.25      64.68
   OUTFLOW: ID= 1 (  0719)      0.150      0.002      7.08      60.08

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 18.28
                  TIME SHIFT OF PEAK FLOW         (min)=110.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0064

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  5133)|   Area    (ha)=   0.38
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.27         0.11
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.60
     Length            (m)=       6.00       200.00
     Mannings n             =    0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        44.57
                 over (min)       5.00        40.00
     Storage Coeff.  (min)=       0.57 (ii)   37.32 (ii)
     Unit Hyd. Tpeak (min)=       5.00        40.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.029 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.58          5.25
     RUNOFF VOLUME    (mm)=      80.72        48.79         64.70
     TOTAL RAINFALL   (mm)=      80.82        80.82         80.82
     RUNOFF COEFFICIENT   =       1.00         0.60          0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0720)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  5133)      0.380      0.029      5.25      64.70
   OUTFLOW: ID= 1 (  0720)      0.380      0.006      7.33      62.88
```

```
                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 20.15
                  TIME SHIFT OF PEAK FLOW         (min)=125.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0158

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  5134)|   Area    (ha)=   0.38
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.27         0.11
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.60
     Length            (m)=       6.00       200.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        44.57
               over (min)         5.00        40.00
     Storage Coeff.  (min)=       0.57 (ii)   37.32 (ii)
     Unit Hyd. Tpeak (min)=       5.00        40.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.029 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.58           5.25
     RUNOFF VOLUME    (mm)=      80.72        48.79          64.70
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.60           0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0721)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  5134)      0.380      0.029      5.25      64.70
   OUTFLOW: ID= 1 (  0721)      0.380      0.006      7.33      62.88

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 20.15
                  TIME SHIFT OF PEAK FLOW         (min)=125.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0158

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--------------------
| ADD HYD  ( 51300)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0718):     1.29   0.011     9.17    63.64
     + ID2= 2 (  0719):     0.15   0.002     7.08    60.08
       ================================================
       ID = 3 ( 51300):     1.44   0.013     8.58    63.27

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD  ( 51300)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 ( 51300):     1.44   0.013     8.58    63.27
     + ID2= 2 (  0720):     0.38   0.006     7.33    62.88
       ================================================
       ID = 1 ( 51300):     1.82   0.019     8.25    63.19
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (51300)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (51300):	1.82	0.019	8.25	63.19
	+ ID2= 2 (0721):	0.38	0.006	7.33	62.88
	ID = 3 (51300):	2.20	0.024	8.08	63.14

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB STANDHYD (0011) | Area (ha)= 1.13
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.79	0.34
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.50	0.60
Length	(m)=	6.00	596.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		37.17	34.36
over (min)		5.00	80.00
Storage Coeff. (min)=		0.62 (ii)	79.15 (ii)
Unit Hyd. Tpeak (min)=		5.00	80.00
Unit Hyd. peak (cms)=		0.34	0.01

				TOTALS
PEAK FLOW	(cms)=	0.06	0.02	0.067 (iii)
TIME TO PEAK	(hrs)=	4.50	6.33	5.25
RUNOFF VOLUME	(mm)=	80.72	41.40	61.02
TOTAL RAINFALL	(mm)=	80.82	80.82	80.82
RUNOFF COEFFICIENT	=	1.00	0.51	0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 69.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0722)
IN= 2---> OUT= 1
DT= 5.0 min

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0150	0.0825

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0011)	1.130	0.067	5.25	61.02
OUTFLOW: ID= 1 (0722)	1.130	0.009	9.17	59.78

PEAK FLOW REDUCTION [Qout/Qin](%)= 13.53
TIME SHIFT OF PEAK FLOW (min)=235.00
MAXIMUM STORAGE USED (ha.m.)= 0.0496

CALIB STANDHYD (0021) | Area (ha)= 0.58
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.41	0.17
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.50	0.60
Length	(m)=	6.00	304.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		37.17	33.68

```
              over (min)        5.00        55.00
     Storage Coeff.  (min)=     0.62 (ii)   53.48 (ii)
     Unit Hyd. Tpeak (min)=     5.00        55.00
     Unit Hyd. peak  (cms)=     0.34         0.02
                                                    *TOTALS*
     PEAK FLOW       (cms)=     0.03         0.01     0.037 (iii)
     TIME TO PEAK    (hrs)=     4.50         5.83      5.25
     RUNOFF VOLUME    (mm)=    80.72        39.61     60.11
     TOTAL RAINFALL   (mm)=    80.82        80.82     80.82
     RUNOFF COEFFICIENT   =     1.00         0.49      0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0022)|   Area    (ha)=   0.60
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.42         0.18
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.50         0.60
     Length            (m)=       6.00       314.00
     Mannings n            =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        33.68
              over (min)         5.00        55.00
     Storage Coeff.  (min)=      0.62 (ii)   54.51 (ii)
     Unit Hyd. Tpeak (min)=      5.00        55.00
     Unit Hyd. peak  (cms)=      0.34         0.02
                                                    *TOTALS*
     PEAK FLOW       (cms)=      0.03         0.01     0.038 (iii)
     TIME TO PEAK    (hrs)=      4.42         5.92      5.25
     RUNOFF VOLUME    (mm)=     80.72        39.61     60.11
     TOTAL RAINFALL   (mm)=     80.82        80.82     80.82
     RUNOFF COEFFICIENT   =      1.00         0.49      0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0200)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0021):     0.58   0.037     5.25    60.11
     + ID2= 2 (  0022):     0.60   0.038     5.25    60.11
       ================================================
       ID = 3 (  0200):     1.18   0.076     5.25    60.11

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  3121)|   Area    (ha)=   0.68
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.48         0.20
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         4.50
     Length            (m)=       6.00       355.50
     Mannings n            =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        40.03
```

```
              over (min)        5.00         35.00
     Storage Coeff.  (min)=     0.57 (ii)    30.17 (ii)
     Unit Hyd. Tpeak (min)=     5.00         35.00
     Unit Hyd. peak  (cms)=     0.34          0.04
                                                      *TOTALS*
     PEAK FLOW       (cms)=     0.04          0.02       0.051 (iii)
     TIME TO PEAK    (hrs)=     4.42          5.50        5.25
     RUNOFF VOLUME    (mm)=    80.72         42.22       61.44
     TOTAL RAINFALL   (mm)=    80.82         80.82       80.82
     RUNOFF COEFFICIENT   =     1.00          0.52        0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  69.9    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0704)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  3121)      0.680      0.051      5.25      61.44
   OUTFLOW: ID= 1 (  0704)      0.680      0.010      7.25      60.43

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 19.46
                  TIME SHIFT OF PEAK FLOW         (min)=120.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0270

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  3122)|   Area    (ha)=   0.86
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.60         0.26
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.25
     Length            (m)=       6.00       450.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        35.11
              over (min)         5.00        90.00
     Storage Coeff.  (min)=      0.57 (ii)   86.10 (ii)
     Unit Hyd. Tpeak (min)=      5.00        90.00
     Unit Hyd. peak  (cms)=      0.34         0.01
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.04         0.01       0.050 (iii)
     TIME TO PEAK    (hrs)=      4.42         6.50        5.25
     RUNOFF VOLUME    (mm)=     80.72        42.22       61.41
     TOTAL RAINFALL   (mm)=     80.82        80.82       80.82
     RUNOFF COEFFICIENT   =      1.00         0.52        0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  69.9    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0705)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
```

```
   INFLOW : ID= 2 (  3122)      0.855      0.050      5.25      61.41
   OUTFLOW: ID= 1 (  0705)      0.855      0.011      8.25      60.60

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 22.58
                  TIME SHIFT OF PEAK FLOW         (min)=180.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0308
```

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--------------------
| ADD HYD  ( 31200)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0704):     0.68   0.010     7.25    60.43
     + ID2= 2 (  0705):     0.86   0.011     8.25    60.60
       ================================================
       ID = 3 ( 31200):     1.53   0.021     7.58    60.52

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

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--------------------
| CALIB            |
| STANDHYD (  6043)|   Area    (ha)=   1.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.83         0.35
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.50
     Length            (m)=       6.00       620.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        40.34
               over (min)         5.00        85.00
     Storage Coeff.  (min)=       0.57 (ii)   80.22 (ii)
     Unit Hyd. Tpeak (min)=       5.00        85.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.06         0.02          0.071 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.33           5.25
     RUNOFF VOLUME    (mm)=      80.72        47.88          64.26
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.59           0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
--------------------
| CALIB            |
| STANDHYD (  6201)|   Area    (ha)=   0.78
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.55         0.23
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         2.80
     Length            (m)=       6.00       410.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        47.04
               over (min)         5.00        40.00
     Storage Coeff.  (min)=       0.57 (ii)   35.42 (ii)
     Unit Hyd. Tpeak (min)=       5.00        40.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.02          0.060 (iii)
     TIME TO PEAK    (hrs)=       4.50         5.58           5.25
     RUNOFF VOLUME    (mm)=      80.72        50.86          65.76
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.63           0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
```

```
       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  78.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0711)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  6201)      0.780      0.060      5.25      65.76
   OUTFLOW: ID= 1 (  0711)      0.780      0.012      7.33      64.87

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 20.05
                  TIME SHIFT OF PEAK FLOW         (min)=125.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0331

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  5222)|   Area    (ha)=   0.74
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.52         0.22
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         1.25
     Length            (m)=       6.00       388.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        43.83
               over (min)         5.00        45.00
     Storage Coeff.  (min)=       0.57 (ii)   44.75 (ii)
     Unit Hyd. Tpeak (min)=       5.00        45.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.02          0.053 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.67           5.25
     RUNOFF VOLUME    (mm)=      80.72        48.79          64.72
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.60           0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  5223)|   Area    (ha)=   0.82
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.57         0.25
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.50
     Length            (m)=       6.00       432.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        41.18
               over (min)         5.00        65.00
     Storage Coeff.  (min)=       0.57 (ii)   64.17 (ii)
     Unit Hyd. Tpeak (min)=       5.00        65.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.02          0.053 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.00           5.25
     RUNOFF VOLUME    (mm)=      80.72        48.79          64.71
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     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.60           0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  ( 52200)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  5222):     0.74   0.053     5.25    64.72
     + ID2= 2 (  5223):     0.82   0.053     5.25    64.71
       ================================================
       ID = 3 ( 52200):     1.56   0.106     5.25    64.72

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  5221)|   Area    (ha)=   0.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.13         0.05
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         1.25
     Length            (m)=       6.00        97.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        47.01
               over (min)         5.00        20.00
     Storage Coeff.  (min)=       0.57 (ii)   19.27 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.34         0.06
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.01          0.015 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.33          5.25
     RUNOFF VOLUME    (mm)=      80.72        48.79         64.70
     TOTAL RAINFALL   (mm)=      80.82        80.82         80.82
     RUNOFF COEFFICIENT   =       1.00         0.60          0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0714)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  5221)     0.180      0.015      5.25      64.70
   OUTFLOW: ID= 1 (  0714)     0.180      0.003      7.00      60.85

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 18.02
                  TIME SHIFT OF PEAK FLOW         (min)=105.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0076

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--------------------
| CALIB            |
| STANDHYD (  5111)|   Area    (ha)=   0.85
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
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--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.59         0.25
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         5.67
     Length            (m)=       6.00       449.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        45.25
               over (min)         5.00        35.00
     Storage Coeff.  (min)=       0.57 (ii)   30.82 (ii)
     Unit Hyd. Tpeak (min)=       5.00        35.00
     Unit Hyd. peak  (cms)=       0.34         0.04
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.02          0.067 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.50           5.25
     RUNOFF VOLUME    (mm)=      80.72        48.79          64.73
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.60           0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0717)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  5111)      0.850      0.067      5.25      64.73
   OUTFLOW: ID= 1 (  0717)      0.850      0.013      7.25      63.92

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 19.50
                  TIME SHIFT OF PEAK FLOW         (min)=120.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0357

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--------------------
| CALIB            |
| STANDHYD (  3181)|   Area    (ha)=   0.42
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.29         0.13
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         0.30
     Length            (m)=       6.00       462.10
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        31.15
               over (min)         5.00        90.00
     Storage Coeff.  (min)=       0.57 (ii)   86.88 (ii)
     Unit Hyd. Tpeak (min)=       5.00        90.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.024 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.50           5.25
     RUNOFF VOLUME    (mm)=      78.82        37.88          58.23
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       0.98         0.47           0.72

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  65.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB            |
| STANDHYD (  3182)|   Area    (ha)=   0.46
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.32         0.14
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         0.30
     Length            (m)=       6.00       462.10
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        31.15
               over (min)         5.00        90.00
     Storage Coeff.  (min)=       0.57 (ii)   86.88 (ii)
     Unit Hyd. Tpeak (min)=       5.00        90.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.026 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.50           5.25
     RUNOFF VOLUME    (mm)=      78.82        37.88          58.24
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       0.98         0.47           0.72

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  65.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  ( 31800)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  3181):     0.42   0.024     5.25    58.23
      + ID2= 2 (  3182):     0.46   0.026     5.25    58.24
        ==================================================
        ID = 3 ( 31800):     0.88   0.050     5.25    58.24

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  6142)|   Area    (ha)=   1.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.00         0.43
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.25
     Length            (m)=       6.00       753.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        41.18
               over (min)         5.00       110.00
     Storage Coeff.  (min)=       0.57 (ii)  109.85 (ii)
     Unit Hyd. Tpeak (min)=       5.00       110.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.07         0.02          0.081 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.83           5.25
     RUNOFF VOLUME    (mm)=      80.72        48.79          64.71
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.60           0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB            |
| STANDHYD (  6143)|   Area    (ha)=   0.71
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.50         0.21
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.90
     Length            (m)=       6.00       372.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        43.03
               over (min)         5.00        50.00
     Storage Coeff.  (min)=       0.57 (ii)   48.47 (ii)
     Unit Hyd. Tpeak (min)=       5.00        50.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.02          0.050 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.75           5.25
     RUNOFF VOLUME    (mm)=      80.72        48.79          64.72
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.60           0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0550)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  6142):     1.43   0.081     5.25    64.71
     + ID2= 2 (  6143):     0.71   0.050     5.25    64.72
       ================================================
       ID = 3 (  0550):     2.14   0.131     5.25    64.72

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| RESERVOIR(  0707)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.1238

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0550)      2.140      0.131      5.25      64.72
   OUTFLOW: ID= 1 (  0707)      2.140      0.013     10.00      63.74

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  9.82
                  TIME SHIFT OF PEAK FLOW         (min)=285.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.1062

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  6141)|   Area    (ha)=   0.89
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.62         0.27
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.25
     Length            (m)=       6.00       470.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        41.18
               over (min)         5.00        85.00
     Storage Coeff.  (min)=       0.57 (ii)   82.93 (ii)
     Unit Hyd. Tpeak (min)=       5.00        85.00
```

```
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.02          0.053 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.42           5.25
     RUNOFF VOLUME    (mm)=      80.72        48.79          64.71
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.60           0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0706)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  6141)      0.890      0.053      5.25      64.71
   OUTFLOW: ID= 1 (  0706)      0.890      0.012      8.25      63.93

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 23.12
                  TIME SHIFT OF PEAK FLOW         (min)=180.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0340

--------------------------------------------------------------------------------

--------------------
| ADD HYD  ( 61400)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0706):     0.89   0.012     8.25    63.93
      + ID2= 2 (  0707):     2.14   0.013    10.00    63.74
        ================================================
        ID = 3 ( 61400):     3.03   0.025     8.75    63.79

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
================================================================================================================

       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

  Output  filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\16b514b5-72a2-424e-9397-1992aa3348f
9\scenar
  Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\16b514b5-72a2-424e-9397-1992aa3348f
9\scenar


DATE: 10/07/2016                          TIME: 09:43:55
```

USER:

COMMENTS: _____

****
**** SIMULATION NUMBER: 6 ****
****

READ STORM	Filename: C:\Users\p002311c\AppData\Local\Temp\6647f5f5-a8d6-436e-b676-fc6c608e06b0\43140fc3
Ptotal= 88.54 mm	Comments: 100yr/12hr

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	3.50	15.05	6.75	6.20	10.00	0.89
0.50	0.89	3.75	15.05	7.00	6.20	10.25	0.89
0.75	0.89	4.00	15.05	7.25	6.20	10.50	0.89
1.00	0.89	4.25	15.05	7.50	3.54	10.75	0.89
1.25	0.89	4.50	40.71	7.75	3.54	11.00	0.89
1.50	0.89	4.75	40.71	8.00	3.54	11.25	0.89
1.75	0.89	5.00	40.71	8.25	3.54	11.50	0.89
2.00	0.89	5.25	40.71	8.50	1.77	11.75	0.89
2.25	0.89	5.50	11.51	8.75	1.77	12.00	0.89
2.50	5.31	5.75	11.51	9.00	1.77	12.25	0.89
2.75	5.31	6.00	11.51	9.25	1.77		
3.00	5.31	6.25	11.51	9.50	0.89		
3.25	5.31	6.50	6.20	9.75	0.89		

CALIB STANDHYD (3141)	Area (ha)= 0.88
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.62	0.26
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	3.57
Length	(m)=	6.00	462.10
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	5.31	6.250	11.51	9.33	0.89
0.167	0.00	3.250	5.31	6.333	6.20	9.42	0.89
0.250	0.00	3.333	15.05	6.417	6.20	9.50	0.89
0.333	0.89	3.417	15.05	6.500	6.20	9.58	0.89
0.417	0.89	3.500	15.05	6.583	6.20	9.67	0.89
0.500	0.89	3.583	15.05	6.667	6.20	9.75	0.89
0.583	0.89	3.667	15.05	6.750	6.20	9.83	0.89
0.667	0.89	3.750	15.05	6.833	6.20	9.92	0.89
0.750	0.89	3.833	15.05	6.917	6.20	10.00	0.89
0.833	0.89	3.917	15.05	7.000	6.20	10.08	0.89
0.917	0.89	4.000	15.05	7.083	6.20	10.17	0.89
1.000	0.89	4.083	15.05	7.167	6.20	10.25	0.89
1.083	0.89	4.167	15.05	7.250	6.20	10.33	0.89
1.167	0.89	4.250	15.05	7.333	3.54	10.42	0.89
1.250	0.89	4.333	40.71	7.417	3.54	10.50	0.89
1.333	0.89	4.417	40.71	7.500	3.54	10.58	0.89
1.417	0.89	4.500	40.71	7.583	3.54	10.67	0.89
1.500	0.89	4.583	40.71	7.667	3.54	10.75	0.89
1.583	0.89	4.667	40.71	7.750	3.54	10.83	0.89
1.667	0.89	4.750	40.71	7.833	3.54	10.92	0.89
1.750	0.89	4.833	40.71	7.917	3.54	11.00	0.89
1.833	0.89	4.917	40.71	8.000	3.54	11.08	0.89
1.917	0.89	5.000	40.71	8.083	3.54	11.17	0.89
2.000	0.89	5.083	40.71	8.167	3.54	11.25	0.89

2.083	0.89	5.167	40.71	8.250	3.54	11.33	0.89
2.167	0.89	5.250	40.71	8.333	1.77	11.42	0.89
2.250	0.89	5.333	11.51	8.417	1.77	11.50	0.89
2.333	5.31	5.417	11.51	8.500	1.77	11.58	0.89
2.417	5.31	5.500	11.51	8.583	1.77	11.67	0.89
2.500	5.31	5.583	11.51	8.667	1.77	11.75	0.89
2.583	5.31	5.667	11.51	8.750	1.77	11.83	0.89
2.667	5.31	5.750	11.51	8.833	1.77	11.92	0.89
2.750	5.31	5.833	11.51	8.917	1.77	12.00	0.89
2.833	5.31	5.917	11.51	9.000	1.77	12.08	0.89
2.917	5.31	6.000	11.51	9.083	1.77	12.17	0.89
3.000	5.31	6.083	11.51	9.167	1.77	12.25	0.89
3.083	5.31	6.167	11.51	9.250	1.77		

Max.Eff.Inten.(mm/hr)=	40.71	41.56	
over (min)	5.00	40.00	
Storage Coeff. (min)=	0.55 (ii)	37.14 (ii)	
Unit Hyd. Tpeak (min)=	5.00	40.00	
Unit Hyd. peak (cms)=	0.34	0.03	
			TOTALS
PEAK FLOW (cms)=	0.05	0.02	0.068 (iii)
TIME TO PEAK (hrs)=	4.42	5.58	5.25
RUNOFF VOLUME (mm)=	88.44	45.56	66.98
TOTAL RAINFALL (mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT =	1.00	0.51	0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB		
STANDHYD (3142)	Area (ha)=	0.52
ID= 1 DT= 5.0 min	Total Imp(%)=	70.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.36	0.16
Dep. Storage (mm)=	0.10	5.00
Average Slope (%)=	2.00	0.30
Length (m)=	6.00	274.60
Mannings n =	0.013	0.250

Max.Eff.Inten.(mm/hr)=	40.71	37.77	
over (min)	5.00	60.00	
Storage Coeff. (min)=	0.55 (ii)	59.02 (ii)	
Unit Hyd. Tpeak (min)=	5.00	60.00	
Unit Hyd. peak (cms)=	0.34	0.02	
			TOTALS
PEAK FLOW (cms)=	0.03	0.01	0.036 (iii)
TIME TO PEAK (hrs)=	4.42	6.00	5.25
RUNOFF VOLUME (mm)=	88.44	45.56	66.93
TOTAL RAINFALL (mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT =	1.00	0.51	0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0520)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (3141):	0.88	0.068	5.25	66.98
+ ID2= 2 (3142):	0.52	0.036	5.25	66.93
ID = 3 (0520):	1.40	0.104	5.25	66.96

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0701)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0825

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0520)      1.400      0.104      5.25      66.96
   OUTFLOW: ID= 1 (  0701)      1.400      0.013      8.33      65.96

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 12.19
                  TIME SHIFT OF PEAK FLOW         (min)=185.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0700

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  3143)|   Area    (ha)=   1.12
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.78         0.34
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.30
     Length            (m)=       6.00       590.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        37.77
               over (min)        5.00        95.00
     Storage Coeff.  (min)=       0.55 (ii)   93.07 (ii)
     Unit Hyd. Tpeak (min)=       5.00        95.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.06         0.02          0.070 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.58           5.25
     RUNOFF VOLUME    (mm)=      88.44        45.56          66.95
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       1.00         0.51           0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0702)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0825

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  3143)      1.121      0.070      5.25      66.95
   OUTFLOW: ID= 1 (  0702)      1.121      0.010      9.25      65.71

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 13.74
                  TIME SHIFT OF PEAK FLOW         (min)=240.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0531

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  3144)|   Area    (ha)=   0.85
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.59         0.25
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         4.35
     Length            (m)=       6.00       444.50
```

```
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        42.36
               over (min)         5.00        35.00
     Storage Coeff.  (min)=       0.55 (ii)   33.98 (ii)
     Unit Hyd. Tpeak (min)=       5.00        35.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.02          0.067 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.50           5.25
     RUNOFF VOLUME    (mm)=      88.44        45.56          66.97
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       1.00         0.51           0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0703)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  3144)      0.845      0.067      5.25      66.97
   OUTFLOW: ID= 1 (  0703)      0.845      0.013      7.25      66.16

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 19.68
                  TIME SHIFT OF PEAK FLOW         (min)=120.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0365

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--------------------
| ADD HYD  ( 31400)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0701):     1.40   0.013     8.33    65.96
     + ID2= 2 (  0702):     1.12   0.010     9.25    65.71
       ================================================
       ID = 3 ( 31400):     2.52   0.022     8.75    65.85

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD  ( 31400)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 ( 31400):     2.52   0.022     8.75    65.85
     + ID2= 2 (  0703):     0.85   0.013     7.25    66.16
       ================================================
       ID = 1 ( 31400):     3.37   0.035     8.25    65.93

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  6041)|   Area    (ha)=   1.07
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.75         0.32
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         3.10
     Length            (m)=       6.00       565.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        48.86
```

over (min)		5.00	45.00	
Storage Coeff. (min)=		0.55 (ii)	40.91 (ii)	
Unit Hyd. Tpeak (min)=		5.00	45.00	
Unit Hyd. peak (cms)=		0.34	0.03	
				TOTALS
PEAK FLOW	(cms)=	0.06	0.03	0.086 (iii)
TIME TO PEAK	(hrs)=	4.42	5.67	5.25
RUNOFF VOLUME	(mm)=	88.44	54.52	71.46
TOTAL RAINFALL	(mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT	=	1.00	0.62	0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.8 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0708)				
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0150	0.0825

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (6041)	1.070	0.086	5.25	71.46
OUTFLOW: ID= 1 (0708)	1.070	0.010	8.33	70.15

PEAK FLOW REDUCTION [Qout/Qin](%)= 12.15
TIME SHIFT OF PEAK FLOW (min)=185.00
MAXIMUM STORAGE USED (ha.m.)= 0.0575

CALIB			
STANDHYD (6042)	Area (ha)= 1.52		
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00	
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	1.06	0.46	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	1.40	
Length (m)=	6.00	800.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	40.71	46.01	
over (min)	5.00	70.00	
Storage Coeff. (min)=	0.55 (ii)	65.20 (ii)	
Unit Hyd. Tpeak (min)=	5.00	70.00	
Unit Hyd. peak (cms)=	0.34	0.02	
			TOTALS
PEAK FLOW (cms)=	0.09	0.03	0.106 (iii)
TIME TO PEAK (hrs)=	4.42	6.08	5.25
RUNOFF VOLUME (mm)=	88.44	54.53	71.46
TOTAL RAINFALL (mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT =	1.00	0.62	0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.8 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0709)				
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0150	0.0825

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)

```
   INFLOW : ID= 2 (  6042)      1.520      0.106      5.25      71.46
   OUTFLOW: ID= 1 (  0709)      1.520      0.014      8.83      70.54

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 13.60
                  TIME SHIFT OF PEAK FLOW         (min)=215.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0794
```

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--------------------
| ADD HYD  ( 60400)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0708):     1.07   0.010     8.33    70.15
     + ID2= 2 (  0709):     1.52   0.014     8.83    70.54
       ================================================
       ID = 3 ( 60400):     2.59   0.025     8.58    70.38

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

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--------------------
| CALIB            |
| STANDHYD (  5212)|   Area    (ha)=   0.82
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.57         0.25
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.20
     Length            (m)=       6.00       433.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        46.91
               over (min)         5.00        85.00
     Storage Coeff.  (min)=       0.55 (ii)   80.13 (ii)
     Unit Hyd. Tpeak (min)=       5.00        85.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.02          0.055 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.33           5.25
     RUNOFF VOLUME    (mm)=      88.44        55.50          71.92
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       1.00         0.63           0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
--------------------
| RESERVOIR(  0713)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  5212)     0.820      0.055      5.25      71.92
   OUTFLOW: ID= 1 (  0713)     0.820      0.013      8.25      71.07

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 23.29
                  TIME SHIFT OF PEAK FLOW         (min)=180.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0349
```

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--------------------
| CALIB            |
| STANDHYD (  5211)|   Area    (ha)=   0.42
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.29         0.13
     Dep. Storage     (mm)=       0.10         5.00
```

Average Slope	(%)=	2.00	0.20	
Length	(m)=	6.00	220.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		40.71	47.94	
over (min)		5.00	55.00	
Storage Coeff. (min)=		0.55 (ii)	53.10 (ii)	
Unit Hyd. Tpeak (min)=		5.00	55.00	
Unit Hyd. peak (cms)=		0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.01	0.032 (iii)
TIME TO PEAK	(hrs)=	4.42	5.83	5.25
RUNOFF VOLUME	(mm)=	88.44	55.50	71.89
TOTAL RAINFALL	(mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT	=	1.00	0.63	0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0712)				
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0150	0.0413

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (5211)	0.420	0.032	5.25	71.89
OUTFLOW: ID= 1 (0712)	0.420	0.007	7.58	70.24

PEAK FLOW REDUCTION [Qout/Qin](%)= 21.64
TIME SHIFT OF PEAK FLOW (min)=140.00
MAXIMUM STORAGE USED (ha.m.)= 0.0189

ADD HYD (52100)		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
1 + 2 = 3	ID1= 1 (0712):	0.42	0.007	7.58	70.24
	+ ID2= 2 (0713):	0.82	0.013	8.25	71.07
	ID = 3 (52100):	1.24	0.020	8.08	70.79

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB			
STANDHYD (5131)	Area (ha)= 1.29		
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00	
	IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)= 0.90	0.39	
Dep. Storage	(mm)= 0.10	5.00	
Average Slope	(%)= 2.00	0.70	
Length	(m)= 6.00	681.00	
Mannings n	= 0.013	0.250	
Max.Eff.Inten.(mm/hr)=	40.71	46.91	
over (min)	5.00	75.00	
Storage Coeff. (min)=	0.55 (ii)	72.26 (ii)	
Unit Hyd. Tpeak (min)=	5.00	75.00	
Unit Hyd. peak (cms)=	0.34	0.02	
			TOTALS
PEAK FLOW	(cms)= 0.07	0.03	0.088 (iii)
TIME TO PEAK	(hrs)= 4.42	6.17	5.25
RUNOFF VOLUME	(mm)= 88.44	55.50	71.94
TOTAL RAINFALL	(mm)= 88.54	88.54	88.54
RUNOFF COEFFICIENT	= 1.00	0.63	0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0718)						
IN= 2---> OUT= 1						
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)		OUTFLOW (cms)	STORAGE (ha.m.)	
	0.0000	0.0000		0.0150	0.0825	

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (5131)	1.290	0.088	5.25	71.94
OUTFLOW: ID= 1 (0718)	1.290	0.012	9.08	70.86

PEAK FLOW REDUCTION [Qout/Qin](%)= 13.84
TIME SHIFT OF PEAK FLOW (min)=230.00
MAXIMUM STORAGE USED (ha.m.)= 0.0673

CALIB		
STANDHYD (5132)	Area (ha)= 0.15	
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.10	0.05	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.70	
Length	(m)=	6.00	80.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		40.71	53.05	
over (min)		5.00	20.00	
Storage Coeff.	(min)=	0.55 (ii)	19.44 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	20.00	
Unit Hyd. peak	(cms)=	0.34	0.06	
				TOTALS
PEAK FLOW	(cms)=	0.01	0.01	0.014 (iii)
TIME TO PEAK	(hrs)=	4.42	5.33	5.25
RUNOFF VOLUME	(mm)=	88.44	55.50	71.89
TOTAL RAINFALL	(mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT	=	1.00	0.63	0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0719)						
IN= 2---> OUT= 1						
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)		OUTFLOW (cms)	STORAGE (ha.m.)	
	0.0000	0.0000		0.0150	0.0413	

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (5132)	0.150	0.014	5.25	71.89
OUTFLOW: ID= 1 (0719)	0.150	0.003	7.00	67.27

PEAK FLOW REDUCTION [Qout/Qin](%)= 18.04
TIME SHIFT OF PEAK FLOW (min)=105.00
MAXIMUM STORAGE USED (ha.m.)= 0.0071

CALIB	
STANDHYD (5133)	Area (ha)= 0.38

|ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.27	0.11
Dep. Storage (mm)=	0.10	5.00
Average Slope (%)=	2.00	0.60
Length (m)=	6.00	200.00
Mannings n =	0.013	0.250
Max.Eff.Inten.(mm/hr)=	40.71	51.22
over (min)	5.00	40.00
Storage Coeff. (min)=	0.55 (ii)	35.31 (ii)
Unit Hyd. Tpeak (min)=	5.00	40.00
Unit Hyd. peak (cms)=	0.34	0.03

			TOTALS
PEAK FLOW (cms)=	0.02	0.01	0.032 (iii)
TIME TO PEAK (hrs)=	4.42	5.58	5.25
RUNOFF VOLUME (mm)=	88.44	55.50	71.92
TOTAL RAINFALL (mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT =	1.00	0.63	0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0720)
IN= 2---> OUT= 1
DT= 5.0 min

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0150	0.0413

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (5133)	0.380	0.032	5.25	71.92
OUTFLOW: ID= 1 (0720)	0.380	0.006	7.33	70.10

PEAK FLOW REDUCTION [Qout/Qin](%)= 20.06
TIME SHIFT OF PEAK FLOW (min)=125.00
MAXIMUM STORAGE USED (ha.m.)= 0.0176

CALIB
STANDHYD (5134)| Area (ha)= 0.38
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.27	0.11
Dep. Storage (mm)=	0.10	5.00
Average Slope (%)=	2.00	0.60
Length (m)=	6.00	200.00
Mannings n =	0.013	0.250
Max.Eff.Inten.(mm/hr)=	40.71	51.22
over (min)	5.00	40.00
Storage Coeff. (min)=	0.55 (ii)	35.31 (ii)
Unit Hyd. Tpeak (min)=	5.00	40.00
Unit Hyd. peak (cms)=	0.34	0.03

			TOTALS
PEAK FLOW (cms)=	0.02	0.01	0.032 (iii)
TIME TO PEAK (hrs)=	4.42	5.58	5.25
RUNOFF VOLUME (mm)=	88.44	55.50	71.92
TOTAL RAINFALL (mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT =	1.00	0.63	0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
| RESERVOIR(  0721)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  5134)      0.380      0.032      5.25      71.92
   OUTFLOW: ID= 1 (  0721)      0.380      0.006      7.33      70.10

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 20.06
                  TIME SHIFT OF PEAK FLOW         (min)=125.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0176
```

```
| ADD HYD  ( 51300)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0718):     1.29   0.012     9.08    70.86
     + ID2= 2 (  0719):     0.15   0.003     7.00    67.27
       ================================================
       ID = 3 ( 51300):     1.44   0.015     8.50    70.49

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

```
| ADD HYD  ( 51300)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 3 ( 51300):     1.44   0.015     8.50    70.49
     + ID2= 2 (  0720):     0.38   0.006     7.33    70.10
       ================================================
       ID = 1 ( 51300):     1.82   0.021     8.25    70.41

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

```
| ADD HYD  ( 51300)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 ( 51300):     1.82   0.021     8.25    70.41
     + ID2= 2 (  0721):     0.38   0.006     7.33    70.10
       ================================================
       ID = 3 ( 51300):     2.20   0.027     8.00    70.35

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

```
| CALIB            |
| STANDHYD (  0011)|   Area    (ha)=   1.13
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
-------------------

                           IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.79         0.34
    Dep. Storage     (mm)=       0.10         5.00
    Average Slope     (%)=       1.50         0.60
    Length            (m)=       6.00       596.00
    Mannings n           =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=      40.71        39.56
              over (min)         5.00        75.00
    Storage Coeff.  (min)=       0.60 (ii)   74.83 (ii)
    Unit Hyd. Tpeak (min)=       5.00        75.00
    Unit Hyd. peak  (cms)=       0.34         0.02
                                                      *TOTALS*
    PEAK FLOW       (cms)=       0.06         0.02       0.075 (iii)
    TIME TO PEAK    (hrs)=       4.50         6.25        5.25
    RUNOFF VOLUME    (mm)=      88.44        47.51       67.94
    TOTAL RAINFALL   (mm)=      88.54        88.54       88.54
```

```
     RUNOFF COEFFICIENT   =       1.00         0.54          0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  69.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0722)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0825

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0011)      1.130     0.075      5.25      67.94
   OUTFLOW: ID= 1 (  0722)      1.130     0.010      9.00      66.71

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 13.53
                  TIME SHIFT OF PEAK FLOW         (min)=225.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0555

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0021)|   Area    (ha)=   0.58
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.41         0.17
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.50         0.60
     Length            (m)=       6.00       304.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        39.79
               over (min)        5.00        55.00
     Storage Coeff.  (min)=       0.60 (ii)   50.04 (ii)
     Unit Hyd. Tpeak (min)=       5.00        55.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.042 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.83           5.25
     RUNOFF VOLUME    (mm)=      88.44        45.56          66.95
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       1.00         0.51           0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0022)|   Area    (ha)=   0.60
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.42         0.18
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.50         0.60
     Length            (m)=       6.00       314.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        38.82
               over (min)        5.00        55.00
     Storage Coeff.  (min)=       0.60 (ii)   51.51 (ii)
     Unit Hyd. Tpeak (min)=       5.00        55.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
```

PEAK FLOW (cms)=	0.03	0.01	0.043 (iii)
TIME TO PEAK (hrs)=	4.50	5.83	5.25
RUNOFF VOLUME (mm)=	88.44	45.56	66.95
TOTAL RAINFALL (mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT =	1.00	0.51	0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0200)					
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0021):	0.58	0.042	5.25	66.95
+ ID2= 2 (0022):	0.60	0.043	5.25	66.95
ID = 3 (0200):	1.18	0.084	5.25	66.95

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB STANDHYD (3121)	Area (ha)= 0.68		
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00	
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.48	0.20	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	4.50	
Length (m)=	6.00	355.50	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	40.71	45.70	
over (min)	5.00	30.00	
Storage Coeff. (min)=	0.55 (ii)	28.63 (ii)	
Unit Hyd. Tpeak (min)=	5.00	30.00	
Unit Hyd. peak (cms)=	0.34	0.04	
			TOTALS
PEAK FLOW (cms)=	0.04	0.02	0.057 (iii)
TIME TO PEAK (hrs)=	4.42	5.42	5.25
RUNOFF VOLUME (mm)=	88.44	48.40	68.40
TOTAL RAINFALL (mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT =	1.00	0.55	0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 69.9 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0704)				
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0150	0.0413

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (3121)	0.680	0.057	5.25	68.40
OUTFLOW: ID= 1 (0704)	0.680	0.011	7.25	67.38

PEAK FLOW REDUCTION [Qout/Qin](%)= 19.12
TIME SHIFT OF PEAK FLOW (min)=120.00
MAXIMUM STORAGE USED (ha.m.)= 0.0302

```
| CALIB            |
| STANDHYD (  3122)|   Area    (ha)=   0.86
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.60         0.26
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.25
     Length            (m)=       6.00       450.00
     Mannings n            =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        40.38
               over (min)        5.00        85.00
     Storage Coeff.  (min)=       0.55 (ii)   81.43 (ii)
     Unit Hyd. Tpeak (min)=       5.00        85.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.01          0.055 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.42           5.25
     RUNOFF VOLUME    (mm)=      88.44        48.40          68.37
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       1.00         0.55           0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  69.9    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0705)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0413

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  3122)      0.855      0.055      5.25       68.37
   OUTFLOW: ID= 1 (  0705)      0.855      0.013      8.25       67.55

                 PEAK   FLOW   REDUCTION [Qout/Qin](%)= 22.71
                 TIME SHIFT OF PEAK FLOW         (min)=180.00
                 MAXIMUM  STORAGE   USED       (ha.m.)=  0.0345

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--------------------
| ADD HYD  ( 31200)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0704):     0.68   0.011     7.25    67.38
     + ID2= 2 (  0705):     0.86   0.013     8.25    67.55
       ================================================
       ID = 3 ( 31200):     1.53   0.023     7.58    67.48

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  6043)|   Area    (ha)=   1.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.83         0.35
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.50
     Length            (m)=       6.00       620.00
     Mannings n            =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        46.01
               over (min)        5.00        80.00
     Storage Coeff.  (min)=       0.55 (ii)   76.12 (ii)
     Unit Hyd. Tpeak (min)=       5.00        80.00
     Unit Hyd. peak  (cms)=       0.34         0.01
```

				TOTALS
PEAK FLOW	(cms)=	0.07	0.02	0.079 (iii)
TIME TO PEAK	(hrs)=	4.42	6.25	5.25
RUNOFF VOLUME	(mm)=	88.44	54.52	71.45
TOTAL RAINFALL	(mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT	=	1.00	0.62	0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.8 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (6201)	Area (ha)=	0.78	
ID= 1 DT= 5.0 min	Total Imp(%)=	70.00	Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.55	0.23
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	2.80
Length	(m)=	6.00	410.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		40.71	53.09
over (min)		5.00	35.00
Storage Coeff. (min)=		0.55 (ii)	33.76 (ii)
Unit Hyd. Tpeak (min)=		5.00	35.00
Unit Hyd. peak (cms)=		0.34	0.03

				TOTALS
PEAK FLOW	(cms)=	0.04	0.03	0.068 (iii)
TIME TO PEAK	(hrs)=	4.42	5.50	5.25
RUNOFF VOLUME	(mm)=	88.44	57.71	73.05
TOTAL RAINFALL	(mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT	=	1.00	0.65	0.83

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 78.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0711)					
IN= 2---> OUT= 1					
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)	
	0.0000	0.0000	0.0150	0.0413	

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (6201)	0.780	0.068	5.25	73.05
OUTFLOW: ID= 1 (0711)	0.780	0.013	7.25	72.17

PEAK FLOW REDUCTION [Qout/Qin](%)= 19.70
TIME SHIFT OF PEAK FLOW (min)=120.00
MAXIMUM STORAGE USED (ha.m.)= 0.0369

CALIB			
STANDHYD (5222)	Area (ha)=	0.74	
ID= 1 DT= 5.0 min	Total Imp(%)=	70.00	Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.52	0.22
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	1.25
Length	(m)=	6.00	388.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		40.71	49.73

```
              over (min)        5.00        45.00
     Storage Coeff.  (min)=     0.55 (ii)   42.56 (ii)
     Unit Hyd. Tpeak (min)=     5.00        45.00
     Unit Hyd. peak  (cms)=     0.34         0.03
                                                      *TOTALS*
     PEAK FLOW       (cms)=     0.04         0.02       0.060 (iii)
     TIME TO PEAK    (hrs)=     4.42         5.67        5.25
     RUNOFF VOLUME    (mm)=    88.44        55.50       71.94
     TOTAL RAINFALL   (mm)=    88.54        88.54       88.54
     RUNOFF COEFFICIENT   =     1.00         0.63        0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  5223)|   Area    (ha)=   0.82
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      0.57         0.25
     Dep. Storage     (mm)=      0.10         5.00
     Average Slope     (%)=      2.00         0.50
     Length            (m)=      6.00       432.00
     Mannings n             =   0.013        0.250

     Max.Eff.Inten.(mm/hr)=     40.71        46.91
              over (min)        5.00        65.00
     Storage Coeff.  (min)=     0.55 (ii)   60.92 (ii)
     Unit Hyd. Tpeak (min)=     5.00        65.00
     Unit Hyd. peak  (cms)=     0.34         0.02
                                                      *TOTALS*
     PEAK FLOW       (cms)=     0.05         0.02       0.059 (iii)
     TIME TO PEAK    (hrs)=     4.42         6.00        5.25
     RUNOFF VOLUME    (mm)=    88.44        55.50       71.93
     TOTAL RAINFALL   (mm)=    88.54        88.54       88.54
     RUNOFF COEFFICIENT   =     1.00         0.63        0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  ( 52200)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  5222):     0.74   0.060     5.25    71.94
     + ID2= 2 (  5223):     0.82   0.059     5.25    71.93
       ================================================
       ID = 3 ( 52200):     1.56   0.118     5.25    71.93

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  5221)|   Area    (ha)=   0.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=      0.13         0.05
     Dep. Storage     (mm)=      0.10         5.00
     Average Slope     (%)=      2.00         1.25
     Length            (m)=      6.00        97.00
     Mannings n             =   0.013        0.250

     Max.Eff.Inten.(mm/hr)=     40.71        53.05
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```
              over (min)        5.00         20.00
     Storage Coeff.  (min)=     0.55 (ii)    18.37 (ii)
     Unit Hyd. Tpeak (min)=     5.00         20.00
     Unit Hyd. peak  (cms)=     0.34          0.06
                                                        *TOTALS*
     PEAK FLOW       (cms)=     0.01          0.01        0.017 (iii)
     TIME TO PEAK    (hrs)=     4.42          5.25         5.25
     RUNOFF VOLUME    (mm)=    88.44         55.50        71.91
     TOTAL RAINFALL   (mm)=    88.54         88.54        88.54
     RUNOFF COEFFICIENT   =     1.00          0.63         0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0714)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  5221)      0.180      0.017      5.25      71.91
   OUTFLOW: ID= 1 (  0714)      0.180      0.003      6.92      68.08

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 17.97
                  TIME SHIFT OF PEAK FLOW         (min)=100.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0085

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--------------------
| CALIB            |
| STANDHYD (  5111)|   Area    (ha)=   0.85
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.59         0.25
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         5.67
     Length            (m)=       6.00       449.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        51.88
              over (min)         5.00        30.00
     Storage Coeff.  (min)=      0.55 (ii)   29.19 (ii)
     Unit Hyd. Tpeak (min)=      5.00        30.00
     Unit Hyd. peak  (cms)=      0.34         0.04
                                                        *TOTALS*
     PEAK FLOW       (cms)=      0.05         0.03        0.076 (iii)
     TIME TO PEAK    (hrs)=      4.42         5.42         5.25
     RUNOFF VOLUME    (mm)=     88.44        55.50        71.95
     TOTAL RAINFALL   (mm)=     88.54        88.54        88.54
     RUNOFF COEFFICIENT   =      1.00         0.63         0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0717)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
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```
   INFLOW : ID= 2 (  5111)      0.850      0.076      5.25      71.95
   OUTFLOW: ID= 1 (  0717)      0.850      0.014      7.25      71.13

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 19.15
                  TIME SHIFT OF PEAK FLOW         (min)=120.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0398

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--------------------
| CALIB            |
| STANDHYD (  3181)|   Area    (ha)=   0.42
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.29         0.13
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         0.30
     Length            (m)=       6.00       462.10
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        36.04
               over (min)         5.00        85.00
     Storage Coeff.  (min)=       0.55 (ii)   81.97 (ii)
     Unit Hyd. Tpeak (min)=       5.00        85.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.027 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.42           5.25
     RUNOFF VOLUME    (mm)=      86.54        43.66          64.99
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       0.98         0.49           0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  65.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  3182)|   Area    (ha)=   0.46
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.32         0.14
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         0.30
     Length            (m)=       6.00       462.10
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        36.04
               over (min)         5.00        85.00
     Storage Coeff.  (min)=       0.55 (ii)   81.97 (ii)
     Unit Hyd. Tpeak (min)=       5.00        85.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.029 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.42           5.25
     RUNOFF VOLUME    (mm)=      86.54        43.66          65.00
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       0.98         0.49           0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  65.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  ( 31800)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
```

```
  ID1= 1 (  3181):     0.42   0.027     5.25    64.99
+ ID2= 2 (  3182):     0.46   0.029     5.25    65.00
  ================================================
  ID = 3 ( 31800):     0.88   0.056     5.25    64.99

NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  6142)|   Area    (ha)=   1.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.00         0.43
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.25
     Length            (m)=       6.00       753.00
     Mannings n            =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        46.91
               over (min)        5.00       105.00
     Storage Coeff.  (min)=       0.55 (ii)  104.28 (ii)
     Unit Hyd. Tpeak (min)=       5.00       105.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.08         0.02          0.090 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.75           5.25
     RUNOFF VOLUME    (mm)=      88.44        55.50          71.93
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       1.00         0.63           0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  6143)|   Area    (ha)=   0.71
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.50         0.21
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.90
     Length            (m)=       6.00       372.00
     Mannings n            =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        48.88
               over (min)        5.00        50.00
     Storage Coeff.  (min)=       0.55 (ii)   46.06 (ii)
     Unit Hyd. Tpeak (min)=       5.00        50.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.02          0.056 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.75           5.25
     RUNOFF VOLUME    (mm)=      88.44        55.50          71.93
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       1.00         0.63           0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0550)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
```

```
       ID1= 1 (  6142):     1.43   0.090     5.25    71.93
     + ID2= 2 (  6143):     0.71   0.056     5.25    71.93
       ================================================
       ID = 3 (  0550):     2.14   0.146     5.25    71.93

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| RESERVOIR(  0707)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.1238

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0550)      2.140      0.146      5.25      71.93
   OUTFLOW: ID= 1 (  0707)      2.140      0.014      9.83      70.95

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  9.84
                  TIME SHIFT OF PEAK FLOW         (min)=275.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.1186

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--------------------
| CALIB            |
| STANDHYD (  6141)|   Area    (ha)=   0.89
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.62         0.27
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.25
     Length            (m)=       6.00       470.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        46.91
               over (min)         5.00        80.00
     Storage Coeff.  (min)=       0.55 (ii)   78.73 (ii)
     Unit Hyd. Tpeak (min)=       5.00        80.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.02          0.060 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.25           5.25
     RUNOFF VOLUME    (mm)=      88.44        55.50          71.92
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       1.00         0.63           0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0706)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  6141)      0.890      0.060      5.25      71.92
   OUTFLOW: ID= 1 (  0706)      0.890      0.014      8.25      71.14

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 23.14
                  TIME SHIFT OF PEAK FLOW         (min)=180.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0381

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| ADD HYD  ( 61400)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
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	(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0706):	0.89	0.014	8.25	71.14
+ ID2= 2 (0707):	2.14	0.014	9.83	70.95
ID = 3 (61400):	3.03	0.028	8.67	71.01

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
```


***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\db936177-c434-4cff-9768-30520c223bef\scenar
Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\db936177-c434-4cff-9768-30520c223bef\scenar

DATE: 10/07/2016 TIME: 09:43:57

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 7 **
****

READ STORM	Filename: C:\Users\p002311c\AppData\Local\Temp\6647f5f5-a8d6-436e-b676-fc6c608e06b0\d4663e10
Ptotal= 25.00 mm	Comments: 25 mm, 4 hr. chicago dist'n. - water qua

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.17	2.40	1.17	33.60	2.17	3.45	3.17	1.65
0.33	1.95	1.33	38.10	2.33	3.00	3.33	1.80
0.50	2.40	1.50	13.80	2.50	2.70	3.50	1.50
0.67	2.85	1.67	7.35	2.67	2.25	3.67	1.50
0.83	4.65	1.83	5.55	2.83	2.25	3.83	0.75
1.00	9.60	2.00	4.35	3.00	1.95	4.00	0.60

CALIB STANDHYD (3141) ID= 1 DT= 5.0 min	Area (ha)= 0.88 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.62	0.26
Dep. Storage	(mm)=	0.10	5.00

Average Slope	(%)=	2.00	3.57
Length	(m)=	6.00	462.10
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.40	1.083	33.60	2.083	3.45	3.08	1.65
0.167	2.40	1.167	33.60	2.167	3.45	3.17	1.65
0.250	1.95	1.250	38.10	2.250	3.00	3.25	1.80
0.333	1.95	1.333	38.10	2.333	3.00	3.33	1.80
0.417	2.40	1.417	13.80	2.417	2.70	3.42	1.50
0.500	2.40	1.500	13.80	2.500	2.70	3.50	1.50
0.583	2.85	1.583	7.35	2.583	2.25	3.58	1.50
0.667	2.85	1.667	7.35	2.667	2.25	3.67	1.50
0.750	4.65	1.750	5.55	2.750	2.25	3.75	0.75
0.833	4.65	1.833	5.55	2.833	2.25	3.83	0.75
0.917	9.60	1.917	4.35	2.917	1.95	3.92	0.60
1.000	9.60	2.000	4.35	3.000	1.95	4.00	0.60

Max.Eff.Inten.(mm/hr)=	38.10	5.84		
over (min)	5.00	85.00		
Storage Coeff. (min)=	0.56 (ii)	80.77 (ii)		
Unit Hyd. Tpeak (min)=	5.00	85.00		
Unit Hyd. peak (cms)=	0.34	0.01		
			TOTALS	
PEAK FLOW (cms)=	0.05	0.00	0.047 (iii)	
TIME TO PEAK (hrs)=	1.33	2.83	1.33	
RUNOFF VOLUME (mm)=	24.90	4.99	14.89	
TOTAL RAINFALL (mm)=	25.00	25.00	25.00	
RUNOFF COEFFICIENT =	1.00	0.20	0.60	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (3142)	Area (ha)=	0.52	
ID= 1 DT= 5.0 min	Total Imp(%)=	70.00	Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.36	0.16	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.30	
Length	(m)=	6.00	274.60	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		38.10	5.84	
over (min)		5.00	125.00	
Storage Coeff. (min)=		0.56 (ii)	123.95 (ii)	
Unit Hyd. Tpeak (min)=		5.00	125.00	
Unit Hyd. peak (cms)=		0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.03	0.00	0.028 (iii)
TIME TO PEAK	(hrs)=	1.33	3.50	1.33
RUNOFF VOLUME	(mm)=	24.90	4.99	14.80
TOTAL RAINFALL	(mm)=	25.00	25.00	25.00
RUNOFF COEFFICIENT	=	1.00	0.20	0.59

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0520)					
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (3141):	0.88	0.047	1.33	14.89
+ ID2= 2 (3142):	0.52	0.028	1.33	14.80
ID = 3 (0520):	1.40	0.074	1.33	14.86

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0701)					
IN= 2---> OUT= 1					
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)	
	0.0000	0.0000	0.0150	0.0825	

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0520)	1.400	0.074	1.33	14.86
OUTFLOW: ID= 1 (0701)	1.400	0.003	4.00	13.86

PEAK FLOW REDUCTION [Qout/Qin](%)= 4.04
TIME SHIFT OF PEAK FLOW (min)=160.00
MAXIMUM STORAGE USED (ha.m.)= 0.0165

CALIB		
STANDHYD (3143)|	Area (ha)= 1.12	
ID= 1 DT= 5.0 min |	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.78	0.34	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.30	
Length	(m)=	6.00	590.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		38.10	5.84	
over (min)		5.00	200.00	
Storage Coeff. (min)=		0.56 (ii)	195.79 (ii)	
Unit Hyd. Tpeak (min)=		5.00	200.00	
Unit Hyd. peak (cms)=		0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.06	0.00	0.059 (iii)
TIME TO PEAK	(hrs)=	1.33	4.75	1.33
RUNOFF VOLUME	(mm)=	24.90	4.99	14.84
TOTAL RAINFALL	(mm)=	25.00	25.00	25.00
RUNOFF COEFFICIENT	=	1.00	0.20	0.59

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0702)					
IN= 2---> OUT= 1					
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)	
	0.0000	0.0000	0.0150	0.0825	

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (3143)	1.121	0.059	1.33	14.84
OUTFLOW: ID= 1 (0702)	1.121	0.002	3.75	13.60

PEAK FLOW REDUCTION [Qout/Qin](%)= 3.76
TIME SHIFT OF PEAK FLOW (min)=145.00
MAXIMUM STORAGE USED (ha.m.)= 0.0123

```
| CALIB           |
| STANDHYD (  3144)|   Area    (ha)=   0.85
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.59         0.25
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         4.35
     Length            (m)=       6.00       444.50
     Mannings n            =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10         5.84
               over (min)        5.00        75.00
     Storage Coeff.  (min)=       0.56 (ii)   74.41 (ii)
     Unit Hyd. Tpeak (min)=       5.00        75.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.00          0.045 (iii)
     TIME TO PEAK    (hrs)=       1.33         2.67           1.33
     RUNOFF VOLUME    (mm)=      24.90         4.99          14.89
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       1.00         0.20           0.60

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0703)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  3144)      0.845      0.045      1.33       14.89
   OUTFLOW: ID= 1 (  0703)      0.845      0.003      3.67       14.07

                 PEAK   FLOW   REDUCTION [Qout/Qin](%)=  7.19
                 TIME SHIFT OF PEAK FLOW         (min)=140.00
                 MAXIMUM  STORAGE   USED       (ha.m.)=  0.0089

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--------------------
| ADD HYD  ( 31400)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0701):     1.40   0.003     4.00    13.86
     + ID2= 2 (  0702):     1.12   0.002     3.75    13.60
       ================================================
       ID = 3 ( 31400):     2.52   0.005     4.00    13.74

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD  ( 31400)|
|   3 +  2 =  1    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 3 ( 31400):     2.52   0.005     4.00    13.74
     + ID2= 2 (  0703):     0.85   0.003     3.67    14.07
       ================================================
       ID = 1 ( 31400):     3.37   0.008     3.75    13.82

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB           |
| STANDHYD (  6041)|   Area    (ha)=   1.07
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
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                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.75         0.32
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         3.10
     Length            (m)=       6.00       565.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10         8.15
               over (min)         5.00        85.00
     Storage Coeff.  (min)=       0.56 (ii)   83.20 (ii)
     Unit Hyd. Tpeak (min)=       5.00        85.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.06         0.00          0.057 (iii)
     TIME TO PEAK    (hrs)=       1.33         2.83           1.33
     RUNOFF VOLUME    (mm)=      24.90         6.85          15.83
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       1.00         0.27           0.63

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0708)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0825

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  6041)      1.070      0.057      1.33      15.83
   OUTFLOW: ID= 1 (  0708)      1.070      0.002      4.08      14.53

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  4.27
                  TIME SHIFT OF PEAK FLOW         (min)=165.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0134

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--------------------
| CALIB            |
| STANDHYD (  6042)|   Area    (ha)=   1.52
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.06         0.46
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         1.40
     Length            (m)=       6.00       800.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10         8.15
               over (min)         5.00       130.00
     Storage Coeff.  (min)=       0.56 (ii)  129.79 (ii)
     Unit Hyd. Tpeak (min)=       5.00       130.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.08         0.00          0.081 (iii)
     TIME TO PEAK    (hrs)=       1.33         3.58           1.33
     RUNOFF VOLUME    (mm)=      24.90         6.85          15.83
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       1.00         0.27           0.63

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| RESERVOIR(  0709)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0825

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  6042)      1.520      0.081      1.33      15.83
   OUTFLOW: ID= 1 (  0709)      1.520      0.003      4.08      14.91

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  4.03
                  TIME SHIFT OF PEAK FLOW         (min)=165.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0179

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--------------------
| ADD HYD  ( 60400)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0708):     1.07   0.002     4.08    14.53
      + ID2= 2 (  0709):     1.52   0.003     4.08    14.91
        ================================================
        ID = 3 ( 60400):     2.59   0.006     4.08    14.75

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| CALIB            |
| STANDHYD (  5212)|   Area    (ha)=   0.82
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.57         0.25
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.20
     Length            (m)=       6.00       433.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10         8.45
               over (min)         5.00       160.00
     Storage Coeff.  (min)=       0.56 (ii)  158.57 (ii)
     Unit Hyd. Tpeak (min)=       5.00       160.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.00          0.043 (iii)
     TIME TO PEAK    (hrs)=       1.33         4.08           1.33
     RUNOFF VOLUME    (mm)=      24.90         7.09          15.88
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       1.00         0.28           0.64

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| RESERVOIR(  0713)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  5212)      0.820      0.043      1.33      15.88
   OUTFLOW: ID= 1 (  0713)      0.820      0.003      3.67      15.04

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  6.78
                  TIME SHIFT OF PEAK FLOW         (min)=140.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0081
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| CALIB            |
| STANDHYD (  5211)|   Area    (ha)=   0.42
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.29         0.13
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.20
     Length            (m)=       6.00       220.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10         8.45
               over (min)         5.00       110.00
     Storage Coeff.  (min)=       0.56 (ii)  105.82 (ii)
     Unit Hyd. Tpeak (min)=       5.00       110.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.00          0.022 (iii)
     TIME TO PEAK    (hrs)=       1.33         3.25           1.33
     RUNOFF VOLUME    (mm)=      24.90         7.09          15.85
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       1.00         0.28           0.63

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0712)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  5211)      0.420      0.022      1.33      15.85
   OUTFLOW: ID= 1 (  0712)      0.420      0.002      3.75      14.20

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  7.19
                  TIME SHIFT OF PEAK FLOW         (min)=145.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0044

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--------------------
| ADD HYD  ( 52100)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0712):     0.42   0.002     3.75    14.20
     + ID2= 2 (  0713):     0.82   0.003     3.67    15.04
       ================================================
       ID = 3 ( 52100):     1.24   0.005     3.67    14.76

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  5131)|   Area    (ha)=   1.29
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.90         0.39
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.70
     Length            (m)=       6.00       681.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10         8.45
               over (min)         5.00       145.00
     Storage Coeff.  (min)=       0.56 (ii)  142.94 (ii)
```

```
     Unit Hyd. Tpeak (min)=       5.00       145.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.07         0.00          0.068 (iii)
     TIME TO PEAK    (hrs)=       1.33         3.83           1.33
     RUNOFF VOLUME    (mm)=      24.90         7.09          15.93
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       1.00         0.28           0.64

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0718)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0825

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  5131)      1.290      0.068      1.33      15.93
   OUTFLOW: ID= 1 (  0718)      1.290      0.003      4.17      14.85

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  3.99
                  TIME SHIFT OF PEAK FLOW         (min)=170.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0150

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--------------------
| CALIB            |
| STANDHYD (  5132)|   Area    (ha)=   0.15
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.10         0.05
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.70
     Length            (m)=       6.00        80.00
     Mannings n             =    0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10        11.51
               over (min)         5.00        40.00
     Storage Coeff.  (min)=       0.56 (ii)   35.37 (ii)
     Unit Hyd. Tpeak (min)=       5.00        40.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.008 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.92           1.33
     RUNOFF VOLUME    (mm)=      24.90         7.09          15.85
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       1.00         0.28           0.63

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0719)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  5132)      0.150      0.008      1.33      15.85
   OUTFLOW: ID= 1 (  0719)      0.150      0.001      3.42      11.25
```

```
                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=  7.93
                    TIME SHIFT OF PEAK FLOW         (min)=125.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.0018

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--------------------
| CALIB            |
| STANDHYD (  5133)|   Area    (ha)=   0.38
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.27         0.11
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.60
     Length            (m)=       6.00       200.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10         8.45
               over (min)        5.00        75.00
     Storage Coeff.  (min)=       0.56 (ii)   72.06 (ii)
     Unit Hyd. Tpeak (min)=       5.00        75.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.00          0.020 (iii)
     TIME TO PEAK    (hrs)=       1.33         2.58           1.33
     RUNOFF VOLUME    (mm)=      24.90         7.09          15.88
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       1.00         0.28           0.64

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0720)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  5133)      0.380      0.020      1.33      15.88
   OUTFLOW: ID= 1 (  0720)      0.380      0.002      3.75      14.06

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=  7.57
                    TIME SHIFT OF PEAK FLOW         (min)=145.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.0042

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--------------------
| CALIB            |
| STANDHYD (  5134)|   Area    (ha)=   0.38
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.27         0.11
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.60
     Length            (m)=       6.00       200.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10         8.45
               over (min)        5.00        75.00
     Storage Coeff.  (min)=       0.56 (ii)   72.06 (ii)
     Unit Hyd. Tpeak (min)=       5.00        75.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.00          0.020 (iii)
     TIME TO PEAK    (hrs)=       1.33         2.58           1.33
     RUNOFF VOLUME    (mm)=      24.90         7.09          15.88
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       1.00         0.28           0.64
```

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| RESERVOIR(0721)|
| IN= 2---> OUT= 1 |
DT= 5.0 min		OUTFLOW (cms)	STORAGE (ha.m.)		OUTFLOW (cms)	STORAGE (ha.m.)
		0.0000	0.0000		0.0150	0.0413

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (5134)	0.380	0.020	1.33	15.88
OUTFLOW: ID= 1 (0721)	0.380	0.002	3.75	14.06

PEAK FLOW REDUCTION [Qout/Qin](%)= 7.57
TIME SHIFT OF PEAK FLOW (min)=145.00
MAXIMUM STORAGE USED (ha.m.)= 0.0042

| ADD HYD (51300)|
| 1 + 2 = 3 |

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0718):	1.29	0.003	4.17	14.85
+ ID2= 2 (0719):	0.15	0.001	3.42	11.25
ID = 3 (51300):	1.44	0.003	4.00	14.47

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ADD HYD (51300)|
| 3 + 2 = 1 |

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 3 (51300):	1.44	0.003	4.00	14.47
+ ID2= 2 (0720):	0.38	0.002	3.75	14.06
ID = 1 (51300):	1.82	0.005	3.92	14.39

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| ADD HYD (51300)|
| 1 + 2 = 3 |

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (51300):	1.82	0.005	3.92	14.39
+ ID2= 2 (0721):	0.38	0.002	3.75	14.06
ID = 3 (51300):	2.20	0.006	3.83	14.33

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| CALIB |
| STANDHYD (0011)| Area (ha)= 1.13
|ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.79	0.34
Dep. Storage (mm)=	0.10	5.00
Average Slope (%)=	1.50	0.60
Length (m)=	6.00	596.00
Mannings n =	0.013	0.250
Max.Eff.Inten.(mm/hr)=	38.10	6.28

```
              over (min)        5.00       160.00
     Storage Coeff.  (min)=     0.62 (ii)  155.54 (ii)
     Unit Hyd. Tpeak (min)=     5.00       160.00
     Unit Hyd. peak  (cms)=     0.34         0.01
                                                      *TOTALS*
     PEAK FLOW       (cms)=     0.06         0.00       0.060 (iii)
     TIME TO PEAK    (hrs)=     1.33         4.08        1.33
     RUNOFF VOLUME    (mm)=    24.90         5.35       15.04
     TOTAL RAINFALL   (mm)=    25.00        25.00       25.00
     RUNOFF COEFFICIENT   =     1.00         0.21        0.60

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  69.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0722)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0825

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0011)      1.130      0.060      1.33      15.04
   OUTFLOW: ID= 1 (  0722)      1.130      0.002      4.00      13.81

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  3.85
                  TIME SHIFT OF PEAK FLOW         (min)=160.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0127

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--------------------
| CALIB            |
| STANDHYD (  0021)|   Area    (ha)=   0.58
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.41         0.17
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.50         0.60
     Length            (m)=       6.00       304.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10         5.84
              over (min)         5.00       110.00
     Storage Coeff.  (min)=      0.62 (ii)  107.14 (ii)
     Unit Hyd. Tpeak (min)=      5.00       110.00
     Unit Hyd. peak  (cms)=      0.34         0.01
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.03         0.00       0.031 (iii)
     TIME TO PEAK    (hrs)=      1.33         3.25        1.33
     RUNOFF VOLUME    (mm)=     24.90         4.99       14.84
     TOTAL RAINFALL   (mm)=     25.00        25.00       25.00
     RUNOFF COEFFICIENT   =      1.00         0.20        0.59

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  67.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0022)|   Area    (ha)=   0.60
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.42         0.18
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.50         0.60
```

Length (m)=	6.00	314.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	38.10	5.84	
over (min)	5.00	110.00	
Storage Coeff. (min)=	0.62 (ii)	109.23 (ii)	
Unit Hyd. Tpeak (min)=	5.00	110.00	
Unit Hyd. peak (cms)=	0.34	0.01	
			TOTALS
PEAK FLOW (cms)=	0.03	0.00	0.032 (iii)
TIME TO PEAK (hrs)=	1.33	3.25	1.33
RUNOFF VOLUME (mm)=	24.90	4.99	14.84
TOTAL RAINFALL (mm)=	25.00	25.00	25.00
RUNOFF COEFFICIENT =	1.00	0.20	0.59

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 67.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0200)		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
1 + 2 = 3	ID1= 1 (0021):	0.58	0.031	1.33	14.84
	+ ID2= 2 (0022):	0.60	0.032	1.33	14.84
	ID = 3 (0200):	1.18	0.063	1.33	14.84

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB STANDHYD (3121)	Area (ha)= 0.68		
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00	
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.48	0.20	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	4.50	
Length (m)=	6.00	355.50	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	38.10	6.50	
over (min)	5.00	65.00	
Storage Coeff. (min)=	0.56 (ii)	61.82 (ii)	
Unit Hyd. Tpeak (min)=	5.00	65.00	
Unit Hyd. peak (cms)=	0.34	0.02	
			TOTALS
PEAK FLOW (cms)=	0.04	0.00	0.036 (iii)
TIME TO PEAK (hrs)=	1.33	2.42	1.33
RUNOFF VOLUME (mm)=	24.90	5.52	15.16
TOTAL RAINFALL (mm)=	25.00	25.00	25.00
RUNOFF COEFFICIENT =	1.00	0.22	0.61

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 69.9 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0704)	OUTFLOW	STORAGE	OUTFLOW	STORAGE
IN= 2---> OUT= 1	(cms)	(ha.m.)	(cms)	(ha.m.)
DT= 5.0 min	0.0000	0.0000	0.0150	0.0413

AREA	QPEAK	TPEAK	R.V.
(ha)	(cms)	(hrs)	(mm)

```
   INFLOW : ID= 2 (  3121)      0.680      0.036      1.33      15.16
   OUTFLOW: ID= 1 (  0704)      0.680      0.003      3.67      14.14

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  7.39
                  TIME SHIFT OF PEAK FLOW         (min)=140.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0074

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--------------------
| CALIB            |
| STANDHYD (  3122)|   Area    (ha)=   0.86
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.60         0.26
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.25
     Length            (m)=       6.00       450.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10         6.50
               over (min)        5.00       170.00
     Storage Coeff.  (min)=       0.56 (ii)  168.51 (ii)
     Unit Hyd. Tpeak (min)=       5.00       170.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.00          0.045 (iii)
     TIME TO PEAK    (hrs)=       1.33         4.25           1.33
     RUNOFF VOLUME    (mm)=      24.90         5.52          15.10
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       1.00         0.22           0.60

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  69.9    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0705)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  3122)      0.855      0.045      1.33      15.10
   OUTFLOW: ID= 1 (  0705)      0.855      0.003      2.92      14.29

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  6.68
                  TIME SHIFT OF PEAK FLOW         (min)= 95.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0083

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--------------------
| ADD HYD  ( 31200)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0704):     0.68   0.003     3.67    14.14
      + ID2= 2 (  0705):     0.86   0.003     2.92    14.29
        ================================================
        ID = 3 ( 31200):     1.53   0.006     3.42    14.22

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| CALIB            |
| STANDHYD (  6043)|   Area    (ha)=   1.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.83         0.35
     Dep. Storage     (mm)=       0.10         5.00
```

Average Slope	(%)=	2.00	0.50	
Length	(m)=	6.00	620.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		38.10	8.15	
over (min)		5.00	155.00	
Storage Coeff. (min)=		0.56 (ii)	151.60 (ii)	
Unit Hyd. Tpeak (min)=		5.00	155.00	
Unit Hyd. peak (cms)=		0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.06	0.00	0.063 (iii)
TIME TO PEAK	(hrs)=	1.33	4.00	1.33
RUNOFF VOLUME	(mm)=	24.90	6.85	15.80
TOTAL RAINFALL	(mm)=	25.00	25.00	25.00
RUNOFF COEFFICIENT	=	1.00	0.27	0.63

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.8 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (6201)	Area (ha)= 0.78
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.55	0.23	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	2.80	
Length	(m)=	6.00	410.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		38.10	9.16	
over (min)		5.00	70.00	
Storage Coeff. (min)=		0.56 (ii)	67.62 (ii)	
Unit Hyd. Tpeak (min)=		5.00	70.00	
Unit Hyd. peak (cms)=		0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.04	0.00	0.042 (iii)
TIME TO PEAK	(hrs)=	1.33	2.50	1.33
RUNOFF VOLUME	(mm)=	24.90	7.65	16.23
TOTAL RAINFALL	(mm)=	25.00	25.00	25.00
RUNOFF COEFFICIENT	=	1.00	0.31	0.65

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 78.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0711)				
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0150	0.0413

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (6201)	0.780	0.042	1.33	16.23
OUTFLOW: ID= 1 (0711)	0.780	0.003	3.75	15.34

PEAK FLOW REDUCTION [Qout/Qin](%)= 7.73
TIME SHIFT OF PEAK FLOW (min)=145.00
MAXIMUM STORAGE USED (ha.m.)= 0.0088

CALIB	
STANDHYD (5222)	Area (ha)= 0.74
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

```
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.52         0.22
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         1.25
     Length            (m)=       6.00       388.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10         8.45
               over (min)         5.00        90.00
     Storage Coeff.  (min)=       0.56 (ii)   85.94 (ii)
     Unit Hyd. Tpeak (min)=       5.00        90.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.00          0.039 (iii)
     TIME TO PEAK    (hrs)=       1.33         2.92           1.33
     RUNOFF VOLUME    (mm)=      24.90         7.09          15.93
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       1.00         0.28           0.64

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  5223)|   Area    (ha)=   0.82
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.57         0.25
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.50
     Length            (m)=       6.00       432.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10         8.45
               over (min)         5.00       125.00
     Storage Coeff.  (min)=       0.56 (ii)  120.43 (ii)
     Unit Hyd. Tpeak (min)=       5.00       125.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.00          0.043 (iii)
     TIME TO PEAK    (hrs)=       1.33         3.50           1.33
     RUNOFF VOLUME    (mm)=      24.90         7.09          15.91
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       1.00         0.28           0.64

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  ( 52200)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  5222):     0.74   0.039     1.33    15.93
     + ID2= 2 (  5223):     0.82   0.043     1.33    15.91
       ================================================
       ID = 3 ( 52200):     1.56   0.083     1.33    15.92

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  5221)|   Area    (ha)=   0.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
```

```
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.13         0.05
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         1.25
     Length            (m)=       6.00        97.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10        11.51
               over (min)         5.00        35.00
     Storage Coeff.  (min)=       0.56 (ii)   33.40 (ii)
     Unit Hyd. Tpeak (min)=       5.00        35.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.010 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.83           1.33
     RUNOFF VOLUME    (mm)=      24.90         7.09          15.88
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       1.00         0.28           0.64

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0714)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  5221)      0.180      0.010      1.33      15.88
   OUTFLOW: ID= 1 (  0714)      0.180      0.001      3.42      12.02

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  7.92
                  TIME SHIFT OF PEAK FLOW         (min)=125.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0021

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  5111)|   Area    (ha)=   0.85
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.59         0.25
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         5.67
     Length            (m)=       6.00       449.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10         8.45
               over (min)         5.00        60.00
     Storage Coeff.  (min)=       0.56 (ii)   59.77 (ii)
     Unit Hyd. Tpeak (min)=       5.00        60.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.00          0.045 (iii)
     TIME TO PEAK    (hrs)=       1.33         2.33           1.33
     RUNOFF VOLUME    (mm)=      24.90         7.09          15.95
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       1.00         0.28           0.64

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0717)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  5111)      0.850      0.045      1.33      15.95
   OUTFLOW: ID= 1 (  0717)      0.850      0.004      3.67      15.13

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  7.72
                  TIME SHIFT OF PEAK FLOW         (min)=140.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0096

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  3181)|   Area    (ha)=   0.42
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.29         0.13
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         0.30
     Length            (m)=       6.00       462.10
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10         5.43
               over (min)         5.00       175.00
     Storage Coeff.  (min)=       0.56 (ii)  174.12 (ii)
     Unit Hyd. Tpeak (min)=       5.00       175.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.00          0.022 (iii)
     TIME TO PEAK    (hrs)=       1.33         4.42           1.33
     RUNOFF VOLUME    (mm)=      23.00         4.65          13.59
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       0.92         0.19           0.54

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  65.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  3182)|   Area    (ha)=   0.46
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.32         0.14
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       2.00         0.30
     Length            (m)=       6.00       462.10
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10         5.43
               over (min)         5.00       175.00
     Storage Coeff.  (min)=       0.56 (ii)  174.12 (ii)
     Unit Hyd. Tpeak (min)=       5.00       175.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.00          0.024 (iii)
     TIME TO PEAK    (hrs)=       1.33         4.42           1.33
     RUNOFF VOLUME    (mm)=      23.00         4.65          13.61
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       0.92         0.19           0.54

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  65.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
```

THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (31800)		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
1 + 2 = 3	ID1= 1 (3181):	0.42	0.022	1.33	13.59
	+ ID2= 2 (3182):	0.46	0.024	1.33	13.61
	ID = 3 (31800):	0.88	0.047	1.33	13.60

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB STANDHYD (6142)| ID= 1 DT= 5.0 min	Area (ha)= 1.43 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	1.00	0.43	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.25	
Length	(m)=	6.00	753.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		38.10	8.45	
over (min)		5.00	210.00	
Storage Coeff. (min)=		0.56 (ii)	206.52 (ii)	
Unit Hyd. Tpeak (min)=		5.00	210.00	
Unit Hyd. peak (cms)=		0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.08	0.00	0.076 (iii)
TIME TO PEAK	(hrs)=	1.33	4.92	1.33
RUNOFF VOLUME	(mm)=	24.90	7.09	15.91
TOTAL RAINFALL	(mm)=	25.00	25.00	25.00
RUNOFF COEFFICIENT	=	1.00	0.28	0.64

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (6143)| ID= 1 DT= 5.0 min	Area (ha)= 0.71 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.50	0.21	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.90	
Length	(m)=	6.00	372.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		38.10	8.45	
over (min)		5.00	95.00	
Storage Coeff. (min)=		0.56 (ii)	92.43 (ii)	
Unit Hyd. Tpeak (min)=		5.00	95.00	
Unit Hyd. peak (cms)=		0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.04	0.00	0.038 (iii)
TIME TO PEAK	(hrs)=	1.33	3.00	1.33
RUNOFF VOLUME	(mm)=	24.90	7.09	15.92
TOTAL RAINFALL	(mm)=	25.00	25.00	25.00
RUNOFF COEFFICIENT	=	1.00	0.28	0.64

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0550)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (6142):		1.43	0.076	1.33	15.91
+ ID2= 2 (6143):		0.71	0.038	1.33	15.92
ID = 3 (0550):		2.14	0.113	1.33	15.91

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0707)		OUTFLOW	STORAGE		OUTFLOW	STORAGE
IN= 2---> OUT= 1						
DT= 5.0 min		(cms)	(ha.m.)		(cms)	(ha.m.)
		0.0000	0.0000		0.0150	0.1238

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0550)	2.140	0.113	1.33	15.91
OUTFLOW: ID= 1 (0707)	2.140	0.003	5.33	14.94

PEAK FLOW REDUCTION [Qout/Qin](%)= 2.79
TIME SHIFT OF PEAK FLOW (min)=240.00
MAXIMUM STORAGE USED (ha.m.)= 0.0261

CALIB			
STANDHYD (6141)	Area (ha)= 0.89		
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00	
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.62	0.27	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	0.25	
Length (m)=	6.00	470.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	38.10	8.45	
over (min)	5.00	160.00	
Storage Coeff. (min)=	0.56 (ii)	155.79 (ii)	
Unit Hyd. Tpeak (min)=	5.00	160.00	
Unit Hyd. peak (cms)=	0.34	0.01	
			TOTALS
PEAK FLOW (cms)=	0.05	0.00	0.047 (iii)
TIME TO PEAK (hrs)=	1.33	4.08	1.33
RUNOFF VOLUME (mm)=	24.90	7.09	15.89
TOTAL RAINFALL (mm)=	25.00	25.00	25.00
RUNOFF COEFFICIENT =	1.00	0.28	0.64

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0706)		OUTFLOW	STORAGE		OUTFLOW	STORAGE
IN= 2---> OUT= 1						
DT= 5.0 min		(cms)	(ha.m.)		(cms)	(ha.m.)
		0.0000	0.0000		0.0150	0.0413

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (6141)	0.890	0.047	1.33	15.89
OUTFLOW: ID= 1 (0706)	0.890	0.003	3.67	15.11

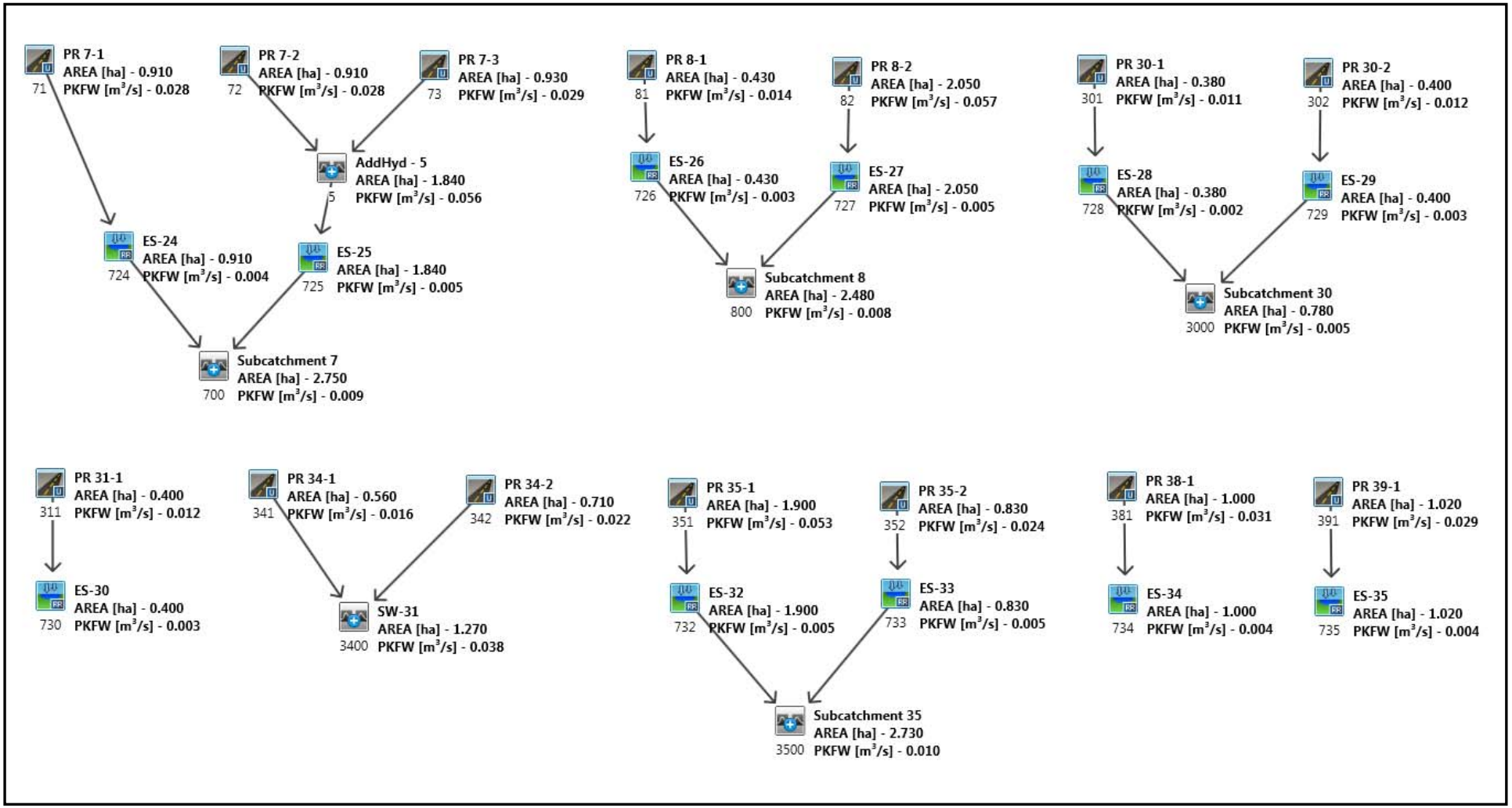
407 TWY - WITH SWM (12hr AES) - ROU-PET
PEAK FLOW REDUCTION [Qout/Qin](%)= 6.79
TIME SHIFT OF PEAK FLOW (min)=140.00
MAXIMUM STORAGE USED (ha.m.)= 0.0088

ADD HYD (61400)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0706):		0.89	0.003	3.67	15.11
+ ID2= 2 (0707):		2.14	0.003	5.33	14.94
ID = 3 (61400):		3.03	0.006	4.00	14.99

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

FINISH

VO2 Modelling Schematic 4.6: 407 TWY Sub-Areas Hydrologic Analysis – Proposed Condition with SWM (Duffins Watershed)



```
       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
```


***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\d6715e85-0614-4a6a-9f9a-8b108027f0cf\scenar
Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\d6715e85-0614-4a6a-9f9a-8b108027f0cf\scenar

DATE: 10/07/2016 TIME: 09:45:07

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 1 **
****

READ STORM	Filename: C:\Users\p002311c\AppData\Local\Temp\bc146ca3-ab7b-4f3b-910f-6a849449fd04\015545a3
Ptotal= 42.00 mm	Comments: 2yr/12hr

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	3.50	7.14	6.75	2.94	10.00	0.42
0.50	0.42	3.75	7.14	7.00	2.94	10.25	0.42
0.75	0.42	4.00	7.14	7.25	2.94	10.50	0.42
1.00	0.42	4.25	7.14	7.50	1.68	10.75	0.42
1.25	0.42	4.50	19.32	7.75	1.68	11.00	0.42
1.50	0.42	4.75	19.32	8.00	1.68	11.25	0.42
1.75	0.42	5.00	19.32	8.25	1.68	11.50	0.42
2.00	0.42	5.25	19.32	8.50	0.84	11.75	0.42
2.25	0.42	5.50	5.46	8.75	0.84	12.00	0.42
2.50	2.52	5.75	5.46	9.00	0.84	12.25	0.42
2.75	2.52	6.00	5.46	9.25	0.84		
3.00	2.52	6.25	5.46	9.50	0.42		
3.25	2.52	6.50	2.94	9.75	0.42		

CALIB STANDHYD (0081) ID= 1 DT= 5.0 min	Area (ha)= 0.43 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.30	0.13
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	3.00
Length	(m)=	6.00	225.00

Mannings n = 0.013 0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	2.52	6.250	5.46	9.33	0.42
0.167	0.00	3.250	2.52	6.333	2.94	9.42	0.42
0.250	0.00	3.333	7.14	6.417	2.94	9.50	0.42
0.333	0.42	3.417	7.14	6.500	2.94	9.58	0.42
0.417	0.42	3.500	7.14	6.583	2.94	9.67	0.42
0.500	0.42	3.583	7.14	6.667	2.94	9.75	0.42
0.583	0.42	3.667	7.14	6.750	2.94	9.83	0.42
0.667	0.42	3.750	7.14	6.833	2.94	9.92	0.42
0.750	0.42	3.833	7.14	6.917	2.94	10.00	0.42
0.833	0.42	3.917	7.14	7.000	2.94	10.08	0.42
0.917	0.42	4.000	7.14	7.083	2.94	10.17	0.42
1.000	0.42	4.083	7.14	7.167	2.94	10.25	0.42
1.083	0.42	4.167	7.14	7.250	2.94	10.33	0.42
1.167	0.42	4.250	7.14	7.333	1.68	10.42	0.42
1.250	0.42	4.333	19.32	7.417	1.68	10.50	0.42
1.333	0.42	4.417	19.32	7.500	1.68	10.58	0.42
1.417	0.42	4.500	19.32	7.583	1.68	10.67	0.42
1.500	0.42	4.583	19.32	7.667	1.68	10.75	0.42
1.583	0.42	4.667	19.32	7.750	1.68	10.83	0.42
1.667	0.42	4.750	19.32	7.833	1.68	10.92	0.42
1.750	0.42	4.833	19.32	7.917	1.68	11.00	0.42
1.833	0.42	4.917	19.32	8.000	1.68	11.08	0.42
1.917	0.42	5.000	19.32	8.083	1.68	11.17	0.42
2.000	0.42	5.083	19.32	8.167	1.68	11.25	0.42
2.083	0.42	5.167	19.32	8.250	1.68	11.33	0.42
2.167	0.42	5.250	19.32	8.333	0.84	11.42	0.42
2.250	0.42	5.333	5.46	8.417	0.84	11.50	0.42
2.333	2.52	5.417	5.46	8.500	0.84	11.58	0.42
2.417	2.52	5.500	5.46	8.583	0.84	11.67	0.42
2.500	2.52	5.583	5.46	8.667	0.84	11.75	0.42
2.583	2.52	5.667	5.46	8.750	0.84	11.83	0.42
2.667	2.52	5.750	5.46	8.833	0.84	11.92	0.42
2.750	2.52	5.833	5.46	8.917	0.84	12.00	0.42
2.833	2.52	5.917	5.46	9.000	0.84	12.08	0.42
2.917	2.52	6.000	5.46	9.083	0.84	12.17	0.42
3.000	2.52	6.083	5.46	9.167	0.84	12.25	0.42
3.083	2.52	6.167	5.46	9.250	0.84		

Max.Eff.Inten.(mm/hr)=	19.32	14.25		
over (min)	5.00	40.00		
Storage Coeff. (min)=	0.74 (ii)	39.14 (ii)		
Unit Hyd. Tpeak (min)=	5.00	40.00		
Unit Hyd. peak (cms)=	0.34	0.03		
			TOTALS	
PEAK FLOW (cms)=	0.01	0.00	0.014 (iii)	
TIME TO PEAK (hrs)=	4.50	5.67	5.25	
RUNOFF VOLUME (mm)=	41.90	15.48	28.63	
TOTAL RAINFALL (mm)=	42.00	42.00	42.00	
RUNOFF COEFFICIENT =	1.00	0.37	0.68	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0726)
IN= 2---> OUT= 1
DT= 5.0 min

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0150	0.0413

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0081)	0.430	0.014	5.25	28.63
OUTFLOW: ID= 1 (0726)	0.430	0.003	7.25	27.01

PEAK FLOW REDUCTION [Qout/Qin](%)= 19.92
TIME SHIFT OF PEAK FLOW (min)=120.00
MAXIMUM STORAGE USED (ha.m.)= 0.0079

CALIB STANDHYD (0082) ID= 1 DT= 5.0 min	Area (ha)= 2.05 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	1.43	0.62	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	1.40	
Length	(m)=	6.00	1080.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		19.32	12.52	
over (min)		5.00	135.00	
Storage Coeff.	(min)=	0.74 (ii)	131.02 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	135.00	
Unit Hyd. peak	(cms)=	0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.06	0.01	0.057 (iii)
TIME TO PEAK	(hrs)=	4.50	7.33	5.25
RUNOFF VOLUME	(mm)=	41.90	15.48	28.65
TOTAL RAINFALL	(mm)=	42.00	42.00	42.00
RUNOFF COEFFICIENT	=	1.00	0.37	0.68

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0727) IN= 2---> OUT= 1 DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0150	0.1238

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0082)	2.050	0.057	5.25	28.65
OUTFLOW: ID= 1 (0727)	2.050	0.005	10.50	27.63

PEAK FLOW REDUCTION [Qout/Qin](%)= 9.32
TIME SHIFT OF PEAK FLOW (min)=315.00
MAXIMUM STORAGE USED (ha.m.)= 0.0437

ADD HYD (0800) 1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0726):	0.43	0.003	7.25	27.01
+ ID2= 2 (0727):	2.05	0.005	10.50	27.63
ID = 3 (0800):	2.48	0.008	8.50	27.52

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB STANDHYD (0071) ID= 1 DT= 5.0 min	Area (ha)= 0.91 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.64	0.27
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	2.10
Length	(m)=	6.00	480.60
Mannings n	=	0.013	0.250

```
     Max.Eff.Inten.(mm/hr)=      19.32        14.31
               over (min)         5.00        70.00
     Storage Coeff.  (min)=       0.74 (ii)   68.02 (ii)
     Unit Hyd. Tpeak (min)=       5.00        70.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.028 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.17           5.25
     RUNOFF VOLUME    (mm)=      41.90        17.46          29.63
     TOTAL RAINFALL   (mm)=      42.00        42.00          42.00
     RUNOFF COEFFICIENT   =       1.00         0.42           0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| RESERVOIR(  0724)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0825

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0071)      0.910      0.028      5.25      29.63
   OUTFLOW: ID= 1 (  0724)      0.910      0.004      8.67      28.10

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 12.94
                  TIME SHIFT OF PEAK FLOW         (min)=205.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0197

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--------------------
| CALIB            |
| STANDHYD (  0072)|   Area    (ha)=   0.91
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.64         0.27
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         2.10
     Length            (m)=       6.00       480.60
     Mannings n             =    0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        14.31
               over (min)         5.00        70.00
     Storage Coeff.  (min)=       0.74 (ii)   68.02 (ii)
     Unit Hyd. Tpeak (min)=       5.00        70.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.028 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.17           5.25
     RUNOFF VOLUME    (mm)=      41.90        17.46          29.63
     TOTAL RAINFALL   (mm)=      42.00        42.00          42.00
     RUNOFF COEFFICIENT   =       1.00         0.42           0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0073)|   Area    (ha)=   0.93
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.65         0.28
```

Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	3.07	
Length	(m)=	6.00	490.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		19.32	14.31	
over (min)		5.00	65.00	
Storage Coeff.	(min)=	0.74 (ii)	61.48 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	65.00	
Unit Hyd. peak	(cms)=	0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.01	0.029 (iii)
TIME TO PEAK	(hrs)=	4.50	6.08	5.25
RUNOFF VOLUME	(mm)=	41.90	17.46	29.64
TOTAL RAINFALL	(mm)=	42.00	42.00	42.00
RUNOFF COEFFICIENT	=	1.00	0.42	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0005)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0072):		0.91	0.028	5.25	29.63
+ ID2= 2 (0073):		0.93	0.029	5.25	29.64
ID = 3 (0005):		1.84	0.056	5.25	29.64

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0725)					
IN= 2---> OUT= 1					
DT= 5.0 min	OUTFLOW	STORAGE	OUTFLOW	STORAGE	
	(cms)	(ha.m.)	(cms)	(ha.m.)	
	0.0000	0.0000	0.0150	0.1238	

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0005)	1.840	0.056	5.25	29.64
OUTFLOW: ID= 1 (0725)	1.840	0.005	9.33	28.50

PEAK FLOW REDUCTION [Qout/Qin](%)= 9.27
TIME SHIFT OF PEAK FLOW (min)=245.00
MAXIMUM STORAGE USED (ha.m.)= 0.0431

ADD HYD (0700)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0724):		0.91	0.004	8.67	28.10
+ ID2= 2 (0725):		1.84	0.005	9.33	28.50
ID = 3 (0700):		2.75	0.009	9.17	28.37

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB					
STANDHYD (0301)	Area (ha)= 0.38				
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00			

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.27	0.11
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	0.52
Length	(m)=	6.00	200.00

```
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        12.12
               over (min)         5.00        70.00
     Storage Coeff.  (min)=       0.74 (ii)   65.34 (ii)
     Unit Hyd. Tpeak (min)=       5.00        70.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.011 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.17          5.25
     RUNOFF VOLUME    (mm)=      41.90        15.02         28.36
     TOTAL RAINFALL   (mm)=      42.00        42.00         42.00
     RUNOFF COEFFICIENT   =       1.00         0.36          0.68

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0728)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0301)      0.380      0.011      5.25      28.36
   OUTFLOW: ID= 1 (  0728)      0.380      0.002      7.50      26.54

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 21.14
                  TIME SHIFT OF PEAK FLOW         (min)=135.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0066

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--------------------
| CALIB            |
| STANDHYD (  0302)|   Area    (ha)=   0.40
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.28         0.12
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.52
     Length            (m)=       6.00       211.60
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        12.12
               over (min)         5.00        70.00
     Storage Coeff.  (min)=       0.74 (ii)   67.56 (ii)
     Unit Hyd. Tpeak (min)=       5.00        70.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.012 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.17          5.25
     RUNOFF VOLUME    (mm)=      41.90        15.02         28.37
     TOTAL RAINFALL   (mm)=      42.00        42.00         42.00
     RUNOFF COEFFICIENT   =       1.00         0.36          0.68

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0729)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413
```

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0302)	0.400	0.012	5.25	28.37
OUTFLOW: ID= 1 (0729)	0.400	0.003	7.50	26.64

PEAK FLOW REDUCTION [Qout/Qin](%)= 21.13
TIME SHIFT OF PEAK FLOW (min)=135.00
MAXIMUM STORAGE USED (ha.m.)= 0.0069

ADD HYD (3000)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0728):	0.38	0.002	7.50	26.54
+ ID2= 2 (0729):	0.40	0.003	7.50	26.64
ID = 3 (3000):	0.78	0.005	7.50	26.59

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB
STANDHYD (0311)
ID= 1 DT= 5.0 min

Area (ha)= 0.40
Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.28	0.12
Dep. Storage (mm)=	0.10	5.00
Average Slope (%)=	2.00	0.50
Length (m)=	6.00	208.40
Mannings n =	0.013	0.250
Max.Eff.Inten.(mm/hr)=	19.32	12.52
over (min)	5.00	70.00
Storage Coeff. (min)=	0.74 (ii)	66.86 (ii)
Unit Hyd. Tpeak (min)=	5.00	70.00
Unit Hyd. peak (cms)=	0.34	0.02

			TOTALS
PEAK FLOW (cms)=	0.01	0.00	0.012 (iii)
TIME TO PEAK (hrs)=	4.50	6.17	5.25
RUNOFF VOLUME (mm)=	41.90	15.48	28.60
TOTAL RAINFALL (mm)=	42.00	42.00	42.00
RUNOFF COEFFICIENT =	1.00	0.37	0.68

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0730)
IN= 2---> OUT= 1
DT= 5.0 min

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0150	0.0413

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0311)	0.400	0.012	5.25	28.60
OUTFLOW: ID= 1 (0730)	0.400	0.003	7.58	26.87

PEAK FLOW REDUCTION [Qout/Qin](%)= 21.21
TIME SHIFT OF PEAK FLOW (min)=140.00
MAXIMUM STORAGE USED (ha.m.)= 0.0070

CALIB
STANDHYD (0341)
ID= 1 DT= 5.0 min

Area (ha)= 0.56
Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.39	0.17	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.50	
Length	(m)=	6.00	295.30	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		19.32	12.12	
over (min)		5.00	85.00	
Storage Coeff. (min)=		0.74 (ii)	83.32 (ii)	
Unit Hyd. Tpeak (min)=		5.00	85.00	
Unit Hyd. peak (cms)=		0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.00	0.016 (iii)
TIME TO PEAK	(hrs)=	4.50	6.50	5.25
RUNOFF VOLUME	(mm)=	41.90	15.02	28.38
TOTAL RAINFALL	(mm)=	42.00	42.00	42.00
RUNOFF COEFFICIENT	=	1.00	0.36	0.68

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB				
STANDHYD (0342)	Area (ha)=	0.71		
ID= 1 DT= 5.0 min	Total Imp(%)=	70.00	Dir. Conn.(%)=	50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.50	0.21	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	2.80	
Length	(m)=	6.00	372.90	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		19.32	12.12	
over (min)		5.00	60.00	
Storage Coeff. (min)=		0.74 (ii)	57.39 (ii)	
Unit Hyd. Tpeak (min)=		5.00	60.00	
Unit Hyd. peak (cms)=		0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.00	0.022 (iii)
TIME TO PEAK	(hrs)=	4.50	6.00	5.25
RUNOFF VOLUME	(mm)=	41.90	15.02	28.41
TOTAL RAINFALL	(mm)=	42.00	42.00	42.00
RUNOFF COEFFICIENT	=	1.00	0.36	0.68

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (3400)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0341):		0.56	0.016	5.25	28.38
+ ID2= 2 (0342):		0.71	0.022	5.25	28.41
ID = 3 (3400):		1.27	0.038	5.25	28.40

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB				
STANDHYD (0351)	Area (ha)=	1.90		
ID= 1 DT= 5.0 min	Total Imp(%)=	70.00	Dir. Conn.(%)=	50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	1.33	0.57	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	1.70	
Length	(m)=	6.00	1001.80	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		19.32	12.12	
over (min)		5.00	120.00	
Storage Coeff. (min)=		0.74 (ii)	119.79 (ii)	
Unit Hyd. Tpeak (min)=		5.00	120.00	
Unit Hyd. peak (cms)=		0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.05	0.01	0.053 (iii)
TIME TO PEAK	(hrs)=	4.50	7.08	5.25
RUNOFF VOLUME	(mm)=	41.90	15.02	28.42
TOTAL RAINFALL	(mm)=	42.00	42.00	42.00
RUNOFF COEFFICIENT	=	1.00	0.36	0.68

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0732)						
IN= 2---> OUT= 1						
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)		OUTFLOW (cms)	STORAGE (ha.m.)	
	0.0000	0.0000		0.0150	0.1238	

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0351)	1.900	0.053	5.25	28.42
OUTFLOW: ID= 1 (0732)	1.900	0.005	10.17	27.32

PEAK FLOW REDUCTION [Qout/Qin](%)= 9.30
TIME SHIFT OF PEAK FLOW (min)=295.00
MAXIMUM STORAGE USED (ha.m.)= 0.0406

CALIB		
STANDHYD (0352)	Area (ha)= 0.83	
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.58	0.25	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	1.60	
Length	(m)=	6.00	435.40	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		19.32	12.12	
over (min)		5.00	75.00	
Storage Coeff. (min)=		0.74 (ii)	74.28 (ii)	
Unit Hyd. Tpeak (min)=		5.00	75.00	
Unit Hyd. peak (cms)=		0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.00	0.024 (iii)
TIME TO PEAK	(hrs)=	4.50	6.33	5.25
RUNOFF VOLUME	(mm)=	41.90	15.02	28.41
TOTAL RAINFALL	(mm)=	42.00	42.00	42.00
RUNOFF COEFFICIENT	=	1.00	0.36	0.68

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
| RESERVOIR(  0733)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0352)      0.830      0.024      5.25      28.41
   OUTFLOW: ID= 1 (  0733)      0.830      0.005      7.58      27.58

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 21.17
                  TIME SHIFT OF PEAK FLOW         (min)=140.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0142

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--------------------
| ADD HYD  (  3500)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0732):     1.90   0.005    10.17    27.32
     + ID2= 2 (  0733):     0.83   0.005     7.58    27.58
       ================================================
       ID = 3 (  3500):     2.73   0.010     8.33    27.40

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0381)|   Area    (ha)=   1.00
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.70         0.30
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         4.95
     Length            (m)=       6.00       524.60
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        14.33
               over (min)         5.00        60.00
     Storage Coeff.  (min)=       0.74 (ii)   55.54 (ii)
     Unit Hyd. Tpeak (min)=       5.00        60.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.031 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.00           5.25
     RUNOFF VOLUME    (mm)=      41.90        16.94          29.39
     TOTAL RAINFALL   (mm)=      42.00        42.00          42.00
     RUNOFF COEFFICIENT   =       1.00         0.40           0.70

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  75.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0734)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0825

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0381)      1.000      0.031      5.25      29.39
   OUTFLOW: ID= 1 (  0734)      1.000      0.004      8.33      27.99

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 12.60
                  TIME SHIFT OF PEAK FLOW         (min)=185.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0217

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| CALIB            |
| STANDHYD (  0391)|   Area    (ha)=   1.02
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.71         0.31
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.80
     Length            (m)=       6.00       535.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        12.12
               over (min)         5.00       105.00
     Storage Coeff.  (min)=       0.74 (ii)  103.18 (ii)
     Unit Hyd. Tpeak (min)=       5.00       105.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.00          0.029 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.83           5.25
     RUNOFF VOLUME    (mm)=      41.90        15.02          28.40
     TOTAL RAINFALL   (mm)=      42.00        42.00          42.00
     RUNOFF COEFFICIENT   =       1.00         0.36           0.68

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0735)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0825

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0391)      1.020      0.029      5.25      28.40
   OUTFLOW: ID= 1 (  0735)      1.020      0.004      9.25      27.04

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 12.85
                  TIME SHIFT OF PEAK FLOW        (min)=240.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0204

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================================================================================================================

       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

  Output  filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\b3868022-36c6-479d-a825-404433a9304
8\scenar
  Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\b3868022-36c6-479d-a825-404433a9304
8\scenar
```

DATE: 10/07/2016 TIME: 09:45:08

USER:

COMMENTS: _____

**** SIMULATION NUMBER: 2 ****

READ STORM	Filename: C:\Users\p002311c\AppData\Local\Temp\bc146ca3-ab7b-4f3b-910f-6a849449fd04\4233047f
Ptotal= 54.38 mm	Comments: 5yr/12hr

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	3.50	9.25	6.75	3.81	10.00	0.54
0.50	0.54	3.75	9.25	7.00	3.81	10.25	0.54
0.75	0.54	4.00	9.25	7.25	3.81	10.50	0.54
1.00	0.54	4.25	9.25	7.50	2.18	10.75	0.54
1.25	0.54	4.50	25.02	7.75	2.18	11.00	0.54
1.50	0.54	4.75	25.02	8.00	2.18	11.25	0.54
1.75	0.54	5.00	25.02	8.25	2.18	11.50	0.54
2.00	0.54	5.25	25.02	8.50	1.09	11.75	0.54
2.25	0.54	5.50	7.07	8.75	1.09	12.00	0.54
2.50	3.26	5.75	7.07	9.00	1.09	12.25	0.54
2.75	3.26	6.00	7.07	9.25	1.09		
3.00	3.26	6.25	7.07	9.50	0.54		
3.25	3.26	6.50	3.81	9.75	0.54		

CALIB STANDHYD (0081) ID= 1 DT= 5.0 min	Area (ha)= 0.43 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.30	0.13
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	3.00
Length	(m)=	6.00	225.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	3.26	6.250	7.07	9.33	0.54
0.167	0.00	3.250	3.26	6.333	3.81	9.42	0.54
0.250	0.00	3.333	9.25	6.417	3.81	9.50	0.54
0.333	0.54	3.417	9.25	6.500	3.81	9.58	0.54
0.417	0.54	3.500	9.25	6.583	3.81	9.67	0.54
0.500	0.54	3.583	9.25	6.667	3.81	9.75	0.54
0.583	0.54	3.667	9.25	6.750	3.81	9.83	0.54
0.667	0.54	3.750	9.25	6.833	3.81	9.92	0.54
0.750	0.54	3.833	9.25	6.917	3.81	10.00	0.54
0.833	0.54	3.917	9.25	7.000	3.81	10.08	0.54
0.917	0.54	4.000	9.25	7.083	3.81	10.17	0.54
1.000	0.54	4.083	9.25	7.167	3.81	10.25	0.54
1.083	0.54	4.167	9.25	7.250	3.81	10.33	0.54
1.167	0.54	4.250	9.25	7.333	2.18	10.42	0.54
1.250	0.54	4.333	25.02	7.417	2.18	10.50	0.54
1.333	0.54	4.417	25.02	7.500	2.18	10.58	0.54
1.417	0.54	4.500	25.02	7.583	2.18	10.67	0.54
1.500	0.54	4.583	25.02	7.667	2.18	10.75	0.54
1.583	0.54	4.667	25.02	7.750	2.18	10.83	0.54
1.667	0.54	4.750	25.02	7.833	2.18	10.92	0.54
1.750	0.54	4.833	25.02	7.917	2.18	11.00	0.54

1.833	0.54	4.917	25.02	8.000	2.18	11.08	0.54
1.917	0.54	5.000	25.02	8.083	2.18	11.17	0.54
2.000	0.54	5.083	25.02	8.167	2.18	11.25	0.54
2.083	0.54	5.167	25.02	8.250	2.18	11.33	0.54
2.167	0.54	5.250	25.02	8.333	1.09	11.42	0.54
2.250	0.54	5.333	7.07	8.417	1.09	11.50	0.54
2.333	3.26	5.417	7.07	8.500	1.09	11.58	0.54
2.417	3.26	5.500	7.07	8.583	1.09	11.67	0.54
2.500	3.26	5.583	7.07	8.667	1.09	11.75	0.54
2.583	3.26	5.667	7.07	8.750	1.09	11.83	0.54
2.667	3.26	5.750	7.07	8.833	1.09	11.92	0.54
2.750	3.26	5.833	7.07	8.917	1.09	12.00	0.54
2.833	3.26	5.917	7.07	9.000	1.09	12.08	0.54
2.917	3.26	6.000	7.07	9.083	1.09	12.17	0.54
3.000	3.26	6.083	7.07	9.167	1.09	12.25	0.54
3.083	3.26	6.167	7.07	9.250	1.09		

				TOTALS
Max.Eff.Inten.(mm/hr)=	25.02	22.47		
over (min)	5.00	35.00		
Storage Coeff. (min)=	0.67 (ii)	32.68 (ii)		
Unit Hyd. Tpeak (min)=	5.00	35.00		
Unit Hyd. peak (cms)=	0.34	0.03		
PEAK FLOW (cms)=	0.01	0.01		0.020 (iii)
TIME TO PEAK (hrs)=	4.50	5.50		5.25
RUNOFF VOLUME (mm)=	54.28	23.86		39.03
TOTAL RAINFALL (mm)=	54.38	54.38		54.38
RUNOFF COEFFICIENT =	1.00	0.44		0.72

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0726)				
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0150	0.0413

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0081)	0.430	0.020	5.25	39.03
OUTFLOW: ID= 1 (0726)	0.430	0.004	7.25	37.42

PEAK FLOW REDUCTION [Qout/Qin](%)= 19.54
TIME SHIFT OF PEAK FLOW (min)=120.00
MAXIMUM STORAGE USED (ha.m.)= 0.0108

CALIB		
STANDHYD (0082)	Area (ha)= 2.05	
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)	*TOTALS*
Surface Area (ha)=	1.43	0.62	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	1.40	
Length (m)=	6.00	1080.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	25.02	19.60	
over (min)	5.00	110.00	
Storage Coeff. (min)=	0.67 (ii)	109.57 (ii)	
Unit Hyd. Tpeak (min)=	5.00	110.00	
Unit Hyd. peak (cms)=	0.34	0.01	
PEAK FLOW (cms)=	0.07	0.01	0.076 (iii)
TIME TO PEAK (hrs)=	4.50	6.92	5.25
RUNOFF VOLUME (mm)=	54.28	23.86	39.04
TOTAL RAINFALL (mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT =	1.00	0.44	0.72

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0727)| IN= 2---> OUT= 1	DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0150	0.1238

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0082)	2.050	0.076	5.25	39.04
OUTFLOW: ID= 1 (0727)	2.050	0.007	10.25	38.02

PEAK FLOW REDUCTION [Qout/Qin](%)= 9.70
TIME SHIFT OF PEAK FLOW (min)=300.00
MAXIMUM STORAGE USED (ha.m.)= 0.0606

ADD HYD (0800)| 1 + 2 = 3		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
	ID1= 1 (0726):	0.43	0.004	7.25	37.42
	+ ID2= 2 (0727):	2.05	0.007	10.25	38.02
	ID = 3 (0800):	2.48	0.011	8.58	37.92

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB	STANDHYD (0071)| ID= 1 DT= 5.0 min	Area (ha)= 0.91 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.64	0.27	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	2.10	
Length	(m)=	6.00	480.60	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		25.02	22.06	
over (min)		5.00	60.00	
Storage Coeff.	(min)=	0.67 (ii)	57.26 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	60.00	
Unit Hyd. peak	(cms)=	0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.03	0.01	0.038 (iii)
TIME TO PEAK	(hrs)=	4.50	6.00	5.25
RUNOFF VOLUME	(mm)=	54.28	26.53	40.37
TOTAL RAINFALL	(mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT	=	1.00	0.49	0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0724)| IN= 2---> OUT= 1	DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0150	0.0825

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0071)	0.910	0.038	5.25	40.37
OUTFLOW: ID= 1 (0724)	0.910	0.005	8.50	38.84

PEAK FLOW REDUCTION [Qout/Qin](%)= 12.86
TIME SHIFT OF PEAK FLOW (min)=195.00
MAXIMUM STORAGE USED (ha.m.)= 0.0271

CALIB STANDHYD (0072)	Area (ha)= 0.91
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.64	0.27	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	2.10	
Length (m)=	6.00	480.60	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	25.02	22.06	
over (min)	5.00	60.00	
Storage Coeff. (min)=	0.67 (ii)	57.26 (ii)	
Unit Hyd. Tpeak (min)=	5.00	60.00	
Unit Hyd. peak (cms)=	0.34	0.02	
			TOTALS
PEAK FLOW (cms)=	0.03	0.01	0.038 (iii)
TIME TO PEAK (hrs)=	4.50	6.00	5.25
RUNOFF VOLUME (mm)=	54.28	26.53	40.37
TOTAL RAINFALL (mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT =	1.00	0.49	0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (0073)	Area (ha)= 0.93
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.65	0.28	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	3.07	
Length (m)=	6.00	490.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	25.02	23.36	
over (min)	5.00	55.00	
Storage Coeff. (min)=	0.67 (ii)	50.59 (ii)	
Unit Hyd. Tpeak (min)=	5.00	55.00	
Unit Hyd. peak (cms)=	0.34	0.02	
			TOTALS
PEAK FLOW (cms)=	0.03	0.01	0.040 (iii)
TIME TO PEAK (hrs)=	4.50	5.83	5.25
RUNOFF VOLUME (mm)=	54.28	26.53	40.37
TOTAL RAINFALL (mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT =	1.00	0.49	0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0005)

1 + 2 = 3		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
	ID1= 1 (0072):	0.91	0.038	5.25	40.37
	+ ID2= 2 (0073):	0.93	0.040	5.25	40.37
	ID = 3 (0005):	1.84	0.079	5.25	40.37

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0725) IN= 2---> OUT= 1 DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0150	0.1238

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0005)	1.840	0.079	5.25	40.37
OUTFLOW: ID= 1 (0725)	1.840	0.007	9.25	39.23

PEAK FLOW REDUCTION [Qout/Qin](%)= 9.13
TIME SHIFT OF PEAK FLOW (min)=240.00
MAXIMUM STORAGE USED (ha.m.)= 0.0592

ADD HYD (0700) 1 + 2 = 3		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
	ID1= 1 (0724):	0.91	0.005	8.50	38.84
	+ ID2= 2 (0725):	1.84	0.007	9.25	39.23
	ID = 3 (0700):	2.75	0.012	8.92	39.10

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB STANDHYD (0301) ID= 1 DT= 5.0 min | Area (ha)= 0.38 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.27	0.11	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.52	
Length	(m)=	6.00	200.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)	=	25.02	19.66	
over (min)		5.00	55.00	
Storage Coeff.	(min)=	0.67 (ii)	53.89 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	55.00	
Unit Hyd. peak	(cms)=	0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.01	0.00	0.016 (iii)
TIME TO PEAK	(hrs)=	4.50	5.92	5.25
RUNOFF VOLUME	(mm)=	54.28	23.23	38.68
TOTAL RAINFALL	(mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT	=	1.00	0.43	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0728) IN= 2---> OUT= 1 DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0150	0.0413

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                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0301)      0.380      0.016      5.25      38.68
   OUTFLOW: ID= 1 (  0728)      0.380      0.003      7.42      36.86

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 21.01
                  TIME SHIFT OF PEAK FLOW         (min)=130.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0092

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--------------------
| CALIB            |
| STANDHYD (  0302)|   Area    (ha)=   0.40
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.28         0.12
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.52
     Length            (m)=       6.00       211.60
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02        19.03
               over (min)        5.00        60.00
     Storage Coeff.  (min)=       0.67 (ii)   56.45 (ii)
     Unit Hyd. Tpeak (min)=       5.00        60.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.016 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.00           5.25
     RUNOFF VOLUME    (mm)=      54.28        23.23          38.67
     TOTAL RAINFALL   (mm)=      54.38        54.38          54.38
     RUNOFF COEFFICIENT   =       1.00         0.43           0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0729)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0302)      0.400      0.016      5.25      38.67
   OUTFLOW: ID= 1 (  0729)      0.400      0.003      7.50      36.94

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 21.23
                  TIME SHIFT OF PEAK FLOW         (min)=135.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0096

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--------------------
| ADD HYD  (  3000)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0728):     0.38   0.003     7.42    36.86
     + ID2= 2 (  0729):     0.40   0.003     7.50    36.94
       ================================================
       ID = 3 (  3000):     0.78   0.007     7.42    36.90

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| CALIB            |
| STANDHYD (  0311)|   Area    (ha)=   0.40
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
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		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.28	0.12	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.50	
Length	(m)=	6.00	208.40	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)	=	25.02	20.24	
over (min)		5.00	60.00	
Storage Coeff. (min)	=	0.67 (ii)	55.23 (ii)	
Unit Hyd. Tpeak (min)	=	5.00	60.00	
Unit Hyd. peak (cms)	=	0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.01	0.00	0.017 (iii)
TIME TO PEAK	(hrs)=	4.50	6.00	5.25
RUNOFF VOLUME	(mm)=	54.28	23.86	38.99
TOTAL RAINFALL	(mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT	=	1.00	0.44	0.72

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0730)				
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0150	0.0413

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0311)	0.400	0.017	5.25	38.99
OUTFLOW: ID= 1 (0730)	0.400	0.004	7.50	37.26

PEAK FLOW REDUCTION [Qout/Qin](%)= 21.28
TIME SHIFT OF PEAK FLOW (min)=135.00
MAXIMUM STORAGE USED (ha.m.)= 0.0097

CALIB		
STANDHYD (0341)	Area (ha)= 0.56	
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.39	0.17	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.50	
Length	(m)=	6.00	295.30	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)	=	25.02	19.03	
over (min)		5.00	70.00	
Storage Coeff. (min)	=	0.67 (ii)	69.60 (ii)	
Unit Hyd. Tpeak (min)	=	5.00	70.00	
Unit Hyd. peak (cms)	=	0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.01	0.022 (iii)
TIME TO PEAK	(hrs)=	4.50	6.17	5.25
RUNOFF VOLUME	(mm)=	54.28	23.23	38.69
TOTAL RAINFALL	(mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT	=	1.00	0.43	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
STANDHYD (0342)	Area (ha)= 0.71				
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00			

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.50	0.21	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	2.80	
Length	(m)=	6.00	372.90	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)	=	25.02	20.26	
over (min)		5.00	50.00	
Storage Coeff. (min)	=	0.67 (ii)	46.79 (ii)	
Unit Hyd. Tpeak (min)	=	5.00	50.00	
Unit Hyd. peak (cms)	=	0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.01	0.030 (iii)
TIME TO PEAK	(hrs)=	4.50	5.83	5.25
RUNOFF VOLUME	(mm)=	54.28	23.23	38.72
TOTAL RAINFALL	(mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT	=	1.00	0.43	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (3400)					
1 + 2 = 3		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
	ID1= 1 (0341):	0.56	0.022	5.25	38.69
	+ ID2= 2 (0342):	0.71	0.030	5.25	38.72
	ID = 3 (3400):	1.27	0.053	5.25	38.70

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB					
STANDHYD (0351)	Area (ha)= 1.90				
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00			

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	1.33	0.57	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	1.70	
Length	(m)=	6.00	1001.80	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)	=	25.02	19.03	
over (min)		5.00	105.00	
Storage Coeff. (min)	=	0.67 (ii)	100.05 (ii)	
Unit Hyd. Tpeak (min)	=	5.00	105.00	
Unit Hyd. peak (cms)	=	0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.07	0.01	0.071 (iii)
TIME TO PEAK	(hrs)=	4.50	6.75	5.25
RUNOFF VOLUME	(mm)=	54.28	23.23	38.73
TOTAL RAINFALL	(mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT	=	1.00	0.43	0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| RESERVOIR(  0732)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.1238

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0351)      1.900      0.071      5.25      38.73
   OUTFLOW: ID= 1 (  0732)      1.900      0.007     10.00      37.62

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  9.65
                  TIME SHIFT OF PEAK FLOW         (min)=285.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0562

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--------------------
| CALIB            |
| STANDHYD (  0352)|   Area    (ha)=   0.83
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.58         0.25
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         1.60
     Length            (m)=       6.00       435.40
     Mannings n            =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02        19.03
               over (min)         5.00        65.00
     Storage Coeff.  (min)=       0.67 (ii)   62.05 (ii)
     Unit Hyd. Tpeak (min)=       5.00        65.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.033 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.08           5.25
     RUNOFF VOLUME    (mm)=      54.28        23.23          38.71
     TOTAL RAINFALL   (mm)=      54.38        54.38          54.38
     RUNOFF COEFFICIENT   =       1.00         0.43           0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0733)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0352)      0.830      0.033      5.25      38.71
   OUTFLOW: ID= 1 (  0733)      0.830      0.007      7.58      37.88

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 21.44
                  TIME SHIFT OF PEAK FLOW         (min)=140.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0197

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--------------------
| ADD HYD  (  3500)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0732):     1.90   0.007    10.00    37.62
     + ID2= 2 (  0733):     0.83   0.007     7.58    37.88
       ================================================
       ID = 3 (  3500):     2.73   0.014     8.33    37.70

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| CALIB            |
| STANDHYD (  0381)|   Area    (ha)=   1.00
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.70         0.30
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         4.95
     Length            (m)=       6.00       524.60
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02        22.70
               over (min)         5.00        50.00
     Storage Coeff.  (min)=       0.67 (ii)   46.25 (ii)
     Unit Hyd. Tpeak (min)=       5.00        50.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.044 (iii)
     TIME TO PEAK    (hrs)=       4.50         5.75           5.25
     RUNOFF VOLUME    (mm)=      54.28        25.84          40.03
     TOTAL RAINFALL   (mm)=      54.38        54.38          54.38
     RUNOFF COEFFICIENT   =       1.00         0.48           0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  75.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| RESERVOIR(  0734)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0825

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0381)      1.000      0.044      5.25      40.03
   OUTFLOW: ID= 1 (  0734)      1.000      0.005      8.33      38.64

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 12.34
                  TIME SHIFT OF PEAK FLOW         (min)=185.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0299

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--------------------
| CALIB            |
| STANDHYD (  0391)|   Area    (ha)=   1.02
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.71         0.31
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.80
     Length            (m)=       6.00       535.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02        19.03
               over (min)         5.00        90.00
     Storage Coeff.  (min)=       0.67 (ii)   86.18 (ii)
     Unit Hyd. Tpeak (min)=       5.00        90.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.01          0.039 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.50           5.25
     RUNOFF VOLUME    (mm)=      54.28        23.23          38.71
     TOTAL RAINFALL   (mm)=      54.38        54.38          54.38
     RUNOFF COEFFICIENT   =       1.00         0.43           0.71

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
```

THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0735)						
IN= 2---> OUT= 1						
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)		OUTFLOW (cms)	STORAGE (ha.m.)	
	0.0000	0.0000		0.0150	0.0825	

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0391)	1.020	0.039	5.25	38.71
OUTFLOW: ID= 1 (0735)	1.020	0.005	9.17	37.34

PEAK FLOW REDUCTION [Qout/Qin](%)= 13.25
TIME SHIFT OF PEAK FLOW (min)=235.00
MAXIMUM STORAGE USED (ha.m.)= 0.0282

```
       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
```

Developed and Distributed by Civica Infrastructure

***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\9fc7da6a-1cb1-4801-be14-cc70b1894841\scenar
Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\9fc7da6a-1cb1-4801-be14-cc70b1894841\scenar

DATE: 10/07/2016 TIME: 09:45:09

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 3 **
****

READ STORM	Filename: C:\Users\p002311c\AppData\Local\Temp\bc146ca3-ab7b-4f3b-910f-6a849449fd04\c2317b21
Ptotal= 62.71 mm	Comments: 10yr/12hr

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	3.50	10.66	6.75	4.39	10.00	0.63
0.50	0.63	3.75	10.66	7.00	4.39	10.25	0.63
0.75	0.63	4.00	10.66	7.25	4.39	10.50	0.63
1.00	0.63	4.25	10.66	7.50	2.51	10.75	0.63
1.25	0.63	4.50	28.84	7.75	2.51	11.00	0.63

1.50	0.63	4.75	28.84	8.00	2.51	11.25	0.63
1.75	0.63	5.00	28.84	8.25	2.51	11.50	0.63
2.00	0.63	5.25	28.84	8.50	1.25	11.75	0.63
2.25	0.63	5.50	8.15	8.75	1.25	12.00	0.63
2.50	3.76	5.75	8.15	9.00	1.25	12.25	0.63
2.75	3.76	6.00	8.15	9.25	1.25		
3.00	3.76	6.25	8.15	9.50	0.63		
3.25	3.76	6.50	4.39	9.75	0.63		

CALIB	
STANDHYD (0081)	Area (ha)= 0.43
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.30	0.13
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	3.00
Length	(m)=	6.00	225.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	3.76	6.250	8.15	9.33	0.63
0.167	0.00	3.250	3.76	6.333	4.39	9.42	0.63
0.250	0.00	3.333	10.66	6.417	4.39	9.50	0.63
0.333	0.63	3.417	10.66	6.500	4.39	9.58	0.63
0.417	0.63	3.500	10.66	6.583	4.39	9.67	0.63
0.500	0.63	3.583	10.66	6.667	4.39	9.75	0.63
0.583	0.63	3.667	10.66	6.750	4.39	9.83	0.63
0.667	0.63	3.750	10.66	6.833	4.39	9.92	0.63
0.750	0.63	3.833	10.66	6.917	4.39	10.00	0.63
0.833	0.63	3.917	10.66	7.000	4.39	10.08	0.63
0.917	0.63	4.000	10.66	7.083	4.39	10.17	0.63
1.000	0.63	4.083	10.66	7.167	4.39	10.25	0.63
1.083	0.63	4.167	10.66	7.250	4.39	10.33	0.63
1.167	0.63	4.250	10.66	7.333	2.51	10.42	0.63
1.250	0.63	4.333	28.84	7.417	2.51	10.50	0.63
1.333	0.63	4.417	28.84	7.500	2.51	10.58	0.63
1.417	0.63	4.500	28.84	7.583	2.51	10.67	0.63
1.500	0.63	4.583	28.84	7.667	2.51	10.75	0.63
1.583	0.63	4.667	28.84	7.750	2.51	10.83	0.63
1.667	0.63	4.750	28.84	7.833	2.51	10.92	0.63
1.750	0.63	4.833	28.84	7.917	2.51	11.00	0.63
1.833	0.63	4.917	28.84	8.000	2.51	11.08	0.63
1.917	0.63	5.000	28.84	8.083	2.51	11.17	0.63
2.000	0.63	5.083	28.84	8.167	2.51	11.25	0.63
2.083	0.63	5.167	28.84	8.250	2.51	11.33	0.63
2.167	0.63	5.250	28.84	8.333	1.25	11.42	0.63
2.250	0.63	5.333	8.15	8.417	1.25	11.50	0.63
2.333	3.76	5.417	8.15	8.500	1.25	11.58	0.63
2.417	3.76	5.500	8.15	8.583	1.25	11.67	0.63
2.500	3.76	5.583	8.15	8.667	1.25	11.75	0.63
2.583	3.76	5.667	8.15	8.750	1.25	11.83	0.63
2.667	3.76	5.750	8.15	8.833	1.25	11.92	0.63
2.750	3.76	5.833	8.15	8.917	1.25	12.00	0.63
2.833	3.76	5.917	8.15	9.000	1.25	12.08	0.63
2.917	3.76	6.000	8.15	9.083	1.25	12.17	0.63
3.000	3.76	6.083	8.15	9.167	1.25	12.25	0.63
3.083	3.76	6.167	8.15	9.250	1.25		

Max.Eff.Inten.(mm/hr)=		28.84	28.67	
over (min)		5.00	30.00	
Storage Coeff. (min)=		0.63 (ii)	29.67 (ii)	
Unit Hyd. Tpeak (min)=		5.00	30.00	
Unit Hyd. peak (cms)=		0.34	0.04	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.01	0.024 (iii)
TIME TO PEAK	(hrs)=	4.50	5.42	5.25
RUNOFF VOLUME	(mm)=	62.61	29.97	46.25
TOTAL RAINFALL	(mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT	=	1.00	0.48	0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| RESERVOIR(0726)|
| IN= 2---> OUT= 1 |
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0150	0.0413

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0081)	0.430	0.024	5.25	46.25
OUTFLOW: ID= 1 (0726)	0.430	0.005	7.25	44.63

PEAK FLOW REDUCTION [Qout/Qin](%)= 19.16
TIME SHIFT OF PEAK FLOW (min)=120.00
MAXIMUM STORAGE USED (ha.m.)= 0.0129

| CALIB |
| STANDHYD (0082)| Area (ha)= 2.05
|ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	1.43	0.62	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	1.40	
Length	(m)=	6.00	1080.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		28.84	24.78	
over (min)		5.00	100.00	
Storage Coeff. (min)=		0.63 (ii)	99.78 (ii)	
Unit Hyd. Tpeak (min)=		5.00	100.00	
Unit Hyd. peak (cms)=		0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.08	0.02	0.089 (iii)
TIME TO PEAK	(hrs)=	4.50	6.67	5.25
RUNOFF VOLUME	(mm)=	62.61	29.97	46.26
TOTAL RAINFALL	(mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT	=	1.00	0.48	0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| RESERVOIR(0727)|
| IN= 2---> OUT= 1 |
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0150	0.1238

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0082)	2.050	0.089	5.25	46.26
OUTFLOW: ID= 1 (0727)	2.050	0.009	10.08	45.24

PEAK FLOW REDUCTION [Qout/Qin](%)= 9.84
TIME SHIFT OF PEAK FLOW (min)=290.00
MAXIMUM STORAGE USED (ha.m.)= 0.0724

| ADD HYD (0800)|

```
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0726):     0.43   0.005     7.25    44.63
     + ID2= 2 (  0727):     2.05   0.009    10.08    45.24
       ================================================
       ID = 3 (  0800):     2.48   0.013     8.50    45.14

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0071)|   Area    (ha)=   0.91
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.64         0.27
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         2.10
     Length            (m)=       6.00       480.60
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=      28.84        28.42
                 over (min)       5.00        55.00
     Storage Coeff.  (min)=       0.63 (ii)   51.76 (ii)
     Unit Hyd. Tpeak (min)=       5.00        55.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.01          0.046 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.83          5.25
     RUNOFF VOLUME    (mm)=      62.61        33.06         47.80
     TOTAL RAINFALL   (mm)=      62.71        62.71         62.71
     RUNOFF COEFFICIENT   =       1.00         0.53          0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0724)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0825

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0071)      0.910      0.046      5.25      47.80
   OUTFLOW: ID= 1 (  0724)      0.910      0.006      8.33      46.27

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 12.70
                  TIME SHIFT OF PEAK FLOW         (min)=185.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0323

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--------------------
| CALIB            |
| STANDHYD (  0072)|   Area    (ha)=   0.91
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.64         0.27
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         2.10
     Length            (m)=       6.00       480.60
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=      28.84        28.42
                 over (min)       5.00        55.00
     Storage Coeff.  (min)=       0.63 (ii)   51.76 (ii)
     Unit Hyd. Tpeak (min)=       5.00        55.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.01          0.046 (iii)
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```
     TIME TO PEAK    (hrs)=       4.42         5.83          5.25
     RUNOFF VOLUME    (mm)=      62.61        33.06         47.80
     TOTAL RAINFALL   (mm)=      62.71        62.71         62.71
     RUNOFF COEFFICIENT   =       1.00         0.53          0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0073)|   Area    (ha)=   0.93
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.65         0.28
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         3.07
     Length            (m)=       6.00       490.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84        29.14
                 over (min)       5.00        50.00
     Storage Coeff.  (min)=       0.63 (ii)   46.33 (ii)
     Unit Hyd. Tpeak (min)=       5.00        50.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.01          0.049 (iii)
     TIME TO PEAK    (hrs)=       4.50         5.75          5.25
     RUNOFF VOLUME    (mm)=      62.61        33.06         47.81
     TOTAL RAINFALL   (mm)=      62.71        62.71         62.71
     RUNOFF COEFFICIENT   =       1.00         0.53          0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0005)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0072):     0.91   0.046     5.25    47.80
     + ID2= 2 (  0073):     0.93   0.049     5.25    47.81
       ================================================
       ID = 3 (  0005):     1.84   0.095     5.25    47.80

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| RESERVOIR(  0725)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.1238

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0005)      1.840      0.095      5.25       47.80
   OUTFLOW: ID= 1 (  0725)      1.840      0.009      9.17       46.67

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  8.98
                  TIME SHIFT OF PEAK FLOW         (min)=235.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0703

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| ADD HYD  (  0700)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
-------------------           (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0724):     0.91   0.006     8.33    46.27
     + ID2= 2 (  0725):     1.84   0.009     9.17    46.67
       ================================================
       ID = 3 (  0700):     2.75   0.014     8.75    46.54

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0301)|   Area    (ha)=   0.38
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.27         0.11
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.52
     Length            (m)=       6.00       200.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84        25.56
               over (min)        5.00        50.00
     Storage Coeff.  (min)=       0.63 (ii)   48.56 (ii)
     Unit Hyd. Tpeak (min)=       5.00        50.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.019 (iii)
     TIME TO PEAK    (hrs)=       4.50         5.75           5.25
     RUNOFF VOLUME    (mm)=      62.61        29.23          45.85
     TOTAL RAINFALL   (mm)=      62.71        62.71          62.71
     RUNOFF COEFFICIENT   =       1.00         0.47           0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0728)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0413

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0301)      0.380      0.019      5.25       45.85
   OUTFLOW: ID= 1 (  0728)      0.380      0.004      7.33       44.02

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 20.85
                  TIME SHIFT OF PEAK FLOW         (min)=125.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0110

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--------------------
| CALIB            |
| STANDHYD (  0302)|   Area    (ha)=   0.40
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.28         0.12
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.52
     Length            (m)=       6.00       211.60
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84        25.56
               over (min)        5.00        55.00
     Storage Coeff.  (min)=       0.63 (ii)   50.20 (ii)
     Unit Hyd. Tpeak (min)=       5.00        55.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
```

PEAK FLOW (cms)=	0.02	0.01	0.020 (iii)
TIME TO PEAK (hrs)=	4.50	5.83	5.25
RUNOFF VOLUME (mm)=	62.61	29.23	45.85
TOTAL RAINFALL (mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT =	1.00	0.47	0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0729)				
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0150	0.0413

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0302)	0.400	0.020	5.25	45.85
OUTFLOW: ID= 1 (0729)	0.400	0.004	7.42	44.11

PEAK FLOW REDUCTION [Qout/Qin](%)= 21.11
TIME SHIFT OF PEAK FLOW (min)=130.00
MAXIMUM STORAGE USED (ha.m.)= 0.0115

ADD HYD (3000)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0728):	0.38	0.004	7.33	44.02
+ ID2= 2 (0729):	0.40	0.004	7.42	44.11
ID = 3 (3000):	0.78	0.008	7.33	44.07

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB				
STANDHYD (0311)	Area (ha)= 0.40			
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00		

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.28	0.12	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	0.50	
Length (m)=	6.00	208.40	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	28.84	26.24	
over (min)	5.00	50.00	
Storage Coeff. (min)=	0.63 (ii)	49.81 (ii)	
Unit Hyd. Tpeak (min)=	5.00	50.00	
Unit Hyd. peak (cms)=	0.34	0.02	
			TOTALS
PEAK FLOW (cms)=	0.02	0.01	0.020 (iii)
TIME TO PEAK (hrs)=	4.50	5.83	5.25
RUNOFF VOLUME (mm)=	62.61	29.97	46.21
TOTAL RAINFALL (mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT =	1.00	0.48	0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
| RESERVOIR(  0730)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0311)      0.400      0.020      5.25      46.21
   OUTFLOW: ID= 1 (  0730)      0.400      0.004      7.33      44.49

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 20.90
                  TIME SHIFT OF PEAK FLOW         (min)=125.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0116

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--------------------
| CALIB            |
| STANDHYD (  0341)|   Area    (ha)=   0.56
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.39         0.17
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.50
     Length            (m)=       6.00       295.30
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84        24.11
               over (min)         5.00        65.00
     Storage Coeff.  (min)=       0.63 (ii)   63.34 (ii)
     Unit Hyd. Tpeak (min)=       5.00        65.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.026 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.08           5.25
     RUNOFF VOLUME    (mm)=      62.61        29.23          45.86
     TOTAL RAINFALL   (mm)=      62.71        62.71          62.71
     RUNOFF COEFFICIENT   =       1.00         0.47           0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0342)|   Area    (ha)=   0.71
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.50         0.21
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         2.80
     Length            (m)=       6.00       372.90
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84        26.21
               over (min)         5.00        45.00
     Storage Coeff.  (min)=       0.63 (ii)   42.23 (ii)
     Unit Hyd. Tpeak (min)=       5.00        45.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.037 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.67           5.25
     RUNOFF VOLUME    (mm)=      62.61        29.23          45.88
     TOTAL RAINFALL   (mm)=      62.71        62.71          62.71
     RUNOFF COEFFICIENT   =       1.00         0.47           0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
```

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (3400)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0341):	0.56	0.026	5.25	45.86
	+ ID2= 2 (0342):	0.71	0.037	5.25	45.88
	ID = 3 (3400):	1.27	0.063	5.25	45.87

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB STANDHYD (0351)	Area (ha)= 1.90		
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00	
		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.33	0.57
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	1.70
Length	(m)=	6.00	1001.80
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		28.84	24.11
over (min)		5.00	95.00
Storage Coeff. (min)=		0.63 (ii)	91.03 (ii)
Unit Hyd. Tpeak (min)=		5.00	95.00
Unit Hyd. peak (cms)=		0.34	0.01

				TOTALS
PEAK FLOW	(cms)=	0.08	0.02	0.083 (iii)
TIME TO PEAK	(hrs)=	4.50	6.58	5.25
RUNOFF VOLUME	(mm)=	62.61	29.23	45.90
TOTAL RAINFALL	(mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT	=	1.00	0.47	0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0732)					
IN= 2---> OUT= 1					
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)	
	0.0000	0.0000	0.0150	0.1238	

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0351)	1.900	0.083	5.25	45.90
OUTFLOW: ID= 1 (0732)	1.900	0.008	9.83	44.79

PEAK FLOW REDUCTION [Qout/Qin](%)= 9.77
TIME SHIFT OF PEAK FLOW (min)=275.00
MAXIMUM STORAGE USED (ha.m.)= 0.0671

CALIB STANDHYD (0352)	Area (ha)= 0.83		
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00	
		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.58	0.25
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	1.60
Length	(m)=	6.00	435.40
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		28.84	24.11

```
               over (min)        5.00         60.00
     Storage Coeff.  (min)=      0.63 (ii)    56.47 (ii)
     Unit Hyd. Tpeak (min)=      5.00         60.00
     Unit Hyd. peak  (cms)=      0.34          0.02
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.03          0.01          0.040 (iii)
     TIME TO PEAK    (hrs)=      4.50          6.00           5.25
     RUNOFF VOLUME    (mm)=     62.61         29.23          45.88
     TOTAL RAINFALL   (mm)=     62.71         62.71          62.71
     RUNOFF COEFFICIENT   =      1.00          0.47           0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0733)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0352)      0.830      0.040      5.25      45.88
   OUTFLOW: ID= 1 (  0733)      0.830      0.009      7.58      45.05

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 21.41
                  TIME SHIFT OF PEAK FLOW         (min)=140.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0235

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--------------------
| ADD HYD  (  3500)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0732):     1.90   0.008     9.83    44.79
     + ID2= 2 (  0733):     0.83   0.009     7.58    45.05
       ================================================
       ID = 3 (  3500):     2.73   0.016     8.33    44.87

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0381)|   Area    (ha)=   1.00
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.70          0.30
     Dep. Storage     (mm)=       0.10          5.00
     Average Slope     (%)=       2.00          4.95
     Length            (m)=       6.00        524.60
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=      28.84         29.06
               over (min)         5.00         45.00
     Storage Coeff.  (min)=       0.63 (ii)    41.93 (ii)
     Unit Hyd. Tpeak (min)=       5.00         45.00
     Unit Hyd. peak  (cms)=       0.34          0.03
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.04          0.02          0.053 (iii)
     TIME TO PEAK    (hrs)=       4.50          5.67           5.25
     RUNOFF VOLUME    (mm)=      62.61         32.26          47.41
     TOTAL RAINFALL   (mm)=      62.71         62.71          62.71
     RUNOFF COEFFICIENT   =       1.00          0.51           0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
```

THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0734) IN= 2---> OUT= 1 DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0150	0.0825

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0381)	1.000	0.053	5.25	47.41
OUTFLOW: ID= 1 (0734)	1.000	0.006	8.33	46.02

PEAK FLOW REDUCTION [Qout/Qin](%)= 12.11
TIME SHIFT OF PEAK FLOW (min)=185.00
MAXIMUM STORAGE USED (ha.m.)= 0.0356

CALIB STANDHYD (0391) ID= 1 DT= 5.0 min	Area (ha)= 1.02 Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.71	0.31	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.80	
Length	(m)=	6.00	535.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		28.84	24.11	
over (min)		5.00	80.00	
Storage Coeff. (min)=		0.63 (ii)	78.42 (ii)	
Unit Hyd. Tpeak (min)=		5.00	80.00	
Unit Hyd. peak (cms)=		0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.04	0.01	0.046 (iii)
TIME TO PEAK	(hrs)=	4.50	6.33	5.25
RUNOFF VOLUME	(mm)=	62.61	29.23	45.88
TOTAL RAINFALL	(mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT	=	1.00	0.47	0.73

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0735) IN= 2---> OUT= 1 DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0150	0.0825

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0391)	1.020	0.046	5.25	45.88
OUTFLOW: ID= 1 (0735)	1.020	0.006	9.08	44.52

PEAK FLOW REDUCTION [Qout/Qin](%)= 13.33
TIME SHIFT OF PEAK FLOW (min)=230.00
MAXIMUM STORAGE USED (ha.m.)= 0.0337

```
V    V   I    SSSSS  U   U    A    L
V    V   I    SS     U   U   A A   L
 V  V    I     SS    U   U  AAAAA  L
 V  V    I      SS   U   U  A   A  L
  VV     I    SSSSS  UUUUU  A   A  LLLLL
```

```
       OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
      O   O    T      T    H   H   Y Y   MM MM  O   O
      O   O    T      T    H   H    Y    M   M  O   O
       OOO     T      T    H   H    Y    M   M   OOO
```


***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\44321c62-f967-4386-bd50-da5de7bcc47e\scenar
Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\44321c62-f967-4386-bd50-da5de7bcc47e\scenar

DATE: 10/07/2016 TIME: 09:45:10

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 4 **
****

READ STORM	Filename: C:\Users\p002311c\AppData\Local\Temp\bc146ca3-ab7b-4f3b-910f-6a849449fd04\f7b7daf8
Ptotal= 73.10 mm	Comments: 25yr/12hr

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	3.50	12.43	6.75	5.12	10.00	0.73
0.50	0.73	3.75	12.43	7.00	5.12	10.25	0.73
0.75	0.73	4.00	12.43	7.25	5.12	10.50	0.73
1.00	0.73	4.25	12.43	7.50	2.92	10.75	0.73
1.25	0.73	4.50	33.63	7.75	2.92	11.00	0.73
1.50	0.73	4.75	33.63	8.00	2.92	11.25	0.73
1.75	0.73	5.00	33.63	8.25	2.92	11.50	0.73
2.00	0.73	5.25	33.63	8.50	1.46	11.75	0.73
2.25	0.73	5.50	9.50	8.75	1.46	12.00	0.73
2.50	4.39	5.75	9.50	9.00	1.46	12.25	0.73
2.75	4.39	6.00	9.50	9.25	1.46		
3.00	4.39	6.25	9.50	9.50	0.73		
3.25	4.39	6.50	5.12	9.75	0.73		

CALIB STANDHYD (0081)	Area (ha)= 0.43
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.30	0.13
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	3.00
Length	(m)=	6.00	225.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr

0.083	0.00	3.167	4.39	6.250	9.50	9.33	0.73
0.167	0.00	3.250	4.39	6.333	5.12	9.42	0.73
0.250	0.00	3.333	12.43	6.417	5.12	9.50	0.73
0.333	0.73	3.417	12.43	6.500	5.12	9.58	0.73
0.417	0.73	3.500	12.43	6.583	5.12	9.67	0.73
0.500	0.73	3.583	12.43	6.667	5.12	9.75	0.73
0.583	0.73	3.667	12.43	6.750	5.12	9.83	0.73
0.667	0.73	3.750	12.43	6.833	5.12	9.92	0.73
0.750	0.73	3.833	12.43	6.917	5.12	10.00	0.73
0.833	0.73	3.917	12.43	7.000	5.12	10.08	0.73
0.917	0.73	4.000	12.43	7.083	5.12	10.17	0.73
1.000	0.73	4.083	12.43	7.167	5.12	10.25	0.73
1.083	0.73	4.167	12.43	7.250	5.12	10.33	0.73
1.167	0.73	4.250	12.43	7.333	2.92	10.42	0.73
1.250	0.73	4.333	33.63	7.417	2.92	10.50	0.73
1.333	0.73	4.417	33.63	7.500	2.92	10.58	0.73
1.417	0.73	4.500	33.63	7.583	2.92	10.67	0.73
1.500	0.73	4.583	33.63	7.667	2.92	10.75	0.73
1.583	0.73	4.667	33.63	7.750	2.92	10.83	0.73
1.667	0.73	4.750	33.63	7.833	2.92	10.92	0.73
1.750	0.73	4.833	33.63	7.917	2.92	11.00	0.73
1.833	0.73	4.917	33.63	8.000	2.92	11.08	0.73
1.917	0.73	5.000	33.63	8.083	2.92	11.17	0.73
2.000	0.73	5.083	33.63	8.167	2.92	11.25	0.73
2.083	0.73	5.167	33.63	8.250	2.92	11.33	0.73
2.167	0.73	5.250	33.63	8.333	1.46	11.42	0.73
2.250	0.73	5.333	9.50	8.417	1.46	11.50	0.73
2.333	4.39	5.417	9.50	8.500	1.46	11.58	0.73
2.417	4.39	5.500	9.50	8.583	1.46	11.67	0.73
2.500	4.39	5.583	9.50	8.667	1.46	11.75	0.73
2.583	4.39	5.667	9.50	8.750	1.46	11.83	0.73
2.667	4.39	5.750	9.50	8.833	1.46	11.92	0.73
2.750	4.39	5.833	9.50	8.917	1.46	12.00	0.73
2.833	4.39	5.917	9.50	9.000	1.46	12.08	0.73
2.917	4.39	6.000	9.50	9.083	1.46	12.17	0.73
3.000	4.39	6.083	9.50	9.167	1.46	12.25	0.73
3.083	4.39	6.167	9.50	9.250	1.46		

Max.Eff.Inten.(mm/hr)=	33.63	36.13		
over (min)	5.00	30.00		
Storage Coeff. (min)=	0.59 (ii)	27.06 (ii)		
Unit Hyd. Tpeak (min)=	5.00	30.00		
Unit Hyd. peak (cms)=	0.34	0.04		
			TOTALS	
PEAK FLOW (cms)=	0.02	0.01	0.030 (iii)	
TIME TO PEAK (hrs)=	4.42	5.42	5.25	
RUNOFF VOLUME (mm)=	73.00	37.98	55.45	
TOTAL RAINFALL (mm)=	73.10	73.10	73.10	
RUNOFF COEFFICIENT =	1.00	0.52	0.76	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0726)				
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0150	0.0413

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0081)	0.430	0.030	5.25	55.45
OUTFLOW: ID= 1 (0726)	0.430	0.006	7.25	53.85

PEAK FLOW REDUCTION [Qout/Qin](%)= 19.01
TIME SHIFT OF PEAK FLOW (min)=120.00
MAXIMUM STORAGE USED (ha.m.)= 0.0155

CALIB		
STANDHYD (0082)	Area (ha)=	2.05

```
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
-------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.43         0.62
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         1.40
     Length            (m)=       6.00      1080.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        31.64
                 over (min)       5.00        95.00
     Storage Coeff.  (min)=       0.59 (ii)   90.52 (ii)
     Unit Hyd. Tpeak (min)=       5.00        95.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.10         0.03          0.106 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.58           5.25
     RUNOFF VOLUME    (mm)=      73.00        37.98          55.47
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       1.00         0.52           0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-------------------
| RESERVOIR(  0727)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.1238

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0082)      2.050      0.106      5.25      55.47
   OUTFLOW: ID= 1 (  0727)      2.050      0.011      9.92      54.45

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  9.98
                  TIME SHIFT OF PEAK FLOW         (min)=280.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0875

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-------------------
| ADD HYD  (  0800)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0726):     0.43   0.006     7.25    53.85
     + ID2= 2 (  0727):     2.05   0.011     9.92    54.45
       ================================================
       ID = 3 (  0800):     2.48   0.016     8.50    54.34

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
-------------------
| CALIB            |
| STANDHYD (  0071)|   Area    (ha)=   0.91
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
-------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.64         0.27
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         2.10
     Length            (m)=       6.00       480.60
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        36.66
                 over (min)       5.00        50.00
     Storage Coeff.  (min)=       0.59 (ii)   46.77 (ii)
     Unit Hyd. Tpeak (min)=       5.00        50.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.02          0.057 (iii)
```

```
     TIME TO PEAK    (hrs)=       4.42         5.75          5.25
     RUNOFF VOLUME    (mm)=      73.00        41.56         57.25
     TOTAL RAINFALL   (mm)=      73.10        73.10         73.10
     RUNOFF COEFFICIENT   =       1.00         0.57          0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0724)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0825

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0071)      0.910      0.057      5.25      57.25
   OUTFLOW: ID= 1 (  0724)      0.910      0.007      8.33      55.72

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 12.47
                  TIME SHIFT OF PEAK FLOW         (min)=185.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0389

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--------------------
| CALIB            |
| STANDHYD (  0072)|   Area    (ha)=   0.91
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.64         0.27
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         2.10
     Length            (m)=       6.00       480.60
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        36.66
               over (min)         5.00        50.00
     Storage Coeff.  (min)=       0.59 (ii)   46.77 (ii)
     Unit Hyd. Tpeak (min)=       5.00        50.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.02          0.057 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.75          5.25
     RUNOFF VOLUME    (mm)=      73.00        41.56         57.25
     TOTAL RAINFALL   (mm)=      73.10        73.10         73.10
     RUNOFF COEFFICIENT   =       1.00         0.57          0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0073)|   Area    (ha)=   0.93
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.65         0.28
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         3.07
     Length            (m)=       6.00       490.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        37.42
               over (min)         5.00        45.00
     Storage Coeff.  (min)=       0.59 (ii)   41.94 (ii)
```

```
     Unit Hyd. Tpeak (min)=       5.00        45.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.02          0.060 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.67           5.25
     RUNOFF VOLUME    (mm)=      73.00        41.56          57.26
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       1.00         0.57           0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0005)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0072):     0.91   0.057     5.25    57.25
     + ID2= 2 (  0073):     0.93   0.060     5.25    57.26
       ================================================
       ID = 3 (  0005):     1.84   0.117     5.25    57.25

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| RESERVOIR(  0725)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.1238

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0005)      1.840      0.117      5.25      57.25
   OUTFLOW: ID= 1 (  0725)      1.840      0.010      9.00      56.11

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  8.79
                  TIME SHIFT OF PEAK FLOW         (min)=225.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0845

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--------------------
| ADD HYD  (  0700)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0724):     0.91   0.007     8.33    55.72
     + ID2= 2 (  0725):     1.84   0.010     9.00    56.11
       ================================================
       ID = 3 (  0700):     2.75   0.017     8.67    55.98

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0301)|   Area    (ha)=   0.38
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.27         0.11
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.52
     Length            (m)=       6.00       200.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        33.31
               over (min)        5.00        45.00
     Storage Coeff.  (min)=       0.59 (ii)   43.70 (ii)
     Unit Hyd. Tpeak (min)=       5.00        45.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                          *TOTALS*
```

PEAK FLOW (cms)=	0.02	0.01	0.023 (iii)
TIME TO PEAK (hrs)=	4.42	5.67	5.25
RUNOFF VOLUME (mm)=	73.00	37.13	55.00
TOTAL RAINFALL (mm)=	73.10	73.10	73.10
RUNOFF COEFFICIENT =	1.00	0.51	0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0728)					
IN= 2---> OUT= 1					
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)	
	0.0000	0.0000	0.0150	0.0413	

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0301)	0.380	0.023	5.25	55.00
OUTFLOW: ID= 1 (0728)	0.380	0.005	7.33	53.16

PEAK FLOW REDUCTION [Qout/Qin](%)= 20.57
TIME SHIFT OF PEAK FLOW (min)=125.00
MAXIMUM STORAGE USED (ha.m.)= 0.0133

CALIB		
STANDHYD (0302)	Area (ha)=	0.40
ID= 1 DT= 5.0 min	Total Imp(%)=	70.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.28	0.12	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	0.52	
Length (m)=	6.00	211.60	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	33.63	33.31	
over (min)	5.00	50.00	
Storage Coeff. (min)=	0.59 (ii)	45.18 (ii)	
Unit Hyd. Tpeak (min)=	5.00	50.00	
Unit Hyd. peak (cms)=	0.34	0.02	
			TOTALS
PEAK FLOW (cms)=	0.02	0.01	0.024 (iii)
TIME TO PEAK (hrs)=	4.50	5.75	5.25
RUNOFF VOLUME (mm)=	73.00	37.13	55.00
TOTAL RAINFALL (mm)=	73.10	73.10	73.10
RUNOFF COEFFICIENT =	1.00	0.51	0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0729)					
IN= 2---> OUT= 1					
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)	
	0.0000	0.0000	0.0150	0.0413	

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0302)	0.400	0.024	5.25	55.00
OUTFLOW: ID= 1 (0729)	0.400	0.005	7.33	53.26

PEAK FLOW REDUCTION [Qout/Qin](%)= 20.87
TIME SHIFT OF PEAK FLOW (min)=125.00

MAXIMUM STORAGE USED (ha.m.)= 0.0139

ADD HYD (3000)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0728):		0.38	0.005	7.33	53.16
+ ID2= 2 (0729):		0.40	0.005	7.33	53.26
ID = 3 (3000):		0.78	0.010	7.33	53.21

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB		
STANDHYD (0311)	Area (ha)=	0.40
ID= 1 DT= 5.0 min	Total Imp(%)=	70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.28	0.12	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.50	
Length	(m)=	6.00	208.40	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		33.63	34.11	
over (min)		5.00	45.00	
Storage Coeff. (min)=		0.59 (ii)	44.88 (ii)	
Unit Hyd. Tpeak (min)=		5.00	45.00	
Unit Hyd. peak (cms)=		0.34	0.03	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.01	0.025 (iii)
TIME TO PEAK	(hrs)=	4.50	5.67	5.25
RUNOFF VOLUME	(mm)=	73.00	37.99	55.43
TOTAL RAINFALL	(mm)=	73.10	73.10	73.10
RUNOFF COEFFICIENT	=	1.00	0.52	0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0730)					
IN= 2---> OUT= 1					
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)	
	0.0000	0.0000	0.0150	0.0413	

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0311)	0.400	0.025	5.25	55.43
OUTFLOW: ID= 1 (0730)	0.400	0.005	7.33	53.69

PEAK FLOW REDUCTION [Qout/Qin](%)= 20.63
TIME SHIFT OF PEAK FLOW (min)=125.00
MAXIMUM STORAGE USED (ha.m.)= 0.0141

CALIB		
STANDHYD (0341)	Area (ha)=	0.56
ID= 1 DT= 5.0 min	Total Imp(%)=	70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.39	0.17
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	0.50
Length	(m)=	6.00	295.30
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		33.63	30.85

```
                over (min)        5.00        60.00
     Storage Coeff.  (min)=       0.59 (ii)   57.41 (ii)
     Unit Hyd. Tpeak (min)=       5.00        60.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.032 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.92           5.25
     RUNOFF VOLUME    (mm)=      73.00        37.13          55.00
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       1.00         0.51           0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0342)|   Area    (ha)=   0.71
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.50         0.21
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         2.80
     Length            (m)=       6.00       372.90
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        34.03
                over (min)        5.00        40.00
     Storage Coeff.  (min)=       0.59 (ii)   38.07 (ii)
     Unit Hyd. Tpeak (min)=       5.00        40.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.045 (iii)
     TIME TO PEAK    (hrs)=       4.50         5.58           5.25
     RUNOFF VOLUME    (mm)=      73.00        37.13          55.03
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       1.00         0.51           0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  3400)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0341):     0.56   0.032     5.25    55.00
     + ID2= 2 (  0342):     0.71   0.045     5.25    55.03
       ================================================
       ID = 3 (  3400):     1.27   0.077     5.25    55.02

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0351)|   Area    (ha)=   1.90
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.33         0.57
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         1.70
     Length            (m)=       6.00      1001.80
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        30.85
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              over (min)        5.00         85.00
     Storage Coeff.  (min)=     0.59 (ii)    82.51 (ii)
     Unit Hyd. Tpeak (min)=     5.00         85.00
     Unit Hyd. peak  (cms)=     0.34          0.01
                                                      *TOTALS*
     PEAK FLOW       (cms)=     0.09          0.03       0.100 (iii)
     TIME TO PEAK    (hrs)=     4.50          6.42        5.25
     RUNOFF VOLUME    (mm)=    73.00         37.13       55.04
     TOTAL RAINFALL   (mm)=    73.10         73.10       73.10
     RUNOFF COEFFICIENT   =     1.00          0.51        0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0732)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.1238

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0351)      1.900      0.100      5.25      55.04
   OUTFLOW: ID= 1 (  0732)      1.900      0.010      9.67      53.94

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  9.83
                  TIME SHIFT OF PEAK FLOW         (min)=265.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0812

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0352)|   Area    (ha)=   0.83
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.58         0.25
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         1.60
     Length            (m)=       6.00       435.40
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        32.55
              over (min)         5.00        55.00
     Storage Coeff.  (min)=      0.59 (ii)   50.12 (ii)
     Unit Hyd. Tpeak (min)=      5.00        55.00
     Unit Hyd. peak  (cms)=      0.34         0.02
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.04         0.01       0.049 (iii)
     TIME TO PEAK    (hrs)=      4.42         5.83        5.25
     RUNOFF VOLUME    (mm)=     73.00        37.13       55.03
     TOTAL RAINFALL   (mm)=     73.10        73.10       73.10
     RUNOFF COEFFICIENT   =      1.00         0.51        0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0733)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
```

```
   INFLOW : ID= 2 (  0352)      0.830      0.049      5.25      55.03
   OUTFLOW: ID= 1 (  0733)      0.830      0.010      7.42      54.19

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 21.24
                  TIME SHIFT OF PEAK FLOW         (min)=130.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0286
```

```
--------------------
| ADD HYD  (  3500)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0732):     1.90   0.010     9.67    53.94
     + ID2= 2 (  0733):     0.83   0.010     7.42    54.19
       ================================================
       ID = 3 (  3500):     2.73   0.020     8.33    54.01

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

```
--------------------
| CALIB            |
| STANDHYD (  0381)|   Area    (ha)=   1.00
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.70         0.30
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         4.95
     Length            (m)=       6.00       524.60
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        37.28
               over (min)         5.00        40.00
     Storage Coeff.  (min)=       0.59 (ii)   37.97 (ii)
     Unit Hyd. Tpeak (min)=       5.00        40.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.02          0.066 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.58           5.25
     RUNOFF VOLUME    (mm)=      73.00        40.64          56.80
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       1.00         0.56           0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

```
--------------------
| RESERVOIR(  0734)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0825

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0381)     1.000      0.066      5.25      56.80
   OUTFLOW: ID= 1 (  0734)     1.000      0.008      8.25      55.41

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 11.84
                  TIME SHIFT OF PEAK FLOW         (min)=180.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0428
```

```
--------------------
| CALIB            |
| STANDHYD (  0391)|   Area    (ha)=   1.02
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.71         0.31
     Dep. Storage     (mm)=       0.10         5.00
```

```
     Average Slope     (%)=       2.00         0.80
     Length            (m)=       6.00       535.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        30.85
               over (min)         5.00        75.00
     Storage Coeff.  (min)=       0.59 (ii)   71.08 (ii)
     Unit Hyd. Tpeak (min)=       5.00        75.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.01          0.055 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.25           5.25
     RUNOFF VOLUME    (mm)=      73.00        37.13          55.02
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       1.00         0.51           0.75

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0735)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0825

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0391)      1.020      0.055      5.25      55.02
   OUTFLOW: ID= 1 (  0735)      1.020      0.007      8.92      53.66

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 13.40
                  TIME SHIFT OF PEAK FLOW         (min)=220.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0407

--------------------------------------------------------------------------------
================================================================================================================

       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

  Output  filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\cf1a2931-e274-4b79-992a-667eba8826e
b\scenar
  Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\cf1a2931-e274-4b79-992a-667eba8826e
b\scenar


DATE: 10/07/2016                          TIME: 09:45:10

USER:


COMMENTS: _____________________________________________________________
```

****
** SIMULATION NUMBER: 5 **
****

READ STORM	Filename: C:\Users\p002311c\AppData\Local\Temp\bc146ca3-ab7b-4f3b-910f-6a849449fd04\290aae49
Ptotal= 80.82 mm	Comments: 50yr/12hr

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	3.50	13.74	6.75	5.66	10.00	0.81
0.50	0.81	3.75	13.74	7.00	5.66	10.25	0.81
0.75	0.81	4.00	13.74	7.25	5.66	10.50	0.81
1.00	0.81	4.25	13.74	7.50	3.23	10.75	0.81
1.25	0.81	4.50	37.17	7.75	3.23	11.00	0.81
1.50	0.81	4.75	37.17	8.00	3.23	11.25	0.81
1.75	0.81	5.00	37.17	8.25	3.23	11.50	0.81
2.00	0.81	5.25	37.17	8.50	1.62	11.75	0.81
2.25	0.81	5.50	10.50	8.75	1.62	12.00	0.81
2.50	4.85	5.75	10.50	9.00	1.62	12.25	0.81
2.75	4.85	6.00	10.50	9.25	1.62		
3.00	4.85	6.25	10.50	9.50	0.81		
3.25	4.85	6.50	5.66	9.75	0.81		

CALIB STANDHYD (0081) ID= 1 DT= 5.0 min	Area (ha)= 0.43
	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.30	0.13
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	3.00
Length	(m)=	6.00	225.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	4.85	6.250	10.50	9.33	0.81
0.167	0.00	3.250	4.85	6.333	5.66	9.42	0.81
0.250	0.00	3.333	13.74	6.417	5.66	9.50	0.81
0.333	0.81	3.417	13.74	6.500	5.66	9.58	0.81
0.417	0.81	3.500	13.74	6.583	5.66	9.67	0.81
0.500	0.81	3.583	13.74	6.667	5.66	9.75	0.81
0.583	0.81	3.667	13.74	6.750	5.66	9.83	0.81
0.667	0.81	3.750	13.74	6.833	5.66	9.92	0.81
0.750	0.81	3.833	13.74	6.917	5.66	10.00	0.81
0.833	0.81	3.917	13.74	7.000	5.66	10.08	0.81
0.917	0.81	4.000	13.74	7.083	5.66	10.17	0.81
1.000	0.81	4.083	13.74	7.167	5.66	10.25	0.81
1.083	0.81	4.167	13.74	7.250	5.66	10.33	0.81
1.167	0.81	4.250	13.74	7.333	3.23	10.42	0.81
1.250	0.81	4.333	37.17	7.417	3.23	10.50	0.81
1.333	0.81	4.417	37.17	7.500	3.23	10.58	0.81
1.417	0.81	4.500	37.17	7.583	3.23	10.67	0.81
1.500	0.81	4.583	37.17	7.667	3.23	10.75	0.81
1.583	0.81	4.667	37.17	7.750	3.23	10.83	0.81
1.667	0.81	4.750	37.17	7.833	3.23	10.92	0.81
1.750	0.81	4.833	37.17	7.917	3.23	11.00	0.81
1.833	0.81	4.917	37.17	8.000	3.23	11.08	0.81
1.917	0.81	5.000	37.17	8.083	3.23	11.17	0.81
2.000	0.81	5.083	37.17	8.167	3.23	11.25	0.81
2.083	0.81	5.167	37.17	8.250	3.23	11.33	0.81
2.167	0.81	5.250	37.17	8.333	1.62	11.42	0.81
2.250	0.81	5.333	10.50	8.417	1.62	11.50	0.81
2.333	4.85	5.417	10.50	8.500	1.62	11.58	0.81
2.417	4.85	5.500	10.50	8.583	1.62	11.67	0.81

2.500	4.85	5.583	10.50	8.667	1.62	11.75	0.81
2.583	4.85	5.667	10.50	8.750	1.62	11.83	0.81
2.667	4.85	5.750	10.50	8.833	1.62	11.92	0.81
2.750	4.85	5.833	10.50	8.917	1.62	12.00	0.81
2.833	4.85	5.917	10.50	9.000	1.62	12.08	0.81
2.917	4.85	6.000	10.50	9.083	1.62	12.17	0.81
3.000	4.85	6.083	10.50	9.167	1.62	12.25	0.81
3.083	4.85	6.167	10.50	9.250	1.62		

Max.Eff.Inten.(mm/hr)=	37.17	42.44	
over (min)	5.00	30.00	
Storage Coeff. (min)=	0.57 (ii)	25.39 (ii)	
Unit Hyd. Tpeak (min)=	5.00	30.00	
Unit Hyd. peak (cms)=	0.34	0.04	
			TOTALS
PEAK FLOW (cms)=	0.02	0.01	0.034 (iii)
TIME TO PEAK (hrs)=	4.42	5.42	5.25
RUNOFF VOLUME (mm)=	80.72	44.18	62.42
TOTAL RAINFALL (mm)=	80.82	80.82	80.82
RUNOFF COEFFICIENT =	1.00	0.55	0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0726)				
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0150	0.0413

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0081)	0.430	0.034	5.25	62.42
OUTFLOW: ID= 1 (0726)	0.430	0.006	7.25	60.80

PEAK FLOW REDUCTION [Qout/Qin](%)= 18.89
TIME SHIFT OF PEAK FLOW (min)=120.00
MAXIMUM STORAGE USED (ha.m.)= 0.0175

CALIB	
STANDHYD (0082)	Area (ha)= 2.05
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	1.43	0.62
Dep. Storage (mm)=	0.10	5.00
Average Slope (%)=	2.00	1.40
Length (m)=	6.00	1080.00
Mannings n =	0.013	0.250

Max.Eff.Inten.(mm/hr)=	37.17	36.91	
over (min)	5.00	90.00	
Storage Coeff. (min)=	0.57 (ii)	85.11 (ii)	
Unit Hyd. Tpeak (min)=	5.00	90.00	
Unit Hyd. peak (cms)=	0.34	0.01	
			TOTALS
PEAK FLOW (cms)=	0.11	0.03	0.120 (iii)
TIME TO PEAK (hrs)=	4.42	6.50	5.25
RUNOFF VOLUME (mm)=	80.72	44.18	62.43
TOTAL RAINFALL (mm)=	80.82	80.82	80.82
RUNOFF COEFFICIENT =	1.00	0.55	0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0727)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.1238

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0082)      2.050      0.120      5.25      62.43
   OUTFLOW: ID= 1 (  0727)      2.050      0.012      9.83      61.40

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 10.03
                  TIME SHIFT OF PEAK FLOW         (min)=275.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0990

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0800)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0726):     0.43   0.006     7.25    60.80
     + ID2= 2 (  0727):     2.05   0.012     9.83    61.40
       ================================================
       ID = 3 (  0800):     2.48   0.018     8.50    61.30

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0071)|   Area    (ha)=   0.91
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       0.64         0.27
    Dep. Storage     (mm)=       0.10         5.00
    Average Slope     (%)=       2.00         2.10
    Length            (m)=       6.00       480.60
    Mannings n           =      0.013         0.250

    Max.Eff.Inten.(mm/hr)=      37.17        43.19
              over (min)         5.00        45.00
    Storage Coeff.  (min)=       0.57 (ii)   43.82 (ii)
    Unit Hyd. Tpeak (min)=       5.00        45.00
    Unit Hyd. peak  (cms)=       0.34         0.03
                                                        *TOTALS*
    PEAK FLOW       (cms)=       0.05         0.02          0.065 (iii)
    TIME TO PEAK    (hrs)=       4.42         5.67           5.25
    RUNOFF VOLUME    (mm)=      80.72        48.08          64.37
    TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
    RUNOFF COEFFICIENT   =       1.00         0.59           0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0724)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0825

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0071)      0.910      0.065      5.25      64.37
   OUTFLOW: ID= 1 (  0724)      0.910      0.008      8.33      62.84

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 12.23
                  TIME SHIFT OF PEAK FLOW         (min)=185.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0439
```

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--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0072)|   Area    (ha)=   0.91
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.64         0.27
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         2.10
     Length            (m)=       6.00       480.60
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        43.19
               over (min)        5.00        45.00
     Storage Coeff.  (min)=       0.57 (ii)   43.82 (ii)
     Unit Hyd. Tpeak (min)=       5.00        45.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.02          0.065 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.67           5.25
     RUNOFF VOLUME    (mm)=      80.72        48.08          64.37
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.59           0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0073)|   Area    (ha)=   0.93
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.65         0.28
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         3.07
     Length            (m)=       6.00       490.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        43.94
               over (min)        5.00        40.00
     Storage Coeff.  (min)=       0.57 (ii)   39.35 (ii)
     Unit Hyd. Tpeak (min)=       5.00        40.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.02          0.069 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.58           5.25
     RUNOFF VOLUME    (mm)=      80.72        48.08          64.38
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.59           0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  0005)|
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0072):     0.91   0.065     5.25    64.37
      + ID2= 2 (  0073):     0.93   0.069     5.25    64.38
        ================================================
        ID = 3 (  0005):     1.84   0.134     5.25    64.38

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------
| RESERVOIR(  0725)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.1238

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0005)      1.840      0.134      5.25      64.38
   OUTFLOW: ID= 1 (  0725)      1.840      0.012      8.83      63.24

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  8.60
                  TIME SHIFT OF PEAK FLOW         (min)=215.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0953

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--------------------
| ADD HYD  (  0700)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0724):     0.91   0.008     8.33    62.84
     + ID2= 2 (  0725):     1.84   0.012     8.83    63.24
       ================================================
       ID = 3 (  0700):     2.75   0.020     8.50    63.11

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0301)|   Area    (ha)=   0.38
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.27         0.11
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.52
     Length            (m)=       6.00       200.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        38.76
               over (min)         5.00        45.00
     Storage Coeff.  (min)=       0.57 (ii)   41.14 (ii)
     Unit Hyd. Tpeak (min)=       5.00        45.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01          0.027 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.67           5.25
     RUNOFF VOLUME    (mm)=      80.72        43.24          61.92
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.53           0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0728)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0301)      0.380      0.027      5.25      61.92
   OUTFLOW: ID= 1 (  0728)      0.380      0.005      7.33      60.09

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 20.53
                  TIME SHIFT OF PEAK FLOW         (min)=125.00
```

MAXIMUM STORAGE USED (ha.m.)= 0.0150

CALIB					
STANDHYD (0302)	Area (ha)= 0.40				
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00			

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.28	0.12	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.52	
Length	(m)=	6.00	211.60	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		37.17	38.76	
over (min)		5.00	45.00	
Storage Coeff. (min)=		0.57 (ii)	42.54 (ii)	
Unit Hyd. Tpeak (min)=		5.00	45.00	
Unit Hyd. peak (cms)=		0.34	0.03	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.01	0.028 (iii)
TIME TO PEAK	(hrs)=	4.42	5.67	5.25
RUNOFF VOLUME	(mm)=	80.72	43.24	61.91
TOTAL RAINFALL	(mm)=	80.82	80.82	80.82
RUNOFF COEFFICIENT	=	1.00	0.53	0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0729)				
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0150	0.0413

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0302)	0.400	0.028	5.25	61.91
OUTFLOW: ID= 1 (0729)	0.400	0.006	7.33	60.18

PEAK FLOW REDUCTION [Qout/Qin](%)= 20.58
TIME SHIFT OF PEAK FLOW (min)=125.00
MAXIMUM STORAGE USED (ha.m.)= 0.0158

ADD HYD (3000)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0728):	0.38	0.005	7.33	60.09
	+ ID2= 2 (0729):	0.40	0.006	7.33	60.18
	ID = 3 (3000):	0.78	0.011	7.33	60.13

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB					
STANDHYD (0311)	Area (ha)= 0.40				
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00			

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.28	0.12
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	0.50
Length	(m)=	6.00	208.40
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		37.17	39.63

```
               over (min)        5.00         45.00
     Storage Coeff.  (min)=      0.57 (ii)    42.28 (ii)
     Unit Hyd. Tpeak (min)=      5.00         45.00
     Unit Hyd. peak  (cms)=      0.34          0.03
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.02          0.01      0.028 (iii)
     TIME TO PEAK    (hrs)=      4.42          5.67       5.25
     RUNOFF VOLUME    (mm)=     80.72         44.18      62.38
     TOTAL RAINFALL   (mm)=     80.82         80.82      80.82
     RUNOFF COEFFICIENT   =      1.00          0.55       0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0730)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0311)      0.400      0.028      5.25      62.38
   OUTFLOW: ID= 1 (  0730)      0.400      0.006      7.33      60.65

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 20.59
                  TIME SHIFT OF PEAK FLOW         (min)=125.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0159

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--------------------
| CALIB            |
| STANDHYD (  0341)|   Area    (ha)=   0.56
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.39         0.17
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.50
     Length            (m)=       6.00       295.30
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        37.02
               over (min)         5.00        55.00
     Storage Coeff.  (min)=       0.57 (ii)   53.39 (ii)
     Unit Hyd. Tpeak (min)=       5.00        55.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01       0.037 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.83        5.25
     RUNOFF VOLUME    (mm)=      80.72        43.24       61.92
     TOTAL RAINFALL   (mm)=      80.82        80.82       80.82
     RUNOFF COEFFICIENT   =       1.00         0.53        0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0342)|   Area    (ha)=   0.71
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.50         0.21
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         2.80
```

Length (m)=	6.00	372.90	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	37.17	39.54	
over (min)	5.00	40.00	
Storage Coeff. (min)=	0.57 (ii)	35.87 (ii)	
Unit Hyd. Tpeak (min)=	5.00	40.00	
Unit Hyd. peak (cms)=	0.34	0.03	
			TOTALS
PEAK FLOW (cms)=	0.04	0.02	0.051 (iii)
TIME TO PEAK (hrs)=	4.42	5.58	5.25
RUNOFF VOLUME (mm)=	80.72	43.24	61.95
TOTAL RAINFALL (mm)=	80.82	80.82	80.82
RUNOFF COEFFICIENT =	1.00	0.53	0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (3400)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0341):		0.56	0.037	5.25	61.92
+ ID2= 2 (0342):		0.71	0.051	5.25	61.95
ID = 3 (3400):		1.27	0.088	5.25	61.93

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB					
STANDHYD (0351)		Area (ha)= 1.90			
ID= 1 DT= 5.0 min		Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00		
		IMPERVIOUS	PERVIOUS (i)		
Surface Area (ha)=		1.33	0.57		
Dep. Storage (mm)=		0.10	5.00		
Average Slope (%)=		2.00	1.70		
Length (m)=		6.00	1001.80		
Mannings n =		0.013	0.250		
Max.Eff.Inten.(mm/hr)=		37.17	36.05		
over (min)		5.00	80.00		
Storage Coeff. (min)=		0.57 (ii)	77.54 (ii)		
Unit Hyd. Tpeak (min)=		5.00	80.00		
Unit Hyd. peak (cms)=		0.34	0.01		
					TOTALS
PEAK FLOW (cms)=		0.10	0.03		0.113 (iii)
TIME TO PEAK (hrs)=		4.50	6.33		5.25
RUNOFF VOLUME (mm)=		80.72	43.24		61.96
TOTAL RAINFALL (mm)=		80.82	80.82		80.82
RUNOFF COEFFICIENT =		1.00	0.53		0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0732)					
IN= 2---> OUT= 1					
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)	
	0.0000	0.0000	0.0150	0.1238	

AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)

```
   INFLOW : ID= 2 (  0351)      1.900      0.113      5.25      61.96
   OUTFLOW: ID= 1 (  0732)      1.900      0.011      9.58      60.85

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  9.84
                  TIME SHIFT OF PEAK FLOW         (min)=260.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0918

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--------------------
| CALIB            |
| STANDHYD (  0352)|   Area    (ha)=   0.83
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.58         0.25
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         1.60
     Length            (m)=       6.00       435.40
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        37.92
               over (min)         5.00        50.00
     Storage Coeff.  (min)=       0.57 (ii)   47.16 (ii)
     Unit Hyd. Tpeak (min)=       5.00        50.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.02          0.056 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.75           5.25
     RUNOFF VOLUME    (mm)=      80.72        43.24          61.94
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.53           0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0733)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0352)      0.830      0.056      5.25      61.94
   OUTFLOW: ID= 1 (  0733)      0.830      0.012      7.33      61.11

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 20.99
                  TIME SHIFT OF PEAK FLOW         (min)=125.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0324

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--------------------
| ADD HYD  (  3500)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0732):     1.90   0.011     9.58    60.85
      + ID2= 2 (  0733):     0.83   0.012     7.33    61.11
        ==================================================
        ID = 3 (  3500):     2.73   0.022     8.25    60.93

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0381)|   Area    (ha)=   1.00
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.70         0.30
     Dep. Storage     (mm)=       0.10         5.00
```

```
     Average Slope     (%)=       2.00         4.95
     Length            (m)=       6.00       524.60
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        43.04
               over (min)         5.00        40.00
     Storage Coeff.  (min)=       0.57 (ii)   35.86 (ii)
     Unit Hyd. Tpeak (min)=       5.00        40.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.03          0.074 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.58           5.25
     RUNOFF VOLUME    (mm)=      80.72        47.08          63.88
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.58           0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0734)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0825

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0381)      1.000      0.074      5.25      63.88
   OUTFLOW: ID= 1 (  0734)      1.000      0.009      8.25      62.48

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 11.77
                  TIME SHIFT OF PEAK FLOW         (min)=180.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0482

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--------------------
| CALIB            |
| STANDHYD (  0391)|   Area    (ha)=   1.02
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.71         0.31
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.80
     Length            (m)=       6.00       535.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        36.05
               over (min)         5.00        70.00
     Storage Coeff.  (min)=       0.57 (ii)   66.80 (ii)
     Unit Hyd. Tpeak (min)=       5.00        70.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.02          0.063 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.17           5.25
     RUNOFF VOLUME    (mm)=      80.72        43.24          61.94
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.53           0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0735)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
```

```
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0825

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0391)      1.020      0.063      5.25      61.94
   OUTFLOW: ID= 1 (  0735)      1.020      0.008      8.83      60.57

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 13.36
                  TIME SHIFT OF PEAK FLOW         (min)=215.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0461

--------------------------------------------------------------------------------
================================================================================================================

       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

  Output  filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\3c6e7d7f-1a00-4861-8b59-1dfcf19b693
9\scenar
  Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\3c6e7d7f-1a00-4861-8b59-1dfcf19b693
9\scenar


DATE: 10/07/2016                          TIME: 09:45:11

USER:


COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------------------------------------------
  ***************************
  ** SIMULATION NUMBER:   6 **
  ***************************


--------------------
|    READ STORM    |    Filename: C:\Users\p002311c\AppD
|                  |              ata\Local\Temp\
|                  |              bc146ca3-ab7b-4f3b-910f-6a849449fd04\8e4b9fd6
| Ptotal= 88.54 mm |    Comments: 100yr/12hr
--------------------
                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                 0.25    0.00 |  3.50   15.05 |  6.75    6.20 | 10.00    0.89
                 0.50    0.89 |  3.75   15.05 |  7.00    6.20 | 10.25    0.89
                 0.75    0.89 |  4.00   15.05 |  7.25    6.20 | 10.50    0.89
                 1.00    0.89 |  4.25   15.05 |  7.50    3.54 | 10.75    0.89
                 1.25    0.89 |  4.50   40.71 |  7.75    3.54 | 11.00    0.89
                 1.50    0.89 |  4.75   40.71 |  8.00    3.54 | 11.25    0.89
                 1.75    0.89 |  5.00   40.71 |  8.25    3.54 | 11.50    0.89
                 2.00    0.89 |  5.25   40.71 |  8.50    1.77 | 11.75    0.89
                 2.25    0.89 |  5.50   11.51 |  8.75    1.77 | 12.00    0.89
                 2.50    5.31 |  5.75   11.51 |  9.00    1.77 | 12.25    0.89
                 2.75    5.31 |  6.00   11.51 |  9.25    1.77 |
                 3.00    5.31 |  6.25   11.51 |  9.50    0.89 |
                 3.25    5.31 |  6.50    6.20 |  9.75    0.89 |
```

CALIB STANDHYD (0081) ID= 1 DT= 5.0 min

Area (ha)= 0.43
Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.30	0.13
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	3.00
Length	(m)=	6.00	225.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	5.31	6.250	11.51	9.33	0.89
0.167	0.00	3.250	5.31	6.333	6.20	9.42	0.89
0.250	0.00	3.333	15.05	6.417	6.20	9.50	0.89
0.333	0.89	3.417	15.05	6.500	6.20	9.58	0.89
0.417	0.89	3.500	15.05	6.583	6.20	9.67	0.89
0.500	0.89	3.583	15.05	6.667	6.20	9.75	0.89
0.583	0.89	3.667	15.05	6.750	6.20	9.83	0.89
0.667	0.89	3.750	15.05	6.833	6.20	9.92	0.89
0.750	0.89	3.833	15.05	6.917	6.20	10.00	0.89
0.833	0.89	3.917	15.05	7.000	6.20	10.08	0.89
0.917	0.89	4.000	15.05	7.083	6.20	10.17	0.89
1.000	0.89	4.083	15.05	7.167	6.20	10.25	0.89
1.083	0.89	4.167	15.05	7.250	6.20	10.33	0.89
1.167	0.89	4.250	15.05	7.333	3.54	10.42	0.89
1.250	0.89	4.333	40.71	7.417	3.54	10.50	0.89
1.333	0.89	4.417	40.71	7.500	3.54	10.58	0.89
1.417	0.89	4.500	40.71	7.583	3.54	10.67	0.89
1.500	0.89	4.583	40.71	7.667	3.54	10.75	0.89
1.583	0.89	4.667	40.71	7.750	3.54	10.83	0.89
1.667	0.89	4.750	40.71	7.833	3.54	10.92	0.89
1.750	0.89	4.833	40.71	7.917	3.54	11.00	0.89
1.833	0.89	4.917	40.71	8.000	3.54	11.08	0.89
1.917	0.89	5.000	40.71	8.083	3.54	11.17	0.89
2.000	0.89	5.083	40.71	8.167	3.54	11.25	0.89
2.083	0.89	5.167	40.71	8.250	3.54	11.33	0.89
2.167	0.89	5.250	40.71	8.333	1.77	11.42	0.89
2.250	0.89	5.333	11.51	8.417	1.77	11.50	0.89
2.333	5.31	5.417	11.51	8.500	1.77	11.58	0.89
2.417	5.31	5.500	11.51	8.583	1.77	11.67	0.89
2.500	5.31	5.583	11.51	8.667	1.77	11.75	0.89
2.583	5.31	5.667	11.51	8.750	1.77	11.83	0.89
2.667	5.31	5.750	11.51	8.833	1.77	11.92	0.89
2.750	5.31	5.833	11.51	8.917	1.77	12.00	0.89
2.833	5.31	5.917	11.51	9.000	1.77	12.08	0.89
2.917	5.31	6.000	11.51	9.083	1.77	12.17	0.89
3.000	5.31	6.083	11.51	9.167	1.77	12.25	0.89
3.083	5.31	6.167	11.51	9.250	1.77		

Max.Eff.Inten.(mm/hr)=		40.71	48.26	
	over (min)	5.00	25.00	
Storage Coeff. (min)=		0.55 (ii)	24.13 (ii)	
Unit Hyd. Tpeak (min)=		5.00	25.00	
Unit Hyd. peak (cms)=		0.34	0.05	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.01	0.038 (iii)
TIME TO PEAK	(hrs)=	4.42	5.33	5.25
RUNOFF VOLUME	(mm)=	88.44	50.53	69.45
TOTAL RAINFALL	(mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT	=	1.00	0.57	0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0726)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0081)      0.430      0.038      5.25      69.45
   OUTFLOW: ID= 1 (  0726)      0.430      0.007      7.25      67.84

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 18.58
                  TIME SHIFT OF PEAK FLOW         (min)=120.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0195

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0082)|   Area    (ha)=   2.05
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.43         0.62
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         1.40
     Length            (m)=       6.00      1080.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        42.33
                over (min)        5.00        85.00
     Storage Coeff.  (min)=       0.55 (ii)   80.59 (ii)
     Unit Hyd. Tpeak (min)=       5.00        85.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.12         0.04          0.134 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.42           5.25
     RUNOFF VOLUME    (mm)=      88.44        50.53          69.46
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       1.00         0.57           0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0727)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.1238

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0082)      2.050      0.134      5.25      69.46
   OUTFLOW: ID= 1 (  0727)      2.050      0.013      9.75      68.44

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 10.03
                  TIME SHIFT OF PEAK FLOW         (min)=270.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.1107

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--------------------
| ADD HYD  (  0800)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0726):     0.43   0.007     7.25    67.84
     + ID2= 2 (  0727):     2.05   0.013     9.75    68.44
       ================================================
       ID = 3 (  0800):     2.48   0.020     8.42    68.34

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0071)|   Area    (ha)=   0.91
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.64         0.27
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         2.10
     Length            (m)=       6.00       480.60
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        49.06
               over (min)        5.00        45.00
     Storage Coeff.  (min)=       0.55 (ii)   41.65 (ii)
     Unit Hyd. Tpeak (min)=       5.00        45.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.03          0.073 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.67           5.25
     RUNOFF VOLUME    (mm)=      88.44        54.74          71.57
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       1.00         0.62           0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0724)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0825

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0071)      0.910      0.073      5.25      71.57
   OUTFLOW: ID= 1 (  0724)      0.910      0.009      8.33      70.03

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 12.18
                  TIME SHIFT OF PEAK FLOW         (min)=185.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0490

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0072)|   Area    (ha)=   0.91
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.64         0.27
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         2.10
     Length            (m)=       6.00       480.60
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        49.06
               over (min)        5.00        45.00
     Storage Coeff.  (min)=       0.55 (ii)   41.65 (ii)
     Unit Hyd. Tpeak (min)=       5.00        45.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.03          0.073 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.67           5.25
     RUNOFF VOLUME    (mm)=      88.44        54.74          71.57
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       1.00         0.62           0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
```

```
          CN*  =  76.0    Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0073)|   Area    (ha)=   0.93
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.65         0.28
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         3.07
     Length            (m)=       6.00       490.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        49.85
               over (min)        5.00        40.00
     Storage Coeff.  (min)=       0.55 (ii)   37.42 (ii)
     Unit Hyd. Tpeak (min)=       5.00        40.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.03          0.077 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.58           5.25
     RUNOFF VOLUME    (mm)=      88.44        54.74          71.57
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       1.00         0.62           0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  0005)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0072):     0.91   0.073     5.25    71.57
     + ID2= 2 (  0073):     0.93   0.077     5.25    71.57
       ================================================
       ID = 3 (  0005):     1.84   0.150     5.25    71.57

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0725)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.1238

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0005)      1.840      0.150      5.25      71.57
   OUTFLOW: ID= 1 (  0725)      1.840      0.013      8.83      70.43

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  8.56
                  TIME SHIFT OF PEAK FLOW         (min)=215.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.1060

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--------------------
| ADD HYD  (  0700)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0724):     0.91   0.009     8.33    70.03
     + ID2= 2 (  0725):     1.84   0.013     8.83    70.43
       ================================================
       ID = 3 (  0700):     2.75   0.022     8.50    70.30
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB STANDHYD (0301)	Area (ha)= 0.38
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.27	0.11	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.52	
Length	(m)=	6.00	200.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		40.71	45.17	
over (min)		5.00	40.00	
Storage Coeff. (min)=		0.55 (ii)	38.71 (ii)	
Unit Hyd. Tpeak (min)=		5.00	40.00	
Unit Hyd. peak (cms)=		0.34	0.03	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.01	0.030 (iii)
TIME TO PEAK	(hrs)=	4.42	5.58	5.25
RUNOFF VOLUME	(mm)=	88.44	49.51	68.91
TOTAL RAINFALL	(mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT	=	1.00	0.56	0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0728)				
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0150	0.0413

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0301)	0.380	0.030	5.25	68.91
OUTFLOW: ID= 1 (0728)	0.380	0.006	7.33	67.09

PEAK FLOW REDUCTION [Qout/Qin](%)= 20.19
TIME SHIFT OF PEAK FLOW (min)=125.00
MAXIMUM STORAGE USED (ha.m.)= 0.0168

CALIB STANDHYD (0302)	Area (ha)= 0.40
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.28	0.12	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.52	
Length	(m)=	6.00	211.60	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		40.71	45.17	
over (min)		5.00	45.00	
Storage Coeff. (min)=		0.55 (ii)	40.02 (ii)	
Unit Hyd. Tpeak (min)=		5.00	45.00	
Unit Hyd. peak (cms)=		0.34	0.03	
				TOTALS
PEAK FLOW	(cms)=	0.02	0.01	0.031 (iii)
TIME TO PEAK	(hrs)=	4.42	5.67	5.25
RUNOFF VOLUME	(mm)=	88.44	49.51	68.92
TOTAL RAINFALL	(mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT	=	1.00	0.56	0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0729)						
IN= 2---> OUT= 1						
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)		OUTFLOW (cms)	STORAGE (ha.m.)	
	0.0000	0.0000		0.0150	0.0413	

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0302)	0.400	0.031	5.25	68.92
OUTFLOW: ID= 1 (0729)	0.400	0.006	7.33	67.19

PEAK FLOW REDUCTION [Qout/Qin](%)= 20.52
TIME SHIFT OF PEAK FLOW (min)=125.00
MAXIMUM STORAGE USED (ha.m.)= 0.0176

ADD HYD (3000)					
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0728):	0.38	0.006	7.33	67.09
+ ID2= 2 (0729):	0.40	0.006	7.33	67.19
ID = 3 (3000):	0.78	0.012	7.33	67.14

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB		
STANDHYD (0311)	Area (ha)= 0.40	
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.28	0.12	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	0.50	
Length (m)=	6.00	208.40	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	40.71	46.10	
over (min)	5.00	40.00	
Storage Coeff. (min)=	0.55 (ii)	39.81 (ii)	
Unit Hyd. Tpeak (min)=	5.00	40.00	
Unit Hyd. peak (cms)=	0.34	0.03	
			TOTALS
PEAK FLOW (cms)=	0.02	0.01	0.032 (iii)
TIME TO PEAK (hrs)=	4.42	5.58	5.25
RUNOFF VOLUME (mm)=	88.44	50.53	69.43
TOTAL RAINFALL (mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT =	1.00	0.57	0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0730)						
IN= 2---> OUT= 1						
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)		OUTFLOW (cms)	STORAGE (ha.m.)	
	0.0000	0.0000		0.0150	0.0413	

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)

```
   INFLOW : ID= 2 (  0311)      0.400      0.032      5.25      69.43
   OUTFLOW: ID= 1 (  0730)      0.400      0.006      7.33      67.69

                PEAK   FLOW   REDUCTION [Qout/Qin](%)= 20.26
                TIME SHIFT OF PEAK FLOW         (min)=125.00
                MAXIMUM  STORAGE   USED       (ha.m.)=  0.0178

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0341)|   Area    (ha)=   0.56
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.39         0.17
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.50
     Length            (m)=       6.00       295.30
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        43.43
               over (min)         5.00        55.00
     Storage Coeff.  (min)=       0.55 (ii)   50.11 (ii)
     Unit Hyd. Tpeak (min)=       5.00        55.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01          0.041 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.83           5.25
     RUNOFF VOLUME    (mm)=      88.44        49.51          68.92
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       1.00         0.56           0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0342)|   Area    (ha)=   0.71
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.50         0.21
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         2.80
     Length            (m)=       6.00       372.90
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        45.96
               over (min)         5.00        35.00
     Storage Coeff.  (min)=       0.55 (ii)   33.79 (ii)
     Unit Hyd. Tpeak (min)=       5.00        35.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.02          0.058 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.50           5.25
     RUNOFF VOLUME    (mm)=      88.44        49.51          68.95
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       1.00         0.56           0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD  (  3400)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
```

```
       ID1= 1 (  0341):     0.56   0.041     5.25    68.92
     + ID2= 2 (  0342):     0.71   0.058     5.25    68.95
       ================================================
       ID = 3 (  3400):     1.27   0.099     5.25    68.94

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0351)|   Area    (ha)=   1.90
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.33         0.57
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         1.70
     Length            (m)=       6.00      1001.80
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        41.39
               over (min)        5.00        75.00
     Storage Coeff.  (min)=       0.55 (ii)   73.38 (ii)
     Unit Hyd. Tpeak (min)=       5.00        75.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.11         0.04          0.127 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.25           5.25
     RUNOFF VOLUME    (mm)=      88.44        49.51          68.95
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       1.00         0.56           0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0732)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.1238

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0351)      1.900      0.127      5.25      68.95
   OUTFLOW: ID= 1 (  0732)      1.900      0.012      9.50      67.85

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  9.82
                  TIME SHIFT OF PEAK FLOW         (min)=255.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.1026

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0352)|   Area    (ha)=   0.83
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.58         0.25
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         1.60
     Length            (m)=       6.00       435.40
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        44.33
               over (min)        5.00        45.00
     Storage Coeff.  (min)=       0.55 (ii)   44.32 (ii)
     Unit Hyd. Tpeak (min)=       5.00        45.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.02          0.064 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.67           5.25
     RUNOFF VOLUME    (mm)=      88.44        49.51          68.94
```

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     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       1.00         0.56           0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0733)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0352)      0.830      0.064      5.25      68.94
   OUTFLOW: ID= 1 (  0733)      0.830      0.013      7.33      68.11

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 20.69
                  TIME SHIFT OF PEAK FLOW         (min)=125.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0363

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--------------------
| ADD HYD  (  3500)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0732):     1.90   0.012     9.50    67.85
     + ID2= 2 (  0733):     0.83   0.013     7.33    68.11
       ==========================================================
       ID = 3 (  3500):     2.73   0.025     8.25    67.93

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0381)|   Area    (ha)=   1.00
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.70         0.30
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         4.95
     Length            (m)=       6.00       524.60
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        49.64
               over (min)         5.00        35.00
     Storage Coeff.  (min)=       0.55 (ii)   33.89 (ii)
     Unit Hyd. Tpeak (min)=       5.00        35.00
     Unit Hyd. peak  (cms)=       0.34         0.03
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.06         0.03          0.085 (iii)
     TIME TO PEAK    (hrs)=       4.42         5.50           5.25
     RUNOFF VOLUME    (mm)=      88.44        53.67          71.03
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       1.00         0.61           0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0734)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
```

```
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                        0.0000     0.0000   |   0.0150      0.0825

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0381)      1.000      0.085      5.25      71.03
   OUTFLOW: ID= 1 (  0734)      1.000      0.010      8.25      69.64

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 11.53
                  TIME SHIFT OF PEAK FLOW         (min)=180.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0537

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0391)|   Area    (ha)=   1.02
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.71         0.31
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.80
     Length            (m)=       6.00       535.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        41.39
               over (min)         5.00        65.00
     Storage Coeff.  (min)=       0.55 (ii)   63.22 (ii)
     Unit Hyd. Tpeak (min)=       5.00        65.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.06         0.02          0.071 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.00           5.25
     RUNOFF VOLUME    (mm)=      88.44        49.51          68.94
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       1.00         0.56           0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0735)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                        0.0000     0.0000   |   0.0150      0.0825

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0391)      1.020      0.071      5.25      68.94
   OUTFLOW: ID= 1 (  0735)      1.020      0.009      8.75      67.57

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 13.27
                  TIME SHIFT OF PEAK FLOW         (min)=210.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0515

--------------------------------------------------------------------------------
================================================================================================================

       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat

Output filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\7989372b-f1f2-467a-80f5-134923f89c8d\scenar
Summary filename:
C:\Users\p002311c\AppData\Local\CEG\VO3\508ccdf0-8e2e-49e7-aa5d-1019e662234a\7989372b-f1f2-467a-80f5-134923f89c8d\scenar

DATE: 10/07/2016 TIME: 09:45:12

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 7 **
****

READ STORM | Filename: C:\Users\p002311c\AppData\Local\Temp\bc146ca3-ab7b-4f3b-910f-6a849449fd04\1032f0af
Ptotal= 25.00 mm | Comments: 25 mm, 4 hr. chicago dist'n. - water qua

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.17	2.40	1.17	33.60	2.17	3.45	3.17	1.65
0.33	1.95	1.33	38.10	2.33	3.00	3.33	1.80
0.50	2.40	1.50	13.80	2.50	2.70	3.50	1.50
0.67	2.85	1.67	7.35	2.67	2.25	3.67	1.50
0.83	4.65	1.83	5.55	2.83	2.25	3.83	0.75
1.00	9.60	2.00	4.35	3.00	1.95	4.00	0.60

CALIB STANDHYD (0081) | Area (ha)= 0.43
ID= 1 DT= 5.0 min | Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.30	0.13
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	3.00
Length	(m)=	6.00	225.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.40	1.083	33.60	2.083	3.45	3.08	1.65
0.167	2.40	1.167	33.60	2.167	3.45	3.17	1.65
0.250	1.95	1.250	38.10	2.250	3.00	3.25	1.80
0.333	1.95	1.333	38.10	2.333	3.00	3.33	1.80
0.417	2.40	1.417	13.80	2.417	2.70	3.42	1.50
0.500	2.40	1.500	13.80	2.500	2.70	3.50	1.50
0.583	2.85	1.583	7.35	2.583	2.25	3.58	1.50
0.667	2.85	1.667	7.35	2.667	2.25	3.67	1.50
0.750	4.65	1.750	5.55	2.750	2.25	3.75	0.75
0.833	4.65	1.833	5.55	2.833	2.25	3.83	0.75
0.917	9.60	1.917	4.35	2.917	1.95	3.92	0.60
1.000	9.60	2.000	4.35	3.000	1.95	4.00	0.60

Max.Eff.Inten.(mm/hr)=		38.10	7.85
over (min)		5.00	50.00

```
     Storage Coeff.  (min)=       0.56 (ii)   49.32 (ii)
     Unit Hyd. Tpeak (min)=       5.00        50.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.00          0.023 (iii)
     TIME TO PEAK    (hrs)=       1.33         2.17           1.33
     RUNOFF VOLUME    (mm)=      24.90         5.96          15.36
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       1.00         0.24           0.61

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0726)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0081)      0.430      0.023      1.33      15.36
   OUTFLOW: ID= 1 (  0726)      0.430      0.002      3.58      13.75

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  7.59
                  TIME SHIFT OF PEAK FLOW         (min)=135.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0048

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--------------------
| CALIB            |
| STANDHYD (  0082)|   Area    (ha)=   2.05
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.43         0.62
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         1.40
     Length            (m)=       6.00      1080.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10         7.03
               over (min)        5.00       165.00
     Storage Coeff.  (min)=       0.56 (ii)  164.68 (ii)
     Unit Hyd. Tpeak (min)=       5.00       165.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.11         0.00          0.109 (iii)
     TIME TO PEAK    (hrs)=       1.33         4.17           1.33
     RUNOFF VOLUME    (mm)=      24.90         5.96          15.38
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       1.00         0.24           0.62

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0727)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.1238

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0082)      2.050      0.109      1.33      15.38
```

```
   OUTFLOW: ID= 1 (  0727)      2.050      0.003      5.17      14.36

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  2.73
                  TIME SHIFT OF PEAK FLOW         (min)=230.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0244

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--------------------
| ADD HYD  (  0800)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0726):     0.43   0.002     3.58    13.75
     + ID2= 2 (  0727):     2.05   0.003     5.17    14.36
       ================================================
       ID = 3 (  0800):     2.48   0.005     3.92    14.25

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0071)|   Area    (ha)=   0.91
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.64         0.27
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         2.10
     Length            (m)=       6.00       480.60
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10         8.21
               over (min)        5.00        85.00
     Storage Coeff.  (min)=       0.56 (ii)   84.58 (ii)
     Unit Hyd. Tpeak (min)=       5.00        85.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.00          0.048 (iii)
     TIME TO PEAK    (hrs)=       1.33         2.83           1.33
     RUNOFF VOLUME    (mm)=      24.90         6.90          15.85
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       1.00         0.28           0.63

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0724)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0825

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0071)     0.910      0.048      1.33      15.85
   OUTFLOW: ID= 1 (  0724)     0.910      0.002      4.08      14.31

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  4.27
                  TIME SHIFT OF PEAK FLOW         (min)=165.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0114

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--------------------
| CALIB            |
| STANDHYD (  0072)|   Area    (ha)=   0.91
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.64         0.27
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         2.10
```

Length (m)=	6.00	480.60	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	38.10	8.21	
over (min)	5.00	85.00	
Storage Coeff. (min)=	0.56 (ii)	84.58 (ii)	
Unit Hyd. Tpeak (min)=	5.00	85.00	
Unit Hyd. peak (cms)=	0.34	0.01	
			TOTALS
PEAK FLOW (cms)=	0.05	0.00	0.048 (iii)
TIME TO PEAK (hrs)=	1.33	2.83	1.33
RUNOFF VOLUME (mm)=	24.90	6.90	15.85
TOTAL RAINFALL (mm)=	25.00	25.00	25.00
RUNOFF COEFFICIENT =	1.00	0.28	0.63

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0073)	Area (ha)= 0.93
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.65	0.28
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	2.00	3.07
Length	(m)=	6.00	490.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		38.10	8.21
over (min)		5.00	80.00
Storage Coeff. (min)=		0.56 (ii)	76.41 (ii)
Unit Hyd. Tpeak (min)=		5.00	80.00
Unit Hyd. peak (cms)=		0.34	0.01
			TOTALS
PEAK FLOW (cms)=		0.05	0.00 0.049 (iii)
TIME TO PEAK (hrs)=		1.33	2.67 1.33
RUNOFF VOLUME (mm)=		24.90	6.90 15.85
TOTAL RAINFALL (mm)=		25.00	25.00 25.00
RUNOFF COEFFICIENT =		1.00	0.28 0.63

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0005)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0072):		0.91	0.048	1.33	15.85
+ ID2= 2 (0073):		0.93	0.049	1.33	15.85
ID = 3 (0005):		1.84	0.098	1.33	15.85

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR(0725)				
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW	STORAGE	OUTFLOW	STORAGE
	(cms)	(ha.m.)	(cms)	(ha.m.)
	0.0000	0.0000	0.0150	0.1238

	AREA	QPEAK	TPEAK	R.V.
	(ha)	(cms)	(hrs)	(mm)

```
   INFLOW : ID= 2 (  0005)      1.840      0.098      1.33      15.85
   OUTFLOW: ID= 1 (  0725)      1.840      0.003      4.75      14.71

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  3.03
                  TIME SHIFT OF PEAK FLOW         (min)=205.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0244
```

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--------------------
| ADD HYD  (  0700)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0724):     0.91   0.002     4.08    14.31
     + ID2= 2 (  0725):     1.84   0.003     4.75    14.71
       ================================================
       ID = 3 (  0700):     2.75   0.005     4.42    14.58

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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| CALIB            |
| STANDHYD (  0301)|   Area    (ha)=   0.38
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.27         0.11
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.52
     Length            (m)=       6.00       200.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10         6.77
               over (min)         5.00        85.00
     Storage Coeff.  (min)=       0.56 (ii)   82.09 (ii)
     Unit Hyd. Tpeak (min)=       5.00        85.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.00          0.020 (iii)
     TIME TO PEAK    (hrs)=       1.33         2.83           1.33
     RUNOFF VOLUME    (mm)=      24.90         5.74          15.20
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       1.00         0.23           0.61

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

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--------------------
| RESERVOIR(  0728)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0413

                              AREA     QPEAK     TPEAK       R.V.
                              (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0301)    0.380      0.020      1.33      15.20
   OUTFLOW: ID= 1 (  0728)    0.380      0.001      3.67      13.36

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  7.24
                  TIME SHIFT OF PEAK FLOW         (min)=140.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0040
```

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--------------------
| CALIB            |
| STANDHYD (  0302)|   Area    (ha)=   0.40
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.28         0.12
     Dep. Storage     (mm)=       0.10         5.00
```

Average Slope (%)=	2.00	0.52	
Length (m)=	6.00	211.60	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	38.10	6.77	
over (min)	5.00	85.00	
Storage Coeff. (min)=	0.56 (ii)	84.90 (ii)	
Unit Hyd. Tpeak (min)=	5.00	85.00	
Unit Hyd. peak (cms)=	0.34	0.01	
			TOTALS
PEAK FLOW (cms)=	0.02	0.00	0.021 (iii)
TIME TO PEAK (hrs)=	1.33	2.83	1.33
RUNOFF VOLUME (mm)=	24.90	5.74	15.20
TOTAL RAINFALL (mm)=	25.00	25.00	25.00
RUNOFF COEFFICIENT =	1.00	0.23	0.61

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0729)				
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0150	0.0413

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0302)	0.400	0.021	1.33	15.20
OUTFLOW: ID= 1 (0729)	0.400	0.002	3.67	13.46

PEAK FLOW REDUCTION [Qout/Qin](%)= 7.22
TIME SHIFT OF PEAK FLOW (min)=140.00
MAXIMUM STORAGE USED (ha.m.)= 0.0042

ADD HYD (3000)		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
ID1= 1 (0728):		0.38	0.001	3.67	13.36
+ ID2= 2 (0729):		0.40	0.002	3.67	13.46
ID = 3 (3000):		0.78	0.003	3.67	13.41

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB			
STANDHYD (0311)	Area (ha)= 0.40		
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00	
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.28	0.12	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	0.50	
Length (m)=	6.00	208.40	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	38.10	7.03	
over (min)	5.00	85.00	
Storage Coeff. (min)=	0.56 (ii)	83.85 (ii)	
Unit Hyd. Tpeak (min)=	5.00	85.00	
Unit Hyd. peak (cms)=	0.34	0.01	
			TOTALS
PEAK FLOW (cms)=	0.02	0.00	0.021 (iii)
TIME TO PEAK (hrs)=	1.33	2.83	1.33
RUNOFF VOLUME (mm)=	24.90	5.96	15.30
TOTAL RAINFALL (mm)=	25.00	25.00	25.00
RUNOFF COEFFICIENT =	1.00	0.24	0.61

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR(0730)						
IN= 2---> OUT= 1						
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)		OUTFLOW (cms)	STORAGE (ha.m.)	
	0.0000	0.0000		0.0150	0.0413	

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0311)	0.400	0.021	1.33	15.30
OUTFLOW: ID= 1 (0730)	0.400	0.002	3.67	13.57

PEAK FLOW REDUCTION [Qout/Qin](%)= 7.26
TIME SHIFT OF PEAK FLOW (min)=140.00
MAXIMUM STORAGE USED (ha.m.)= 0.0042

CALIB		
STANDHYD (0341)	Area (ha)= 0.56	
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.39	0.17	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	0.50	
Length	(m)=	6.00	295.30	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		38.10	6.77	
over (min)		5.00	105.00	
Storage Coeff.	(min)=	0.56 (ii)	104.79 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	105.00	
Unit Hyd. peak	(cms)=	0.34	0.01	
				TOTALS
PEAK FLOW	(cms)=	0.03	0.00	0.030 (iii)
TIME TO PEAK	(hrs)=	1.33	3.17	1.33
RUNOFF VOLUME	(mm)=	24.90	5.74	15.21
TOTAL RAINFALL	(mm)=	25.00	25.00	25.00
RUNOFF COEFFICIENT	=	1.00	0.23	0.61

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB		
STANDHYD (0342)	Area (ha)= 0.71	
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.50	0.21	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	2.00	2.80	
Length	(m)=	6.00	372.90	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		38.10	6.77	
over (min)		5.00	75.00	
Storage Coeff.	(min)=	0.56 (ii)	72.06 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	75.00	
Unit Hyd. peak	(cms)=	0.34	0.02	
				TOTALS
PEAK FLOW	(cms)=	0.04	0.00	0.038 (iii)
TIME TO PEAK	(hrs)=	1.33	2.58	1.33

```
     RUNOFF VOLUME    (mm)=      24.90         5.74          15.26
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       1.00         0.23           0.61

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD  (  3400)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
        ID1= 1 (  0341):     0.56   0.030     1.33    15.21
      + ID2= 2 (  0342):     0.71   0.038     1.33    15.26
        ================================================
        ID = 3 (  3400):     1.27   0.067     1.33    15.24

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD (  0351)|   Area    (ha)=   1.90
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.33         0.57
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         1.70
     Length            (m)=       6.00      1001.80
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10         6.77
                 over (min)       5.00       155.00
     Storage Coeff.  (min)=       0.56 (ii)  150.82 (ii)
     Unit Hyd. Tpeak (min)=       5.00       155.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.10         0.00          0.101 (iii)
     TIME TO PEAK    (hrs)=       1.33         4.00           1.33
     RUNOFF VOLUME    (mm)=      24.90         5.74          15.28
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       1.00         0.23           0.61

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR(  0732)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.1238

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0351)      1.900      0.101      1.33      15.28
   OUTFLOW: ID= 1 (  0732)      1.900      0.003      5.08      14.17

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  2.74
                  TIME SHIFT OF PEAK FLOW         (min)=225.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0228

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| CALIB            |
| STANDHYD (  0352)|   Area    (ha)=   0.83
```

```
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
-------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.58         0.25
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         1.60
     Length            (m)=       6.00       435.40
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10         6.77
               over (min)         5.00        95.00
     Storage Coeff.  (min)=       0.56 (ii)   93.37 (ii)
     Unit Hyd. Tpeak (min)=       5.00        95.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.00          0.044 (iii)
     TIME TO PEAK    (hrs)=       1.33         3.00           1.33
     RUNOFF VOLUME    (mm)=      24.90         5.74          15.26
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       1.00         0.23           0.61

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-------------------
| RESERVOIR(  0733)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0413

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0352)      0.830      0.044      1.33      15.26
   OUTFLOW: ID= 1 (  0733)      0.830      0.003      3.67      14.42

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  7.14
                  TIME SHIFT OF PEAK FLOW         (min)=140.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0086

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-------------------
| ADD HYD  (  3500)|
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
       ID1= 1 (  0732):     1.90   0.003     5.08    14.17
     + ID2= 2 (  0733):     0.83   0.003     3.67    14.42
       ================================================
       ID = 3 (  3500):     2.73   0.006     3.92    14.25

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
-------------------
| CALIB            |
| STANDHYD (  0381)|   Area    (ha)=   1.00
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
-------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.70         0.30
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         4.95
     Length            (m)=       6.00       524.60
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10         7.89
               over (min)         5.00        75.00
     Storage Coeff.  (min)=       0.56 (ii)   70.12 (ii)
     Unit Hyd. Tpeak (min)=       5.00        75.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.00          0.053 (iii)
```

```
     TIME TO PEAK    (hrs)=       1.33         2.58          1.33
     RUNOFF VOLUME    (mm)=      24.90         6.65         15.73
     TOTAL RAINFALL   (mm)=      25.00        25.00         25.00
     RUNOFF COEFFICIENT   =       1.00         0.27          0.63

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0734)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0825

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0381)      1.000      0.053      1.33      15.73
   OUTFLOW: ID= 1 (  0734)      1.000      0.002      4.08      14.34

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  4.32
                  TIME SHIFT OF PEAK FLOW         (min)=165.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0126

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD (  0391)|   Area    (ha)=   1.02
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.71         0.31
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.80
     Length            (m)=       6.00       535.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10         6.77
               over (min)        5.00       130.00
     Storage Coeff.  (min)=       0.56 (ii)  129.86 (ii)
     Unit Hyd. Tpeak (min)=       5.00       130.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.00          0.054 (iii)
     TIME TO PEAK    (hrs)=       1.33         3.58          1.33
     RUNOFF VOLUME    (mm)=      24.90         5.74         15.25
     TOTAL RAINFALL   (mm)=      25.00        25.00         25.00
     RUNOFF COEFFICIENT   =       1.00         0.23          0.61

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR(  0735)|
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0825

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
   INFLOW : ID= 2 (  0391)      1.020      0.054      1.33      15.25
   OUTFLOW: ID= 1 (  0735)      1.020      0.002      4.08      13.88

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  3.96
                  TIME SHIFT OF PEAK FLOW         (min)=165.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0118
```

FINISH

==========

APPENDIX E

PROPOSED STATIONS

HYDROLOGIC ANALYSIS AND SWM DESIGN

APPENDIX E: Proposed Stations- Hydrologic Analysis and SWM Design

MARKHAM ROAD STATION

Figure 5.1: Markham Station – Drainage Area Map and SWMF-1 Details

Visual OTTHYMO Modelling Schematic 5.1: Markham Road Station

Table 5.1a: Markham Station Hydrologic Analysis - Existing Condition

Table 5.1b: Markham Road Station Hydrologic Analysis Post-Development Condition (12hr AES)

Table 5.1c: Markham Road Station Hydrologic Analysis Post-Development Condition (4hr Chicago)

Table 5.1d: Markham Station Proposed SWMF-1 – Design Parameters

Table 5.1e: Markham Road Station - Proposed SWMF 1 - Stage-Storage, Stage-Discharge Relationships and Outlet Structure Design

Table 5.1f: Markham Road Station - Proposed SWMF-1 - 25 mm Drawdown Time Calculations

VO Output Files: 12-hour AES

VO Output Files: 4-hour Chicago

NINTH LINE STATION

Figure 5.2: Ninth Line Station – Drainage Area Map and SWMF-2 Details

Visual OTTHYMO Modelling Schematic 5.2: Ninth Line Station

Table 5.2a: Ninth Line Station Hydrologic Analysis - Existing Condition

Table 5.2b: Ninth Line SWM Pond Hydrologic Analysis Post-Development Condition SWMF-2 (12hr AES)

Table 5.2c: Ninth Line SWM Pond Hydrologic Analysis Post-Development Condition SWMF-2 (4hr Chicago)

Table 5.2d: Ninth Line Station - Proposed SWMF-2 – Design Parameters

Table 5.2e: Ninth Line Station - Proposed SWMF 2 - Stage-Storage, Stage-Discharge Relationships and Outlet Structure Design

Table 5.2f: Ninth Line Station - Proposed SWMF-2 - 25 mm Drawdown Time Calculations

VO Output Files: 12-hour AES

VO Output Files: 4-hour Chicago

DONALD COUSENS PARKWAY STATION

Figure 5.3: Donald Cousens Parkway Station – Drainage Area Map and SWMF-3 Details

Visual OTTHYMO Modelling Schematic 5.3: Donald Cousens Parkway Station

Table 5.3-a: Donald Cousens Parkway Station Hydrologic Analysis - Existing Condition

Table 5.3-b: Donald Cousens Parkway Station SWMF-3 – Post-Development Condition Hydologic Analysis (12hr AES)

Table 5.3-c: Donald Cousens Parkway Station SWMF-3 – Post-Development Condition Hydologic Analysis (4hr Chicago)

Table 5.3-d: Donald Cousens Parkway Station - Proposed SWMF-3 – Design Parameters

Table 5.3-e: Donald Cousens Parkway Station- Proposed SWMF 3 - Stage-Storage, Stage-Discharge Relationships and Outlet Structure Design

Table 5.3-f: Donald Cousens Parkway Station - Proposed SWMF-3 - 25 mm Drawdown Time Calculations

VO Output Files: 12-hour AES

VO Output Files: 4-hour Chicago

WHITES ROAD STATION

Figure 5.4: Whites Station – Drainage Area Map and SWMF-4 and SWMF-5 Details

Sketch E1. Whites Road Station South SWMF Option 1 (Underground Tank)

Sketch E2. Whites Road Station South SWMF Option 2 (Wet Pond)

Visual OTTHYMO Modelling Schematic 5.4: Whites Road Station

Table 5.4a: Whites Road Station SWMF-4 – Allowable Release Rates and Storage Required

Table 5.4b: Whites Road Station - Post-Development Condition Hydrologic Analysis - SWMF-4 (12hr AES)

Table 5.4c: Whites Road Station - Post-Development Condition Hydrologic Analysis - SWMF-4 (4hr Chicago)

Table 5.4d: Whites Road Station Proposed SWMF-4 – Design Parameters

Table 5.4e: Whites Road Station - Proposed SWMF-4 - Stage-Storage, Stage-Discharge Relationships and Outlet Structure Design

Table 5.4f: Whites Road Station Proposed SWMF-4 - 25 mm Drawdown Time Calculations

Table 5.5a: Whites Road Station SWMF-5 – Allowable Release Rates and Storage Required

Table 5.5b: Whites Road Station - Post-Development Condition Hydrologic Analysis - SWMF-5 (12hr AES)

Table 5.5c: Whites Road Station - Post-Development Condition Hydrologic Analysis - SWMF-5 (4hr Chicago)

Table 5.5d: Whites Road Station Proposed SWMF-5 – Design Parameters

Table 5.5e: Whites Road Station - Proposed SWMF-5 - Stage-Storage, Stage-Discharge Relationships and Outlet Structure Design

Table 5.5f: Whites Road Station Proposed SWMF-5 - 25 mm Drawdown Time Calculations

VO Output Files: 12-hour AES

VO Output Files: 4-hour Chicago

BROCK ROAD STATION

Figure 5.5: Brock Station – Drainage Area Map and SWMF-6 and SWMF-7 Details

Visual OTTHYMO Modelling Schematic 5.5: Brock Road Station

Table 5.6a: Brock Road Station SWMF-6 – Allowable Release Rates and Storage Required

Table 5.6b: Brock Road Station - Post-Development Condition Hydrologic Analysis - SWMF-6 (12hr AES)

Table 5.6c: Brock Road Station - Post-Development Condition Hydrologic Analysis - SWMF-6 (4hr Chicago)

Table 5.6d: Brock Road Station Proposed SWMF-6 – Design Parameters

Table 5.6e: Brock Road Station - Proposed SWMF-6 - Stage-Storage, Stage-Discharge Relationships and Outlet Structure Design

Table 5.6f: Brock Road Station Proposed SWMF-6 - 25 mm Drawdown Time Calculations

Table 5.7a: Brock Road Station SWMF-7 – Allowable Release Rates and Storage Required

Table 5.7b: Brock Road Station - Post-Development Condition Hydrologic Analysis - SWMF-7 (12hr AES)

Table 5.7c: Brock Road Station - Post-Development Condition Hydrologic Analysis - SWMF-7 (4hr Chicago)

Table 5.7d: Brock Road Station Proposed SWMF-7 – Design Parameters

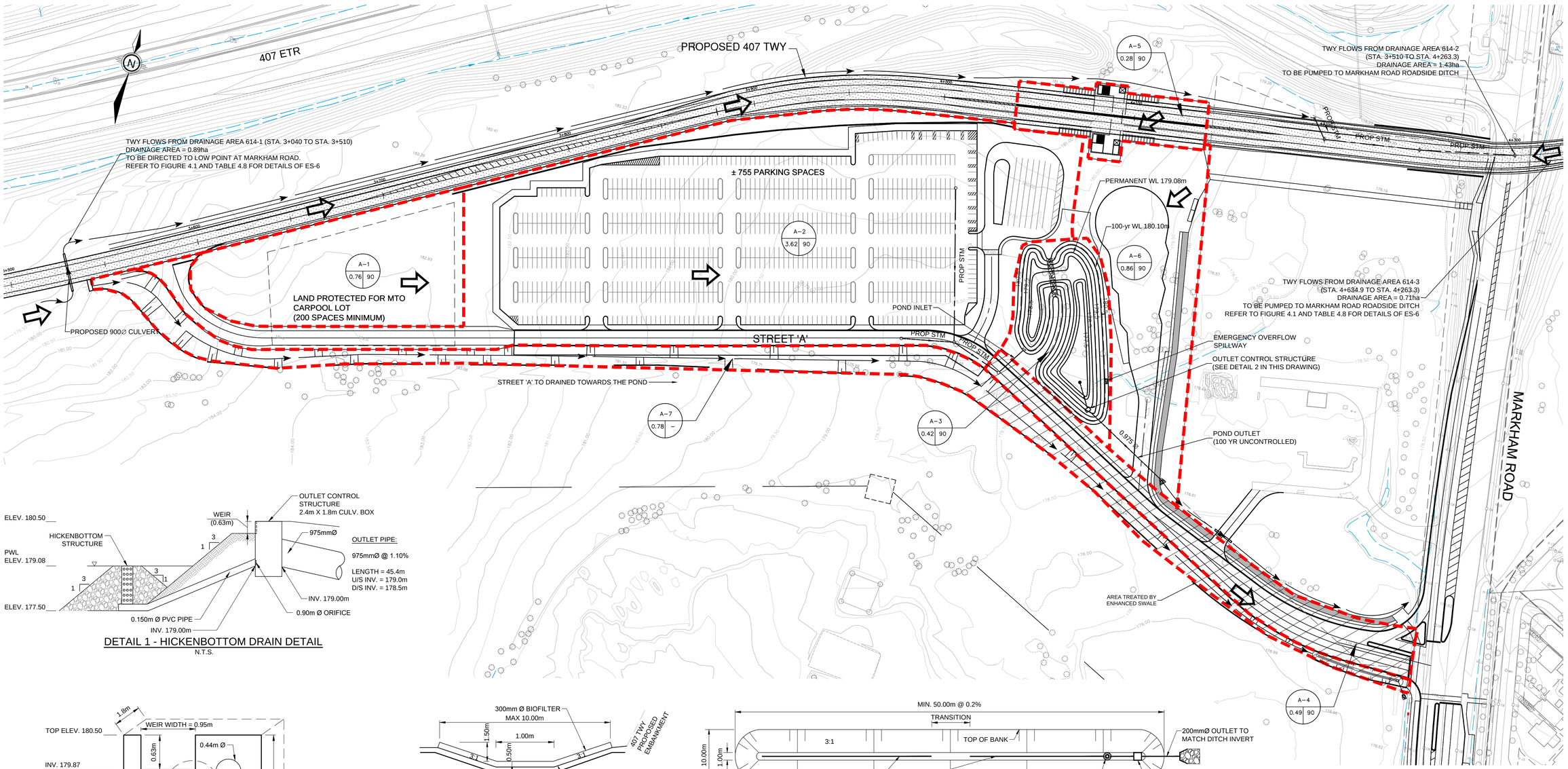
Table 5.7e: Brock Road Station - Proposed SWMF-7 - Stage-Storage, Stage-Discharge Relationships and Outlet Structure Design

Table 5.7f: Brock Road Station Proposed SWMF-7 - 25 mm Drawdown Time Calculations

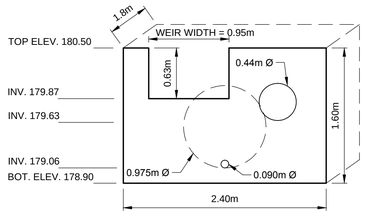
VO Output Files: 12-hour AES

VO Output Files: 4-hour Chicago

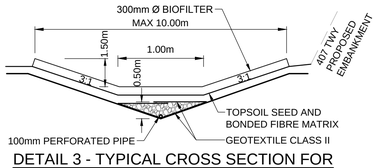
MARKHAM ROAD STATION



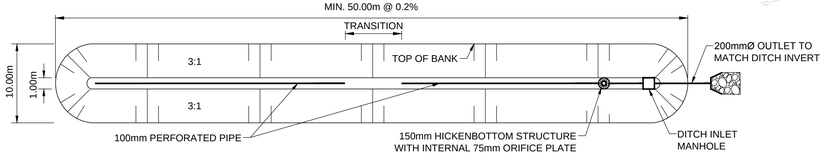
DETAIL 1 - HICKENBOTTOM DRAIN DETAIL
N.T.S.



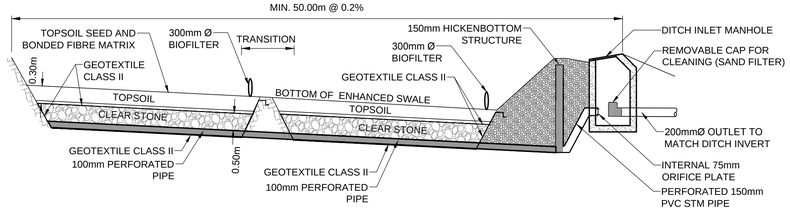
DETAIL 2 - SWMF 1 OUTLET CONTROL STRUCTURE
N.T.S.



DETAIL 3 - TYPICAL CROSS SECTION FOR ENHANCED SWALE / DRY POND
N.T.S.



DETAIL 4 - ENHANCED SWALE / DRY POND PLAN VIEW
N.T.S.



DETAIL 5 - TYPICAL LONGITUDINAL PROFILE FOR ENHANCED SWALE / DRY POND
N.T.S.

LEGEND

- PROPOSED 407 TWY
- EXISTING DITCH
- EXISTING CREEK
- PROPERTY LINES
- EXISTING CULVERT
- DRAINAGE AREA BOUNDARY
- SWALE AND FLOW DIRECTION

AREA ID
A–2
0.29 90
A (ha)
% IMPERVIOUSNESS

SCALE HORIZONTAL 1:1000
5m 0m 10m 20m 30m

DATE: SEPTEMBER 2016
SCALE: 1:1000

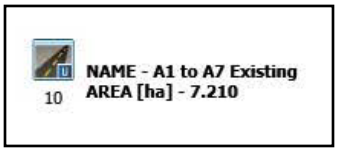
Ontario

PARSONS
625 COCHRANE DRIVE, SUITE 500
MARKHAM, ONTARIO L3R 9R9
TEL: 905-943-0500
FAX: 905-943-0400

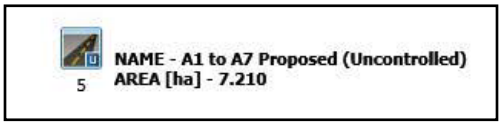
407 TRANSITWAY FROM KENNEDY RD TO BROCK RD

FIGURE 5.1 - PROPOSED STATION MARKHAM AND SWMF - 1 DETAILS

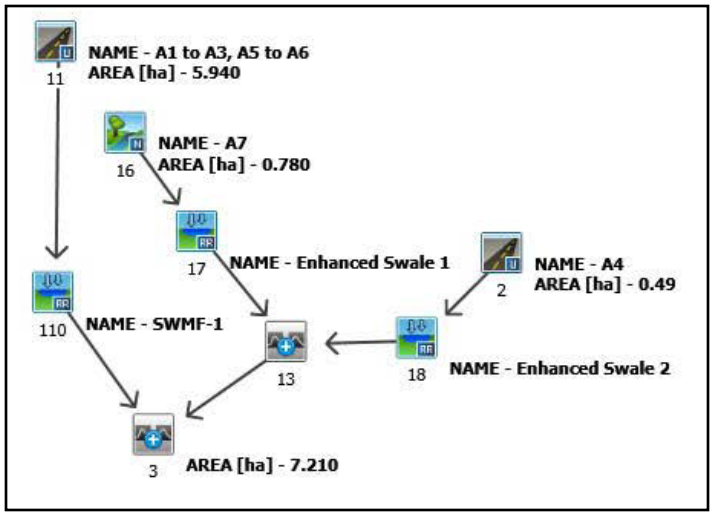
Visual OTTHYMO Modelling Schematic 5.1 – Markham Road Station



Existing Condition



Proposed (Uncontrolled) Condition



Proposed (Controlled) Condition

MARKHAM ROAD STATION HYDROLOGIC ANALYSIS - EXISTING CONDITION

Input parameters

Proposed Markham Station is located within Subcatchment 614& 312 - Rouge Watershed
For modeling purposes, input parameters of Area 614 are used in VO2 (ID 614- Standhyd)

CN= 76.7
Ia= 5
Drainage area Total (ha)= 7.21 (A1 to A7)

Table 5.1a: Markham Road Station Hydrologic Analysis - Existing Condition

Return Period	VO2 ID 10	
	EX Qp-12hr AES (m^3/s)	EX Qp-Chicago 4hr (m^3/s)
2-yr	0.145	0.356
5-yr	0.228	0.522
10-yr	0.294	0.630
25-yr	0.374	0.814
50-yr	0.437	0.935
100-yr	0.513	1.073

MARKHAM ROAD STATION HYDROLOGIC ANALYSIS - POST-DEVELOPMENT CONDITION

Table 5.1b: Markham Road Station Hydrologic Analysis Post-Development Condition (12 hr AES)

12hr AES Return Period	Allowable Release Rates ID 10 (A = 7.21 ha)	Post-Development Condition (Uncontrolled) VO2 ID 5 (A = 7.21 ha)	Increase from Allowable to Post-Dev Uncontrolled	SWMF-1 POST-DEVELOPMENT CONDITION VO2 ID 110 (A = 5.94 ha)		Overall Post-Development (Controlled) VO2 ID 3 (A = 7.21 ha)	Decrease from Allowable to Post-Dev Controlled
	EX Qp (m^3/s)	Qp (m^3/s)	(%)	Storage Provided (m^3)	Release Rate (m^3/s)	Qp (m^3/s)	(%)
2-yr	0.145	0.347	139.31%	1300	0.113	0.118	-22.88%
5-yr	0.228	0.467	104.82%	1560	0.187	0.184	-23.91%
10-yr	0.294	0.545	85.37%	1748	0.226	0.235	-25.11%
25-yr	0.374	0.644	72.19%	1967	0.304	0.313	-19.49%
50-yr	0.437	0.717	64.07%	2113	0.366	0.378	-15.61%
100-yr	0.513	0.789	53.80%	2257	0.425	0.437	-17.39%

Table 5.1c: Markham Road Station Hydrologic Analysis Post-Development Condition (4 hr Chicago)

12hr AES Return Period	Allowable Release Rates ID 10 (A = 7.21 ha)	Post-Development Condition (Uncontrolled) VO2 ID 5 (A = 7.21 ha)	Increase from Allowable to Post-Dev Uncontrolled	SWMF-1 POST-DEVELOPMENT CONDITION VO2 ID 110 (A = 5.94 ha)		Overall Post-Development (Controlled) VO2 ID 3 (A = 7.21 ha)	Decrease from Allowable to Post-Dev Controlled
	EX Qp (m^3/s)	Qp (m^3/s)	(%)	Storage Provided (m^3)	Release Rate (m^3/s)	Qp (m^3/s)	(%)
2-yr	0.356	1.068	200.00%	1227	0.055	0.060	-493.33%
5-yr	0.522	1.554	197.70%	1401	0.141	0.148	-252.70%
10-yr	0.630	1.868	196.51%	1588	0.193	0.200	-215.00%
25-yr	0.814	2.297	182.19%	1847	0.260	0.269	-202.60%
50-yr	0.935	2.607	178.82%	2026	0.329	0.339	-175.81%
100-yr	1.073	2.927	172.79%	2207	0.404	0.416	-157.93%

Table 5.1d: MARKHAM STATION Proposed SWMF-1 - Design Parameters

Pond Catchment Area 5.94 ha

Water Quality Storage Requirements

MOECC (2003, Table 3.2)

Level 1	265 m^3/ha	Interpolated from Table 3.2 (MOECC)		
Extended	40 m^3/ha	(or 25mm rainfall event whichever greater)	*237.60*	m^3
25 mm Event From OTTHYMO	19.75 mm		*1,173.15*	m^3
% imperviousness	90 %			
Permanent Volume Required			*1,336.50*	m^3

Quantity Control Required

Total Volume required up to and including the 100 yr storm **2,257.00** m^3

Total Pond Volume Required (Permanent and Extended) **3,593.50** m^3

Settling Calculations MOECC Eq. 4.5

$$Dist = \sqrt{\frac{r \times Q_p}{V_s}}$$

Dist	16	Minimum Forebay length	m
r	5.73	Length to width ratio	-
Qp	0.01	Peak flow rate from the pond during design quality storm	m^3/s
Vs	0.0003	settling velocity	m/s

Dispersion Length MOECC Eq. 4.6

$$Dist = \frac{8Q}{dV_f}$$

Minimum Width 2 m

Dist	13	Minimum Dispersion Length	
Q	0.39	Inlet Flow Rate	(5 year Storm)
d	1.6	Depth of the Permanent Pool	
Vf	0.15	Desired Velocity in the Forebay	

(0.15 m/s is the maximum permissible velocity before erosion occurs in a channel (MOECC))

Minimum Forebay Deep Zone Bottom Width MOECC Eq. 4.7

Width = Dist/8 Width 1.97 m

Design Quality Storm MOECC Eq 4.9

$$i_{25} = 43C + 5.9$$

A	5.94	Area	
C	90	Runoff Coefficient	
i	44.6	Intensity	mm/hr
Qp	0.67	Flow Rational Method	

Flow Velocity Check

Qd	0.39	Inlet Flow Rate	m^3/s
A	8.78	Crossectional Area	m^2
Vfb	0.044	Flow Velocity	m/s
	Yes	< 0.15	

Forebay Dimensions

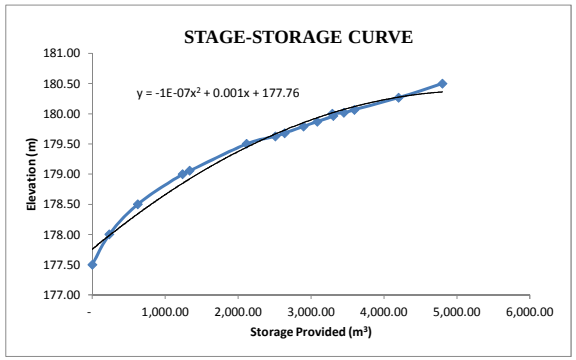
3:1	Average Side Slope	%
40.60	Top Length	m
29.14	Bottom Length	m
7.30	Average Top Width	m
4.40	Bottom Width	m
1.50	Average Depth of the Pool	m
318.45	Approximate Volume of the Pool	m^3
1336.50	Total Permanent Pool Volume	m^3
0.24	Forebay/Total Volume Ratio	
330.89	Forebay Area	m^2
2676.96	Total Permanent Pool Area	
0.12	Forebay/Total Area Ratio	
5.96	Average L/W Ratio Check	

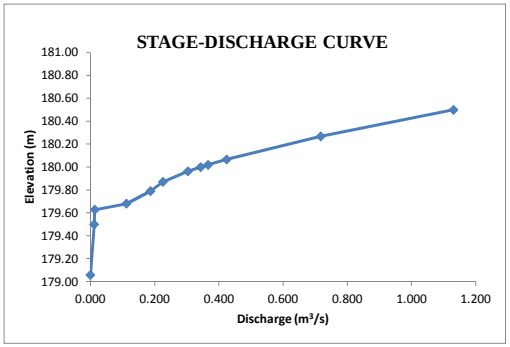
Forebay Cleanout Frequency

Ac	5.94	Contributing Area	(ha)
Ds	0.6	Maximum Sediment Depth	(m)
Vsf	295	Maximum Sediment Volume	(m3)
a	30%	Impervious Level	%
da	0.6	Annual Sediment Loading	(m^3/ha/yr) (Table 6.3 MOECC Manual)
Fs	82.8	Forebay Cleanout Frequency	(years)
	75%	Target Maintenance TSS Removal Efficiency	

Table 5.1e: MARKHAM ROAD STATION - Proposed SWMF-1 - Stage-Storage, Stage-Discharge Relationships and Outlet Structure Design

Elevation m	Forebay	Cell 2	Sec Area m^2	Avg Area m^2	Sec Volume m^3	Cumulative Volume	Fluctuation/ Extended Cum.Volume	Stage (m) Active	Storage (ha.m) Active	Discharge Orifice 1 179.06 0.090	Orifice 2 179.63 0.440	Weir 179.87 0.950	Total	Description
177.50		365.96	365.96		-	-								
178.00		563.36	563.36	464.7	232.33	232.33								
178.50	122.48	870.76	993.24	778.3	389.15	621.48								
179.00	235.58	1235.26	1,470.84	1232.0	616.02	1,237.50								
179.06						***1,336.50***	-	0.00	0.0000	0.000			0.000	**Permanent Water Level**
179.50	407.96	1627.60	2,035.56	1753.2	876.60	2,114.10	876.60	0.44	0.0877	0.012			0.012	
179.63						2,509.65	1,173.15	0.57	0.1173	0.013	0.000		0.013	*25-mm*
179.68						2,636.50	1,300.00	0.62	0.1300	0.014	0.098		0.113	*2-yr*
179.79						2,896.50	1,560.00	0.73	0.1560	0.015	0.172		0.187	*5-yr*
179.87						3,084.50	1,748.00	0.81	0.1748	0.016	0.210	0.000	0.226	*10-yr*
179.96						3,303.50	1,967.00	0.91	0.1967	0.017	0.246	0.040	0.304	*25-yr*
180.00	631.94	2045.02	2,676.96	2356.3	1,178.13	3,292.22	2,054.73	0.94	0.2055	0.017	0.260	0.067	0.344	
180.02						3,449.50	2,113.00	0.96	0.2113	0.017	0.266	0.082	0.366	*50-yr*
180.07						3,593.50	2,257.00	1.01	0.2257	0.018	0.282	0.125	0.425	*100-yr*
180.27						4,199.50	2,863.00	1.21	0.2863	0.020	0.340	0.358	0.717	
180.50	874.00	2483.90	3,357.90	3017.4	1,508.72	4,800.94	3,563.44	1.44	0.3563	0.021	0.397	0.713	1.131	





Orifice Discharge

$$Q = C_d A \sqrt{2gH}$$

Q	Varies	Discharge	(m^3/s)
C_d	0.63	Discharge Coefficient	-
A	Varies	Area of Orifice	(m^2)
g	9.81	Gravitational Constant	(m/s^2)
H	Varies	Hydraulic Head	(m)

Weir Discharge

$$Q = C_d L \sqrt{2g} H^{\frac{3}{2}}$$

Q	Varies	Discharge	(m^3/s)
C_d	1.5	Discharge Coefficient	-
L	#REF!	Weir Length	(m)
g	9.81	Gravitational Constant	(m/s^2)
H	Varies	Hydraulic Head	m

Table 5.1f: MARKHAM ROAD STATION - Proposed SWMF 1
25 mm Drawdown Time Calculations

Project: 407 TWY from Kennedy Rd. to Brock Rd.

C	0.63000		Extended Quality Volume:	1,173	m^3
Orifice	0.09013	m	Initial Head:	0.57	m
Area	0.00638	m^2	Detention:	48.00	hrs
				2,880.00	min

F A L L I N G H E A D E Q U A T I O N

Time (min)	Head (m)	Q (m3/s)	Volume (m3)	Declining Volume Start	Declining Volume End
0	0.5694	0.0134	4.03	1,173.15	1,169.12
5	0.5674	0.0134	4.02	1,169.12	1,165.10
10	0.5655	0.0134	4.02	1,165.10	1,161.08
15	0.5635	0.0134	4.01	1,161.08	1,157.07
20	0.5616	0.0133	4.00	1,157.07	1,153.07
25	0.5596	0.0133	4.00	1,153.07	1,149.07
30	0.5577	0.0133	3.99	1,149.07	1,145.08
35	0.5558	0.0133	3.98	1,145.08	1,141.10
40	0.5538	0.0132	3.97	1,141.10	1,137.13
45	0.5519	0.0132	3.97	1,137.13	1,133.16
50	0.5500	0.0132	3.96	1,133.16	1,129.20
55	0.5481	0.0132	3.95	1,129.20	1,125.24
60	0.5461	0.0132	3.95	1,125.24	1,121.30
65	0.5442	0.0131	3.94	1,121.30	1,117.36
70	0.5423	0.0131	3.93	1,117.36	1,113.42
75	0.5404	0.0131	3.93	1,113.42	1,109.50
80	0.5385	0.0131	3.92	1,109.50	1,105.58
85	0.5366	0.0130	3.91	1,105.58	1,101.66
90	0.5347	0.0130	3.91	1,101.66	1,097.76
95	0.5328	0.0130	3.90	1,097.76	1,093.86
100	0.5309	0.0130	3.89	1,093.86	1,089.97
105	0.5290	0.0129	3.88	1,089.97	1,086.08
		-- B R E A K --			-
2860	0.0000	0.0001	0.03	6.49	6.46
2865	0.0000	0.0001	0.02	6.46	6.43
2870	0.0000	0.0001	0.02	6.43	6.42
2875	0.0000	0.0000	0.01	6.42	6.41
2880	(0.0000)		-	6.41	6.41

```
==========================================================================================================

       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat
  Output  filename: C:\Users\p004967b\AppData\Local\Temp\c2142e63-c4e1-4cb3-9aae-d2566f8a26c9\Scenario.out
  Summary filename: C:\Users\p004967b\AppData\Local\Temp\c2142e63-c4e1-4cb3-9aae-d2566f8a26c9\Scenario.sum


DATE: 10/07/2016                          TIME: 11:24:45

USER:



COMMENTS: _____________________________________________________________


----------------------------------------------------------------------------------------------------------
  ****************************
  ** SIMULATION NUMBER:   1 **
  ****************************


--------------------
|    READ STORM    |    Filename: C:\Users\p004967b\AppD
|                  |              ata\Local\Temp\
|                  |              c2142e63-c4e1-4cb3-9aae-d2566f8a26c9\ce1467d0
| Ptotal= 42.00 mm |    Comments: 2yr/12hr
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.25    0.00 |  3.50    7.14 |  6.75    2.94 | 10.00    0.42
                0.50    0.42 |  3.75    7.14 |  7.00    2.94 | 10.25    0.42
                0.75    0.42 |  4.00    7.14 |  7.25    2.94 | 10.50    0.42
                1.00    0.42 |  4.25    7.14 |  7.50    1.68 | 10.75    0.42
                1.25    0.42 |  4.50   19.32 |  7.75    1.68 | 11.00    0.42
                1.50    0.42 |  4.75   19.32 |  8.00    1.68 | 11.25    0.42
                1.75    0.42 |  5.00   19.32 |  8.25    1.68 | 11.50    0.42
                2.00    0.42 |  5.25   19.32 |  8.50    0.84 | 11.75    0.42
                2.25    0.42 |  5.50    5.46 |  8.75    0.84 | 12.00    0.42
                2.50    2.52 |  5.75    5.46 |  9.00    0.84 | 12.25    0.42
                2.75    2.52 |  6.00    5.46 |  9.25    0.84 |
                3.00    2.52 |  6.25    5.46 |  9.50    0.42 |
                3.25    2.52 |  6.50    2.94 |  9.75    0.42 |

------------------------------------------------------------------------------

--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=  13.45
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.69        10.76
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     299.44        40.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.083    0.00 | 3.167    2.52 | 6.250    5.46 |  9.33    0.42
                0.167    0.00 | 3.250    2.52 | 6.333    2.94 |  9.42    0.42
```

0.250	0.00	3.333	7.14	6.417	2.94	9.50	0.42
0.333	0.42	3.417	7.14	6.500	2.94	9.58	0.42
0.417	0.42	3.500	7.14	6.583	2.94	9.67	0.42
0.500	0.42	3.583	7.14	6.667	2.94	9.75	0.42
0.583	0.42	3.667	7.14	6.750	2.94	9.83	0.42
0.667	0.42	3.750	7.14	6.833	2.94	9.92	0.42
0.750	0.42	3.833	7.14	6.917	2.94	10.00	0.42
0.833	0.42	3.917	7.14	7.000	2.94	10.08	0.42
0.917	0.42	4.000	7.14	7.083	2.94	10.17	0.42
1.000	0.42	4.083	7.14	7.167	2.94	10.25	0.42
1.083	0.42	4.167	7.14	7.250	2.94	10.33	0.42
1.167	0.42	4.250	7.14	7.333	1.68	10.42	0.42
1.250	0.42	4.333	19.32	7.417	1.68	10.50	0.42
1.333	0.42	4.417	19.32	7.500	1.68	10.58	0.42
1.417	0.42	4.500	19.32	7.583	1.68	10.67	0.42
1.500	0.42	4.583	19.32	7.667	1.68	10.75	0.42
1.583	0.42	4.667	19.32	7.750	1.68	10.83	0.42
1.667	0.42	4.750	19.32	7.833	1.68	10.92	0.42
1.750	0.42	4.833	19.32	7.917	1.68	11.00	0.42
1.833	0.42	4.917	19.32	8.000	1.68	11.08	0.42
1.917	0.42	5.000	19.32	8.083	1.68	11.17	0.42
2.000	0.42	5.083	19.32	8.167	1.68	11.25	0.42
2.083	0.42	5.167	19.32	8.250	1.68	11.33	0.42
2.167	0.42	5.250	19.32	8.333	0.84	11.42	0.42
2.250	0.42	5.333	5.46	8.417	0.84	11.50	0.42
2.333	2.52	5.417	5.46	8.500	0.84	11.58	0.42
2.417	2.52	5.500	5.46	8.583	0.84	11.67	0.42
2.500	2.52	5.583	5.46	8.667	0.84	11.75	0.42
2.583	2.52	5.667	5.46	8.750	0.84	11.83	0.42
2.667	2.52	5.750	5.46	8.833	0.84	11.92	0.42
2.750	2.52	5.833	5.46	8.917	0.84	12.00	0.42
2.833	2.52	5.917	5.46	9.000	0.84	12.08	0.42
2.917	2.52	6.000	5.46	9.083	0.84	12.17	0.42
3.000	2.52	6.083	5.46	9.167	0.84	12.25	0.42
3.083	2.52	6.167	5.46	9.250	0.84		

Max.Eff.Inten.(mm/hr)=	19.32	5.72	
over (min)	10.00	40.00	
Storage Coeff. (min)=	9.52 (ii)	36.82 (ii)	
Unit Hyd. Tpeak (min)=	10.00	40.00	
Unit Hyd. peak (cms)=	0.12	0.03	
			TOTALS
PEAK FLOW (cms)=	0.14	0.11	0.228 (iii)
TIME TO PEAK (hrs)=	5.25	5.67	5.25
RUNOFF VOLUME (mm)=	41.90	9.73	16.16
TOTAL RAINFALL (mm)=	42.00	42.00	42.00
RUNOFF COEFFICIENT =	1.00	0.23	0.38

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0010)	Area (ha)= 9.06		
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00	Dir. Conn.(%)= 50.00	
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	8.15	0.91	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	1.00	1.00	
Length (m)=	245.76	40.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	19.32	78.50	
over (min)	10.00	20.00	
Storage Coeff. (min)=	8.46 (ii)	18.03 (ii)	
Unit Hyd. Tpeak (min)=	10.00	20.00	
Unit Hyd. peak (cms)=	0.12	0.06	
			TOTALS
PEAK FLOW (cms)=	0.24	0.17	0.416 (iii)
TIME TO PEAK (hrs)=	5.25	5.25	5.25
RUNOFF VOLUME (mm)=	41.90	27.22	34.56
TOTAL RAINFALL (mm)=	42.00	42.00	42.00
RUNOFF COEFFICIENT =	1.00	0.65	0.82

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

```
           CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0110) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0340      0.4199
                          0.0010     0.0025   |   0.0690      0.4796
                          0.0070     0.0838   |   0.0820      0.5250
                          0.0100     0.1711   |   0.0910      0.5651
                          0.0210     0.2236   |   0.0930      0.5741
                          0.0250     0.2641   |   1.1670      0.7426
                          0.0260     0.2642   |   1.1680      0.7427
                          0.0310     0.3558   |   1.1690      0.7428
                          0.0320     0.3838   |   1.2030      0.7682

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0010)      9.060      0.416      5.25      34.56
     OUTFLOW: ID= 1 (0110)      9.060      0.026      8.67      34.49

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  6.17
                   TIME SHIFT OF PEAK FLOW         (min)=205.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.2642

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        78.50
               over (min)         5.00        20.00
     Storage Coeff.  (min)=       6.81 (ii)   16.38 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.18         0.06
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.12         0.09        0.203 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25         5.25
     RUNOFF VOLUME    (mm)=      41.90        27.22        34.56
     TOTAL RAINFALL   (mm)=      42.00        42.00        42.00
     RUNOFF COEFFICIENT   =       1.00         0.65         0.82


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0111) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0290      0.2324
                          0.0030     0.0104   |   0.0360      0.2562
                          0.0070     0.0755   |   0.0420      0.2800
                          0.0090     0.1297   |   0.0430      0.2801
                          0.0180     0.1702   |   0.5520      0.3715
                          0.0210     0.1985   |   0.9030      0.4069

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0002)      4.390      0.203      5.25      34.56
     OUTFLOW: ID= 1 (0111)      4.390      0.009      9.33      34.36

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  4.44
                   TIME SHIFT OF PEAK FLOW         (min)=245.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.1297
```

```
--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0110):     9.06   0.026     8.67    34.49
       + ID2= 2 (0111):     4.39   0.009     9.33    34.36
         ================================================
         ID = 3 (0005):    13.45   0.035     8.67    34.45

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0006) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        78.50
               over (min)        5.00        20.00
     Storage Coeff.  (min)=       6.81 (ii)   16.38 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.18         0.06
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.12         0.09         0.203 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25          5.25
     RUNOFF VOLUME    (mm)=      41.90        27.22         34.56
     TOTAL RAINFALL   (mm)=      42.00        42.00         42.00
     RUNOFF COEFFICIENT   =       1.00         0.65          0.82


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0008) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.15         0.91
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     245.76        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        78.50
               over (min)       10.00        20.00
     Storage Coeff.  (min)=       8.46 (ii)   18.03 (ii)
     Unit Hyd. Tpeak (min)=      10.00        20.00
     Unit Hyd. peak  (cms)=       0.12         0.06
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.24         0.17         0.416 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25          5.25
     RUNOFF VOLUME    (mm)=      41.90        27.22         34.56
     TOTAL RAINFALL   (mm)=      42.00        42.00         42.00
     RUNOFF COEFFICIENT   =       1.00         0.65          0.82


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0011) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0006):     4.39   0.203     5.25    34.56
```

```
       + ID2= 2 (0008):     9.06   0.416     5.25    34.56
         ================================================
         ID = 3 (0011):    13.45   0.619     5.25    34.56

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
  ***************************
  ** SIMULATION NUMBER:   2 **
  ***************************


--------------------
|    READ STORM    |    Filename: C:\Users\p004967b\AppD
|                  |              ata\Local\Temp\
|                  |              c2142e63-c4e1-4cb3-9aae-d2566f8a26c9\cdb8431f
| Ptotal= 54.38 mm |    Comments: 5yr/12hr
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.25    0.00 |  3.50    9.25 |  6.75    3.81 | 10.00    0.54
                0.50    0.54 |  3.75    9.25 |  7.00    3.81 | 10.25    0.54
                0.75    0.54 |  4.00    9.25 |  7.25    3.81 | 10.50    0.54
                1.00    0.54 |  4.25    9.25 |  7.50    2.18 | 10.75    0.54
                1.25    0.54 |  4.50   25.02 |  7.75    2.18 | 11.00    0.54
                1.50    0.54 |  4.75   25.02 |  8.00    2.18 | 11.25    0.54
                1.75    0.54 |  5.00   25.02 |  8.25    2.18 | 11.50    0.54
                2.00    0.54 |  5.25   25.02 |  8.50    1.09 | 11.75    0.54
                2.25    0.54 |  5.50    7.07 |  8.75    1.09 | 12.00    0.54
                2.50    3.26 |  5.75    7.07 |  9.00    1.09 | 12.25    0.54
                2.75    3.26 |  6.00    7.07 |  9.25    1.09 |
                3.00    3.26 |  6.25    7.07 |  9.50    0.54 |
                3.25    3.26 |  6.50    3.81 |  9.75    0.54 |

--------------------------------------------------------------------------------

--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=  13.45
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       2.69        10.76
    Dep. Storage     (mm)=       0.10         5.00
    Average Slope     (%)=       1.00         1.00
    Length            (m)=     299.44        40.00
    Mannings n           =      0.013        0.250

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                        ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    0.00 | 3.167    3.26 | 6.250    7.07 |  9.33    0.54
               0.167    0.00 | 3.250    3.26 | 6.333    3.81 |  9.42    0.54
               0.250    0.00 | 3.333    9.25 | 6.417    3.81 |  9.50    0.54
               0.333    0.54 | 3.417    9.25 | 6.500    3.81 |  9.58    0.54
               0.417    0.54 | 3.500    9.25 | 6.583    3.81 |  9.67    0.54
               0.500    0.54 | 3.583    9.25 | 6.667    3.81 |  9.75    0.54
               0.583    0.54 | 3.667    9.25 | 6.750    3.81 |  9.83    0.54
               0.667    0.54 | 3.750    9.25 | 6.833    3.81 |  9.92    0.54
               0.750    0.54 | 3.833    9.25 | 6.917    3.81 | 10.00    0.54
               0.833    0.54 | 3.917    9.25 | 7.000    3.81 | 10.08    0.54
               0.917    0.54 | 4.000    9.25 | 7.083    3.81 | 10.17    0.54
               1.000    0.54 | 4.083    9.25 | 7.167    3.81 | 10.25    0.54
               1.083    0.54 | 4.167    9.25 | 7.250    3.81 | 10.33    0.54
               1.167    0.54 | 4.250    9.25 | 7.333    2.18 | 10.42    0.54
               1.250    0.54 | 4.333   25.02 | 7.417    2.18 | 10.50    0.54
               1.333    0.54 | 4.417   25.02 | 7.500    2.18 | 10.58    0.54
               1.417    0.54 | 4.500   25.02 | 7.583    2.18 | 10.67    0.54
               1.500    0.54 | 4.583   25.02 | 7.667    2.18 | 10.75    0.54
               1.583    0.54 | 4.667   25.02 | 7.750    2.18 | 10.83    0.54
               1.667    0.54 | 4.750   25.02 | 7.833    2.18 | 10.92    0.54
               1.750    0.54 | 4.833   25.02 | 7.917    2.18 | 11.00    0.54
               1.833    0.54 | 4.917   25.02 | 8.000    2.18 | 11.08    0.54
               1.917    0.54 | 5.000   25.02 | 8.083    2.18 | 11.17    0.54
               2.000    0.54 | 5.083   25.02 | 8.167    2.18 | 11.25    0.54
               2.083    0.54 | 5.167   25.02 | 8.250    2.18 | 11.33    0.54
               2.167    0.54 | 5.250   25.02 | 8.333    1.09 | 11.42    0.54
               2.250    0.54 | 5.333    7.07 | 8.417    1.09 | 11.50    0.54
               2.333    3.26 | 5.417    7.07 | 8.500    1.09 | 11.58    0.54
               2.417    3.26 | 5.500    7.07 | 8.583    1.09 | 11.67    0.54
               2.500    3.26 | 5.583    7.07 | 8.667    1.09 | 11.75    0.54
```

2.583	3.26	5.667	7.07	8.750	1.09	11.83	0.54
2.667	3.26	5.750	7.07	8.833	1.09	11.92	0.54
2.750	3.26	5.833	7.07	8.917	1.09	12.00	0.54
2.833	3.26	5.917	7.07	9.000	1.09	12.08	0.54
2.917	3.26	6.000	7.07	9.083	1.09	12.17	0.54
3.000	3.26	6.083	7.07	9.167	1.09	12.25	0.54
3.083	3.26	6.167	7.07	9.250	1.09		

Max.Eff.Inten.(mm/hr)=	25.02	9.57	
over (min)	10.00	35.00	
Storage Coeff. (min)=	8.59 (ii)	30.80 (ii)	
Unit Hyd. Tpeak (min)=	10.00	35.00	
Unit Hyd. peak (cms)=	0.12	0.04	
			TOTALS
PEAK FLOW (cms)=	0.19	0.20	0.354 (iii)
TIME TO PEAK (hrs)=	5.25	5.58	5.25
RUNOFF VOLUME (mm)=	54.28	15.92	23.59
TOTAL RAINFALL (mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT =	1.00	0.29	0.43

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0010)
ID= 1 DT= 5.0 min

Area (ha)= 9.06
Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=		8.15	0.91
Dep. Storage (mm)=		0.10	5.00
Average Slope (%)=		1.00	1.00
Length (m)=		245.76	40.00
Mannings n =		0.013	0.250

Max.Eff.Inten.(mm/hr)=	25.02	108.07	
over (min)	10.00	20.00	
Storage Coeff. (min)=	7.63 (ii)	16.05 (ii)	
Unit Hyd. Tpeak (min)=	10.00	20.00	
Unit Hyd. peak (cms)=	0.13	0.06	
			TOTALS
PEAK FLOW (cms)=	0.31	0.25	0.562 (iii)
TIME TO PEAK (hrs)=	5.25	5.25	5.25
RUNOFF VOLUME (mm)=	54.28	38.44	46.36
TOTAL RAINFALL (mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT =	1.00	0.71	0.85

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR (0110)
IN= 2---> OUT= 1
DT= 5.0 min

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0340	0.4199
0.0010	0.0025	0.0690	0.4796
0.0070	0.0838	0.0820	0.5250
0.0100	0.1711	0.0910	0.5651
0.0210	0.2236	0.0930	0.5741
0.0250	0.2641	1.1670	0.7426
0.0260	0.2642	1.1680	0.7427
0.0310	0.3558	1.1690	0.7428
0.0320	0.3838	1.2030	0.7682

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0010)	9.060	0.562	5.25	46.36
OUTFLOW: ID= 1 (0110)	9.060	0.031	8.75	46.29

PEAK FLOW REDUCTION [Qout/Qin](%)= 5.51
TIME SHIFT OF PEAK FLOW (min)=210.00

```
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.3558

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02       108.07
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       6.14 (ii)   14.56 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.19         0.08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.15         0.12          0.276 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25           5.25
     RUNOFF VOLUME    (mm)=      54.28        38.44          46.36
     TOTAL RAINFALL   (mm)=      54.38        54.38          54.38
     RUNOFF COEFFICIENT   =       1.00         0.71           0.85


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR (0111) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0290      0.2324
                          0.0030     0.0104   |   0.0360      0.2562
                          0.0070     0.0755   |   0.0420      0.2800
                          0.0090     0.1297   |   0.0430      0.2801
                          0.0180     0.1702   |   0.5520      0.3715
                          0.0210     0.1985   |   0.9030      0.4069

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0002)      4.390      0.276      5.25      46.36
     OUTFLOW: ID= 1 (0111)      4.390      0.018      8.42      46.16

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  6.52
                  TIME SHIFT OF PEAK FLOW         (min)=190.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.1702

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--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0110):     9.06   0.031     8.75    46.29
       + ID2= 2 (0111):     4.39   0.018     8.42    46.16
         ================================================
         ID = 3 (0005):    13.45   0.049     8.50    46.25

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0006) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02       108.07
               over (min)        5.00        15.00
```

```
     Storage Coeff.  (min)=       6.14 (ii)   14.56 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.19         0.08
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.15         0.12          0.276 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25           5.25
     RUNOFF VOLUME    (mm)=      54.28        38.44          46.36
     TOTAL RAINFALL   (mm)=      54.38        54.38          54.38
     RUNOFF COEFFICIENT   =       1.00         0.71           0.85


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0008) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.15         0.91
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     245.76        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02       108.07
               over (min)        10.00        20.00
     Storage Coeff.  (min)=       7.63 (ii)   16.05 (ii)
     Unit Hyd. Tpeak (min)=      10.00        20.00
     Unit Hyd. peak  (cms)=       0.13         0.06
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.31         0.25          0.562 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25           5.25
     RUNOFF VOLUME    (mm)=      54.28        38.44          46.36
     TOTAL RAINFALL   (mm)=      54.38        54.38          54.38
     RUNOFF COEFFICIENT   =       1.00         0.71           0.85


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0011) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0006):     4.39   0.276     5.25    46.36
       + ID2= 2 (0008):     9.06   0.562     5.25    46.36
         ================================================
         ID = 3 (0011):    13.45   0.838     5.25    46.36

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ***************************
  ** SIMULATION NUMBER:   3 **
  ***************************



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|    READ STORM    |    Filename: C:\Users\p004967b\AppD
|                  |              ata\Local\Temp\
|                  |              c2142e63-c4e1-4cb3-9aae-d2566f8a26c9\29d7434a
| Ptotal= 62.71 mm |    Comments: 10yr/12hr
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.25    0.00 |  3.50   10.66 |  6.75    4.39 | 10.00    0.63
                0.50    0.63 |  3.75   10.66 |  7.00    4.39 | 10.25    0.63
                0.75    0.63 |  4.00   10.66 |  7.25    4.39 | 10.50    0.63
                1.00    0.63 |  4.25   10.66 |  7.50    2.51 | 10.75    0.63
                1.25    0.63 |  4.50   28.84 |  7.75    2.51 | 11.00    0.63
                1.50    0.63 |  4.75   28.84 |  8.00    2.51 | 11.25    0.63
                1.75    0.63 |  5.00   28.84 |  8.25    2.51 | 11.50    0.63
                2.00    0.63 |  5.25   28.84 |  8.50    1.25 | 11.75    0.63
```

2.25	0.63	5.50	8.15	8.75	1.25	12.00	0.63
2.50	3.76	5.75	8.15	9.00	1.25	12.25	0.63
2.75	3.76	6.00	8.15	9.25	1.25		
3.00	3.76	6.25	8.15	9.50	0.63		
3.25	3.76	6.50	4.39	9.75	0.63		

CALIB
STANDHYD (0001)
ID= 1 DT= 5.0 min

Area (ha)= 13.45
Total Imp(%)= 20.00 Dir. Conn.(%)= 20.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	2.69	10.76
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.00	1.00
Length	(m)=	299.44	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	3.76	6.250	8.15	9.33	0.63
0.167	0.00	3.250	3.76	6.333	4.39	9.42	0.63
0.250	0.00	3.333	10.66	6.417	4.39	9.50	0.63
0.333	0.63	3.417	10.66	6.500	4.39	9.58	0.63
0.417	0.63	3.500	10.66	6.583	4.39	9.67	0.63
0.500	0.63	3.583	10.66	6.667	4.39	9.75	0.63
0.583	0.63	3.667	10.66	6.750	4.39	9.83	0.63
0.667	0.63	3.750	10.66	6.833	4.39	9.92	0.63
0.750	0.63	3.833	10.66	6.917	4.39	10.00	0.63
0.833	0.63	3.917	10.66	7.000	4.39	10.08	0.63
0.917	0.63	4.000	10.66	7.083	4.39	10.17	0.63
1.000	0.63	4.083	10.66	7.167	4.39	10.25	0.63
1.083	0.63	4.167	10.66	7.250	4.39	10.33	0.63
1.167	0.63	4.250	10.66	7.333	2.51	10.42	0.63
1.250	0.63	4.333	28.84	7.417	2.51	10.50	0.63
1.333	0.63	4.417	28.84	7.500	2.51	10.58	0.63
1.417	0.63	4.500	28.84	7.583	2.51	10.67	0.63
1.500	0.63	4.583	28.84	7.667	2.51	10.75	0.63
1.583	0.63	4.667	28.84	7.750	2.51	10.83	0.63
1.667	0.63	4.750	28.84	7.833	2.51	10.92	0.63
1.750	0.63	4.833	28.84	7.917	2.51	11.00	0.63
1.833	0.63	4.917	28.84	8.000	2.51	11.08	0.63
1.917	0.63	5.000	28.84	8.083	2.51	11.17	0.63
2.000	0.63	5.083	28.84	8.167	2.51	11.25	0.63
2.083	0.63	5.167	28.84	8.250	2.51	11.33	0.63
2.167	0.63	5.250	28.84	8.333	1.25	11.42	0.63
2.250	0.63	5.333	8.15	8.417	1.25	11.50	0.63
2.333	3.76	5.417	8.15	8.500	1.25	11.58	0.63
2.417	3.76	5.500	8.15	8.583	1.25	11.67	0.63
2.500	3.76	5.583	8.15	8.667	1.25	11.75	0.63
2.583	3.76	5.667	8.15	8.750	1.25	11.83	0.63
2.667	3.76	5.750	8.15	8.833	1.25	11.92	0.63
2.750	3.76	5.833	8.15	8.917	1.25	12.00	0.63
2.833	3.76	5.917	8.15	9.000	1.25	12.08	0.63
2.917	3.76	6.000	8.15	9.083	1.25	12.17	0.63
3.000	3.76	6.083	8.15	9.167	1.25	12.25	0.63
3.083	3.76	6.167	8.15	9.250	1.25		

				TOTALS
Max.Eff.Inten.(mm/hr)=		28.84	12.63	
	over (min)	10.00	30.00	
Storage Coeff. (min)=		8.11 (ii)	27.99 (ii)	
Unit Hyd. Tpeak (min)=		10.00	30.00	
Unit Hyd. peak (cms)=		0.13	0.04	
PEAK FLOW	(cms)=	0.22	0.27	0.458 (iii)
TIME TO PEAK	(hrs)=	5.25	5.50	5.25
RUNOFF VOLUME	(mm)=	62.61	20.63	29.02
TOTAL RAINFALL	(mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT	=	1.00	0.33	0.46

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0010) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.15         0.91
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     245.76        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84       127.95
               over (min)         5.00        20.00
     Storage Coeff.  (min)=       7.21 (ii)   15.08 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.17         0.07
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.36         0.30         0.661 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25          5.25
     RUNOFF VOLUME    (mm)=      62.61        46.18         54.39
     TOTAL RAINFALL   (mm)=      62.71        62.71         62.71
     RUNOFF COEFFICIENT   =       1.00         0.74          0.87


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR (0110) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000    |   0.0340      0.4199
                         0.0010     0.0025    |   0.0690      0.4796
                         0.0070     0.0838    |   0.0820      0.5250
                         0.0100     0.1711    |   0.0910      0.5651
                         0.0210     0.2236    |   0.0930      0.5741
                         0.0250     0.2641    |   1.1670      0.7426
                         0.0260     0.2642    |   1.1680      0.7427
                         0.0310     0.3558    |   1.1690      0.7428
                         0.0320     0.3838    |   1.2030      0.7682

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0010)     9.060      0.661      5.25      54.39
     OUTFLOW: ID= 1 (0110)     9.060      0.034      8.75      54.33

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  5.15
                  TIME SHIFT OF PEAK FLOW         (min)=210.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.4199

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--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84       127.95
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       5.80 (ii)   13.67 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.20         0.08
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.18         0.15         0.324 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25          5.25
     RUNOFF VOLUME    (mm)=      62.61        46.18         54.39
     TOTAL RAINFALL   (mm)=      62.71        62.71         62.71
     RUNOFF COEFFICIENT   =       1.00         0.74          0.87
```

```
       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0111) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0290      0.2324
                          0.0030     0.0104   |   0.0360      0.2562
                          0.0070     0.0755   |   0.0420      0.2800
                          0.0090     0.1297   |   0.0430      0.2801
                          0.0180     0.1702   |   0.5520      0.3715
                          0.0210     0.1985   |   0.9030      0.4069

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0002)      4.390      0.324      5.25      54.39
     OUTFLOW: ID= 1 (0111)      4.390      0.021      8.42      54.19

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  6.48
                   TIME SHIFT OF PEAK FLOW         (min)=190.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.1985

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0110):     9.06   0.034     8.75    54.33
        + ID2= 2 (0111):     4.39   0.021     8.42    54.19
          ================================================
          ID = 3 (0005):    13.45   0.055     8.58    54.28

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0006) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84       127.95
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       5.80 (ii)   13.67 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.20         0.08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.18         0.15         0.324 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25          5.25
     RUNOFF VOLUME    (mm)=      62.61        46.18         54.39
     TOTAL RAINFALL   (mm)=      62.71        62.71         62.71
     RUNOFF COEFFICIENT   =       1.00         0.74          0.87


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0008) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.15         0.91
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     245.76        40.00
```

```
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84       127.95
               over (min)         5.00        20.00
     Storage Coeff.  (min)=       7.21 (ii)   15.08 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.17         0.07
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.36         0.30          0.661 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25           5.25
     RUNOFF VOLUME    (mm)=      62.61        46.18          54.39
     TOTAL RAINFALL   (mm)=      62.71        62.71          62.71
     RUNOFF COEFFICIENT   =       1.00         0.74           0.87


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0011) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0006):     4.39   0.324     5.25    54.39
       + ID2= 2 (0008):     9.06   0.661     5.25    54.39
         ================================================
         ID = 3 (0011):    13.45   0.985     5.25    54.39

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ****************************
  ** SIMULATION NUMBER:   4 **
  ****************************



--------------------
|    READ STORM    |    Filename: C:\Users\p004967b\AppD
|                  |              ata\Local\Temp\
|                  |              c2142e63-c4e1-4cb3-9aae-d2566f8a26c9\9542bed4
| Ptotal= 73.10 mm |    Comments: 25yr/12hr
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'    hrs   mm/hr |    hrs   mm/hr
                0.25    0.00 |  3.50   12.43 |  6.75    5.12 | 10.00    0.73
                0.50    0.73 |  3.75   12.43 |  7.00    5.12 | 10.25    0.73
                0.75    0.73 |  4.00   12.43 |  7.25    5.12 | 10.50    0.73
                1.00    0.73 |  4.25   12.43 |  7.50    2.92 | 10.75    0.73
                1.25    0.73 |  4.50   33.63 |  7.75    2.92 | 11.00    0.73
                1.50    0.73 |  4.75   33.63 |  8.00    2.92 | 11.25    0.73
                1.75    0.73 |  5.00   33.63 |  8.25    2.92 | 11.50    0.73
                2.00    0.73 |  5.25   33.63 |  8.50    1.46 | 11.75    0.73
                2.25    0.73 |  5.50    9.50 |  8.75    1.46 | 12.00    0.73
                2.50    4.39 |  5.75    9.50 |  9.00    1.46 | 12.25    0.73
                2.75    4.39 |  6.00    9.50 |  9.25    1.46 |
                3.00    4.39 |  6.25    9.50 |  9.50    0.73 |
                3.25    4.39 |  6.50    5.12 |  9.75    0.73 |

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--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=  13.45
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.69         10.76
     Dep. Storage     (mm)=       0.10          5.00
     Average Slope     (%)=       1.00          1.00
     Length            (m)=     299.44         40.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'    hrs   mm/hr |    hrs   mm/hr
               0.083    0.00 | 3.167    4.39 | 6.250    9.50 |  9.33    0.73
               0.167    0.00 | 3.250    4.39 | 6.333    5.12 |  9.42    0.73
```

0.250	0.00	3.333	12.43	6.417	5.12	9.50	0.73
0.333	0.73	3.417	12.43	6.500	5.12	9.58	0.73
0.417	0.73	3.500	12.43	6.583	5.12	9.67	0.73
0.500	0.73	3.583	12.43	6.667	5.12	9.75	0.73
0.583	0.73	3.667	12.43	6.750	5.12	9.83	0.73
0.667	0.73	3.750	12.43	6.833	5.12	9.92	0.73
0.750	0.73	3.833	12.43	6.917	5.12	10.00	0.73
0.833	0.73	3.917	12.43	7.000	5.12	10.08	0.73
0.917	0.73	4.000	12.43	7.083	5.12	10.17	0.73
1.000	0.73	4.083	12.43	7.167	5.12	10.25	0.73
1.083	0.73	4.167	12.43	7.250	5.12	10.33	0.73
1.167	0.73	4.250	12.43	7.333	2.92	10.42	0.73
1.250	0.73	4.333	33.63	7.417	2.92	10.50	0.73
1.333	0.73	4.417	33.63	7.500	2.92	10.58	0.73
1.417	0.73	4.500	33.63	7.583	2.92	10.67	0.73
1.500	0.73	4.583	33.63	7.667	2.92	10.75	0.73
1.583	0.73	4.667	33.63	7.750	2.92	10.83	0.73
1.667	0.73	4.750	33.63	7.833	2.92	10.92	0.73
1.750	0.73	4.833	33.63	7.917	2.92	11.00	0.73
1.833	0.73	4.917	33.63	8.000	2.92	11.08	0.73
1.917	0.73	5.000	33.63	8.083	2.92	11.17	0.73
2.000	0.73	5.083	33.63	8.167	2.92	11.25	0.73
2.083	0.73	5.167	33.63	8.250	2.92	11.33	0.73
2.167	0.73	5.250	33.63	8.333	1.46	11.42	0.73
2.250	0.73	5.333	9.50	8.417	1.46	11.50	0.73
2.333	4.39	5.417	9.50	8.500	1.46	11.58	0.73
2.417	4.39	5.500	9.50	8.583	1.46	11.67	0.73
2.500	4.39	5.583	9.50	8.667	1.46	11.75	0.73
2.583	4.39	5.667	9.50	8.750	1.46	11.83	0.73
2.667	4.39	5.750	9.50	8.833	1.46	11.92	0.73
2.750	4.39	5.833	9.50	8.917	1.46	12.00	0.73
2.833	4.39	5.917	9.50	9.000	1.46	12.08	0.73
2.917	4.39	6.000	9.50	9.083	1.46	12.17	0.73
3.000	4.39	6.083	9.50	9.167	1.46	12.25	0.73
3.083	4.39	6.167	9.50	9.250	1.46		

Max.Eff.Inten.(mm/hr)=	33.63	16.40	
over (min)	10.00	30.00	
Storage Coeff. (min)=	7.63 (ii)	25.54 (ii)	
Unit Hyd. Tpeak (min)=	10.00	30.00	
Unit Hyd. peak (cms)=	0.13	0.04	
			TOTALS
PEAK FLOW (cms)=	0.25	0.36	0.585 (iii)
TIME TO PEAK (hrs)=	5.25	5.42	5.25
RUNOFF VOLUME (mm)=	73.00	26.99	36.19
TOTAL RAINFALL (mm)=	73.10	73.10	73.10
RUNOFF COEFFICIENT =	1.00	0.37	0.50

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0010)	Area (ha)= 9.06		
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00	Dir. Conn.(%)= 50.00	
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	8.15	0.91	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	1.00	1.00	
Length (m)=	245.76	40.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	33.63	152.86	
over (min)	5.00	15.00	
Storage Coeff. (min)=	6.78 (ii)	14.11 (ii)	
Unit Hyd. Tpeak (min)=	5.00	15.00	
Unit Hyd. peak (cms)=	0.18	0.08	
			TOTALS
PEAK FLOW (cms)=	0.42	0.37	0.789 (iii)
TIME TO PEAK (hrs)=	5.25	5.25	5.25
RUNOFF VOLUME (mm)=	73.00	55.99	64.49
TOTAL RAINFALL (mm)=	73.10	73.10	73.10
RUNOFF COEFFICIENT =	1.00	0.77	0.88

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

```
           CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0110) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0340      0.4199
                          0.0010     0.0025   |   0.0690      0.4796
                          0.0070     0.0838   |   0.0820      0.5250
                          0.0100     0.1711   |   0.0910      0.5651
                          0.0210     0.2236   |   0.0930      0.5741
                          0.0250     0.2641   |   1.1670      0.7426
                          0.0260     0.2642   |   1.1680      0.7427
                          0.0310     0.3558   |   1.1690      0.7428
                          0.0320     0.3838   |   1.2030      0.7682

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0010)      9.060      0.789      5.25      64.49
     OUTFLOW: ID= 1 (0110)      9.060      0.069      8.25      64.42

                 PEAK   FLOW   REDUCTION [Qout/Qin](%)=  8.74
                 TIME SHIFT OF PEAK FLOW         (min)=180.00
                 MAXIMUM  STORAGE   USED       (ha.m.)=  0.4796

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63       152.86
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       5.45 (ii)   12.78 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.20         0.08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.21         0.18        0.384 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25         5.25
     RUNOFF VOLUME    (mm)=      73.00        55.99        64.49
     TOTAL RAINFALL   (mm)=      73.10        73.10        73.10
     RUNOFF COEFFICIENT   =       1.00         0.77         0.88


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0111) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0290      0.2324
                          0.0030     0.0104   |   0.0360      0.2562
                          0.0070     0.0755   |   0.0420      0.2800
                          0.0090     0.1297   |   0.0430      0.2801
                          0.0180     0.1702   |   0.5520      0.3715
                          0.0210     0.1985   |   0.9030      0.4069

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0002)      4.390      0.384      5.25      64.49
     OUTFLOW: ID= 1 (0111)      4.390      0.029      8.33      64.29

                 PEAK   FLOW   REDUCTION [Qout/Qin](%)=  7.56
                 TIME SHIFT OF PEAK FLOW         (min)=185.00
                 MAXIMUM  STORAGE   USED       (ha.m.)=  0.2324
```

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--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0110):     9.06   0.069     8.25    64.42
       + ID2= 2 (0111):     4.39   0.029     8.33    64.29
         ================================================
         ID = 3 (0005):    13.45   0.098     8.25    64.38

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0006) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63       152.86
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       5.45 (ii)   12.78 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.20         0.08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.21         0.18         0.384 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25          5.25
     RUNOFF VOLUME    (mm)=      73.00        55.99         64.49
     TOTAL RAINFALL   (mm)=      73.10        73.10         73.10
     RUNOFF COEFFICIENT   =       1.00         0.77          0.88


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0008) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.15         0.91
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     245.76        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63       152.86
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       6.78 (ii)   14.11 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.18         0.08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.42         0.37         0.789 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25          5.25
     RUNOFF VOLUME    (mm)=      73.00        55.99         64.49
     TOTAL RAINFALL   (mm)=      73.10        73.10         73.10
     RUNOFF COEFFICIENT   =       1.00         0.77          0.88


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0011) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0006):     4.39   0.384     5.25    64.49
```

```
       + ID2= 2 (0008):     9.06   0.789     5.25    64.49
         ================================================
         ID = 3 (0011):    13.45   1.173     5.25    64.49

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ****************************
  ** SIMULATION NUMBER:   5 **
  ****************************


--------------------
|    READ STORM    |    Filename: C:\Users\p004967b\AppD
|                  |              ata\Local\Temp\
|                  |              c2142e63-c4e1-4cb3-9aae-d2566f8a26c9\0b5bd3f2
| Ptotal= 80.82 mm |    Comments: 50yr/12hr
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.25    0.00 |  3.50   13.74 |  6.75    5.66 | 10.00    0.81
                0.50    0.81 |  3.75   13.74 |  7.00    5.66 | 10.25    0.81
                0.75    0.81 |  4.00   13.74 |  7.25    5.66 | 10.50    0.81
                1.00    0.81 |  4.25   13.74 |  7.50    3.23 | 10.75    0.81
                1.25    0.81 |  4.50   37.17 |  7.75    3.23 | 11.00    0.81
                1.50    0.81 |  4.75   37.17 |  8.00    3.23 | 11.25    0.81
                1.75    0.81 |  5.00   37.17 |  8.25    3.23 | 11.50    0.81
                2.00    0.81 |  5.25   37.17 |  8.50    1.62 | 11.75    0.81
                2.25    0.81 |  5.50   10.50 |  8.75    1.62 | 12.00    0.81
                2.50    4.85 |  5.75   10.50 |  9.00    1.62 | 12.25    0.81
                2.75    4.85 |  6.00   10.50 |  9.25    1.62 |
                3.00    4.85 |  6.25   10.50 |  9.50    0.81 |
                3.25    4.85 |  6.50    5.66 |  9.75    0.81 |

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--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=  13.45
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       2.69         10.76
    Dep. Storage     (mm)=       0.10          5.00
    Average Slope     (%)=       1.00          1.00
    Length            (m)=     299.44         40.00
    Mannings n           =      0.013         0.250

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                        ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    0.00 | 3.167    4.85 | 6.250   10.50 |  9.33    0.81
               0.167    0.00 | 3.250    4.85 | 6.333    5.66 |  9.42    0.81
               0.250    0.00 | 3.333   13.74 | 6.417    5.66 |  9.50    0.81
               0.333    0.81 | 3.417   13.74 | 6.500    5.66 |  9.58    0.81
               0.417    0.81 | 3.500   13.74 | 6.583    5.66 |  9.67    0.81
               0.500    0.81 | 3.583   13.74 | 6.667    5.66 |  9.75    0.81
               0.583    0.81 | 3.667   13.74 | 6.750    5.66 |  9.83    0.81
               0.667    0.81 | 3.750   13.74 | 6.833    5.66 |  9.92    0.81
               0.750    0.81 | 3.833   13.74 | 6.917    5.66 | 10.00    0.81
               0.833    0.81 | 3.917   13.74 | 7.000    5.66 | 10.08    0.81
               0.917    0.81 | 4.000   13.74 | 7.083    5.66 | 10.17    0.81
               1.000    0.81 | 4.083   13.74 | 7.167    5.66 | 10.25    0.81
               1.083    0.81 | 4.167   13.74 | 7.250    5.66 | 10.33    0.81
               1.167    0.81 | 4.250   13.74 | 7.333    3.23 | 10.42    0.81
               1.250    0.81 | 4.333   37.17 | 7.417    3.23 | 10.50    0.81
               1.333    0.81 | 4.417   37.17 | 7.500    3.23 | 10.58    0.81
               1.417    0.81 | 4.500   37.17 | 7.583    3.23 | 10.67    0.81
               1.500    0.81 | 4.583   37.17 | 7.667    3.23 | 10.75    0.81
               1.583    0.81 | 4.667   37.17 | 7.750    3.23 | 10.83    0.81
               1.667    0.81 | 4.750   37.17 | 7.833    3.23 | 10.92    0.81
               1.750    0.81 | 4.833   37.17 | 7.917    3.23 | 11.00    0.81
               1.833    0.81 | 4.917   37.17 | 8.000    3.23 | 11.08    0.81
               1.917    0.81 | 5.000   37.17 | 8.083    3.23 | 11.17    0.81
               2.000    0.81 | 5.083   37.17 | 8.167    3.23 | 11.25    0.81
               2.083    0.81 | 5.167   37.17 | 8.250    3.23 | 11.33    0.81
               2.167    0.81 | 5.250   37.17 | 8.333    1.62 | 11.42    0.81
               2.250    0.81 | 5.333   10.50 | 8.417    1.62 | 11.50    0.81
               2.333    4.85 | 5.417   10.50 | 8.500    1.62 | 11.58    0.81
               2.417    4.85 | 5.500   10.50 | 8.583    1.62 | 11.67    0.81
               2.500    4.85 | 5.583   10.50 | 8.667    1.62 | 11.75    0.81
```

2.583	4.85	5.667	10.50	8.750	1.62	11.83	0.81
2.667	4.85	5.750	10.50	8.833	1.62	11.92	0.81
2.750	4.85	5.833	10.50	8.917	1.62	12.00	0.81
2.833	4.85	5.917	10.50	9.000	1.62	12.08	0.81
2.917	4.85	6.000	10.50	9.083	1.62	12.17	0.81
3.000	4.85	6.083	10.50	9.167	1.62	12.25	0.81
3.083	4.85	6.167	10.50	9.250	1.62		

Max.Eff.Inten.(mm/hr)=	37.17	19.34	
over (min)	5.00	25.00	
Storage Coeff. (min)=	7.33 (ii)	24.09 (ii)	
Unit Hyd. Tpeak (min)=	5.00	25.00	
Unit Hyd. peak (cms)=	0.17	0.05	
			TOTALS
PEAK FLOW (cms)=	0.28	0.45	0.704 (iii)
TIME TO PEAK (hrs)=	5.25	5.42	5.25
RUNOFF VOLUME (mm)=	80.72	32.01	41.75
TOTAL RAINFALL (mm)=	80.82	80.82	80.82
RUNOFF COEFFICIENT =	1.00	0.40	0.52

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0010)	Area (ha)= 9.06
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	8.15	0.91
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.00	1.00
Length	(m)=	245.76	40.00
Mannings n	=	0.013	0.250

Max.Eff.Inten.(mm/hr)=	37.17	171.22	
over (min)	5.00	15.00	
Storage Coeff. (min)=	6.51 (ii)	13.52 (ii)	
Unit Hyd. Tpeak (min)=	5.00	15.00	
Unit Hyd. peak (cms)=	0.18	0.08	
			TOTALS
PEAK FLOW (cms)=	0.47	0.41	0.881 (iii)
TIME TO PEAK (hrs)=	5.25	5.25	5.25
RUNOFF VOLUME (mm)=	80.72	63.35	72.03
TOTAL RAINFALL (mm)=	80.82	80.82	80.82
RUNOFF COEFFICIENT =	1.00	0.78	0.89

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR (0110)
IN= 2---> OUT= 1
DT= 5.0 min

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0340	0.4199
0.0010	0.0025	0.0690	0.4796
0.0070	0.0838	0.0820	0.5250
0.0100	0.1711	0.0910	0.5651
0.0210	0.2236	0.0930	0.5741
0.0250	0.2641	1.1670	0.7426
0.0260	0.2642	1.1680	0.7427
0.0310	0.3558	1.1690	0.7428
0.0320	0.3838	1.2030	0.7682

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0010)	9.060	0.881	5.25	72.03
OUTFLOW: ID= 1 (0110)	9.060	0.082	7.92	71.97

PEAK FLOW REDUCTION [Qout/Qin](%)= 9.31
TIME SHIFT OF PEAK FLOW (min)=160.00

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                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.5250

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--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17       171.22
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       5.24 (ii)   12.25 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.21         0.09
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.23         0.20          0.428 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25           5.25
     RUNOFF VOLUME    (mm)=      80.72        63.35          72.03
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.78           0.89


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR (0111) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000    |   0.0290      0.2324
                         0.0030     0.0104    |   0.0360      0.2562
                         0.0070     0.0755    |   0.0420      0.2800
                         0.0090     0.1297    |   0.0430      0.2801
                         0.0180     0.1702    |   0.5520      0.3715
                         0.0210     0.1985    |   0.9030      0.4069

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0002)      4.390      0.428      5.25      72.03
     OUTFLOW: ID= 1 (0111)      4.390      0.036      8.25      71.83

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  8.40
                  TIME SHIFT OF PEAK FLOW         (min)=180.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.2562

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--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0110):     9.06   0.082     7.92    71.97
       + ID2= 2 (0111):     4.39   0.036     8.25    71.83
         ================================================
         ID = 3 (0005):    13.45   0.118     8.25    71.92

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0006) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17       171.22
               over (min)        5.00        15.00
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     Storage Coeff.  (min)=       5.24 (ii)   12.25 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.21         0.09
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.23         0.20          0.428 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25           5.25
     RUNOFF VOLUME    (mm)=      80.72        63.35          72.03
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.78           0.89


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0008) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.15         0.91
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     245.76        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17       171.22
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       6.51 (ii)   13.52 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.18         0.08
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.47         0.41          0.881 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25           5.25
     RUNOFF VOLUME    (mm)=      80.72        63.35          72.03
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.78           0.89


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0011) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0006):     4.39   0.428     5.25    72.03
       + ID2= 2 (0008):     9.06   0.881     5.25    72.03
         ================================================
         ID = 3 (0011):    13.45   1.309     5.25    72.03

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ***************************
  ** SIMULATION NUMBER:   6 **
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|    READ STORM    |    Filename: C:\Users\p004967b\AppD
|                  |              ata\Local\Temp\
|                  |              c2142e63-c4e1-4cb3-9aae-d2566f8a26c9\f1cdf7f0
| Ptotal= 88.54 mm |    Comments: 100yr/12hr
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.25    0.00 |  3.50   15.05 |  6.75    6.20 | 10.00    0.89
                0.50    0.89 |  3.75   15.05 |  7.00    6.20 | 10.25    0.89
                0.75    0.89 |  4.00   15.05 |  7.25    6.20 | 10.50    0.89
                1.00    0.89 |  4.25   15.05 |  7.50    3.54 | 10.75    0.89
                1.25    0.89 |  4.50   40.71 |  7.75    3.54 | 11.00    0.89
                1.50    0.89 |  4.75   40.71 |  8.00    3.54 | 11.25    0.89
                1.75    0.89 |  5.00   40.71 |  8.25    3.54 | 11.50    0.89
                2.00    0.89 |  5.25   40.71 |  8.50    1.77 | 11.75    0.89
```

2.25	0.89	5.50	11.51	8.75	1.77	12.00	0.89
2.50	5.31	5.75	11.51	9.00	1.77	12.25	0.89
2.75	5.31	6.00	11.51	9.25	1.77		
3.00	5.31	6.25	11.51	9.50	0.89		
3.25	5.31	6.50	6.20	9.75	0.89		

CALIB	
STANDHYD (0001)	Area (ha)= 13.45
ID= 1 DT= 5.0 min	Total Imp(%)= 20.00 Dir. Conn.(%)= 20.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	2.69	10.76
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.00	1.00
Length	(m)=	299.44	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	5.31	6.250	11.51	9.33	0.89
0.167	0.00	3.250	5.31	6.333	6.20	9.42	0.89
0.250	0.00	3.333	15.05	6.417	6.20	9.50	0.89
0.333	0.89	3.417	15.05	6.500	6.20	9.58	0.89
0.417	0.89	3.500	15.05	6.583	6.20	9.67	0.89
0.500	0.89	3.583	15.05	6.667	6.20	9.75	0.89
0.583	0.89	3.667	15.05	6.750	6.20	9.83	0.89
0.667	0.89	3.750	15.05	6.833	6.20	9.92	0.89
0.750	0.89	3.833	15.05	6.917	6.20	10.00	0.89
0.833	0.89	3.917	15.05	7.000	6.20	10.08	0.89
0.917	0.89	4.000	15.05	7.083	6.20	10.17	0.89
1.000	0.89	4.083	15.05	7.167	6.20	10.25	0.89
1.083	0.89	4.167	15.05	7.250	6.20	10.33	0.89
1.167	0.89	4.250	15.05	7.333	3.54	10.42	0.89
1.250	0.89	4.333	40.71	7.417	3.54	10.50	0.89
1.333	0.89	4.417	40.71	7.500	3.54	10.58	0.89
1.417	0.89	4.500	40.71	7.583	3.54	10.67	0.89
1.500	0.89	4.583	40.71	7.667	3.54	10.75	0.89
1.583	0.89	4.667	40.71	7.750	3.54	10.83	0.89
1.667	0.89	4.750	40.71	7.833	3.54	10.92	0.89
1.750	0.89	4.833	40.71	7.917	3.54	11.00	0.89
1.833	0.89	4.917	40.71	8.000	3.54	11.08	0.89
1.917	0.89	5.000	40.71	8.083	3.54	11.17	0.89
2.000	0.89	5.083	40.71	8.167	3.54	11.25	0.89
2.083	0.89	5.167	40.71	8.250	3.54	11.33	0.89
2.167	0.89	5.250	40.71	8.333	1.77	11.42	0.89
2.250	0.89	5.333	11.51	8.417	1.77	11.50	0.89
2.333	5.31	5.417	11.51	8.500	1.77	11.58	0.89
2.417	5.31	5.500	11.51	8.583	1.77	11.67	0.89
2.500	5.31	5.583	11.51	8.667	1.77	11.75	0.89
2.583	5.31	5.667	11.51	8.750	1.77	11.83	0.89
2.667	5.31	5.750	11.51	8.833	1.77	11.92	0.89
2.750	5.31	5.833	11.51	8.917	1.77	12.00	0.89
2.833	5.31	5.917	11.51	9.000	1.77	12.08	0.89
2.917	5.31	6.000	11.51	9.083	1.77	12.17	0.89
3.000	5.31	6.083	11.51	9.167	1.77	12.25	0.89
3.083	5.31	6.167	11.51	9.250	1.77		

				TOTALS
Max.Eff.Inten.(mm/hr)=		40.71	22.39	
	over (min)	5.00	25.00	
Storage Coeff.	(min)=	7.07 (ii)	22.88 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	25.00	
Unit Hyd. peak	(cms)=	0.17	0.05	
PEAK FLOW	(cms)=	0.30	0.53	0.811 (iii)
TIME TO PEAK	(hrs)=	5.25	5.42	5.25
RUNOFF VOLUME	(mm)=	88.44	37.26	47.50
TOTAL RAINFALL	(mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT	=	1.00	0.42	0.54

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB            |
| STANDHYD  (0010) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.15         0.91
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     245.76        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71       189.56
               over (min)        5.00         15.00
     Storage Coeff.  (min)=       6.28 (ii)   13.01 (ii)
     Unit Hyd. Tpeak (min)=       5.00         15.00
     Unit Hyd. peak  (cms)=       0.19         0.08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.51         0.46         0.972 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25          5.25
     RUNOFF VOLUME    (mm)=      88.44        70.77         79.60
     TOTAL RAINFALL   (mm)=      88.54        88.54         88.54
     RUNOFF COEFFICIENT   =       1.00         0.80          0.90


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0110) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000    |   0.0340      0.4199
                         0.0010     0.0025    |   0.0690      0.4796
                         0.0070     0.0838    |   0.0820      0.5250
                         0.0100     0.1711    |   0.0910      0.5651
                         0.0210     0.2236    |   0.0930      0.5741
                         0.0250     0.2641    |   1.1670      0.7426
                         0.0260     0.2642    |   1.1680      0.7427
                         0.0310     0.3558    |   1.1690      0.7428
                         0.0320     0.3838    |   1.2030      0.7682

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0010)     9.060      0.972      5.25      79.60
     OUTFLOW: ID= 1 (0110)     9.060      0.093      7.75      79.53

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  9.57
                  TIME SHIFT OF PEAK FLOW         (min)=150.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.5741

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71       189.56
               over (min)        5.00         15.00
     Storage Coeff.  (min)=       5.05 (ii)   11.78 (ii)
     Unit Hyd. Tpeak (min)=       5.00         15.00
     Unit Hyd. peak  (cms)=       0.21         0.09
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.25         0.22         0.473 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25          5.25
     RUNOFF VOLUME    (mm)=      88.44        70.77         79.60
     TOTAL RAINFALL   (mm)=      88.54        88.54         88.54
     RUNOFF COEFFICIENT   =       1.00         0.80          0.90
```

```
      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  71.0    Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0111) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0290      0.2324
                          0.0030     0.0104   |   0.0360      0.2562
                          0.0070     0.0755   |   0.0420      0.2800
                          0.0090     0.1297   |   0.0430      0.2801
                          0.0180     0.1702   |   0.5520      0.3715
                          0.0210     0.1985   |   0.9030      0.4069

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
    INFLOW : ID= 2 (0002)      4.390      0.473      5.25      79.60
    OUTFLOW: ID= 1 (0111)      4.390      0.042      8.25      79.40

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  8.98
                  TIME SHIFT OF PEAK FLOW         (min)=180.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.2800

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0110):     9.06   0.093     7.75    79.53
       + ID2= 2 (0111):     4.39   0.042     8.25    79.40
         ================================================
         ID = 3 (0005):    13.45   0.135     8.17    79.49

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0006) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       3.95         0.44
    Dep. Storage     (mm)=       0.10         5.00
    Average Slope     (%)=       1.00         1.00
    Length            (m)=     171.08        40.00
    Mannings n           =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=      40.71       189.56
              over (min)         5.00        15.00
    Storage Coeff.  (min)=       5.05 (ii)   11.78 (ii)
    Unit Hyd. Tpeak (min)=       5.00        15.00
    Unit Hyd. peak  (cms)=       0.21         0.09
                                                        *TOTALS*
    PEAK FLOW       (cms)=       0.25         0.22          0.473 (iii)
    TIME TO PEAK    (hrs)=       5.25         5.25           5.25
    RUNOFF VOLUME    (mm)=      88.44        70.77          79.60
    TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
    RUNOFF COEFFICIENT   =       1.00         0.80           0.90


      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  71.0    Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0008) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       8.15         0.91
    Dep. Storage     (mm)=       0.10         5.00
    Average Slope     (%)=       1.00         1.00
    Length            (m)=     245.76        40.00
```

Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)	=	40.71	189.56
over (min)		5.00	15.00
Storage Coeff. (min)	=	6.28 (ii)	13.01 (ii)
Unit Hyd. Tpeak (min)	=	5.00	15.00
Unit Hyd. peak (cms)	=	0.19	0.08

				TOTALS
PEAK FLOW	(cms)=	0.51	0.46	0.972 (iii)
TIME TO PEAK	(hrs)=	5.25	5.25	5.25
RUNOFF VOLUME	(mm)=	88.44	70.77	79.60
TOTAL RAINFALL	(mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT	=	1.00	0.80	0.90

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0011)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0006):	4.39	0.473	5.25	79.60
+ ID2= 2 (0008):	9.06	0.972	5.25	79.60
ID = 3 (0011):	13.45	1.445	5.25	79.60

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

****
** SIMULATION NUMBER: 7 **
****

READ STORM | Filename: C:\Users\p004967b\AppData\Local\Temp\c2142e63-c4e1-4cb3-9aae-d2566f8a26c9\0ad2fd4a
Ptotal=212.00 mm | Comments: HURRICANE HAZEL - FINAL 12 HOURS

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
1.00	6.00	4.00	13.00	7.00	23.00	10.00	53.00
2.00	4.00	5.00	17.00	8.00	13.00	11.00	38.00
3.00	6.00	6.00	13.00	9.00	13.00	12.00	13.00

CALIB
STANDHYD (0001) | Area (ha)= 13.45
ID= 1 DT= 5.0 min | Total Imp(%)= 20.00 Dir. Conn.(%)= 20.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	2.69	10.76
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.00	1.00
Length	(m)=	299.44	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	6.00	3.083	13.00	6.083	23.00	9.08	53.00
0.167	6.00	3.167	13.00	6.167	23.00	9.17	53.00
0.250	6.00	3.250	13.00	6.250	23.00	9.25	53.00
0.333	6.00	3.333	13.00	6.333	23.00	9.33	53.00
0.417	6.00	3.417	13.00	6.417	23.00	9.42	53.00
0.500	6.00	3.500	13.00	6.500	23.00	9.50	53.00
0.583	6.00	3.583	13.00	6.583	23.00	9.58	53.00
0.667	6.00	3.667	13.00	6.667	23.00	9.67	53.00
0.750	6.00	3.750	13.00	6.750	23.00	9.75	53.00
0.833	6.00	3.833	13.00	6.833	23.00	9.83	53.00
0.917	6.00	3.917	13.00	6.917	23.00	9.92	53.00
1.000	6.00	4.000	13.00	7.000	23.00	10.00	53.00

1.083	4.00	4.083	17.00	7.083	13.00	10.08	38.00
1.167	4.00	4.167	17.00	7.167	13.00	10.17	38.00
1.250	4.00	4.250	17.00	7.250	13.00	10.25	38.00
1.333	4.00	4.333	17.00	7.333	13.00	10.33	38.00
1.417	4.00	4.417	17.00	7.417	13.00	10.42	38.00
1.500	4.00	4.500	17.00	7.500	13.00	10.50	38.00
1.583	4.00	4.583	17.00	7.583	13.00	10.58	38.00
1.667	4.00	4.667	17.00	7.667	13.00	10.67	38.00
1.750	4.00	4.750	17.00	7.750	13.00	10.75	38.00
1.833	4.00	4.833	17.00	7.833	13.00	10.83	38.00
1.917	4.00	4.917	17.00	7.917	13.00	10.92	38.00
2.000	4.00	5.000	17.00	8.000	13.00	11.00	38.00
2.083	6.00	5.083	13.00	8.083	13.00	11.08	13.00
2.167	6.00	5.167	13.00	8.167	13.00	11.17	13.00
2.250	6.00	5.250	13.00	8.250	13.00	11.25	13.00
2.333	6.00	5.333	13.00	8.333	13.00	11.33	13.00
2.417	6.00	5.417	13.00	8.417	13.00	11.42	13.00
2.500	6.00	5.500	13.00	8.500	13.00	11.50	13.00
2.583	6.00	5.583	13.00	8.583	13.00	11.58	13.00
2.667	6.00	5.667	13.00	8.667	13.00	11.67	13.00
2.750	6.00	5.750	13.00	8.750	13.00	11.75	13.00
2.833	6.00	5.833	13.00	8.833	13.00	11.83	13.00
2.917	6.00	5.917	13.00	8.917	13.00	11.92	13.00
3.000	6.00	6.000	13.00	9.000	13.00	12.00	13.00

Max.Eff.Inten.(mm/hr)=	53.00	44.09	
over (min)	5.00	20.00	
Storage Coeff. (min)=	6.36 (ii)	18.42 (ii)	
Unit Hyd. Tpeak (min)=	5.00	20.00	
Unit Hyd. peak (cms)=	0.19	0.06	
			TOTALS
PEAK FLOW (cms)=	0.40	1.23	1.615 (iii)
TIME TO PEAK (hrs)=	10.00	10.08	10.00
RUNOFF VOLUME (mm)=	211.90	137.89	152.69
TOTAL RAINFALL (mm)=	212.00	212.00	212.00
RUNOFF COEFFICIENT =	1.00	0.65	0.72

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0010)	Area (ha)= 9.06		
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00	Dir. Conn.(%)= 50.00	
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	8.15	0.91	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	1.00	1.00	
Length (m)=	245.76	40.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	53.00	261.33	
over (min)	5.00	15.00	
Storage Coeff. (min)=	5.65 (ii)	11.57 (ii)	
Unit Hyd. Tpeak (min)=	5.00	15.00	
Unit Hyd. peak (cms)=	0.20	0.09	
			TOTALS
PEAK FLOW (cms)=	0.67	0.65	1.318 (iii)
TIME TO PEAK (hrs)=	10.00	10.00	10.00
RUNOFF VOLUME (mm)=	211.90	192.11	202.00
TOTAL RAINFALL (mm)=	212.00	212.00	212.00
RUNOFF COEFFICIENT =	1.00	0.91	0.95

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR (0110)				
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)

```
=============================================================================================================

       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat
  Output  filename: C:\Users\p004967b\AppData\Local\Temp\3b068a81-224f-405b-b61c-b324b8bd3ece\Scenario.out
  Summary filename: C:\Users\p004967b\AppData\Local\Temp\3b068a81-224f-405b-b61c-b324b8bd3ece\Scenario.sum


DATE: 10/07/2016                          TIME: 11:26:32

USER:


COMMENTS: _____________________________________________________________


-------------------------------------------------------------------------------------------------------------
  ****************************
  ** SIMULATION NUMBER:   1 **
  ****************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 424.160
| Ptotal= 32.11 mm |                          B=   1.500
--------------------                          C=   0.723
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  4.00 hrs
                       Storm time step    =  5.00 min
                       Time to peak ratio =  0.33

                     The CORRELATION coefficient is = 0.9996

                      TIME       INPUT INT.          TAB. INT.
                     (min)        (mm/hr)             (mm/hr)
                        5.         118.10              109.60
                       10.          72.80               72.55
                       15.          54.80               55.88
                       30.          33.80               35.01
                       60.          20.80               21.59
                      120.          12.80               13.19
                      360.           5.90                6.00
                      720.           3.70                3.64
                     1440.           2.30                2.21


                  TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                   hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                  0.08    2.39 |  1.08    8.35 |  2.08    5.74 |  3.08    3.07
                  0.17    2.51 |  1.17   11.90 |  2.17    5.31 |  3.17    2.96
                  0.25    2.66 |  1.25   24.99 |  2.25    4.94 |  3.25    2.87
                  0.33    2.82 |  1.33  109.60 |  2.33    4.63 |  3.33    2.78
                  0.42    3.01 |  1.42   31.83 |  2.42    4.37 |  3.42    2.70
                  0.50    3.24 |  1.50   18.18 |  2.50    4.13 |  3.50    2.62
                  0.58    3.50 |  1.58   13.23 |  2.58    3.93 |  3.58    2.55
                  0.67    3.83 |  1.67   10.60 |  2.67    3.75 |  3.67    2.48
                  0.75    4.25 |  1.75    8.94 |  2.75    3.58 |  3.75    2.42
                  0.83    4.78 |  1.83    7.78 |  2.83    3.43 |  3.83    2.36
                  0.92    5.52 |  1.92    6.93 |  2.92    3.30 |  3.92    2.31
                  1.00    6.59 |  2.00    6.27 |  3.00    3.18 |  4.00    2.25


-----------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=  13.45
```

```
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
-------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.69         10.76
     Dep. Storage     (mm)=       0.10          5.00
     Average Slope     (%)=       1.00          1.00
     Length            (m)=     299.44         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     109.60          5.51
               over (min)         5.00         35.00
     Storage Coeff.  (min)=       4.76 (ii)    32.45 (ii)
     Unit Hyd. Tpeak (min)=       5.00         35.00
     Unit Hyd. peak  (cms)=       0.22          0.03
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.58          0.09          0.591 (iii)
     TIME TO PEAK    (hrs)=       1.33          2.00           1.33
     RUNOFF VOLUME    (mm)=      32.01          5.62          10.90
     TOTAL RAINFALL   (mm)=      32.11         32.11          32.11
     RUNOFF COEFFICIENT   =       1.00          0.17           0.34

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-------------------
| CALIB             |
| STANDHYD  (0008) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
-------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.15          0.91
     Dep. Storage     (mm)=       0.10          5.00
     Average Slope     (%)=       1.00          1.00
     Length            (m)=     245.76         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     109.60        210.72
               over (min)         5.00         10.00
     Storage Coeff.  (min)=       4.22 (ii)     8.62 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.24          0.12
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.04          0.36          1.233 (iii)
     TIME TO PEAK    (hrs)=       1.33          1.42           1.33
     RUNOFF VOLUME    (mm)=      32.01         18.67          25.34
     TOTAL RAINFALL   (mm)=      32.11         32.11          32.11
     RUNOFF COEFFICIENT   =       1.00          0.58           0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-------------------
| CALIB             |
| STANDHYD  (0006) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
-------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95          0.44
     Dep. Storage     (mm)=       0.10          5.00
     Average Slope     (%)=       1.00          1.00
     Length            (m)=     171.08         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     109.60        210.72
               over (min)         5.00         10.00
     Storage Coeff.  (min)=       3.40 (ii)     7.80 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.26          0.13
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.55          0.19          0.646 (iii)
```

```
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      32.01        18.67         25.34
     TOTAL RAINFALL   (mm)=      32.11        32.11         32.11
     RUNOFF COEFFICIENT   =       1.00         0.58          0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0011) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0006):     4.39   0.646     1.33    25.34
        + ID2= 2 (0008):     9.06   1.233     1.33    25.34
          ================================================
          ID = 3 (0011):    13.45   1.879     1.33    25.34

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0010) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.15         0.91
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     245.76        40.00
     Mannings n             =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     109.60       210.72
               over (min)          5.00        10.00
     Storage Coeff.  (min)=       4.22 (ii)    8.62 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.24         0.12
                                                        *TOTALS*
     PEAK FLOW       (cms)=       1.04         0.36        1.233 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42         1.33
     RUNOFF VOLUME    (mm)=      32.01        18.67         25.34
     TOTAL RAINFALL   (mm)=      32.11        32.11         32.11
     RUNOFF COEFFICIENT   =       1.00         0.58          0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR (0110) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0340      0.4199
                          0.0010     0.0025   |   0.0690      0.4796
                          0.0070     0.0838   |   0.0820      0.5250
                          0.0100     0.1711   |   0.0910      0.5651
                          0.0210     0.2236   |   0.0930      0.5741
                          0.0250     0.2641   |   1.1670      0.7426
                          0.0260     0.2642   |   1.1680      0.7427
                          0.0310     0.3558   |   1.1690      0.7428
                          0.0320     0.3838   |   1.2030      0.7682

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0010)     9.060      1.233      1.33      25.34
     OUTFLOW: ID= 1 (0110)     9.060      0.019      4.17      25.27

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=  1.55
                    TIME SHIFT OF PEAK FLOW         (min)=170.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.2144
```

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--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     109.60       210.72
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       3.40 (ii)    7.80 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.26         0.13
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.55         0.19          0.646 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42           1.33
     RUNOFF VOLUME    (mm)=      32.01        18.67          25.34
     TOTAL RAINFALL   (mm)=      32.11        32.11          32.11
     RUNOFF COEFFICIENT   =       1.00         0.58           0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0111) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0290      0.2324
                          0.0030     0.0104   |   0.0360      0.2562
                          0.0070     0.0755   |   0.0420      0.2800
                          0.0090     0.1297   |   0.0430      0.2801
                          0.0180     0.1702   |   0.5520      0.3715
                          0.0210     0.1985   |   0.9030      0.4069

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0002)      4.390      0.646      1.33      25.34
     OUTFLOW: ID= 1 (0111)      4.390      0.008      4.17      25.14

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=  1.24
                    TIME SHIFT OF PEAK FLOW         (min)=170.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.1029

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--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0110):     9.06   0.019     4.17    25.27
        + ID2= 2 (0111):     4.39   0.008     4.17    25.14
          ================================================
          ID = 3 (0005):    13.45   0.027     4.17    25.23

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ****************************
  ** SIMULATION NUMBER:   2 **
  ****************************


--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 578.969
| Ptotal= 42.88 mm |                          B=   1.508
--------------------                          C=   0.727
                         used in:   INTENSITY =  A / (t + B)^C

                         Duration of storm  =  4.00 hrs
                         Storm time step    =  5.00 min
                         Time to peak ratio =  0.33

                     The CORRELATION coefficient is = 0.9997
```

TIME (min)	INPUT INT. (mm/hr)	TAB. INT. (mm/hr)
5.	159.00	148.35
10.	98.00	98.02
15.	73.80	75.40
30.	45.50	47.13
60.	28.00	28.98
120.	17.20	17.67
360.	8.00	8.00
720.	4.90	4.84
1440.	3.00	2.93

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.08	3.15	1.08	11.09	2.08	7.60	3.08	4.04
0.17	3.31	1.17	15.85	2.17	7.02	3.17	3.91
0.25	3.50	1.25	33.48	2.25	6.54	3.25	3.78
0.33	3.72	1.33	148.35	2.33	6.13	3.33	3.66
0.42	3.97	1.42	42.72	2.42	5.77	3.42	3.56
0.50	4.27	1.50	24.29	2.50	5.46	3.50	3.46
0.58	4.63	1.58	17.63	2.58	5.19	3.58	3.36
0.67	5.06	1.67	14.10	2.67	4.95	3.67	3.27
0.75	5.61	1.75	11.87	2.75	4.73	3.75	3.19
0.83	6.33	1.83	10.33	2.83	4.53	3.83	3.11
0.92	7.30	1.92	9.19	2.92	4.36	3.92	3.04
1.00	8.74	2.00	8.31	3.00	4.19	4.00	2.97

CALIB			
STANDHYD (0001)	Area (ha)= 13.45		
ID= 1 DT= 5.0 min	Total Imp(%)= 20.00	Dir. Conn.(%)= 20.00	

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	2.69	10.76	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	299.44	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.	(mm/hr)=	148.35	13.26	
	over (min)	5.00	25.00	
Storage Coeff.	(min)=	4.21 (ii)	23.71 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	25.00	
Unit Hyd. peak	(cms)=	0.24	0.05	
				TOTALS
PEAK FLOW	(cms)=	0.83	0.20	0.860 (iii)
TIME TO PEAK	(hrs)=	1.33	1.75	1.33
RUNOFF VOLUME	(mm)=	42.78	10.13	16.66
TOTAL RAINFALL	(mm)=	42.88	42.88	42.88
RUNOFF COEFFICIENT	=	1.00	0.24	0.39

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0008)	Area (ha)= 9.06		
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00	Dir. Conn.(%)= 50.00	

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	8.15	0.91	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	245.76	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.	(mm/hr)=	148.35	326.31	
	over (min)	5.00	10.00	
Storage Coeff.	(min)=	3.74 (ii)	7.64 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	10.00	
Unit Hyd. peak	(cms)=	0.25	0.13	
				TOTALS

```
     PEAK FLOW       (cms)=       1.47         0.61          1.805 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42           1.33
     RUNOFF VOLUME    (mm)=      42.78        28.01          35.39
     TOTAL RAINFALL   (mm)=      42.88        42.88          42.88
     RUNOFF COEFFICIENT   =       1.00         0.65           0.83

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0006) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=     148.35       326.31
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       3.01 (ii)    6.91 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.28         0.14
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.77         0.31          0.938 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42           1.33
     RUNOFF VOLUME    (mm)=      42.78        28.01          35.39
     TOTAL RAINFALL   (mm)=      42.88        42.88          42.88
     RUNOFF COEFFICIENT   =       1.00         0.65           0.83

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0011) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0006):     4.39   0.938     1.33    35.39
        + ID2= 2 (0008):     9.06   1.805     1.33    35.39
          ================================================
          ID = 3 (0011):    13.45   2.743     1.33    35.39

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0010) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.15         0.91
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     245.76        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=     148.35       326.31
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       3.74 (ii)    7.64 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.25         0.13
                                                      *TOTALS*
     PEAK FLOW       (cms)=       1.47         0.61          1.805 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42           1.33
     RUNOFF VOLUME    (mm)=      42.78        28.01          35.39
     TOTAL RAINFALL   (mm)=      42.88        42.88          42.88
     RUNOFF COEFFICIENT   =       1.00         0.65           0.83
```

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR (0110)
IN= 2---> OUT= 1
DT= 5.0 min

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0340	0.4199
0.0010	0.0025	0.0690	0.4796
0.0070	0.0838	0.0820	0.5250
0.0100	0.1711	0.0910	0.5651
0.0210	0.2236	0.0930	0.5741
0.0250	0.2641	1.1670	0.7426
0.0260	0.2642	1.1680	0.7427
0.0310	0.3558	1.1690	0.7428
0.0320	0.3838	1.2030	0.7682

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0010)	9.060	1.805	1.33	35.39
OUTFLOW: ID= 1 (0110)	9.060	0.028	4.08	35.33

PEAK FLOW REDUCTION [Qout/Qin](%)= 1.53
TIME SHIFT OF PEAK FLOW (min)=165.00
MAXIMUM STORAGE USED (ha.m.)= 0.2956

CALIB
STANDHYD (0002)
ID= 1 DT= 5.0 min

Area (ha)= 4.39
Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	3.95	0.44
Dep. Storage (mm)=	0.10	5.00
Average Slope (%)=	1.00	1.00
Length (m)=	171.08	40.00
Mannings n =	0.013	0.250
Max.Eff.Inten.(mm/hr)=	148.35	326.31
over (min)	5.00	10.00
Storage Coeff. (min)=	3.01 (ii)	6.91 (ii)
Unit Hyd. Tpeak (min)=	5.00	10.00
Unit Hyd. peak (cms)=	0.28	0.14

			TOTALS
PEAK FLOW (cms)=	0.77	0.31	0.938 (iii)
TIME TO PEAK (hrs)=	1.33	1.42	1.33
RUNOFF VOLUME (mm)=	42.78	28.01	35.39
TOTAL RAINFALL (mm)=	42.88	42.88	42.88
RUNOFF COEFFICIENT =	1.00	0.65	0.83

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR (0111)
IN= 2---> OUT= 1
DT= 5.0 min

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0290	0.2324
0.0030	0.0104	0.0360	0.2562
0.0070	0.0755	0.0420	0.2800
0.0090	0.1297	0.0430	0.2801
0.0180	0.1702	0.5520	0.3715
0.0210	0.1985	0.9030	0.4069

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0002)	4.390	0.938	1.33	35.39
OUTFLOW: ID= 1 (0111)	4.390	0.012	4.08	35.20

```
                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  1.31
                  TIME SHIFT OF PEAK FLOW        (min)=165.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.1447

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--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0110):     9.06   0.028     4.08    35.33
        + ID2= 2 (0111):     4.39   0.012     4.08    35.20
          ================================================
          ID = 3 (0005):    13.45   0.040     4.08    35.28

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ****************************
  ** SIMULATION NUMBER:   3 **
  ****************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 665.492
| Ptotal= 50.39 mm |                          B=   1.500
--------------------                          C=   0.723
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  4.00 hrs
                       Storm time step    =  5.00 min
                       Time to peak ratio =  0.33

                     The CORRELATION coefficient is = 0.9996

                      TIME       INPUT INT.           TAB. INT.
                     (min)        (mm/hr)              (mm/hr)
                        5.         185.30               171.95
                       10.         114.20               113.83
                       15.          86.10                87.68
                       30.          53.00                54.94
                       60.          32.70                33.87
                      120.          20.20                20.70
                      360.           9.40                 9.41
                      720.           5.80                 5.71
                     1440.           3.60                 3.46


                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.08    3.75 |  1.08   13.10 |  2.08    9.01 |  3.08    4.81
                0.17    3.94 |  1.17   18.68 |  2.17    8.32 |  3.17    4.65
                0.25    4.17 |  1.25   39.21 |  2.25    7.75 |  3.25    4.50
                0.33    4.43 |  1.33  171.95 |  2.33    7.27 |  3.33    4.36
                0.42    4.73 |  1.42   49.94 |  2.42    6.85 |  3.42    4.23
                0.50    5.08 |  1.50   28.53 |  2.50    6.49 |  3.50    4.11
                0.58    5.50 |  1.58   20.76 |  2.58    6.16 |  3.58    4.00
                0.67    6.01 |  1.67   16.63 |  2.67    5.88 |  3.67    3.90
                0.75    6.66 |  1.75   14.02 |  2.75    5.62 |  3.75    3.80
                0.83    7.50 |  1.83   12.21 |  2.83    5.39 |  3.83    3.70
                0.92    8.66 |  1.92   10.87 |  2.92    5.18 |  3.92    3.62
                1.00   10.34 |  2.00    9.83 |  3.00    4.99 |  4.00    3.53


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=  13.45
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=         2.69          10.76
     Dep. Storage     (mm)=         0.10           5.00
     Average Slope     (%)=         1.00           1.00
     Length            (m)=       299.44          40.00
     Mannings n             =       0.013          0.250

     Max.Eff.Inten.(mm/hr)=       171.95          18.23
               over (min)           5.00          25.00
     Storage Coeff.  (min)=         3.97 (ii)     21.14 (ii)
     Unit Hyd. Tpeak (min)=         5.00          25.00
     Unit Hyd. peak  (cms)=         0.24           0.05
                                                          *TOTALS*
     PEAK FLOW       (cms)=         0.99           0.29           1.034 (iii)
```

```
     TIME TO PEAK    (hrs)=       1.33         1.75          1.33
     RUNOFF VOLUME    (mm)=      50.29        13.81         21.11
     TOTAL RAINFALL   (mm)=      50.39        50.39         50.39
     RUNOFF COEFFICIENT   =       1.00         0.27          0.42

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0008) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.15         0.91
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     245.76        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     171.95       403.55
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       3.53 (ii)    7.20 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.26         0.14
                                                      *TOTALS*
     PEAK FLOW       (cms)=       1.74         0.78          2.179 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42           1.33
     RUNOFF VOLUME    (mm)=      50.29        34.78          42.53
     TOTAL RAINFALL   (mm)=      50.39        50.39          50.39
     RUNOFF COEFFICIENT   =       1.00         0.69           0.84

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0006) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     171.95       403.55
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       2.84 (ii)    6.51 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.28         0.14
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.91         0.39          1.127 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42           1.33
     RUNOFF VOLUME    (mm)=      50.29        34.78          42.53
     TOTAL RAINFALL   (mm)=      50.39        50.39          50.39
     RUNOFF COEFFICIENT   =       1.00         0.69           0.84

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| ADD HYD   (0011) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0006):     4.39   1.127     1.33    42.53
       + ID2= 2 (0008):     9.06   2.179     1.33    42.53
         ================================================
         ID = 3 (0011):    13.45   3.306     1.33    42.53

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0010) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.15         0.91
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     245.76        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     171.95       403.55
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       3.53 (ii)    7.20 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.26         0.14
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.74         0.78          2.179 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42           1.33
     RUNOFF VOLUME    (mm)=      50.29        34.78          42.53
     TOTAL RAINFALL   (mm)=      50.39        50.39          50.39
     RUNOFF COEFFICIENT   =       1.00         0.69           0.84

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR (0110) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0340      0.4199
                         0.0010     0.0025   |   0.0690      0.4796
                         0.0070     0.0838   |   0.0820      0.5250
                         0.0100     0.1711   |   0.0910      0.5651
                         0.0210     0.2236   |   0.0930      0.5741
                         0.0250     0.2641   |   1.1670      0.7426
                         0.0260     0.2642   |   1.1680      0.7427
                         0.0310     0.3558   |   1.1690      0.7428
                         0.0320     0.3838   |   1.2030      0.7682

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0010)     9.060     2.179      1.33      42.53
     OUTFLOW: ID= 1 (0110)     9.060     0.031      4.17      42.46

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  1.42
                   TIME SHIFT OF PEAK FLOW         (min)=170.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.3561

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--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     171.95       403.55
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       2.84 (ii)    6.51 (ii)
```

```
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.28         0.14
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.91         0.39         1.127 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      50.29        34.78         42.53
     TOTAL RAINFALL   (mm)=      50.39        50.39         50.39
     RUNOFF COEFFICIENT   =       1.00         0.69          0.84

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0111) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0290      0.2324
                          0.0030     0.0104   |   0.0360      0.2562
                          0.0070     0.0755   |   0.0420      0.2800
                          0.0090     0.1297   |   0.0430      0.2801
                          0.0180     0.1702   |   0.5520      0.3715
                          0.0210     0.1985   |   0.9030      0.4069

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0002)      4.390     1.127      1.33       42.53
     OUTFLOW: ID= 1 (0111)      4.390     0.018      4.08       42.33

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  1.61
                  TIME SHIFT OF PEAK FLOW         (min)=165.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.1717

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--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0110):     9.06   0.031     4.17    42.46
        + ID2= 2 (0111):     4.39   0.018     4.08    42.33
          ================================================
          ID = 3 (0005):    13.45   0.049     4.08    42.42

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ****************************
  ** SIMULATION NUMBER:   4 **
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--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 792.607
| Ptotal= 59.36 mm |                          B=   1.500
--------------------                          C=   0.725
                         used in:   INTENSITY =  A / (t + B)^C

                         Duration of storm  =  4.00 hrs
                         Storm time step    =  5.00 min
                         Time to peak ratio =  0.33

                      The CORRELATION coefficient is = 0.9997

                       TIME       INPUT INT.           TAB. INT.
                      (min)        (mm/hr)              (mm/hr)
                         5.         219.20               204.03
                        10.         135.10               134.91
                        15.         101.70               103.84
                        30.          62.70                64.98
                        60.          38.60                40.01
                       120.          23.80                24.42
                       360.          11.00                11.08
                       720.           6.80                 6.71
                      1440.           4.20                 4.06


                  TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                   hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
```

0.08	4.38	1.08	15.39	2.08	10.56	3.08	5.63
0.17	4.62	1.17	21.96	2.17	9.76	3.17	5.44
0.25	4.88	1.25	46.25	2.25	9.09	3.25	5.27
0.33	5.18	1.33	204.03	2.33	8.52	3.33	5.11
0.42	5.53	1.42	58.96	2.42	8.03	3.42	4.95
0.50	5.94	1.50	33.61	2.50	7.60	3.50	4.81
0.58	6.44	1.58	24.43	2.58	7.22	3.58	4.68
0.67	7.05	1.67	19.55	2.67	6.88	3.67	4.56
0.75	7.81	1.75	16.47	2.75	6.58	3.75	4.44
0.83	8.80	1.83	14.34	2.83	6.31	3.83	4.33
0.92	10.15	1.92	12.76	2.92	6.06	3.92	4.23
1.00	12.14	2.00	11.54	3.00	5.84	4.00	4.13

CALIB				
STANDHYD (0001)	Area (ha)= 13.45			
ID= 1 DT= 5.0 min	Total Imp(%)= 20.00	Dir. Conn.(%)= 20.00		
	IMPERVIOUS	PERVIOUS (i)		
Surface Area (ha)=	2.69	10.76		
Dep. Storage (mm)=	0.10	5.00		
Average Slope (%)=	1.00	1.00		
Length (m)=	299.44	40.00		
Mannings n =	0.013	0.250		
Max.Eff.Inten.(mm/hr)=	204.03	30.07		
over (min)	5.00	20.00		
Storage Coeff. (min)=	3.71 (ii)	17.76 (ii)		
Unit Hyd. Tpeak (min)=	5.00	20.00		
Unit Hyd. peak (cms)=	0.25	0.06		
			TOTALS	
PEAK FLOW (cms)=	1.21	0.46	1.304 (iii)	
TIME TO PEAK (hrs)=	1.33	1.58	1.33	
RUNOFF VOLUME (mm)=	59.26	18.69	26.80	
TOTAL RAINFALL (mm)=	59.36	59.36	59.36	
RUNOFF COEFFICIENT =	1.00	0.31	0.45	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB				
STANDHYD (0008)	Area (ha)= 9.06			
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00	Dir. Conn.(%)= 50.00		
	IMPERVIOUS	PERVIOUS (i)		
Surface Area (ha)=	8.15	0.91		
Dep. Storage (mm)=	0.10	5.00		
Average Slope (%)=	1.00	1.00		
Length (m)=	245.76	40.00		
Mannings n =	0.013	0.250		
Max.Eff.Inten.(mm/hr)=	204.03	505.91		
over (min)	5.00	10.00		
Storage Coeff. (min)=	3.29 (ii)	6.73 (ii)		
Unit Hyd. Tpeak (min)=	5.00	10.00		
Unit Hyd. peak (cms)=	0.27	0.14		
			TOTALS	
PEAK FLOW (cms)=	2.12	1.01	2.691 (iii)	
TIME TO PEAK (hrs)=	1.33	1.42	1.33	
RUNOFF VOLUME (mm)=	59.26	43.05	51.15	
TOTAL RAINFALL (mm)=	59.36	59.36	59.36	
RUNOFF COEFFICIENT =	1.00	0.73	0.86	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
| CALIB             |
| STANDHYD  (0006) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     204.03       505.91
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.65 (ii)    6.08 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.29         0.15
                                                        *TOTALS*
     PEAK FLOW       (cms)=       1.09         0.51         1.386 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      59.26        43.05         51.15
     TOTAL RAINFALL   (mm)=      59.36        59.36         59.36
     RUNOFF COEFFICIENT   =       1.00         0.73          0.86

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0011) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0006):     4.39   1.386     1.33    51.15
        + ID2= 2 (0008):     9.06   2.691     1.33    51.15
          ================================================
          ID = 3 (0011):    13.45   4.077     1.33    51.15

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD  (0010) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.15         0.91
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     245.76        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     204.03       505.91
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       3.29 (ii)    6.73 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.27         0.14
                                                        *TOTALS*
     PEAK FLOW       (cms)=       2.12         1.01         2.691 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      59.26        43.05         51.15
     TOTAL RAINFALL   (mm)=      59.36        59.36         59.36
     RUNOFF COEFFICIENT   =       1.00         0.73          0.86

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR (0110) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000    |   0.0340      0.4199
```

0.0010	0.0025	0.0690	0.4796
0.0070	0.0838	0.0820	0.5250
0.0100	0.1711	0.0910	0.5651
0.0210	0.2236	0.0930	0.5741
0.0250	0.2641	1.1670	0.7426
0.0260	0.2642	1.1680	0.7427
0.0310	0.3558	1.1690	0.7428
0.0320	0.3838	1.2030	0.7682

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0010)	9.060	2.691	1.33	51.15
OUTFLOW: ID= 1 (0110)	9.060	0.040	4.08	51.08

PEAK FLOW REDUCTION [Qout/Qin](%)= 1.48
TIME SHIFT OF PEAK FLOW (min)=165.00
MAXIMUM STORAGE USED (ha.m.)= 0.4299

CALIB	
STANDHYD (0002)	Area (ha)= 4.39
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	3.95	0.44	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	171.08	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		204.03	505.91	
over (min)		5.00	10.00	
Storage Coeff.	(min)=	2.65 (ii)	6.08 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	10.00	
Unit Hyd. peak	(cms)=	0.29	0.15	
				TOTALS
PEAK FLOW	(cms)=	1.09	0.51	1.386 (iii)
TIME TO PEAK	(hrs)=	1.33	1.42	1.33
RUNOFF VOLUME	(mm)=	59.26	43.05	51.15
TOTAL RAINFALL	(mm)=	59.36	59.36	59.36
RUNOFF COEFFICIENT	=	1.00	0.73	0.86

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR (0111)				
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0290	0.2324
	0.0030	0.0104	0.0360	0.2562
	0.0070	0.0755	0.0420	0.2800
	0.0090	0.1297	0.0430	0.2801
	0.0180	0.1702	0.5520	0.3715
	0.0210	0.1985	0.9030	0.4069

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0002)	4.390	1.386	1.33	51.15
OUTFLOW: ID= 1 (0111)	4.390	0.023	4.08	50.95

PEAK FLOW REDUCTION [Qout/Qin](%)= 1.63
TIME SHIFT OF PEAK FLOW (min)=165.00
MAXIMUM STORAGE USED (ha.m.)= 0.2050

ADD HYD (0005)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0110):	9.06	0.040	4.08	51.08
+ ID2= 2 (0111):	4.39	0.023	4.08	50.95
ID = 3 (0005):	13.45	0.062	4.08	51.04

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

****
** SIMULATION NUMBER: 5 **
****

CHICAGO STORM	Ptotal= 66.15 mm

IDF curve parameters: A= 878.493
B= 1.500
C= 0.724
used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step = 5.00 min
Time to peak ratio = 0.33

The CORRELATION coefficient is = 0.9997

TIME (min)	INPUT INT. (mm/hr)	TAB. INT. (mm/hr)
5.	243.60	226.56
10.	150.20	149.90
15.	113.20	115.42
30.	69.80	72.27
60.	43.00	44.52
120.	26.50	27.20
360.	12.30	12.35
720.	7.60	7.49
1440.	4.70	4.54

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.08	4.90	1.08	17.18	2.08	11.80	3.08	6.30
0.17	5.16	1.17	24.50	2.17	10.90	3.17	6.09
0.25	5.46	1.25	51.51	2.25	10.16	3.25	5.89
0.33	5.79	1.33	226.56	2.33	9.52	3.33	5.71
0.42	6.18	1.42	65.63	2.42	8.97	3.42	5.54
0.50	6.65	1.50	37.45	2.50	8.49	3.50	5.38
0.58	7.20	1.58	27.24	2.58	8.07	3.58	5.24
0.67	7.87	1.67	21.81	2.67	7.69	3.67	5.10
0.75	8.72	1.75	18.38	2.75	7.36	3.75	4.97
0.83	9.83	1.83	16.01	2.83	7.05	3.83	4.85
0.92	11.34	1.92	14.25	2.92	6.78	3.92	4.73
1.00	13.55	2.00	12.89	3.00	6.53	4.00	4.62

CALIB STANDHYD (0001) ID= 1 DT= 5.0 min	Area (ha)= 13.45 Total Imp(%)= 20.00 Dir. Conn.(%)= 20.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	2.69	10.76	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	299.44	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)	=	226.56	36.82	
over (min)		5.00	20.00	
Storage Coeff.	(min)=	3.56 (ii)	16.51 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	20.00	
Unit Hyd. peak	(cms)=	0.26	0.06	
				TOTALS
PEAK FLOW	(cms)=	1.36	0.59	1.491 (iii)
TIME TO PEAK	(hrs)=	1.33	1.58	1.33
RUNOFF VOLUME	(mm)=	66.05	22.68	31.35
TOTAL RAINFALL	(mm)=	66.15	66.15	66.15
RUNOFF COEFFICIENT	=	1.00	0.34	0.47

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0008) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.15         0.91
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     245.76        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     226.56       580.70
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       3.16 (ii)    6.45 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.27         0.14
                                                      *TOTALS*
     PEAK FLOW       (cms)=       2.38         1.19         3.063 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      66.05        49.41         57.73
     TOTAL RAINFALL   (mm)=      66.15        66.15         66.15
     RUNOFF COEFFICIENT   =       1.00         0.75          0.87

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0006) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     226.56       580.70
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.54 (ii)    5.83 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.29         0.15
                                                      *TOTALS*
     PEAK FLOW       (cms)=       1.23         0.60         1.573 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      66.05        49.41         57.73
     TOTAL RAINFALL   (mm)=      66.15        66.15         66.15
     RUNOFF COEFFICIENT   =       1.00         0.75          0.87

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0011) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0006):     4.39   1.573     1.33    57.73
        + ID2= 2 (0008):     9.06   3.063     1.33    57.73
          ================================================
          ID = 3 (0011):    13.45   4.636     1.33    57.73

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0010) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
```

```
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.15          0.91
     Dep. Storage     (mm)=       0.10          5.00
     Average Slope     (%)=       1.00          1.00
     Length            (m)=     245.76         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     226.56        580.70
               over (min)         5.00         10.00
     Storage Coeff.  (min)=       3.16 (ii)     6.45 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.27          0.14
                                                        *TOTALS*
     PEAK FLOW       (cms)=       2.38          1.19          3.063 (iii)
     TIME TO PEAK    (hrs)=       1.33          1.42           1.33
     RUNOFF VOLUME    (mm)=      66.05         49.41          57.73
     TOTAL RAINFALL   (mm)=      66.15         66.15          66.15
     RUNOFF COEFFICIENT   =       1.00          0.75           0.87

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR (0110) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000    |   0.0340      0.4199
                         0.0010     0.0025    |   0.0690      0.4796
                         0.0070     0.0838    |   0.0820      0.5250
                         0.0100     0.1711    |   0.0910      0.5651
                         0.0210     0.2236    |   0.0930      0.5741
                         0.0250     0.2641    |   1.1670      0.7426
                         0.0260     0.2642    |   1.1680      0.7427
                         0.0310     0.3558    |   1.1690      0.7428
                         0.0320     0.3838    |   1.2030      0.7682

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0010)      9.060      3.063      1.33       57.73
     OUTFLOW: ID= 1 (0110)      9.060      0.067      4.08       57.66

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  2.19
                   TIME SHIFT OF PEAK FLOW         (min)=165.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.4763

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--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95          0.44
     Dep. Storage     (mm)=       0.10          5.00
     Average Slope     (%)=       1.00          1.00
     Length            (m)=     171.08         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     226.56        580.70
               over (min)         5.00         10.00
     Storage Coeff.  (min)=       2.54 (ii)     5.83 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.29          0.15
                                                        *TOTALS*
     PEAK FLOW       (cms)=       1.23          0.60          1.573 (iii)
     TIME TO PEAK    (hrs)=       1.33          1.42           1.33
     RUNOFF VOLUME    (mm)=      66.05         49.41          57.73
     TOTAL RAINFALL   (mm)=      66.15         66.15          66.15
     RUNOFF COEFFICIENT   =       1.00          0.75           0.87

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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| RESERVOIR (0111) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |
--------------------
```

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0290	0.2324
0.0030	0.0104	0.0360	0.2562
0.0070	0.0755	0.0420	0.2800
0.0090	0.1297	0.0430	0.2801
0.0180	0.1702	0.5520	0.3715
0.0210	0.1985	0.9030	0.4069

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0002)	4.390	1.573	1.33	57.73
OUTFLOW: ID= 1 (0111)	4.390	0.028	4.08	57.53

```
                PEAK   FLOW   REDUCTION [Qout/Qin](%)=  1.80
                TIME SHIFT OF PEAK FLOW        (min)=165.00
                MAXIMUM  STORAGE   USED       (ha.m.)=  0.2297

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--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |
--------------------
```

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0110):	9.06	0.067	4.08	57.66
+ ID2= 2 (0111):	4.39	0.028	4.08	57.53
ID = 3 (0005):	13.45	0.095	4.08	57.62

```
    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ***************************
  ** SIMULATION NUMBER:   6 **
  ***************************


--------------------
| CHICAGO STORM    |
| Ptotal= 73.18 mm |
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```

IDF curve parameters: A= 966.620
B= 1.507
C= 0.723

used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step = 5.00 min
Time to peak ratio = 0.33

The CORRELATION coefficient is = 0.9996

TIME (min)	INPUT INT. (mm/hr)	TAB. INT. (mm/hr)
5.	268.60	249.56
10.	165.50	165.26
15.	124.70	127.32
30.	76.90	79.78
60.	47.40	49.19
120.	29.20	30.07
360.	13.60	13.67
720.	8.40	8.29
1440.	5.20	5.03

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.08	5.44	1.08	19.04	2.08	13.08	3.08	6.99
0.17	5.73	1.17	27.14	2.17	12.09	3.17	6.75
0.25	6.06	1.25	56.99	2.25	11.27	3.25	6.54
0.33	6.43	1.33	249.56	2.33	10.56	3.33	6.34
0.42	6.86	1.42	72.58	2.42	9.95	3.42	6.15
0.50	7.37	1.50	41.46	2.50	9.42	3.50	5.98
0.58	7.99	1.58	30.17	2.58	8.95	3.58	5.81
0.67	8.74	1.67	24.16	2.67	8.54	3.67	5.66
0.75	9.68	1.75	20.37	2.75	8.16	3.75	5.52
0.83	10.90	1.83	17.74	2.83	7.83	3.83	5.38
0.92	12.57	1.92	15.79	2.92	7.52	3.92	5.25
1.00	15.03	2.00	14.29	3.00	7.24	4.00	5.13

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| CALIB           |
| STANDHYD  (0001) |   Area    (ha)=  13.45
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.69         10.76
     Dep. Storage     (mm)=       0.10          5.00
     Average Slope     (%)=       1.00          1.00
     Length            (m)=     299.44         40.00
     Mannings n            =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     249.56         44.23
               over (min)        5.00         20.00
     Storage Coeff.  (min)=       3.42 (ii)    15.46 (ii)
     Unit Hyd. Tpeak (min)=       5.00         20.00
     Unit Hyd. peak  (cms)=       0.26          0.07
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.52          0.74          1.689 (iii)
     TIME TO PEAK    (hrs)=       1.33          1.58           1.33
     RUNOFF VOLUME    (mm)=      73.08         27.04          36.25
     TOTAL RAINFALL   (mm)=      73.18         73.18          73.18
     RUNOFF COEFFICIENT   =       1.00          0.37           0.50

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB           |
| STANDHYD  (0008) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.15          0.91
     Dep. Storage     (mm)=       0.10          5.00
     Average Slope     (%)=       1.00          1.00
     Length            (m)=     245.76         40.00
     Mannings n            =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     249.56        658.03
               over (min)        5.00         10.00
     Storage Coeff.  (min)=       3.04 (ii)     6.21 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.27          0.15
                                                          *TOTALS*
     PEAK FLOW       (cms)=       2.66          1.37          3.450 (iii)
     TIME TO PEAK    (hrs)=       1.33          1.42           1.33
     RUNOFF VOLUME    (mm)=      73.08         56.07          64.58
     TOTAL RAINFALL   (mm)=      73.18         73.18          73.18
     RUNOFF COEFFICIENT   =       1.00          0.77           0.88

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB           |
| STANDHYD  (0006) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95          0.44
     Dep. Storage     (mm)=       0.10          5.00
     Average Slope     (%)=       1.00          1.00
     Length            (m)=     171.08         40.00
     Mannings n            =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     249.56        658.03
               over (min)        5.00         10.00
     Storage Coeff.  (min)=       2.45 (ii)     5.61 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.30          0.15
```

				TOTALS
PEAK FLOW	(cms)=	1.37	0.69	1.767 (iii)
TIME TO PEAK	(hrs)=	1.33	1.42	1.33
RUNOFF VOLUME	(mm)=	73.08	56.07	64.58
TOTAL RAINFALL	(mm)=	73.18	73.18	73.18
RUNOFF COEFFICIENT	=	1.00	0.77	0.88

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0011)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0006):	4.39	1.767	1.33	64.58
+ ID2= 2 (0008):	9.06	3.450	1.33	64.58
ID = 3 (0011):	13.45	5.218	1.33	64.58

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB
STANDHYD (0010)
ID= 1 DT= 5.0 min

Area (ha)= 9.06
Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	8.15	0.91
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.00	1.00
Length	(m)=	245.76	40.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		249.56	658.03
over (min)		5.00	10.00
Storage Coeff.	(min)=	3.04 (ii)	6.21 (ii)
Unit Hyd. Tpeak	(min)=	5.00	10.00
Unit Hyd. peak	(cms)=	0.27	0.15

				TOTALS
PEAK FLOW	(cms)=	2.66	1.37	3.450 (iii)
TIME TO PEAK	(hrs)=	1.33	1.42	1.33
RUNOFF VOLUME	(mm)=	73.08	56.07	64.58
TOTAL RAINFALL	(mm)=	73.18	73.18	73.18
RUNOFF COEFFICIENT	=	1.00	0.77	0.88

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR (0110)
IN= 2---> OUT= 1
DT= 5.0 min

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0340	0.4199
0.0010	0.0025	0.0690	0.4796
0.0070	0.0838	0.0820	0.5250
0.0100	0.1711	0.0910	0.5651
0.0210	0.2236	0.0930	0.5741
0.0250	0.2641	1.1670	0.7426
0.0260	0.2642	1.1680	0.7427
0.0310	0.3558	1.1690	0.7428
0.0320	0.3838	1.2030	0.7682

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0010)	9.060	3.450	1.33	64.58
OUTFLOW: ID= 1 (0110)	9.060	0.081	4.08	64.51

PEAK FLOW REDUCTION [Qout/Qin](%)= 2.35
TIME SHIFT OF PEAK FLOW (min)=165.00

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                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.5226

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--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=     249.56       658.03
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.45 (ii)    5.61 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.30         0.15
                                                        *TOTALS*
     PEAK FLOW       (cms)=       1.37         0.69         1.767 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      73.08        56.07         64.58
     TOTAL RAINFALL   (mm)=      73.18        73.18         73.18
     RUNOFF COEFFICIENT   =       1.00         0.77          0.88

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR (0111) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0290      0.2324
                         0.0030     0.0104   |   0.0360      0.2562
                         0.0070     0.0755   |   0.0420      0.2800
                         0.0090     0.1297   |   0.0430      0.2801
                         0.0180     0.1702   |   0.5520      0.3715
                         0.0210     0.1985   |   0.9030      0.4069

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0002)     4.390      1.767      1.33      64.58
     OUTFLOW: ID= 1 (0111)     4.390      0.035      4.08      64.38

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  2.01
                  TIME SHIFT OF PEAK FLOW        (min)=165.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.2545

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--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0110):     9.06   0.081     4.08    64.51
        + ID2= 2 (0111):     4.39   0.035     4.08    64.38
          ================================================
          ID = 3 (0005):    13.45   0.117     4.08    64.46

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ***************************
  ** SIMULATION NUMBER:   7 **
  ***************************



--------------------
|    READ STORM    |    Filename: C:\Users\p004967b\AppD
|                  |              ata\Local\Temp\
|                  |              3b068a81-224f-405b-b61c-b324b8bd3ece\1cda33d7
| Ptotal=212.00 mm |    Comments: HURRICANE HAZEL - FINAL 12 HOURS
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
```

1.00	6.00	4.00	13.00	7.00	23.00	10.00	53.00
2.00	4.00	5.00	17.00	8.00	13.00	11.00	38.00
3.00	6.00	6.00	13.00	9.00	13.00	12.00	13.00

CALIB	
STANDHYD (0001)	Area (ha)= 13.45
ID= 1 DT= 5.0 min	Total Imp(%)= 20.00 Dir. Conn.(%)= 20.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	2.69	10.76
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.00	1.00
Length	(m)=	299.44	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	6.00	3.083	13.00	6.083	23.00	9.08	53.00
0.167	6.00	3.167	13.00	6.167	23.00	9.17	53.00
0.250	6.00	3.250	13.00	6.250	23.00	9.25	53.00
0.333	6.00	3.333	13.00	6.333	23.00	9.33	53.00
0.417	6.00	3.417	13.00	6.417	23.00	9.42	53.00
0.500	6.00	3.500	13.00	6.500	23.00	9.50	53.00
0.583	6.00	3.583	13.00	6.583	23.00	9.58	53.00
0.667	6.00	3.667	13.00	6.667	23.00	9.67	53.00
0.750	6.00	3.750	13.00	6.750	23.00	9.75	53.00
0.833	6.00	3.833	13.00	6.833	23.00	9.83	53.00
0.917	6.00	3.917	13.00	6.917	23.00	9.92	53.00
1.000	6.00	4.000	13.00	7.000	23.00	10.00	53.00
1.083	4.00	4.083	17.00	7.083	13.00	10.08	38.00
1.167	4.00	4.167	17.00	7.167	13.00	10.17	38.00
1.250	4.00	4.250	17.00	7.250	13.00	10.25	38.00
1.333	4.00	4.333	17.00	7.333	13.00	10.33	38.00
1.417	4.00	4.417	17.00	7.417	13.00	10.42	38.00
1.500	4.00	4.500	17.00	7.500	13.00	10.50	38.00
1.583	4.00	4.583	17.00	7.583	13.00	10.58	38.00
1.667	4.00	4.667	17.00	7.667	13.00	10.67	38.00
1.750	4.00	4.750	17.00	7.750	13.00	10.75	38.00
1.833	4.00	4.833	17.00	7.833	13.00	10.83	38.00
1.917	4.00	4.917	17.00	7.917	13.00	10.92	38.00
2.000	4.00	5.000	17.00	8.000	13.00	11.00	38.00
2.083	6.00	5.083	13.00	8.083	13.00	11.08	13.00
2.167	6.00	5.167	13.00	8.167	13.00	11.17	13.00
2.250	6.00	5.250	13.00	8.250	13.00	11.25	13.00
2.333	6.00	5.333	13.00	8.333	13.00	11.33	13.00
2.417	6.00	5.417	13.00	8.417	13.00	11.42	13.00
2.500	6.00	5.500	13.00	8.500	13.00	11.50	13.00
2.583	6.00	5.583	13.00	8.583	13.00	11.58	13.00
2.667	6.00	5.667	13.00	8.667	13.00	11.67	13.00
2.750	6.00	5.750	13.00	8.750	13.00	11.75	13.00
2.833	6.00	5.833	13.00	8.833	13.00	11.83	13.00
2.917	6.00	5.917	13.00	8.917	13.00	11.92	13.00
3.000	6.00	6.000	13.00	9.000	13.00	12.00	13.00

Max.Eff.Inten.(mm/hr)=	53.00	44.09		
over (min)	5.00	20.00		
Storage Coeff. (min)=	6.36 (ii)	18.42 (ii)		
Unit Hyd. Tpeak (min)=	5.00	20.00		
Unit Hyd. peak (cms)=	0.19	0.06		
			TOTALS	
PEAK FLOW (cms)=	0.40	1.23	1.615 (iii)	
TIME TO PEAK (hrs)=	10.00	10.08	10.00	
RUNOFF VOLUME (mm)=	211.90	137.89	152.69	
TOTAL RAINFALL (mm)=	212.00	212.00	212.00	
RUNOFF COEFFICIENT =	1.00	0.65	0.72	

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
| CALIB             |
| STANDHYD  (0008) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.15         0.91
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     245.76        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      53.00       261.33
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       5.65 (ii)   11.57 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.20         0.09
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.67         0.65         1.318 (iii)
     TIME TO PEAK    (hrs)=      10.00        10.00         10.00
     RUNOFF VOLUME    (mm)=     211.90       192.11        202.00
     TOTAL RAINFALL   (mm)=     212.00       212.00        212.00
     RUNOFF COEFFICIENT   =       1.00         0.91          0.95


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB             |
| STANDHYD  (0006) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      53.00       261.33
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       4.55 (ii)   10.46 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.23         0.09
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.32         0.32         0.640 (iii)
     TIME TO PEAK    (hrs)=      10.00        10.00         10.00
     RUNOFF VOLUME    (mm)=     211.90       192.11        202.00
     TOTAL RAINFALL   (mm)=     212.00       212.00        212.00
     RUNOFF COEFFICIENT   =       1.00         0.91          0.95

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0011) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0006):     4.39   0.640    10.00   202.00
       + ID2= 2 (0008):     9.06   1.318    10.00   202.00
         ================================================
         ID = 3 (0011):    13.45   1.958    10.00   202.00

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB             |
| STANDHYD  (0010) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.15         0.91
```

```
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     245.76        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      53.00       261.33
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       5.65 (ii)   11.57 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.20         0.09
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.67         0.65         1.318 (iii)
     TIME TO PEAK    (hrs)=      10.00        10.00         10.00
     RUNOFF VOLUME    (mm)=     211.90       192.11        202.00
     TOTAL RAINFALL   (mm)=     212.00       212.00        212.00
     RUNOFF COEFFICIENT   =       1.00         0.91          0.95


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR (0110) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0340      0.4199
                         0.0010     0.0025   |   0.0690      0.4796
                         0.0070     0.0838   |   0.0820      0.5250
                         0.0100     0.1711   |   0.0910      0.5651
                         0.0210     0.2236   |   0.0930      0.5741
                         0.0250     0.2641   |   1.1670      0.7426
                         0.0260     0.2642   |   1.1680      0.7427
                         0.0310     0.3558   |   1.1690      0.7428
                         0.0320     0.3838   |   1.2030      0.7682

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0010)      9.060      1.318     10.00     202.00
     OUTFLOW: ID= 1 (0110)      9.060      1.165     10.08     201.93

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 88.36
                   TIME SHIFT OF PEAK FLOW         (min)=  5.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.7427

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      53.00       261.33
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       4.55 (ii)   10.46 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.23         0.09
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.32         0.32         0.640 (iii)
     TIME TO PEAK    (hrs)=      10.00        10.00         10.00
     RUNOFF VOLUME    (mm)=     211.90       192.11        202.00
     TOTAL RAINFALL   (mm)=     212.00       212.00        212.00
     RUNOFF COEFFICIENT   =       1.00         0.91          0.95

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| RESERVOIR (0111) |
| IN= 2---> OUT= 1 |
| DT= 5.0 min |

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0290	0.2324
0.0030	0.0104	0.0360	0.2562
0.0070	0.0755	0.0420	0.2800
0.0090	0.1297	0.0430	0.2801
0.0180	0.1702	0.5520	0.3715
0.0210	0.1985	0.9030	0.4069

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0002)	4.390	0.640	10.00	202.00
OUTFLOW: ID= 1 (0111)	4.390	0.551	10.17	201.80

PEAK FLOW REDUCTION [Qout/Qin](%)= 86.07
TIME SHIFT OF PEAK FLOW (min)= 10.00
MAXIMUM STORAGE USED (ha.m.)= 0.3715

| ADD HYD (0005) |
| 1 + 2 = 3 |

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0110):	9.06	1.165	10.08	201.93
+ ID2= 2 (0111):	4.39	0.551	10.17	201.80
ID = 3 (0005):	13.45	1.715	10.08	201.89

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

****
** SIMULATION NUMBER: 8 **
****

| READ STORM |
| Ptotal= 25.00 mm |

Filename: C:\Users\p004967b\AppData\Local\Temp\3b068a81-224f-405b-b61c-b324b8bd3ece\d810821e
Comments: 25 mm, 4 hr. chicago dist'n. - water qua

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.17	2.40	1.17	33.60	2.17	3.45	3.17	1.65
0.33	1.95	1.33	38.10	2.33	3.00	3.33	1.80
0.50	2.40	1.50	13.80	2.50	2.70	3.50	1.50
0.67	2.85	1.67	7.35	2.67	2.25	3.67	1.50
0.83	4.65	1.83	5.55	2.83	2.25	3.83	0.75
1.00	9.60	2.00	4.35	3.00	1.95	4.00	0.60

| CALIB |
| STANDHYD (0001) |
|ID= 1 DT= 5.0 min |

Area (ha)= 13.45
Total Imp(%)= 20.00 Dir. Conn.(%)= 20.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	2.69	10.76
Dep. Storage (mm)=	0.10	5.00
Average Slope (%)=	1.00	1.00
Length (m)=	299.44	40.00
Mannings n =	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.40	1.083	33.60	2.083	3.45	3.08	1.65
0.167	2.40	1.167	33.60	2.167	3.45	3.17	1.65
0.250	1.95	1.250	38.10	2.250	3.00	3.25	1.80
0.333	1.95	1.333	38.10	2.333	3.00	3.33	1.80
0.417	2.40	1.417	13.80	2.417	2.70	3.42	1.50
0.500	2.40	1.500	13.80	2.500	2.70	3.50	1.50
0.583	2.85	1.583	7.35	2.583	2.25	3.58	1.50
0.667	2.85	1.667	7.35	2.667	2.25	3.67	1.50
0.750	4.65	1.750	5.55	2.750	2.25	3.75	0.75
0.833	4.65	1.833	5.55	2.833	2.25	3.83	0.75

```
              0.917    9.60 | 1.917    4.35 | 2.917    1.95 |  3.92    0.60
              1.000    9.60 | 2.000    4.35 | 3.000    1.95 |  4.00    0.60

     Max.Eff.Inten.(mm/hr)=      38.10         2.77
               over (min)         5.00        45.00
     Storage Coeff.  (min)=       7.26 (ii)   43.75 (ii)
     Unit Hyd. Tpeak (min)=       5.00        45.00
     Unit Hyd. peak  (cms)=       0.17         0.03
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.26         0.04          0.270 (iii)
     TIME TO PEAK    (hrs)=       1.33         2.17           1.33
     RUNOFF VOLUME    (mm)=      24.90         3.23           7.56
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       1.00         0.13           0.30

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
             YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0008) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.15         0.91
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     245.76        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10       112.10
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       6.45 (ii)   14.75 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.18         0.08
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.45         0.17          0.583 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50           1.33
     RUNOFF VOLUME    (mm)=      24.90        12.87          18.88
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       1.00         0.51           0.76


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0006) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10       112.10
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       5.19 (ii)   13.49 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.21         0.08
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.23         0.09          0.291 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50           1.33
     RUNOFF VOLUME    (mm)=      24.90        12.87          18.88
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       1.00         0.51           0.76


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
```

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0011)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0006):	4.39	0.291	1.33	18.88
	+ ID2= 2 (0008):	9.06	0.583	1.33	18.88
	ID = 3 (0011):	13.45	0.874	1.33	18.88

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB STANDHYD (0010)	Area (ha)= 9.06		
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00	Dir. Conn.(%)= 50.00	
		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	8.15	0.91
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.00	1.00
Length	(m)=	245.76	40.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		38.10	112.10
over (min)		5.00	15.00
Storage Coeff.	(min)=	6.45 (ii)	14.75 (ii)
Unit Hyd. Tpeak	(min)=	5.00	15.00
Unit Hyd. peak	(cms)=	0.18	0.08

				TOTALS
PEAK FLOW	(cms)=	0.45	0.17	0.583 (iii)
TIME TO PEAK	(hrs)=	1.33	1.50	1.33
RUNOFF VOLUME	(mm)=	24.90	12.87	18.88
TOTAL RAINFALL	(mm)=	25.00	25.00	25.00
RUNOFF COEFFICIENT	=	1.00	0.51	0.76

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR (0110)				
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0340	0.4199
	0.0010	0.0025	0.0690	0.4796
	0.0070	0.0838	0.0820	0.5250
	0.0100	0.1711	0.0910	0.5651
	0.0210	0.2236	0.0930	0.5741
	0.0250	0.2641	1.1670	0.7426
	0.0260	0.2642	1.1680	0.7427
	0.0310	0.3558	1.1690	0.7428
	0.0320	0.3838	1.2030	0.7682

		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0010)		9.060	0.583	1.33	18.88
OUTFLOW: ID= 1 (0110)		9.060	0.010	4.17	18.82

PEAK FLOW REDUCTION [Qout/Qin](%)= 1.65
TIME SHIFT OF PEAK FLOW (min)=170.00
MAXIMUM STORAGE USED (ha.m.)= 0.1607

CALIB STANDHYD (0002)	Area (ha)= 4.39		
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00	Dir. Conn.(%)= 50.00	
		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	3.95	0.44
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.00	1.00

```
     Length           (m)=     171.08        40.00
     Mannings n          =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10       112.10
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       5.19 (ii)   13.49 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.21         0.08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.23         0.09          0.291 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50           1.33
     RUNOFF VOLUME    (mm)=      24.90        12.87          18.88
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       1.00         0.51           0.76


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0111) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0290      0.2324
                         0.0030     0.0104   |   0.0360      0.2562
                         0.0070     0.0755   |   0.0420      0.2800
                         0.0090     0.1297   |   0.0430      0.2801
                         0.0180     0.1702   |   0.5520      0.3715
                         0.0210     0.1985   |   0.9030      0.4069

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0002)      4.390      0.291      1.33      18.88
     OUTFLOW: ID= 1 (0111)      4.390      0.007      4.08      18.68

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  2.40
                   TIME SHIFT OF PEAK FLOW         (min)=165.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.0756

--------------------------------------------------------------------------------

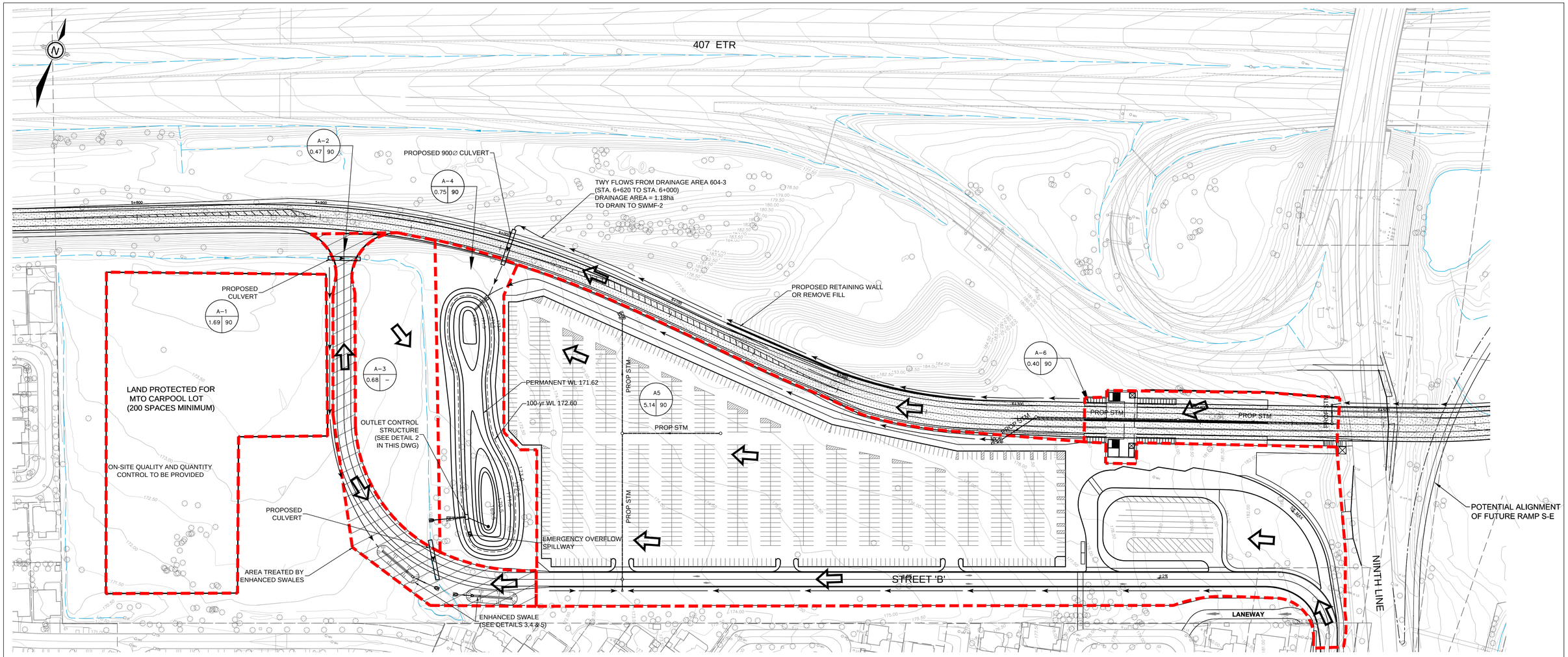
--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0110):     9.06   0.010     4.17    18.82
        + ID2= 2 (0111):     4.39   0.007     4.08    18.68
          ================================================
          ID = 3 (0005):    13.45   0.017     4.08    18.77

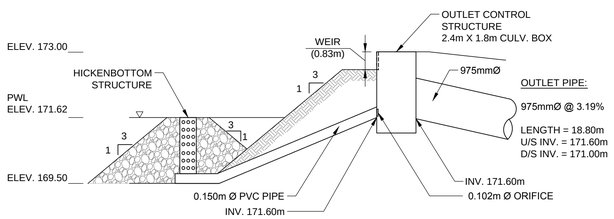
     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

 FINISH
================================================================================================================
```

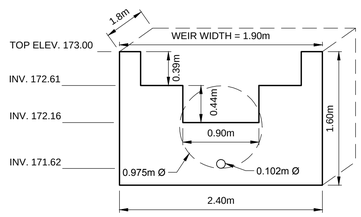
NINTH LINE STATION





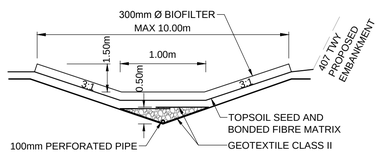
DETAIL 1 - HICKENBOTTOM DRAIN DETAIL

N.T.S.



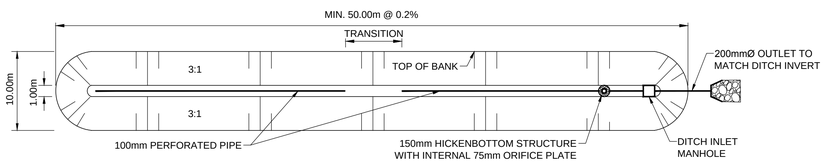
DETAIL 2 - SWMF 2 OUTLET CONTROL STRUCTURE

N.T.S.



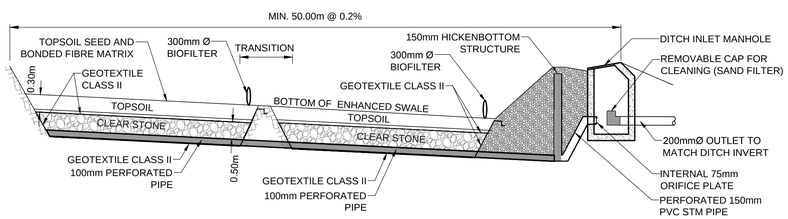
DETAIL 3 - TYPICAL CROSS SECTION FOR ENHANCED SWALE / DRY POND

N.T.S.



DETAIL 4 - ENHANCED SWALE / DRY POND PLAN VIEW

N.T.S.

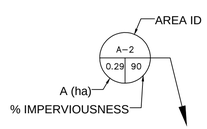


DETAIL 5 - TYPICAL LONGITUDINAL PROFILE FOR ENHANCED SWALE / DRY POND

N.T.S.

LEGEND

PROPOSED 407 TWY
EXISTING DITCH
EXISTING CREEK
PROPERTY LINES
EXISTING CULVERT
DRAINAGE AREA BOUNDARY
SWALE AND FLOW DIRECTION



SCALE HORIZONTAL
1:1000

5m 0m 10m 20m 30m

DATE: SEPTEMBER 2016

SCALE: 1:1000

Ontario

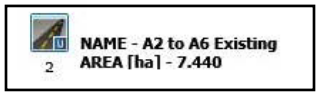
PARSONS

625 COCHRANE DRIVE, SUITE 500
MARKHAM, ONTARIO L3R 9R9
TEL: 905-943-0500
FAX: 905-943-0400

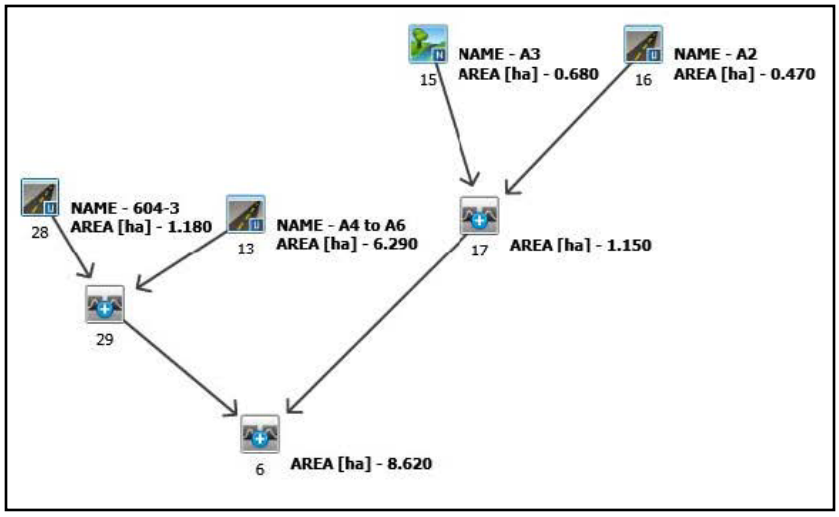
407 TRANSITWAY FROM KENNEDY RD TO BROCK RD

FIGURE 5.2 - PROPOSED STATION NINTH LINE AND SWMF - 2 DETAILS

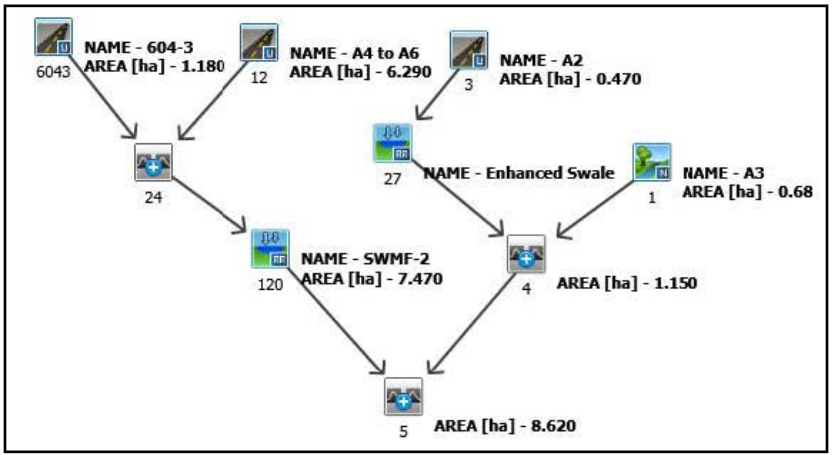
Visual OTTHYMO Modelling Schematic 5.2 – Ninth Line Station



Existing Condition



Proposed (Uncontrolled) Condition



Proposed (Controlled) Condition

NINTH LINE STATION HYDROLOGIC ANALYSIS - EXISTING CONDITION

Input parameters

Proposed Ninth Line Station is within Subcatchment 604 - Rouge Watershed
ID 604- Standhyd

CN= 75.8
Ia= 5

Drainage Area(ha)= 7.44

Table 5.2a: Ninth Line Station Hydrologic Analysis - Existing Condition

12hr AES Return Period	VO2 ID 2	
	EX Qp 12hr AES (m^3/s)	EX Qp 4hr Ch
2-yr	0.146	0.365
5-yr	0.23	0.535
10-yr	0.297	0.646
25-yr	0.378	0.833
50-yr	0.442	0.957
100-yr	0.519	1.097

NINTH LINE STATION HYDROLOGIC ANALYSIS - POST-DEVELOPMENT CONDITION

Table 5.2b: Ninth Line SWM Pond Hydrologic Analysis Post-Development Condition SWMF-2 (12 hr AES)

12hr AES Return Period	**Allowable Release Rates** ID 2 (A = 7.44 ha)	**Post-Development Condition (Uncontrolled)** VO2 ID 6 (A = 8.62 ha)	**Increase from Allowable to Post-Dev Uncontrolled**	**SWMF-2 POST-DEVELOPMENT CONDITION** VO2 ID 120 (A = 7.47 ha)		**Overall Post-Development (Controlled)** VO2 ID 5 (A = 8.62 ha)	**Decrease from Allowable to Post-Dev Controlled**
	EX Qp (m^3/s)	**Qp** (m^3/s)	**(%)**	**Storage Provided** (m^3)	**Release Rate** (m^3/s)	**Qp** (m^3/s)	**(%)**
2-yr	0.146	0.370	153.42%	1823	0.071	0.079	-84.81%
5-yr	0.230	0.501	117.83%	2115	0.149	0.162	-41.98%
10-yr	0.297	0.589	98.32%	2330	0.218	0.242	-22.73%
25-yr	0.378	0.699	84.92%	2604	0.313	0.348	-8.62%
50-yr	0.442	0.781	76.70%	2801	0.373	0.417	-6.00%
100-yr	0.519	0.864	66.47%	2992	0.436	0.487	-6.57%

Table 5.2c: Ninth Line SWM Pond Hydrologic Analysis Post-Development Condition SWMF-2 (4 hr Chicago)

Chicago 4-hr Return Period	**Allowable Release Rates** ID 2 (A = 7.44 ha)	**Post-Development Condition (Uncontrolled)** VO2 ID 6 (A = 8.62 ha)	**Increase from Allowable to Post-Dev Uncontrolled**	**SWMF-2 POST-DEVELOPMENT CONDITION** VO2 ID 120 (A = 7.47 ha)		**Overall Post-Development (Controlled)** VO2 ID 5 (A = 8.62 ha)	**Decrease from Allowable to Post-Dev Controlled**
	EX Qp (m^3/s)	**Qp** (m^3/s)	**(%)**	**Storage Provided** (m^3)	**Release Rate** (m^3/s)	**Qp** (m^3/s)	**(%)**
2-yr	0.365	1.208	230.96%	1642	0.044	0.049	-644.90%
5-yr	0.535	1.737	224.67%	1936	0.101	0.111	-381.98%
10-yr	0.646	2.108	226.32%	2140	0.157	0.173	-273.41%
25-yr	0.833	2.581	209.84%	2395	0.241	0.270	-208.52%
50-yr	0.957	2.922	205.33%	2594	0.310	0.350	-173.43%
100-yr	1.097	3.275	198.54%	2814	0.378	0.429	-155.71%

Table 5.2d: NINTH LINE STATION - Proposed SWMF-2 - Design Parameters

Pond Catchment Area 7.47 ha

Water Quality Storage Requirements

MOECC (2003, Table 3.2)

Level 1	265 m^3/ha	Interpolated from Table 3.2 (MOECC)		
Extended	40 m^3/ha	(or 25mm rainfall event whichever greater)	*298.80*	m^3
25 mm Event From OTTHYMO	19.61 mm		*1,464.87*	m^3
% imperviousness	90 %			
Permanent Volume Required			*1,680.75*	m^3

Quantity Control Required

Total Volume required up to and including the 100 yr storm **2,992.00** m^3

Total Pond Volume Required (Permanent and Extended) **4,672.75** m^3

Settling Calculations MOECC Eq. 4.5

$$Dist = \sqrt{\frac{r \times Q_p}{V_s}}$$

Dist	10	Minimum Forebay length	m
r	1.87	Length to width ratio	-
Qp	0.02	Peak flow rate from the pond during design quality storm	m^3/s
Vs	0.0003	settling velocity'	m/s

Dispersion Length MOECC Eq. 4.6

$$Dist = \frac{8Q}{dV_f}$$

Minimum Width 2 m

Dist	14	Minimum Dispersion Length	
Q	0.57	Inlet Flow Rate	(5 year Storm)
d	2.1	Depth of the Permanent Pool	
Vf	0.15	Desired Velocity in the Forebay	

(0.15 m/s is the maximum permissible velocity before erosion occurs in a channel (MOECC))

Minimum Forebay Deep Zone Bottom Width MOECC Eq. 4.7

Width = Dist/8 Width 1.25 m

Design Quality Storm MOECC Eq 4.9

$$i_{25} = 43C + 5.9$$

A	7.47	Area	
C	90	Runoff Coefficient	
i	44.6	Intensity	mm/hr
Qp	0.84	Flow Rational Method	

Flow Velocity Check

Qd	0.57	Inlet Flow Rate	m^3/s
A	49.06	Crossectional Area	m^2
Vfb	0.012	Flow Velocity	m/s
	Yes	< 0.15	

Forebay Dimensions

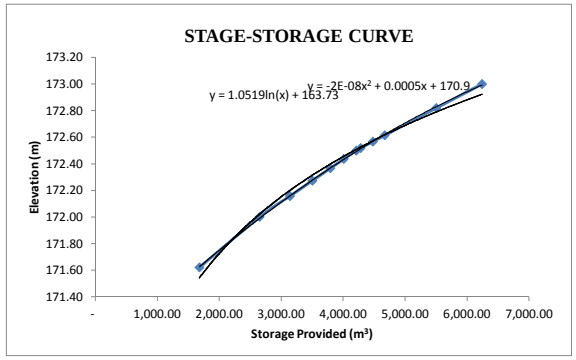
4.5:1	Average Side Slope	%
54.79	Top Length	m
18.43	Bottom Length	m
31.96	Average Top Width	m
7.29	Bottom Width	m
2.50	Average Depth of the Pool	m
728.10	Approximate Volume of the Pool	m^3
1681	Total Permanent Pool Volume	m^3
0.43	Forebay/Total Volume Ratio	
469	Forebay Area	m^2
2097	Total Permanent Pool Area	
0.22	Forebay/Total Area Ratio	
1.87	Average L/W Ratio Check	

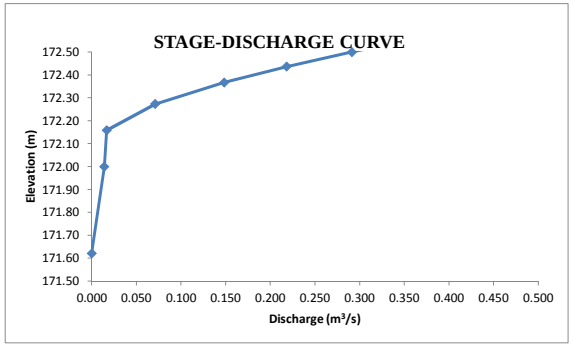
Forebay Cleanout Frequency

Ac	7.47	Contributing Area	(ha)
Ds	0.6	Maximum Sediment Depth	(m)
Vsf	295	Maximum Sediment Volume	(m^3)
a	30%	Impervious Level	%
da	0.6	Annual Sediment Loading	(m^3/ha/yr) (Table 6.3 MOECC Manual)
Fs	65.8	Forebay Cleanout Frequency	(years)
	75%	Target Maintenance TSS Removal Efficiency	

Table 5.e: NINTH LINE STATION - Proposed SWMF 2 - Stage-Storage, Stage-Discharge Relationships and Outlet Structure Design

Elevation m	Forebay	Cell 2	Sec Area m^2	Avg Area m^2	Sec Volume m^3	Cumulative Volume	Fluctuation/ Extended Cum.Volume	Stage (m) Active	Storage (ha.m) Active	Discharge Orifice 1 171.62 0.102	Weir 1 172.16 0.900	Overflow Weir 1.000	Pond Total	Description
169.50		172.03	172.03		-	-								
170.00		274.85	274.85	223.4	111.72	111.72								
170.50	118.41	437.81	556.22	415.5	207.77	319.49								
171.00	297.86	779.06	1,076.93	816.6	408.29	727.78								
171.50	433.84	1559.92	1,993.76	1535.3	767.67	1,495.45								
171.62	***469.40***	***1627.57***	***2096.97***	***1660.30***	***830.15***	***1,680.75***	-	0.00	0.0000	0.000			0.000	**Permanent Water Level**
172.00	656.09	1982.76	2,638.84	2316.3	1,158.15	2,653.60	972.85	0.38	0.0973	0.014			0.014	
172.16						3,145.62	1,464.87	0.54	0.1465	0.017	0.000		0.017	*25-mm*
172.27						3,503.75	1,823.00	0.65	0.1823	0.018	0.053		0.071	*2-yr*
172.37						3,795.75	2,115.00	0.75	0.2115	0.020	0.129		0.149	*5-yr*
172.44						4,010.75	2,330.00	0.82	0.2330	0.021	0.198		0.218	*10-yr*
172.50	923.06	2663.49	3,586.55	3112.7	1,556.35	4,209.95	2,529.20	0.88	0.2529	0.021	0.270		0.291	
172.52						4,284.75	2,604.00	0.90	0.2604	0.022	0.292		0.314	*25-yr*
172.57						4,481.75	2,801.00	0.95	0.2801	0.022	0.353		0.375	*50-yr*
172.61						4,672.75	2,992.00	0.99	0.2992	0.023	0.415	0.000	0.438	*100-yr*
172.82						5,503.75	3,823.00	1.20	0.3823	0.025	0.724	0.139	0.888	
173.00		4539.72	4,539.72	4063.1	2,031.57	6,241.51	4,560.76	1.38	0.4561	0.027	1.043	0.360	1.430	





Orifice Discharge

$$Q = C_d A\sqrt{2gH}$$

Q	Varies	Discharge	(m^3/s)
C_d	0.63	Discharge Coefficient	-
A	Varies	Area of Orifice	(m^2)
g	9.81	Gravitational Constant	(m/s^2)
H	Varies	Hydraulic Head	(m)

Weir Discharge

$$Q = C_d LH^{\frac{3}{2}}$$

Q	Varies	Discharge	(m^3/s)
C_d	1.5	Discharge Coefficient	-
L	#REF!	Weir Length	(m)
			(m/s^2)
H	Varies	Hydraulic Head	m

Table 5.2f: NINTH LINE STATION - Proposed SWMF-2
25 mm Drawdown Time Calculations

Project: 407 TWY from Kennedy Rd. to Brock Rd.

C	0.63000		Extended Quality Volume:	1,465	m^3
Orifice	0.10200	m	Initial Head:	0.54	m
Area	0.00817	m^2	Detention:	48.00	hrs
				2,880.00	min

FALLING HEAD EQUATION

Time (min)	Head (m)	Q (m3/s)	Volume (m3)	Declining Volume Start	Declining Volume End
0	0.5374	0.0167	5.01	1,464.87	1,459.85
5	0.5355	0.0167	5.01	1,459.85	1,454.85
10	0.5337	0.0167	5.00	1,454.85	1,449.85
15	0.5319	0.0166	4.99	1,449.85	1,444.86
20	0.5300	0.0166	4.98	1,444.86	1,439.88
25	0.5282	0.0166	4.97	1,439.88	1,434.91
30	0.5264	0.0165	4.96	1,434.91	1,429.94
35	0.5246	0.0165	4.95	1,429.94	1,424.99
40	0.5227	0.0165	4.95	1,424.99	1,420.04
45	0.5209	0.0165	4.94	1,420.04	1,415.11
50	0.5191	0.0164	4.93	1,415.11	1,410.18
55	0.5173	0.0164	4.92	1,410.18	1,405.26
60	0.5155	0.0164	4.91	1,405.26	1,400.35
65	0.5137	0.0163	4.90	1,400.35	1,395.44
70	0.5119	0.0163	4.89	1,395.44	1,390.55
75	0.5101	0.0163	4.89	1,390.55	1,385.66
80	0.5083	0.0163	4.88	1,385.66	1,380.79
85	0.5065	0.0162	4.87	1,380.79	1,375.92
90	0.5047	0.0162	4.86	1,375.92	1,371.06
95	0.5030	0.0162	4.85	1,371.06	1,366.21
100	0.5012	0.0161	4.84	1,366.21	1,361.36
105	0.4994	0.0161	4.83	1,361.36	1,356.53
		-- B R E A K --			-
2860	0.0001	0.0002	0.06	9.29	9.23
2865	0.0000	0.0002	0.05	9.23	9.19
2870	0.0000	0.0001	0.04	9.19	9.15
2875	0.0000	0.0001	0.03	9.15	9.12
2880	0.0000			9.12	9.12

```
==========================================================================================================

       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat
  Output  filename: C:\Users\p004967b\AppData\Local\Temp\4ac2f434-3a7d-4cc2-ac30-61c66bfb95bc\Scenario.out
  Summary filename: C:\Users\p004967b\AppData\Local\Temp\4ac2f434-3a7d-4cc2-ac30-61c66bfb95bc\Scenario.sum


DATE: 10/05/2016                          TIME: 11:20:09

USER:



COMMENTS: _____________________________________________________________


----------------------------------------------------------------------------------------------------------
  ***************************
  ** SIMULATION NUMBER:   1 **
  ***************************


--------------------
|    READ STORM    |    Filename: C:\Users\p004967b\AppD
|                  |              ata\Local\Temp\
|                  |              4ac2f434-3a7d-4cc2-ac30-61c66bfb95bc\62ca0784
| Ptotal= 42.00 mm |    Comments: 2yr/12hr
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.25    0.00 |  3.50    7.14 |  6.75    2.94 | 10.00    0.42
                0.50    0.42 |  3.75    7.14 |  7.00    2.94 | 10.25    0.42
                0.75    0.42 |  4.00    7.14 |  7.25    2.94 | 10.50    0.42
                1.00    0.42 |  4.25    7.14 |  7.50    1.68 | 10.75    0.42
                1.25    0.42 |  4.50   19.32 |  7.75    1.68 | 11.00    0.42
                1.50    0.42 |  4.75   19.32 |  8.00    1.68 | 11.25    0.42
                1.75    0.42 |  5.00   19.32 |  8.25    1.68 | 11.50    0.42
                2.00    0.42 |  5.25   19.32 |  8.50    0.84 | 11.75    0.42
                2.25    0.42 |  5.50    5.46 |  8.75    0.84 | 12.00    0.42
                2.50    2.52 |  5.75    5.46 |  9.00    0.84 | 12.25    0.42
                2.75    2.52 |  6.00    5.46 |  9.25    0.84 |
                3.00    2.52 |  6.25    5.46 |  9.50    0.42 |
                3.25    2.52 |  6.50    2.94 |  9.75    0.42 |

------------------------------------------------------------------------------

--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   7.44
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.49         5.95
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=     222.71        40.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.083    0.00 | 3.167    2.52 | 6.250    5.46 |  9.33    0.42
                0.167    0.00 | 3.250    2.52 | 6.333    2.94 |  9.42    0.42
```

0.250	0.00	3.333	7.14	6.417	2.94	9.50	0.42
0.333	0.42	3.417	7.14	6.500	2.94	9.58	0.42
0.417	0.42	3.500	7.14	6.583	2.94	9.67	0.42
0.500	0.42	3.583	7.14	6.667	2.94	9.75	0.42
0.583	0.42	3.667	7.14	6.750	2.94	9.83	0.42
0.667	0.42	3.750	7.14	6.833	2.94	9.92	0.42
0.750	0.42	3.833	7.14	6.917	2.94	10.00	0.42
0.833	0.42	3.917	7.14	7.000	2.94	10.08	0.42
0.917	0.42	4.000	7.14	7.083	2.94	10.17	0.42
1.000	0.42	4.083	7.14	7.167	2.94	10.25	0.42
1.083	0.42	4.167	7.14	7.250	2.94	10.33	0.42
1.167	0.42	4.250	7.14	7.333	1.68	10.42	0.42
1.250	0.42	4.333	19.32	7.417	1.68	10.50	0.42
1.333	0.42	4.417	19.32	7.500	1.68	10.58	0.42
1.417	0.42	4.500	19.32	7.583	1.68	10.67	0.42
1.500	0.42	4.583	19.32	7.667	1.68	10.75	0.42
1.583	0.42	4.667	19.32	7.750	1.68	10.83	0.42
1.667	0.42	4.750	19.32	7.833	1.68	10.92	0.42
1.750	0.42	4.833	19.32	7.917	1.68	11.00	0.42
1.833	0.42	4.917	19.32	8.000	1.68	11.08	0.42
1.917	0.42	5.000	19.32	8.083	1.68	11.17	0.42
2.000	0.42	5.083	19.32	8.167	1.68	11.25	0.42
2.083	0.42	5.167	19.32	8.250	1.68	11.33	0.42
2.167	0.42	5.250	19.32	8.333	0.84	11.42	0.42
2.250	0.42	5.333	5.46	8.417	0.84	11.50	0.42
2.333	2.52	5.417	5.46	8.500	0.84	11.58	0.42
2.417	2.52	5.500	5.46	8.583	0.84	11.67	0.42
2.500	2.52	5.583	5.46	8.667	0.84	11.75	0.42
2.583	2.52	5.667	5.46	8.750	0.84	11.83	0.42
2.667	2.52	5.750	5.46	8.833	0.84	11.92	0.42
2.750	2.52	5.833	5.46	8.917	0.84	12.00	0.42
2.833	2.52	5.917	5.46	9.000	0.84	12.08	0.42
2.917	2.52	6.000	5.46	9.083	0.84	12.17	0.42
3.000	2.52	6.083	5.46	9.167	0.84	12.25	0.42
3.083	2.52	6.167	5.46	9.250	0.84		

Max.Eff.Inten.(mm/hr)=	19.32	7.06	
over (min)	5.00	35.00	
Storage Coeff. (min)=	7.37 (ii)	30.55 (ii)	
Unit Hyd. Tpeak (min)=	5.00	35.00	
Unit Hyd. peak (cms)=	0.17	0.04	
			TOTALS
PEAK FLOW (cms)=	0.08	0.08	0.146 (iii)
TIME TO PEAK (hrs)=	5.25	5.58	5.25
RUNOFF VOLUME (mm)=	41.90	11.59	17.65
TOTAL RAINFALL (mm)=	42.00	42.00	42.00
RUNOFF COEFFICIENT =	1.00	0.28	0.42

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.8 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (6043)	Area (ha)= 1.18		
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00	
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.83	0.35	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	0.50	
Length (m)=	6.00	620.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	19.32	14.21	
over (min)	5.00	125.00	
Storage Coeff. (min)=	0.74 (ii)	121.63 (ii)	
Unit Hyd. Tpeak (min)=	5.00	125.00	
Unit Hyd. peak (cms)=	0.34	0.01	
			TOTALS
PEAK FLOW (cms)=	0.03	0.01	0.033 (iii)
TIME TO PEAK (hrs)=	4.50	7.17	5.25
RUNOFF VOLUME (mm)=	41.90	17.35	29.57
TOTAL RAINFALL (mm)=	42.00	42.00	42.00
RUNOFF COEFFICIENT =	1.00	0.41	0.70

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

```
      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  75.8    Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0012) |   Area    (ha)=   6.29
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  75.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       5.66          0.63
     Dep. Storage     (mm)=       0.10          5.00
     Average Slope     (%)=       1.30          1.30
     Length            (m)=     204.78         40.00
     Mannings n             =     0.013         0.250

     Max.Eff.Inten.(mm/hr)=      19.32         33.08
               over (min)        5.00         20.00
     Storage Coeff.  (min)=       7.01 (ii)    19.51 (ii)
     Unit Hyd. Tpeak (min)=       5.00         20.00
     Unit Hyd. peak  (cms)=       0.17          0.06
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.25          0.05          0.301 (iii)
     TIME TO PEAK    (hrs)=       5.25          5.33           5.25
     RUNOFF VOLUME    (mm)=      41.90         22.09          36.95
     TOTAL RAINFALL   (mm)=      42.00         42.00          42.00
     RUNOFF COEFFICIENT   =       1.00          0.53           0.88


      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  75.8    Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0024) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0012):     6.29   0.301     5.25    36.95
        + ID2= 2 (6043):     1.18   0.033     5.25    29.57
          ================================================
          ID = 3 (0024):     7.47   0.335     5.25    35.78

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0120) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.2910      0.2529
                          0.0140     0.0973   |   0.3130      0.2603
                          0.0170     0.1465   |   0.3140      0.2604
                          0.0710     0.1823   |   0.3750      0.2801
                          0.1480     0.2114   |   0.4380      0.2992
                          0.1490     0.2115   |   0.8880      0.3823
                          0.2180     0.2330   |   1.4300      0.4561

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0024)      7.470      0.335      5.25      35.78
     OUTFLOW: ID= 1 (0120)      7.470      0.071      6.50      35.54

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)= 21.20
                    TIME SHIFT OF PEAK FLOW         (min)= 75.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.1823

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   0.68   Curve Number   (CN)= 75.8
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.20

     Unit Hyd Qpeak  (cms)=   0.130

     PEAK FLOW       (cms)=   0.013 (i)
```

```
     TIME TO PEAK    (hrs)=   5.250
     RUNOFF VOLUME    (mm)=  11.570
     TOTAL RAINFALL   (mm)=  42.000
     RUNOFF COEFFICIENT   =   0.275

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD  (0003) |   Area    (ha)=   0.47
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.42         0.05
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      55.98        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        83.11
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       3.22 (ii)   11.87 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.27         0.09
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.01         0.023 (iii)
     TIME TO PEAK    (hrs)=       4.92         5.25          5.25
     RUNOFF VOLUME    (mm)=      41.00        29.38         35.17
     TOTAL RAINFALL   (mm)=      42.00        42.00         42.00
     RUNOFF COEFFICIENT   =       0.98         0.70          0.84

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
--------------------
| RESERVOIR (0027) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0003)      0.470      0.023      5.25      35.17
     OUTFLOW: ID= 1 (0027)      0.470      0.004      6.67      33.70

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 17.40
                   TIME SHIFT OF PEAK FLOW         (min)= 85.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.0110

-------------------------------------------------------------------------------

--------------------
| ADD HYD   (0004) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     0.68   0.013     5.25    11.57
        + ID2= 2 (0027):     0.47   0.004     6.67    33.70
          ================================================
          ID = 3 (0004):     1.15   0.016     5.25    20.62

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------

--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0120):     7.47   0.071     6.50    35.54
        + ID2= 2 (0004):     1.15   0.016     5.25    20.62
          ================================================
          ID = 3 (0005):     8.62   0.079     6.33    33.55

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
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--------------------
| CALIB            |
| STANDHYD  (0016) |   Area    (ha)=   0.47
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.42         0.05
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      55.98        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        83.11
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       3.22 (ii)   11.87 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.27         0.09
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.01         0.023 (iii)
     TIME TO PEAK    (hrs)=       4.92         5.25          5.25
     RUNOFF VOLUME    (mm)=      41.00        29.38         35.17
     TOTAL RAINFALL   (mm)=      42.00        42.00         42.00
     RUNOFF COEFFICIENT   =       0.98         0.70          0.84

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0015) |   Area    (ha)=   0.68   Curve Number   (CN)= 75.8
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.20

     Unit Hyd Qpeak  (cms)=   0.130

     PEAK FLOW       (cms)=   0.013 (i)
     TIME TO PEAK    (hrs)=   5.250
     RUNOFF VOLUME    (mm)=  11.570
     TOTAL RAINFALL   (mm)=  42.000
     RUNOFF COEFFICIENT   =   0.275

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0017) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0015):     0.68   0.013     5.25    11.57
       + ID2= 2 (0016):     0.47   0.023     5.25    35.17
         ================================================
         ID = 3 (0017):     1.15   0.036     5.25    21.22

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0028) |   Area    (ha)=   1.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.83         0.35
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.50
     Length            (m)=       6.00       620.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        14.21
               over (min)        5.00       125.00
     Storage Coeff.  (min)=       0.74 (ii)  121.63 (ii)
     Unit Hyd. Tpeak (min)=       5.00       125.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01         0.033 (iii)
     TIME TO PEAK    (hrs)=       4.50         7.17          5.25
     RUNOFF VOLUME    (mm)=      41.90        17.35         29.57
```

```
     TOTAL RAINFALL   (mm)=      42.00        42.00          42.00
     RUNOFF COEFFICIENT   =       1.00         0.41           0.70

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0013) |   Area    (ha)=   6.29
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       5.66         0.63
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=     204.78        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        83.11
               over (min)        5.00        20.00
     Storage Coeff.  (min)=       7.01 (ii)   15.66 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.17         0.07
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.17         0.13          0.301 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25           5.25
     RUNOFF VOLUME    (mm)=      41.90        29.38          35.64
     TOTAL RAINFALL   (mm)=      42.00        42.00          42.00
     RUNOFF COEFFICIENT   =       1.00         0.70           0.85


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0029) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0013):     6.29   0.301     5.25    35.64
       + ID2= 2 (0028):     1.18   0.033     5.25    29.57
         ================================================
         ID = 3 (0029):     7.47   0.334     5.25    34.68

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0017):     1.15   0.036     5.25    21.22
       + ID2= 2 (0029):     7.47   0.334     5.25    34.68
         ================================================
         ID = 3 (0006):     8.62   0.370     5.25    32.88

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ****************************
  ** SIMULATION NUMBER:   2 **
  ****************************



--------------------
|    READ STORM    |    Filename: C:\Users\p004967b\AppD
|                  |              ata\Local\Temp\
|                  |              4ac2f434-3a7d-4cc2-ac30-61c66bfb95bc\7abaea23
| Ptotal= 54.38 mm |    Comments: 5yr/12hr
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.25    0.00 |  3.50    9.25 |  6.75    3.81 | 10.00    0.54
```

0.50	0.54	3.75	9.25	7.00	3.81	10.25	0.54
0.75	0.54	4.00	9.25	7.25	3.81	10.50	0.54
1.00	0.54	4.25	9.25	7.50	2.18	10.75	0.54
1.25	0.54	4.50	25.02	7.75	2.18	11.00	0.54
1.50	0.54	4.75	25.02	8.00	2.18	11.25	0.54
1.75	0.54	5.00	25.02	8.25	2.18	11.50	0.54
2.00	0.54	5.25	25.02	8.50	1.09	11.75	0.54
2.25	0.54	5.50	7.07	8.75	1.09	12.00	0.54
2.50	3.26	5.75	7.07	9.00	1.09	12.25	0.54
2.75	3.26	6.00	7.07	9.25	1.09		
3.00	3.26	6.25	7.07	9.50	0.54		
3.25	3.26	6.50	3.81	9.75	0.54		

CALIB STANDHYD (0002) ID= 1 DT= 5.0 min	Area (ha)= 7.44 Total Imp(%)= 20.00 Dir. Conn.(%)= 20.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.49	5.95
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.30	1.30
Length	(m)=	222.71	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	3.26	6.250	7.07	9.33	0.54
0.167	0.00	3.250	3.26	6.333	3.81	9.42	0.54
0.250	0.00	3.333	9.25	6.417	3.81	9.50	0.54
0.333	0.54	3.417	9.25	6.500	3.81	9.58	0.54
0.417	0.54	3.500	9.25	6.583	3.81	9.67	0.54
0.500	0.54	3.583	9.25	6.667	3.81	9.75	0.54
0.583	0.54	3.667	9.25	6.750	3.81	9.83	0.54
0.667	0.54	3.750	9.25	6.833	3.81	9.92	0.54
0.750	0.54	3.833	9.25	6.917	3.81	10.00	0.54
0.833	0.54	3.917	9.25	7.000	3.81	10.08	0.54
0.917	0.54	4.000	9.25	7.083	3.81	10.17	0.54
1.000	0.54	4.083	9.25	7.167	3.81	10.25	0.54
1.083	0.54	4.167	9.25	7.250	3.81	10.33	0.54
1.167	0.54	4.250	9.25	7.333	2.18	10.42	0.54
1.250	0.54	4.333	25.02	7.417	2.18	10.50	0.54
1.333	0.54	4.417	25.02	7.500	2.18	10.58	0.54
1.417	0.54	4.500	25.02	7.583	2.18	10.67	0.54
1.500	0.54	4.583	25.02	7.667	2.18	10.75	0.54
1.583	0.54	4.667	25.02	7.750	2.18	10.83	0.54
1.667	0.54	4.750	25.02	7.833	2.18	10.92	0.54
1.750	0.54	4.833	25.02	7.917	2.18	11.00	0.54
1.833	0.54	4.917	25.02	8.000	2.18	11.08	0.54
1.917	0.54	5.000	25.02	8.083	2.18	11.17	0.54
2.000	0.54	5.083	25.02	8.167	2.18	11.25	0.54
2.083	0.54	5.167	25.02	8.250	2.18	11.33	0.54
2.167	0.54	5.250	25.02	8.333	1.09	11.42	0.54
2.250	0.54	5.333	7.07	8.417	1.09	11.50	0.54
2.333	3.26	5.417	7.07	8.500	1.09	11.58	0.54
2.417	3.26	5.500	7.07	8.583	1.09	11.67	0.54
2.500	3.26	5.583	7.07	8.667	1.09	11.75	0.54
2.583	3.26	5.667	7.07	8.750	1.09	11.83	0.54
2.667	3.26	5.750	7.07	8.833	1.09	11.92	0.54
2.750	3.26	5.833	7.07	8.917	1.09	12.00	0.54
2.833	3.26	5.917	7.07	9.000	1.09	12.08	0.54
2.917	3.26	6.000	7.07	9.083	1.09	12.17	0.54
3.000	3.26	6.083	7.07	9.167	1.09	12.25	0.54
3.083	3.26	6.167	7.07	9.250	1.09		

Max.Eff.Inten.(mm/hr)=		25.02	11.53	
over (min)		5.00	30.00	
Storage Coeff. (min)=		6.64 (ii)	25.70 (ii)	
Unit Hyd. Tpeak (min)=		5.00	30.00	
Unit Hyd. peak (cms)=		0.18	0.04	
				TOTALS
PEAK FLOW	(cms)=	0.10	0.14	0.230 (iii)
TIME TO PEAK	(hrs)=	5.25	5.50	5.25
RUNOFF VOLUME	(mm)=	54.28	18.69	25.80
TOTAL RAINFALL	(mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT	=	1.00	0.34	0.47

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%

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              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (6043) |   Area    (ha)=   1.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.83         0.35
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.50
     Length            (m)=       6.00       620.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02        21.93
               over (min)         5.00       105.00
     Storage Coeff.  (min)=       0.67 (ii)  102.32 (ii)
     Unit Hyd. Tpeak (min)=       5.00       105.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.01          0.044 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.75           5.25
     RUNOFF VOLUME    (mm)=      54.28        26.39          40.29
     TOTAL RAINFALL   (mm)=      54.38        54.38          54.38
     RUNOFF COEFFICIENT   =       1.00         0.49           0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0012) |   Area    (ha)=   6.29
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  75.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       5.66         0.63
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=     204.78        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02        47.37
               over (min)         5.00        20.00
     Storage Coeff.  (min)=       6.32 (ii)   17.15 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.19         0.06
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.33         0.07          0.400 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25           5.25
     RUNOFF VOLUME    (mm)=      54.28        32.35          48.80
     TOTAL RAINFALL   (mm)=      54.38        54.38          54.38
     RUNOFF COEFFICIENT   =       1.00         0.59           0.90


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0024) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0012):     6.29   0.400     5.25    48.80
        + ID2= 2 (6043):     1.18   0.044     5.25    40.29
          ================================================
          ID = 3 (0024):     7.47   0.445     5.25    47.45
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR (0120)
IN= 2---> OUT= 1
DT= 5.0 min

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.2910	0.2529
0.0140	0.0973	0.3130	0.2603
0.0170	0.1465	0.3140	0.2604
0.0710	0.1823	0.3750	0.2801
0.1480	0.2114	0.4380	0.2992
0.1490	0.2115	0.8880	0.3823
0.2180	0.2330	1.4300	0.4561

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0024)	7.470	0.445	5.25	47.45
OUTFLOW: ID= 1 (0120)	7.470	0.149	5.83	47.22

PEAK FLOW REDUCTION [Qout/Qin](%)= 33.42
TIME SHIFT OF PEAK FLOW (min)= 35.00
MAXIMUM STORAGE USED (ha.m.)= 0.2115

CALIB
NASHYD (0001)
ID= 1 DT= 5.0 min

Area (ha)= 0.68 Curve Number (CN)= 75.8
Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
U.H. Tp(hrs)= 0.20

Unit Hyd Qpeak (cms)= 0.130

PEAK FLOW (cms)= 0.021 (i)
TIME TO PEAK (hrs)= 5.250
RUNOFF VOLUME (mm)= 18.652
TOTAL RAINFALL (mm)= 54.380
RUNOFF COEFFICIENT = 0.343

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0003)
ID= 1 DT= 5.0 min

Area (ha)= 0.47
Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.42	0.05	
Dep. Storage (mm)=	1.00	5.00	
Average Slope (%)=	1.30	1.30	
Length (m)=	55.98	40.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	25.02	112.79	
over (min)	5.00	15.00	
Storage Coeff. (min)=	2.90 (ii)	10.56 (ii)	
Unit Hyd. Tpeak (min)=	5.00	15.00	
Unit Hyd. peak (cms)=	0.28	0.09	
			TOTALS
PEAK FLOW (cms)=	0.02	0.01	0.031 (iii)
TIME TO PEAK (hrs)=	4.92	5.25	5.25
RUNOFF VOLUME (mm)=	53.38	40.94	47.14
TOTAL RAINFALL (mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT =	0.98	0.75	0.87

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.8 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR (0027)
IN= 2---> OUT= 1
DT= 5.0 min

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0150	0.0413

	AREA	QPEAK	TPEAK	R.V.

```
                              (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0003)      0.470      0.031      5.25      47.14
     OUTFLOW: ID= 1 (0027)      0.470      0.005      6.58      45.67

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 17.53
                   TIME SHIFT OF PEAK FLOW         (min)= 80.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.0147

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--------------------
| ADD HYD   (0004) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     0.68   0.021     5.25    18.65
        + ID2= 2 (0027):     0.47   0.005     6.58    45.67
          ================================================
          ID = 3 (0004):     1.15   0.025     5.25    29.69

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0120):     7.47   0.149     5.83    47.22
        + ID2= 2 (0004):     1.15   0.025     5.25    29.69
          ================================================
          ID = 3 (0005):     8.62   0.162     5.58    44.88

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0016) |   Area    (ha)=   0.47
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.42         0.05
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      55.98        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02       112.79
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       2.90 (ii)   10.56 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.28         0.09
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01        0.031 (iii)
     TIME TO PEAK    (hrs)=       4.92         5.25         5.25
     RUNOFF VOLUME    (mm)=      53.38        40.94        47.14
     TOTAL RAINFALL   (mm)=      54.38        54.38        54.38
     RUNOFF COEFFICIENT   =       0.98         0.75         0.87

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| NASHYD    (0015) |   Area    (ha)=   0.68   Curve Number   (CN)= 75.8
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.20

     Unit Hyd Qpeak  (cms)=   0.130

     PEAK FLOW       (cms)=   0.021 (i)
     TIME TO PEAK    (hrs)=   5.250
     RUNOFF VOLUME    (mm)=  18.652
     TOTAL RAINFALL   (mm)=  54.380
     RUNOFF COEFFICIENT   =   0.343

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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| ADD HYD   (0017) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0015):     0.68   0.021     5.25    18.65
       + ID2= 2 (0016):     0.47   0.031     5.25    47.14
         ================================================
         ID = 3 (0017):     1.15   0.051     5.25    30.30

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0028) |   Area    (ha)=   1.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.83         0.35
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.50
     Length            (m)=       6.00       620.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02        21.93
               over (min)        5.00       105.00
     Storage Coeff.  (min)=       0.67 (ii)  102.32 (ii)
     Unit Hyd. Tpeak (min)=       5.00       105.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.01          0.044 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.75           5.25
     RUNOFF VOLUME    (mm)=      54.28        26.39          40.29
     TOTAL RAINFALL   (mm)=      54.38        54.38          54.38
     RUNOFF COEFFICIENT   =       1.00         0.49           0.74

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0013) |   Area    (ha)=   6.29
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       5.66         0.63
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=     204.78        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02       112.79
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       6.32 (ii)   13.97 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.19         0.08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.22         0.19          0.406 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25           5.25
     RUNOFF VOLUME    (mm)=      54.28        40.94          47.61
     TOTAL RAINFALL   (mm)=      54.38        54.38          54.38
     RUNOFF COEFFICIENT   =       1.00         0.75           0.88


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0029) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
```

```
          ID1= 1 (0013):     6.29   0.406     5.25    47.61
        + ID2= 2 (0028):     1.18   0.044     5.25    40.29
          ================================================
          ID = 3 (0029):     7.47   0.450     5.25    46.45

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0017):     1.15   0.051     5.25    30.30
        + ID2= 2 (0029):     7.47   0.450     5.25    46.45
          ================================================
          ID = 3 (0006):     8.62   0.501     5.25    44.30

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
  ***************************
  ** SIMULATION NUMBER:   3 **
  ***************************


--------------------
|    READ STORM    |    Filename: C:\Users\p004967b\AppD
|                  |              ata\Local\Temp\
|                  |              4ac2f434-3a7d-4cc2-ac30-61c66bfb95bc\9b840c0e
| Ptotal= 62.71 mm |    Comments: 10yr/12hr
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	3.50	10.66	6.75	4.39	10.00	0.63
0.50	0.63	3.75	10.66	7.00	4.39	10.25	0.63
0.75	0.63	4.00	10.66	7.25	4.39	10.50	0.63
1.00	0.63	4.25	10.66	7.50	2.51	10.75	0.63
1.25	0.63	4.50	28.84	7.75	2.51	11.00	0.63
1.50	0.63	4.75	28.84	8.00	2.51	11.25	0.63
1.75	0.63	5.00	28.84	8.25	2.51	11.50	0.63
2.00	0.63	5.25	28.84	8.50	1.25	11.75	0.63
2.25	0.63	5.50	8.15	8.75	1.25	12.00	0.63
2.50	3.76	5.75	8.15	9.00	1.25	12.25	0.63
2.75	3.76	6.00	8.15	9.25	1.25		
3.00	3.76	6.25	8.15	9.50	0.63		
3.25	3.76	6.50	4.39	9.75	0.63		

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| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   7.44
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.49         5.95
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=     222.71        40.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	3.76	6.250	8.15	9.33	0.63
0.167	0.00	3.250	3.76	6.333	4.39	9.42	0.63
0.250	0.00	3.333	10.66	6.417	4.39	9.50	0.63
0.333	0.63	3.417	10.66	6.500	4.39	9.58	0.63
0.417	0.63	3.500	10.66	6.583	4.39	9.67	0.63
0.500	0.63	3.583	10.66	6.667	4.39	9.75	0.63
0.583	0.63	3.667	10.66	6.750	4.39	9.83	0.63
0.667	0.63	3.750	10.66	6.833	4.39	9.92	0.63
0.750	0.63	3.833	10.66	6.917	4.39	10.00	0.63
0.833	0.63	3.917	10.66	7.000	4.39	10.08	0.63
0.917	0.63	4.000	10.66	7.083	4.39	10.17	0.63
1.000	0.63	4.083	10.66	7.167	4.39	10.25	0.63
1.083	0.63	4.167	10.66	7.250	4.39	10.33	0.63
1.167	0.63	4.250	10.66	7.333	2.51	10.42	0.63
1.250	0.63	4.333	28.84	7.417	2.51	10.50	0.63
1.333	0.63	4.417	28.84	7.500	2.51	10.58	0.63

1.417	0.63	4.500	28.84	7.583	2.51	10.67	0.63
1.500	0.63	4.583	28.84	7.667	2.51	10.75	0.63
1.583	0.63	4.667	28.84	7.750	2.51	10.83	0.63
1.667	0.63	4.750	28.84	7.833	2.51	10.92	0.63
1.750	0.63	4.833	28.84	7.917	2.51	11.00	0.63
1.833	0.63	4.917	28.84	8.000	2.51	11.08	0.63
1.917	0.63	5.000	28.84	8.083	2.51	11.17	0.63
2.000	0.63	5.083	28.84	8.167	2.51	11.25	0.63
2.083	0.63	5.167	28.84	8.250	2.51	11.33	0.63
2.167	0.63	5.250	28.84	8.333	1.25	11.42	0.63
2.250	0.63	5.333	8.15	8.417	1.25	11.50	0.63
2.333	3.76	5.417	8.15	8.500	1.25	11.58	0.63
2.417	3.76	5.500	8.15	8.583	1.25	11.67	0.63
2.500	3.76	5.583	8.15	8.667	1.25	11.75	0.63
2.583	3.76	5.667	8.15	8.750	1.25	11.83	0.63
2.667	3.76	5.750	8.15	8.833	1.25	11.92	0.63
2.750	3.76	5.833	8.15	8.917	1.25	12.00	0.63
2.833	3.76	5.917	8.15	9.000	1.25	12.08	0.63
2.917	3.76	6.000	8.15	9.083	1.25	12.17	0.63
3.000	3.76	6.083	8.15	9.167	1.25	12.25	0.63
3.083	3.76	6.167	8.15	9.250	1.25		

Max.Eff.Inten.(mm/hr)=	28.84	14.67	
over (min)	5.00	25.00	
Storage Coeff. (min)=	6.28 (ii)	23.58 (ii)	
Unit Hyd. Tpeak (min)=	5.00	25.00	
Unit Hyd. peak (cms)=	0.19	0.05	
			TOTALS
PEAK FLOW (cms)=	0.12	0.19	0.297 (iii)
TIME TO PEAK (hrs)=	5.25	5.42	5.25
RUNOFF VOLUME (mm)=	62.61	23.99	31.72
TOTAL RAINFALL (mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT =	1.00	0.38	0.51

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.8 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (6043)	Area (ha)=	1.18	
ID= 1 DT= 5.0 min	Total Imp(%)=	70.00	Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=		0.83	0.35
Dep. Storage (mm)=		0.10	5.00
Average Slope (%)=		2.00	0.50
Length (m)=		6.00	620.00
Mannings n =		0.013	0.250
Max.Eff.Inten.(mm/hr)=		28.84	27.49
over (min)		5.00	95.00
Storage Coeff. (min)=		0.63 (ii)	93.48 (ii)
Unit Hyd. Tpeak (min)=		5.00	95.00
Unit Hyd. peak (cms)=		0.34	0.01
			TOTALS
PEAK FLOW (cms)=		0.05	0.01 0.052 (iii)
TIME TO PEAK (hrs)=		4.50	6.58 5.25
RUNOFF VOLUME (mm)=		62.61	32.90 47.71
TOTAL RAINFALL (mm)=		62.71	62.71 62.71
RUNOFF COEFFICIENT =		1.00	0.52 0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.8 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0012)	Area (ha)=	6.29	
ID= 1 DT= 5.0 min	Total Imp(%)=	90.00	Dir. Conn.(%)= 75.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=		5.66	0.63

```
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=     204.78        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84        57.16
               over (min)        5.00        20.00
     Storage Coeff.  (min)=       5.97 (ii)   16.01 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.19         0.06
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.38         0.09          0.468 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25           5.25
     RUNOFF VOLUME    (mm)=      62.61        39.57          56.85
     TOTAL RAINFALL   (mm)=      62.71        62.71          62.71
     RUNOFF COEFFICIENT   =       1.00         0.63           0.91


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0024) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0012):     6.29   0.468     5.25    56.85
        + ID2= 2 (6043):     1.18   0.052     5.25    47.71
          ================================================
          ID = 3 (0024):     7.47   0.520     5.25    55.40

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| RESERVOIR (0120) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.2910      0.2529
                          0.0140     0.0973   |   0.3130      0.2603
                          0.0170     0.1465   |   0.3140      0.2604
                          0.0710     0.1823   |   0.3750      0.2801
                          0.1480     0.2114   |   0.4380      0.2992
                          0.1490     0.2115   |   0.8880      0.3823
                          0.2180     0.2330   |   1.4300      0.4561

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0024)      7.470      0.520      5.25      55.40
     OUTFLOW: ID= 1 (0120)      7.470      0.218      5.50      55.17

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)= 41.88
                    TIME SHIFT OF PEAK FLOW         (min)= 15.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.2330

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--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   0.68   Curve Number   (CN)= 75.8
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.20

     Unit Hyd Qpeak  (cms)=   0.130

     PEAK FLOW       (cms)=   0.026 (i)
     TIME TO PEAK    (hrs)=   5.250
     RUNOFF VOLUME    (mm)=  23.948
     TOTAL RAINFALL   (mm)=  62.710
     RUNOFF COEFFICIENT   =   0.382

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0003) |   Area    (ha)=   0.47
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
```

```
     Surface Area     (ha)=       0.42         0.05
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      55.98        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84       132.64
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.74 (ii)    9.91 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.28         0.11
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.02         0.036 (iii)
     TIME TO PEAK    (hrs)=       4.83         5.25          5.25
     RUNOFF VOLUME    (mm)=      61.71        48.87         55.28
     TOTAL RAINFALL   (mm)=      62.71        62.71         62.71
     RUNOFF COEFFICIENT   =       0.98         0.78          0.88

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0027) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0003)      0.470      0.036      5.25      55.28
     OUTFLOW: ID= 1 (0027)      0.470      0.006      6.50      53.80

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)= 17.58
                    TIME SHIFT OF PEAK FLOW         (min)= 75.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.0173

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--------------------
| ADD HYD   (0004) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     0.68   0.026     5.25    23.95
        + ID2= 2 (0027):     0.47   0.006     6.50    53.80
          ================================================
          ID = 3 (0004):     1.15   0.031     5.25    36.15

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0120):     7.47   0.218     5.50    55.17
        + ID2= 2 (0004):     1.15   0.031     5.25    36.15
          ================================================
          ID = 3 (0005):     8.62   0.242     5.42    52.63

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0016) |   Area    (ha)=   0.47
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.42         0.05
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      55.98        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84       132.64
               over (min)        5.00        10.00
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```
     Storage Coeff.  (min)=       2.74 (ii)    9.91 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.28         0.11
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.02         0.036 (iii)
     TIME TO PEAK    (hrs)=       4.83         5.25          5.25
     RUNOFF VOLUME    (mm)=      61.71        48.87         55.28
     TOTAL RAINFALL   (mm)=      62.71        62.71         62.71
     RUNOFF COEFFICIENT   =       0.98         0.78          0.88

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| NASHYD    (0015) |   Area    (ha)=   0.68   Curve Number   (CN)= 75.8
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.20

     Unit Hyd Qpeak  (cms)=   0.130

     PEAK FLOW       (cms)=   0.026 (i)
     TIME TO PEAK    (hrs)=   5.250
     RUNOFF VOLUME    (mm)=  23.948
     TOTAL RAINFALL   (mm)=  62.710
     RUNOFF COEFFICIENT   =   0.382

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0017) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0015):     0.68   0.026     5.25    23.95
       + ID2= 2 (0016):     0.47   0.036     5.25    55.28
         ================================================
         ID = 3 (0017):     1.15   0.062     5.25    36.75

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0028) |   Area    (ha)=   1.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.83         0.35
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.50
     Length            (m)=       6.00       620.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84        27.49
               over (min)        5.00        95.00
     Storage Coeff.  (min)=       0.63 (ii)   93.48 (ii)
     Unit Hyd. Tpeak (min)=       5.00        95.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.01         0.052 (iii)
     TIME TO PEAK    (hrs)=       4.50         6.58          5.25
     RUNOFF VOLUME    (mm)=      62.61        32.90         47.71
     TOTAL RAINFALL   (mm)=      62.71        62.71         62.71
     RUNOFF COEFFICIENT   =       1.00         0.52          0.76

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
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| STANDHYD (0013) | Area (ha)= 6.29
|ID= 1 DT= 5.0 min | Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	5.66	0.63
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.30	1.30
Length	(m)=	204.78	40.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		28.84	132.64
over (min)		5.00	15.00
Storage Coeff. (min)=		5.97 (ii)	13.14 (ii)
Unit Hyd. Tpeak (min)=		5.00	15.00
Unit Hyd. peak (cms)=		0.19	0.08

		TOTALS
PEAK FLOW	(cms)=	0.25	0.22	0.474 (iii)
TIME TO PEAK	(hrs)=	5.25	5.25	5.25
RUNOFF VOLUME	(mm)=	62.61	48.87	55.74
TOTAL RAINFALL	(mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT	=	1.00	0.78	0.89

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.8 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0029)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0013):	6.29	0.474	5.25	55.74
	+ ID2= 2 (0028):	1.18	0.052	5.25	47.71
	ID = 3 (0029):	7.47	0.527	5.25	54.47

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0006)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0017):	1.15	0.062	5.25	36.75
	+ ID2= 2 (0029):	7.47	0.527	5.25	54.47
	ID = 3 (0006):	8.62	0.589	5.25	52.11

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

****
** SIMULATION NUMBER: 4 **
****

READ STORM	Filename: C:\Users\p004967b\AppData\Local\Temp\4ac2f434-3a7d-4cc2-ac30-61c66bfb95bc\cb31ac73
Ptotal= 73.10 mm	Comments: 25yr/12hr

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	3.50	12.43	6.75	5.12	10.00	0.73
0.50	0.73	3.75	12.43	7.00	5.12	10.25	0.73
0.75	0.73	4.00	12.43	7.25	5.12	10.50	0.73
1.00	0.73	4.25	12.43	7.50	2.92	10.75	0.73
1.25	0.73	4.50	33.63	7.75	2.92	11.00	0.73
1.50	0.73	4.75	33.63	8.00	2.92	11.25	0.73
1.75	0.73	5.00	33.63	8.25	2.92	11.50	0.73
2.00	0.73	5.25	33.63	8.50	1.46	11.75	0.73
2.25	0.73	5.50	9.50	8.75	1.46	12.00	0.73
2.50	4.39	5.75	9.50	9.00	1.46	12.25	0.73
2.75	4.39	6.00	9.50	9.25	1.46		
3.00	4.39	6.25	9.50	9.50	0.73		
3.25	4.39	6.50	5.12	9.75	0.73		

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--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   7.44
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.49         5.95
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=     222.71        40.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	4.39	6.250	9.50	9.33	0.73
0.167	0.00	3.250	4.39	6.333	5.12	9.42	0.73
0.250	0.00	3.333	12.43	6.417	5.12	9.50	0.73
0.333	0.73	3.417	12.43	6.500	5.12	9.58	0.73
0.417	0.73	3.500	12.43	6.583	5.12	9.67	0.73
0.500	0.73	3.583	12.43	6.667	5.12	9.75	0.73
0.583	0.73	3.667	12.43	6.750	5.12	9.83	0.73
0.667	0.73	3.750	12.43	6.833	5.12	9.92	0.73
0.750	0.73	3.833	12.43	6.917	5.12	10.00	0.73
0.833	0.73	3.917	12.43	7.000	5.12	10.08	0.73
0.917	0.73	4.000	12.43	7.083	5.12	10.17	0.73
1.000	0.73	4.083	12.43	7.167	5.12	10.25	0.73
1.083	0.73	4.167	12.43	7.250	5.12	10.33	0.73
1.167	0.73	4.250	12.43	7.333	2.92	10.42	0.73
1.250	0.73	4.333	33.63	7.417	2.92	10.50	0.73
1.333	0.73	4.417	33.63	7.500	2.92	10.58	0.73
1.417	0.73	4.500	33.63	7.583	2.92	10.67	0.73
1.500	0.73	4.583	33.63	7.667	2.92	10.75	0.73
1.583	0.73	4.667	33.63	7.750	2.92	10.83	0.73
1.667	0.73	4.750	33.63	7.833	2.92	10.92	0.73
1.750	0.73	4.833	33.63	7.917	2.92	11.00	0.73
1.833	0.73	4.917	33.63	8.000	2.92	11.08	0.73
1.917	0.73	5.000	33.63	8.083	2.92	11.17	0.73
2.000	0.73	5.083	33.63	8.167	2.92	11.25	0.73
2.083	0.73	5.167	33.63	8.250	2.92	11.33	0.73
2.167	0.73	5.250	33.63	8.333	1.46	11.42	0.73
2.250	0.73	5.333	9.50	8.417	1.46	11.50	0.73
2.333	4.39	5.417	9.50	8.500	1.46	11.58	0.73
2.417	4.39	5.500	9.50	8.583	1.46	11.67	0.73
2.500	4.39	5.583	9.50	8.667	1.46	11.75	0.73
2.583	4.39	5.667	9.50	8.750	1.46	11.83	0.73
2.667	4.39	5.750	9.50	8.833	1.46	11.92	0.73
2.750	4.39	5.833	9.50	8.917	1.46	12.00	0.73
2.833	4.39	5.917	9.50	9.000	1.46	12.08	0.73
2.917	4.39	6.000	9.50	9.083	1.46	12.17	0.73
3.000	4.39	6.083	9.50	9.167	1.46	12.25	0.73
3.083	4.39	6.167	9.50	9.250	1.46		

```
     Max.Eff.Inten.(mm/hr)=      33.63        18.84
               over (min)         5.00        25.00
     Storage Coeff.  (min)=       5.90 (ii)   21.56 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=       0.19         0.05
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.14         0.25          0.378 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.33           5.25
     RUNOFF VOLUME    (mm)=      73.00        31.08          39.47
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       1.00         0.43           0.54

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (6043) |   Area    (ha)=   1.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
```

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.83	0.35	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	0.50	
Length (m)=	6.00	620.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	33.63	34.78	
over (min)	5.00	90.00	
Storage Coeff. (min)=	0.59 (ii)	85.11 (ii)	
Unit Hyd. Tpeak (min)=	5.00	90.00	
Unit Hyd. peak (cms)=	0.34	0.01	
			TOTALS
PEAK FLOW (cms)=	0.06	0.02	0.063 (iii)
TIME TO PEAK (hrs)=	4.42	6.50	5.25
RUNOFF VOLUME (mm)=	73.00	41.38	57.15
TOTAL RAINFALL (mm)=	73.10	73.10	73.10
RUNOFF COEFFICIENT =	1.00	0.57	0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.8 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0012)	Area (ha)= 6.29
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00 Dir. Conn.(%)= 75.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	5.66	0.63	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	1.30	1.30	
Length (m)=	204.78	40.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	33.63	70.08	
over (min)	5.00	15.00	
Storage Coeff. (min)=	5.61 (ii)	14.87 (ii)	
Unit Hyd. Tpeak (min)=	5.00	15.00	
Unit Hyd. peak (cms)=	0.20	0.08	
			TOTALS
PEAK FLOW (cms)=	0.44	0.11	0.554 (iii)
TIME TO PEAK (hrs)=	5.25	5.25	5.25
RUNOFF VOLUME (mm)=	73.00	48.83	66.95
TOTAL RAINFALL (mm)=	73.10	73.10	73.10
RUNOFF COEFFICIENT =	1.00	0.67	0.92

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.8 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0024)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0012):	6.29	0.554	5.25	66.95
	+ ID2= 2 (6043):	1.18	0.063	5.25	57.15
	ID = 3 (0024):	7.47	0.617	5.25	65.41

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

RESERVOIR (0120)				
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.2910	0.2529
	0.0140	0.0973	0.3130	0.2603
	0.0170	0.1465	0.3140	0.2604
	0.0710	0.1823	0.3750	0.2801
	0.1480	0.2114	0.4380	0.2992
	0.1490	0.2115	0.8880	0.3823

```
                        0.2180     0.2330   |   1.4300      0.4561

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0024)      7.470      0.617      5.25       65.41
     OUTFLOW: ID= 1 (0120)      7.470      0.313      5.42       65.17

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 50.71
                   TIME SHIFT OF PEAK FLOW         (min)= 10.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.2604

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   0.68   Curve Number   (CN)= 75.8
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.20

     Unit Hyd Qpeak  (cms)=   0.130

     PEAK FLOW       (cms)=   0.034 (i)
     TIME TO PEAK    (hrs)=   5.250
     RUNOFF VOLUME    (mm)=  31.025
     TOTAL RAINFALL   (mm)=  73.100
     RUNOFF COEFFICIENT   =   0.424

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0003) |   Area    (ha)=   0.47
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------

                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.42         0.05
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      55.98        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63       157.44
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       2.58 (ii)    9.28 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.29         0.12
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.02         0.042 (iii)
     TIME TO PEAK    (hrs)=       4.83         5.25          5.25
     RUNOFF VOLUME    (mm)=      72.10        58.86         65.47
     TOTAL RAINFALL   (mm)=      73.10        73.10         73.10
     RUNOFF COEFFICIENT   =       0.99         0.81          0.90

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR (0027) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0413

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0003)      0.470      0.042      5.25       65.47
     OUTFLOW: ID= 1 (0027)      0.470      0.007      6.50       64.00

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 17.69
                   TIME SHIFT OF PEAK FLOW         (min)= 75.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.0205

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--------------------
| ADD HYD   (0004) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
```

```
          ID1= 1 (0001):     0.68   0.034     5.25    31.02
        + ID2= 2 (0027):     0.47   0.007     6.50    64.00
          ================================================
          ID = 3 (0004):     1.15   0.040     5.25    44.50

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0120):     7.47   0.313     5.42    65.17
        + ID2= 2 (0004):     1.15   0.040     5.25    44.50
          ================================================
          ID = 3 (0005):     8.62   0.348     5.33    62.41

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0016) |   Area    (ha)=   0.47
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.42         0.05
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      55.98        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63       157.44
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.58 (ii)    9.28 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.29         0.12
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.02         0.042 (iii)
     TIME TO PEAK    (hrs)=       4.83         5.25          5.25
     RUNOFF VOLUME    (mm)=      72.10        58.86         65.47
     TOTAL RAINFALL   (mm)=      73.10        73.10         73.10
     RUNOFF COEFFICIENT   =       0.99         0.81          0.90

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| NASHYD    (0015) |   Area    (ha)=   0.68   Curve Number   (CN)= 75.8
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.20

     Unit Hyd Qpeak  (cms)=   0.130

     PEAK FLOW       (cms)=   0.034 (i)
     TIME TO PEAK    (hrs)=   5.250
     RUNOFF VOLUME    (mm)=  31.025
     TOTAL RAINFALL   (mm)=  73.100
     RUNOFF COEFFICIENT   =   0.424

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0017) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0015):     0.68   0.034     5.25    31.02
        + ID2= 2 (0016):     0.47   0.042     5.25    65.47
          ================================================
          ID = 3 (0017):     1.15   0.076     5.25    45.10

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| CALIB            |
| STANDHYD  (0028) |   Area    (ha)=   1.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.83         0.35
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.50
     Length            (m)=       6.00       620.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63        34.78
               over (min)        5.00        90.00
     Storage Coeff.  (min)=       0.59 (ii)   85.11 (ii)
     Unit Hyd. Tpeak (min)=       5.00        90.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.06         0.02          0.063 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.50           5.25
     RUNOFF VOLUME    (mm)=      73.00        41.38          57.15
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       1.00         0.57           0.78

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0013) |   Area    (ha)=   6.29
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       5.66         0.63
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=     204.78        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63       157.44
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       5.61 (ii)   12.31 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.20         0.09
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.29         0.27          0.560 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25           5.25
     RUNOFF VOLUME    (mm)=      73.00        58.86          65.93
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       1.00         0.81           0.90


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0029) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0013):     6.29   0.560     5.25    65.93
       + ID2= 2 (0028):     1.18   0.063     5.25    57.15
         ================================================
         ID = 3 (0029):     7.47   0.623     5.25    64.54

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0017):     1.15   0.076     5.25    45.10
```

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       + ID2= 2 (0029):     7.47   0.623     5.25    64.54
         ================================================
         ID = 3 (0006):     8.62   0.699     5.25    61.95

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ***************************
  ** SIMULATION NUMBER:   5 **
  ***************************


--------------------
|    READ STORM    |    Filename: C:\Users\p004967b\AppD
|                  |              ata\Local\Temp\
|                  |              4ac2f434-3a7d-4cc2-ac30-61c66bfb95bc\b52c1303
| Ptotal= 80.82 mm |    Comments: 50yr/12hr
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.25    0.00 |  3.50   13.74 |  6.75    5.66 | 10.00    0.81
                0.50    0.81 |  3.75   13.74 |  7.00    5.66 | 10.25    0.81
                0.75    0.81 |  4.00   13.74 |  7.25    5.66 | 10.50    0.81
                1.00    0.81 |  4.25   13.74 |  7.50    3.23 | 10.75    0.81
                1.25    0.81 |  4.50   37.17 |  7.75    3.23 | 11.00    0.81
                1.50    0.81 |  4.75   37.17 |  8.00    3.23 | 11.25    0.81
                1.75    0.81 |  5.00   37.17 |  8.25    3.23 | 11.50    0.81
                2.00    0.81 |  5.25   37.17 |  8.50    1.62 | 11.75    0.81
                2.25    0.81 |  5.50   10.50 |  8.75    1.62 | 12.00    0.81
                2.50    4.85 |  5.75   10.50 |  9.00    1.62 | 12.25    0.81
                2.75    4.85 |  6.00   10.50 |  9.25    1.62 |
                3.00    4.85 |  6.25   10.50 |  9.50    0.81 |
                3.25    4.85 |  6.50    5.66 |  9.75    0.81 |

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--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   7.44
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=        1.49          5.95
    Dep. Storage     (mm)=        0.10          5.00
    Average Slope     (%)=        1.30          1.30
    Length            (m)=      222.71         40.00
    Mannings n           =       0.013         0.250

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    0.00 | 3.167    4.85 | 6.250   10.50 |  9.33    0.81
               0.167    0.00 | 3.250    4.85 | 6.333    5.66 |  9.42    0.81
               0.250    0.00 | 3.333   13.74 | 6.417    5.66 |  9.50    0.81
               0.333    0.81 | 3.417   13.74 | 6.500    5.66 |  9.58    0.81
               0.417    0.81 | 3.500   13.74 | 6.583    5.66 |  9.67    0.81
               0.500    0.81 | 3.583   13.74 | 6.667    5.66 |  9.75    0.81
               0.583    0.81 | 3.667   13.74 | 6.750    5.66 |  9.83    0.81
               0.667    0.81 | 3.750   13.74 | 6.833    5.66 |  9.92    0.81
               0.750    0.81 | 3.833   13.74 | 6.917    5.66 | 10.00    0.81
               0.833    0.81 | 3.917   13.74 | 7.000    5.66 | 10.08    0.81
               0.917    0.81 | 4.000   13.74 | 7.083    5.66 | 10.17    0.81
               1.000    0.81 | 4.083   13.74 | 7.167    5.66 | 10.25    0.81
               1.083    0.81 | 4.167   13.74 | 7.250    5.66 | 10.33    0.81
               1.167    0.81 | 4.250   13.74 | 7.333    3.23 | 10.42    0.81
               1.250    0.81 | 4.333   37.17 | 7.417    3.23 | 10.50    0.81
               1.333    0.81 | 4.417   37.17 | 7.500    3.23 | 10.58    0.81
               1.417    0.81 | 4.500   37.17 | 7.583    3.23 | 10.67    0.81
               1.500    0.81 | 4.583   37.17 | 7.667    3.23 | 10.75    0.81
               1.583    0.81 | 4.667   37.17 | 7.750    3.23 | 10.83    0.81
               1.667    0.81 | 4.750   37.17 | 7.833    3.23 | 10.92    0.81
               1.750    0.81 | 4.833   37.17 | 7.917    3.23 | 11.00    0.81
               1.833    0.81 | 4.917   37.17 | 8.000    3.23 | 11.08    0.81
               1.917    0.81 | 5.000   37.17 | 8.083    3.23 | 11.17    0.81
               2.000    0.81 | 5.083   37.17 | 8.167    3.23 | 11.25    0.81
               2.083    0.81 | 5.167   37.17 | 8.250    3.23 | 11.33    0.81
               2.167    0.81 | 5.250   37.17 | 8.333    1.62 | 11.42    0.81
               2.250    0.81 | 5.333   10.50 | 8.417    1.62 | 11.50    0.81
               2.333    4.85 | 5.417   10.50 | 8.500    1.62 | 11.58    0.81
               2.417    4.85 | 5.500   10.50 | 8.583    1.62 | 11.67    0.81
               2.500    4.85 | 5.583   10.50 | 8.667    1.62 | 11.75    0.81
```

```
              2.583    4.85 | 5.667   10.50 | 8.750    1.62 | 11.83    0.81
              2.667    4.85 | 5.750   10.50 | 8.833    1.62 | 11.92    0.81
              2.750    4.85 | 5.833   10.50 | 8.917    1.62 | 12.00    0.81
              2.833    4.85 | 5.917   10.50 | 9.000    1.62 | 12.08    0.81
              2.917    4.85 | 6.000   10.50 | 9.083    1.62 | 12.17    0.81
              3.000    4.85 | 6.083   10.50 | 9.167    1.62 | 12.25    0.81
              3.083    4.85 | 6.167   10.50 | 9.250    1.62 |

     Max.Eff.Inten.(mm/hr)=      37.17        22.42
               over (min)        5.00        25.00
     Storage Coeff.  (min)=      5.67 (ii)   20.28 (ii)
     Unit Hyd. Tpeak (min)=      5.00        25.00
     Unit Hyd. peak  (cms)=      0.20         0.05
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.15         0.30       0.442 (iii)
     TIME TO PEAK    (hrs)=      5.25         5.33        5.25
     RUNOFF VOLUME    (mm)=     80.72        36.64       45.45
     TOTAL RAINFALL   (mm)=     80.82        80.82       80.82
     RUNOFF COEFFICIENT   =      1.00         0.45        0.56

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
             YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD  (6043)  |   Area    (ha)=   1.18
|ID= 1 DT= 5.0 min  |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.83         0.35
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.50
     Length            (m)=       6.00       620.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        40.34
               over (min)        5.00        85.00
     Storage Coeff.  (min)=      0.57 (ii)   80.22 (ii)
     Unit Hyd. Tpeak (min)=      5.00        85.00
     Unit Hyd. peak  (cms)=      0.34         0.01
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.06         0.02        0.071 (iii)
     TIME TO PEAK    (hrs)=      4.42         6.33        5.25
     RUNOFF VOLUME    (mm)=     80.72        47.88       64.26
     TOTAL RAINFALL   (mm)=     80.82        80.82       80.82
     RUNOFF COEFFICIENT   =      1.00         0.59        0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD  (0012)  |   Area    (ha)=   6.29
|ID= 1 DT= 5.0 min  |   Total Imp(%)=  90.00   Dir. Conn.(%)=  75.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       5.66         0.63
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=     204.78        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        79.28
               over (min)        5.00        15.00
     Storage Coeff.  (min)=      5.39 (ii)   14.21 (ii)
     Unit Hyd. Tpeak (min)=      5.00        15.00
     Unit Hyd. peak  (cms)=      0.21         0.08
                                                      *TOTALS*
     PEAK FLOW       (cms)=      0.49         0.13        0.617 (iii)
     TIME TO PEAK    (hrs)=      5.25         5.25        5.25
     RUNOFF VOLUME    (mm)=     80.72        55.84       74.50
```

```
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.69           0.92


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0024) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0012):     6.29   0.617     5.25    74.50
        + ID2= 2 (6043):     1.18   0.071     5.25    64.26
          ================================================
          ID = 3 (0024):     7.47   0.687     5.25    72.88

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0120) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.2910      0.2529
                          0.0140     0.0973   |   0.3130      0.2603
                          0.0170     0.1465   |   0.3140      0.2604
                          0.0710     0.1823   |   0.3750      0.2801
                          0.1480     0.2114   |   0.4380      0.2992
                          0.1490     0.2115   |   0.8880      0.3823
                          0.2180     0.2330   |   1.4300      0.4561

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0024)      7.470      0.687      5.25      72.88
     OUTFLOW: ID= 1 (0120)      7.470      0.373      5.42      72.65

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)= 54.28
                    TIME SHIFT OF PEAK FLOW         (min)= 10.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.2801

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   0.68   Curve Number   (CN)= 75.8
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.20

     Unit Hyd Qpeak  (cms)=   0.130

     PEAK FLOW       (cms)=   0.040 (i)
     TIME TO PEAK    (hrs)=   5.250
     RUNOFF VOLUME    (mm)=  36.566
     TOTAL RAINFALL   (mm)=  80.820
     RUNOFF COEFFICIENT   =   0.452

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0003) |   Area    (ha)=   0.47
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------

                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.42          0.05
     Dep. Storage     (mm)=       1.00          5.00
     Average Slope     (%)=       1.30          1.30
     Length            (m)=      55.98         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=      37.17        175.71
               over (min)         5.00         10.00
     Storage Coeff.  (min)=       2.48 (ii)     8.89 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.29          0.12
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.02          0.02          0.047 (iii)
     TIME TO PEAK    (hrs)=       4.83          5.25           5.25
```

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     RUNOFF VOLUME    (mm)=      79.82        66.34          73.07
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       0.99         0.82           0.90

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0027) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0413

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0003)      0.470      0.047      5.25      73.07
     OUTFLOW: ID= 1 (0027)      0.470      0.008      6.50      71.60

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)= 17.76
                    TIME SHIFT OF PEAK FLOW         (min)= 75.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.0229

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--------------------
| ADD HYD   (0004) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     0.68   0.040     5.25    36.57
        + ID2= 2 (0027):     0.47   0.008     6.50    71.60
          ================================================
          ID = 3 (0004):     1.15   0.047     5.25    50.88

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0120):     7.47   0.373     5.42    72.65
        + ID2= 2 (0004):     1.15   0.047     5.25    50.88
          ================================================
          ID = 3 (0005):     8.62   0.417     5.33    69.74

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0016) |   Area    (ha)=   0.47
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.42         0.05
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      55.98        40.00
     Mannings n             =    0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17       175.71
                 over (min)       5.00        10.00
     Storage Coeff.  (min)=       2.48 (ii)    8.89 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.29         0.12
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.02        0.047 (iii)
     TIME TO PEAK    (hrs)=       4.83         5.25         5.25
     RUNOFF VOLUME    (mm)=      79.82        66.34          73.07
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       0.99         0.82           0.90

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
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      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| NASHYD    (0015) |   Area    (ha)=   0.68   Curve Number   (CN)= 75.8
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.20

     Unit Hyd Qpeak  (cms)=   0.130

     PEAK FLOW       (cms)=   0.040 (i)
     TIME TO PEAK    (hrs)=   5.250
     RUNOFF VOLUME    (mm)=  36.566
     TOTAL RAINFALL   (mm)=  80.820
     RUNOFF COEFFICIENT   =   0.452

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0017) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0015):     0.68   0.040     5.25    36.57
       + ID2= 2 (0016):     0.47   0.047     5.25    73.07
         ================================================
         ID = 3 (0017):     1.15   0.087     5.25    51.48

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0028) |   Area    (ha)=   1.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.83         0.35
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.50
     Length            (m)=       6.00       620.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17        40.34
               over (min)        5.00        85.00
     Storage Coeff.  (min)=       0.57 (ii)   80.22 (ii)
     Unit Hyd. Tpeak (min)=       5.00        85.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.06         0.02          0.071 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.33           5.25
     RUNOFF VOLUME    (mm)=      80.72        47.88          64.26
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.59           0.80

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0013) |   Area    (ha)=   6.29
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       5.66         0.63
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=     204.78        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17       175.71
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       5.39 (ii)   11.80 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
```

```
     Unit Hyd. peak  (cms)=       0.21         0.09
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.32         0.30          0.624 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25           5.25
     RUNOFF VOLUME    (mm)=      80.72        66.34          73.53
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.82           0.91


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0029) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0013):     6.29   0.624     5.25    73.53
       + ID2= 2 (0028):     1.18   0.071     5.25    64.26
         ================================================
         ID = 3 (0029):     7.47   0.695     5.25    72.07

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0017):     1.15   0.087     5.25    51.48
       + ID2= 2 (0029):     7.47   0.695     5.25    72.07
         ================================================
         ID = 3 (0006):     8.62   0.781     5.25    69.32

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ****************************
  ** SIMULATION NUMBER:   6 **
  ****************************


--------------------
|    READ STORM    |    Filename: C:\Users\p004967b\AppD
|                  |              ata\Local\Temp\
|                  |              4ac2f434-3a7d-4cc2-ac30-61c66bfb95bc\06a7bf98
| Ptotal= 88.54 mm |    Comments: 100yr/12hr
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.25    0.00 |  3.50   15.05 |  6.75    6.20 | 10.00    0.89
                0.50    0.89 |  3.75   15.05 |  7.00    6.20 | 10.25    0.89
                0.75    0.89 |  4.00   15.05 |  7.25    6.20 | 10.50    0.89
                1.00    0.89 |  4.25   15.05 |  7.50    3.54 | 10.75    0.89
                1.25    0.89 |  4.50   40.71 |  7.75    3.54 | 11.00    0.89
                1.50    0.89 |  4.75   40.71 |  8.00    3.54 | 11.25    0.89
                1.75    0.89 |  5.00   40.71 |  8.25    3.54 | 11.50    0.89
                2.00    0.89 |  5.25   40.71 |  8.50    1.77 | 11.75    0.89
                2.25    0.89 |  5.50   11.51 |  8.75    1.77 | 12.00    0.89
                2.50    5.31 |  5.75   11.51 |  9.00    1.77 | 12.25    0.89
                2.75    5.31 |  6.00   11.51 |  9.25    1.77 |
                3.00    5.31 |  6.25   11.51 |  9.50    0.89 |
                3.25    5.31 |  6.50    6.20 |  9.75    0.89 |

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--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   7.44
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.49         5.95
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=     222.71        40.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	5.31	6.250	11.51	9.33	0.89
0.167	0.00	3.250	5.31	6.333	6.20	9.42	0.89
0.250	0.00	3.333	15.05	6.417	6.20	9.50	0.89
0.333	0.89	3.417	15.05	6.500	6.20	9.58	0.89
0.417	0.89	3.500	15.05	6.583	6.20	9.67	0.89
0.500	0.89	3.583	15.05	6.667	6.20	9.75	0.89
0.583	0.89	3.667	15.05	6.750	6.20	9.83	0.89
0.667	0.89	3.750	15.05	6.833	6.20	9.92	0.89
0.750	0.89	3.833	15.05	6.917	6.20	10.00	0.89
0.833	0.89	3.917	15.05	7.000	6.20	10.08	0.89
0.917	0.89	4.000	15.05	7.083	6.20	10.17	0.89
1.000	0.89	4.083	15.05	7.167	6.20	10.25	0.89
1.083	0.89	4.167	15.05	7.250	6.20	10.33	0.89
1.167	0.89	4.250	15.05	7.333	3.54	10.42	0.89
1.250	0.89	4.333	40.71	7.417	3.54	10.50	0.89
1.333	0.89	4.417	40.71	7.500	3.54	10.58	0.89
1.417	0.89	4.500	40.71	7.583	3.54	10.67	0.89
1.500	0.89	4.583	40.71	7.667	3.54	10.75	0.89
1.583	0.89	4.667	40.71	7.750	3.54	10.83	0.89
1.667	0.89	4.750	40.71	7.833	3.54	10.92	0.89
1.750	0.89	4.833	40.71	7.917	3.54	11.00	0.89
1.833	0.89	4.917	40.71	8.000	3.54	11.08	0.89
1.917	0.89	5.000	40.71	8.083	3.54	11.17	0.89
2.000	0.89	5.083	40.71	8.167	3.54	11.25	0.89
2.083	0.89	5.167	40.71	8.250	3.54	11.33	0.89
2.167	0.89	5.250	40.71	8.333	1.77	11.42	0.89
2.250	0.89	5.333	11.51	8.417	1.77	11.50	0.89
2.333	5.31	5.417	11.51	8.500	1.77	11.58	0.89
2.417	5.31	5.500	11.51	8.583	1.77	11.67	0.89
2.500	5.31	5.583	11.51	8.667	1.77	11.75	0.89
2.583	5.31	5.667	11.51	8.750	1.77	11.83	0.89
2.667	5.31	5.750	11.51	8.833	1.77	11.92	0.89
2.750	5.31	5.833	11.51	8.917	1.77	12.00	0.89
2.833	5.31	5.917	11.51	9.000	1.77	12.08	0.89
2.917	5.31	6.000	11.51	9.083	1.77	12.17	0.89
3.000	5.31	6.083	11.51	9.167	1.77	12.25	0.89
3.083	5.31	6.167	11.51	9.250	1.77		

Max.Eff.Inten.(mm/hr)=	40.71	25.75	
over (min)	5.00	20.00	
Storage Coeff. (min)=	5.47 (ii)	19.29 (ii)	
Unit Hyd. Tpeak (min)=	5.00	20.00	
Unit Hyd. peak (cms)=	0.20	0.06	
			TOTALS
PEAK FLOW (cms)=	0.17	0.36	0.519 (iii)
TIME TO PEAK (hrs)=	5.25	5.33	5.25
RUNOFF VOLUME (mm)=	88.44	42.39	51.60
TOTAL RAINFALL (mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT =	1.00	0.48	0.58

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.8 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB		
STANDHYD (6043)	Area (ha)=	1.18
ID= 1 DT= 5.0 min	Total Imp(%)=	70.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	0.83	0.35
Dep. Storage (mm)=	0.10	5.00
Average Slope (%)=	2.00	0.50
Length (m)=	6.00	620.00
Mannings n =	0.013	0.250

Max.Eff.Inten.(mm/hr)=	40.71	46.01	
over (min)	5.00	80.00	
Storage Coeff. (min)=	0.55 (ii)	76.12 (ii)	
Unit Hyd. Tpeak (min)=	5.00	80.00	
Unit Hyd. peak (cms)=	0.34	0.01	
			TOTALS
PEAK FLOW (cms)=	0.07	0.02	0.079 (iii)

```
     TIME TO PEAK    (hrs)=       4.42         6.25          5.25
     RUNOFF VOLUME    (mm)=      88.44        54.52         71.45
     TOTAL RAINFALL   (mm)=      88.54        88.54         88.54
     RUNOFF COEFFICIENT   =       1.00         0.62          0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0012) |   Area    (ha)=   6.29
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  75.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       5.66         0.63
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=     204.78        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        88.50
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       5.20 (ii)   13.63 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.21         0.08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.53         0.15          0.679 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25          5.25
     RUNOFF VOLUME    (mm)=      88.44        62.95         82.07
     TOTAL RAINFALL   (mm)=      88.54        88.54         88.54
     RUNOFF COEFFICIENT   =       1.00         0.71          0.93


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0024) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0012):     6.29   0.679     5.25    82.07
        + ID2= 2 (6043):     1.18   0.079     5.25    71.45
          ================================================
          ID = 3 (0024):     7.47   0.759     5.25    80.39

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0120) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.2910      0.2529
                          0.0140     0.0973   |   0.3130      0.2603
                          0.0170     0.1465   |   0.3140      0.2604
                          0.0710     0.1823   |   0.3750      0.2801
                          0.1480     0.2114   |   0.4380      0.2992
                          0.1490     0.2115   |   0.8880      0.3823
                          0.2180     0.2330   |   1.4300      0.4561

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0024)      7.470      0.759      5.25      80.39
     OUTFLOW: ID= 1 (0120)      7.470      0.436      5.33      80.15

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)= 57.51
                    TIME SHIFT OF PEAK FLOW         (min)=  5.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.2992

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| CALIB            |
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```
| NASHYD    (0001) |   Area    (ha)=   0.68   Curve Number   (CN)= 75.8
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.20

     Unit Hyd Qpeak  (cms)=   0.130

     PEAK FLOW       (cms)=   0.046 (i)
     TIME TO PEAK    (hrs)=   5.250
     RUNOFF VOLUME    (mm)=  42.309
     TOTAL RAINFALL   (mm)=  88.540
     RUNOFF COEFFICIENT   =   0.478

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0003) |   Area    (ha)=   0.47
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.42         0.05
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      55.98        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71       193.93
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       2.39 (ii)    8.55 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.30         0.12
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.03         0.052 (iii)
     TIME TO PEAK    (hrs)=       4.83         5.25          5.25
     RUNOFF VOLUME    (mm)=      87.54        73.86         80.69
     TOTAL RAINFALL   (mm)=      88.54        88.54         88.54
     RUNOFF COEFFICIENT   =       0.99         0.83          0.91

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0027) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0413

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0003)      0.470      0.052      5.25      80.69
     OUTFLOW: ID= 1 (0027)      0.470      0.009      6.42      79.22

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 17.83
                   TIME SHIFT OF PEAK FLOW         (min)= 70.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.0253

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--------------------
| ADD HYD   (0004) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     0.68   0.046     5.25    42.31
        + ID2= 2 (0027):     0.47   0.009     6.42    79.22
          ================================================
          ID = 3 (0004):     1.15   0.054     5.25    57.39

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0120):     7.47   0.436     5.33    80.15
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       + ID2= 2 (0004):     1.15   0.054     5.25    57.39
         ================================================
         ID = 3 (0005):     8.62   0.487     5.33    77.12

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0016) |   Area    (ha)=   0.47
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.42         0.05
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      55.98        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71       193.93
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.39 (ii)    8.55 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.30         0.12
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.03         0.052 (iii)
     TIME TO PEAK    (hrs)=       4.83         5.25          5.25
     RUNOFF VOLUME    (mm)=      87.54        73.86         80.69
     TOTAL RAINFALL   (mm)=      88.54        88.54         88.54
     RUNOFF COEFFICIENT   =       0.99         0.83          0.91

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| NASHYD    (0015) |   Area    (ha)=   0.68   Curve Number   (CN)= 75.8
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.20

     Unit Hyd Qpeak  (cms)=   0.130

     PEAK FLOW       (cms)=   0.046 (i)
     TIME TO PEAK    (hrs)=   5.250
     RUNOFF VOLUME    (mm)=  42.309
     TOTAL RAINFALL   (mm)=  88.540
     RUNOFF COEFFICIENT   =   0.478

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0017) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0015):     0.68   0.046     5.25    42.31
       + ID2= 2 (0016):     0.47   0.052     5.25    80.69
         ================================================
         ID = 3 (0017):     1.15   0.097     5.25    57.99

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0028) |   Area    (ha)=   1.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.83         0.35
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.50
     Length            (m)=       6.00       620.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71        46.01
               over (min)        5.00        80.00
```

```
     Storage Coeff.  (min)=       0.55 (ii)   76.12 (ii)
     Unit Hyd. Tpeak (min)=       5.00        80.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.07         0.02          0.079 (iii)
     TIME TO PEAK    (hrs)=       4.42         6.25           5.25
     RUNOFF VOLUME    (mm)=      88.44        54.52          71.45
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       1.00         0.62           0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0013) |   Area    (ha)=   6.29
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       5.66         0.63
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=     204.78        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71       193.93
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       5.20 (ii)   11.36 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.21         0.09
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.36         0.33          0.687 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25           5.25
     RUNOFF VOLUME    (mm)=      88.44        73.86          81.15
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       1.00         0.83           0.92


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0029) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0013):     6.29   0.687     5.25    81.15
       + ID2= 2 (0028):     1.18   0.079     5.25    71.45
         ================================================
         ID = 3 (0029):     7.47   0.766     5.25    79.61

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0017):     1.15   0.097     5.25    57.99
       + ID2= 2 (0029):     7.47   0.766     5.25    79.61
         ================================================
         ID = 3 (0006):     8.62   0.864     5.25    76.73

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ***************************
  ** SIMULATION NUMBER:   7 **
  ***************************


--------------------
|    READ STORM    |    Filename: C:\Users\p004967b\AppD
```

| | ata\Local\Temp\
| | 4ac2f434-3a7d-4cc2-ac30-61c66bfb95bc\98fc6920
| Ptotal=212.00 mm | Comments: HURRICANE HAZEL - FINAL 12 HOURS

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
1.00	6.00	4.00	13.00	7.00	23.00	10.00	53.00
2.00	4.00	5.00	17.00	8.00	13.00	11.00	38.00
3.00	6.00	6.00	13.00	9.00	13.00	12.00	13.00

CALIB
STANDHYD (0002)
ID= 1 DT= 5.0 min

Area (ha)= 7.44
Total Imp(%)= 20.00 Dir. Conn.(%)= 20.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.49	5.95
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.30	1.30
Length	(m)=	222.71	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	6.00	3.083	13.00	6.083	23.00	9.08	53.00
0.167	6.00	3.167	13.00	6.167	23.00	9.17	53.00
0.250	6.00	3.250	13.00	6.250	23.00	9.25	53.00
0.333	6.00	3.333	13.00	6.333	23.00	9.33	53.00
0.417	6.00	3.417	13.00	6.417	23.00	9.42	53.00
0.500	6.00	3.500	13.00	6.500	23.00	9.50	53.00
0.583	6.00	3.583	13.00	6.583	23.00	9.58	53.00
0.667	6.00	3.667	13.00	6.667	23.00	9.67	53.00
0.750	6.00	3.750	13.00	6.750	23.00	9.75	53.00
0.833	6.00	3.833	13.00	6.833	23.00	9.83	53.00
0.917	6.00	3.917	13.00	6.917	23.00	9.92	53.00
1.000	6.00	4.000	13.00	7.000	23.00	10.00	53.00
1.083	4.00	4.083	17.00	7.083	13.00	10.08	38.00
1.167	4.00	4.167	17.00	7.167	13.00	10.17	38.00
1.250	4.00	4.250	17.00	7.250	13.00	10.25	38.00
1.333	4.00	4.333	17.00	7.333	13.00	10.33	38.00
1.417	4.00	4.417	17.00	7.417	13.00	10.42	38.00
1.500	4.00	4.500	17.00	7.500	13.00	10.50	38.00
1.583	4.00	4.583	17.00	7.583	13.00	10.58	38.00
1.667	4.00	4.667	17.00	7.667	13.00	10.67	38.00
1.750	4.00	4.750	17.00	7.750	13.00	10.75	38.00
1.833	4.00	4.833	17.00	7.833	13.00	10.83	38.00
1.917	4.00	4.917	17.00	7.917	13.00	10.92	38.00
2.000	4.00	5.000	17.00	8.000	13.00	11.00	38.00
2.083	6.00	5.083	13.00	8.083	13.00	11.08	13.00
2.167	6.00	5.167	13.00	8.167	13.00	11.17	13.00
2.250	6.00	5.250	13.00	8.250	13.00	11.25	13.00
2.333	6.00	5.333	13.00	8.333	13.00	11.33	13.00
2.417	6.00	5.417	13.00	8.417	13.00	11.42	13.00
2.500	6.00	5.500	13.00	8.500	13.00	11.50	13.00
2.583	6.00	5.583	13.00	8.583	13.00	11.58	13.00
2.667	6.00	5.667	13.00	8.667	13.00	11.67	13.00
2.750	6.00	5.750	13.00	8.750	13.00	11.75	13.00
2.833	6.00	5.833	13.00	8.833	13.00	11.83	13.00
2.917	6.00	5.917	13.00	8.917	13.00	11.92	13.00
3.000	6.00	6.000	13.00	9.000	13.00	12.00	13.00

Max.Eff.Inten.(mm/hr)=	53.00	46.43		
over (min)	5.00	20.00		
Storage Coeff. (min)=	4.92 (ii)	15.84 (ii)		
Unit Hyd. Tpeak (min)=	5.00	20.00		
Unit Hyd. peak (cms)=	0.22	0.07		
			TOTALS	
PEAK FLOW (cms)=	0.22	0.73	0.948 (iii)	
TIME TO PEAK (hrs)=	10.00	10.08	10.00	
RUNOFF VOLUME (mm)=	211.90	148.73	161.37	
TOTAL RAINFALL (mm)=	212.00	212.00	212.00	
RUNOFF COEFFICIENT =	1.00	0.70	0.76	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

```
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (6043) |   Area    (ha)=   1.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.83         0.35
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.50
     Length            (m)=       6.00       620.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      53.00        81.75
               over (min)        5.00        65.00
     Storage Coeff.  (min)=       0.49 (ii)   60.54 (ii)
     Unit Hyd. Tpeak (min)=       5.00        65.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.09         0.06         0.126 (iii)
     TIME TO PEAK    (hrs)=       9.17        11.00         10.00
     RUNOFF VOLUME    (mm)=     211.90       169.53        190.69
     TOTAL RAINFALL   (mm)=     212.00       212.00        212.00
     RUNOFF COEFFICIENT   =       1.00         0.80          0.90

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0012) |   Area    (ha)=   6.29
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  75.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       5.66         0.63
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=     204.78        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      53.00       128.51
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       4.68 (ii)    9.30 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.22         0.12
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.69         0.22         0.918 (iii)
     TIME TO PEAK    (hrs)=      10.00        10.00         10.00
     RUNOFF VOLUME    (mm)=     211.90       181.90        204.40
     TOTAL RAINFALL   (mm)=     212.00       212.00        212.00
     RUNOFF COEFFICIENT   =       1.00         0.86          0.96

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0024) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0012):     6.29   0.918    10.00   204.40
       + ID2= 2 (6043):     1.18   0.126    10.00   190.69
         ================================================
         ID = 3 (0024):     7.47   1.044    10.00   202.23

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

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--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0120) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.2910      0.2529
                          0.0140     0.0973   |   0.3130      0.2603
                          0.0170     0.1465   |   0.3140      0.2604
                          0.0710     0.1823   |   0.3750      0.2801
                          0.1480     0.2114   |   0.4380      0.2992
                          0.1490     0.2115   |   0.8880      0.3823
                          0.2180     0.2330   |   1.4300      0.4561

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0024)      7.470      1.044     10.00     202.23
     OUTFLOW: ID= 1 (0120)      7.470      0.888     10.08     202.00

                PEAK   FLOW   REDUCTION [Qout/Qin](%)= 85.02
                TIME SHIFT OF PEAK FLOW        (min)=  5.00
                MAXIMUM  STORAGE   USED       (ha.m.)=  0.3823

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   0.68   Curve Number   (CN)= 75.8
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.20

     Unit Hyd Qpeak  (cms)=   0.130

     PEAK FLOW       (cms)=   0.087 (i)
     TIME TO PEAK    (hrs)=  10.000
     RUNOFF VOLUME    (mm)= 148.450
     TOTAL RAINFALL   (mm)= 212.000
     RUNOFF COEFFICIENT   =   0.700

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0003) |   Area    (ha)=   0.47
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------

                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.42         0.05
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      55.98        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      53.00       262.64
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.15 (ii)    7.61 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.31         0.13
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.03         0.069 (iii)
     TIME TO PEAK    (hrs)=       9.58        10.00         10.00
     RUNOFF VOLUME    (mm)=     211.00       195.94        203.46
     TOTAL RAINFALL   (mm)=     212.00       212.00        212.00
     RUNOFF COEFFICIENT   =       1.00         0.92          0.96

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0027) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0003)      0.470      0.069     10.00     203.46
```

```
     OUTFLOW: ID= 1 (0027)      0.470      0.022     11.25     201.98

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 31.93
                  TIME SHIFT OF PEAK FLOW        (min)= 75.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0605

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--------------------
| ADD HYD   (0004) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     0.68    0.087    10.00   148.45
        + ID2= 2 (0027):     0.47    0.022    11.25   201.98
          ================================================
          ID = 3 (0004):     1.15    0.104    10.00   170.33

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0120):     7.47    0.888    10.08   202.00
        + ID2= 2 (0004):     1.15    0.104    10.00   170.33
          ================================================
          ID = 3 (0005):     8.62    0.990    10.08   197.77

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0016) |   Area    (ha)=   0.47
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.42         0.05
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      55.98        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      53.00       262.64
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.15 (ii)    7.61 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.31         0.13
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.03         0.069 (iii)
     TIME TO PEAK    (hrs)=       9.58        10.00         10.00
     RUNOFF VOLUME    (mm)=     211.00       195.94        203.46
     TOTAL RAINFALL   (mm)=     212.00       212.00        212.00
     RUNOFF COEFFICIENT   =       1.00         0.92          0.96

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0015) |   Area    (ha)=   0.68   Curve Number   (CN)= 75.8
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.20

     Unit Hyd Qpeak  (cms)=   0.130

     PEAK FLOW       (cms)=   0.087 (i)
     TIME TO PEAK    (hrs)=  10.000
     RUNOFF VOLUME    (mm)= 148.450
     TOTAL RAINFALL   (mm)= 212.000
     RUNOFF COEFFICIENT   =   0.700

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0017) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0015):     0.68   0.087    10.00   148.45
        + ID2= 2 (0016):     0.47   0.069    10.00   203.46
          ================================================
          ID = 3 (0017):     1.15   0.155    10.00   170.93

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0028) |   Area    (ha)=   1.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.83         0.35
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.50
     Length            (m)=       6.00       620.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      53.00        81.75
               over (min)         5.00        65.00
     Storage Coeff.  (min)=       0.49 (ii)   60.54 (ii)
     Unit Hyd. Tpeak (min)=       5.00        65.00
     Unit Hyd. peak  (cms)=       0.34         0.02
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.09         0.06         0.126 (iii)
     TIME TO PEAK    (hrs)=       9.17        11.00         10.00
     RUNOFF VOLUME    (mm)=     211.90       169.53        190.69
     TOTAL RAINFALL   (mm)=     212.00       212.00        212.00
     RUNOFF COEFFICIENT   =       1.00         0.80          0.90

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0013) |   Area    (ha)=   6.29
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       5.66         0.63
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=     204.78        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      53.00       262.64
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       4.68 (ii)   10.14 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.22         0.10
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.46         0.46         0.920 (iii)
     TIME TO PEAK    (hrs)=      10.00        10.00         10.00
     RUNOFF VOLUME    (mm)=     211.90       195.94        203.92
     TOTAL RAINFALL   (mm)=     212.00       212.00        212.00
     RUNOFF COEFFICIENT   =       1.00         0.92          0.96

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0029) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0013):     6.29   0.920    10.00   203.92
```

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       + ID2= 2 (0028):     1.18   0.126    10.00   190.69
         ================================================
         ID = 3 (0029):     7.47   1.046    10.00   201.83

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0017):     1.15   0.155    10.00   170.93
       + ID2= 2 (0029):     7.47   1.046    10.00   201.83
         ================================================
         ID = 3 (0006):     8.62   1.201    10.00   197.71

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ***************************
  ** SIMULATION NUMBER:   8 **
  ***************************


--------------------
|    READ STORM    |    Filename: C:\Users\p004967b\AppD
|                  |              ata\Local\Temp\
|                  |              4ac2f434-3a7d-4cc2-ac30-61c66bfb95bc\7a45448a
| Ptotal= 25.00 mm |    Comments: 25 mm, 4 hr. chicago dist'n. - water qua
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.17    2.40 |  1.17   33.60 |'  2.17    3.45 |  3.17    1.65
                0.33    1.95 |  1.33   38.10 |'  2.33    3.00 |  3.33    1.80
                0.50    2.40 |  1.50   13.80 |'  2.50    2.70 |  3.50    1.50
                0.67    2.85 |  1.67    7.35 |'  2.67    2.25 |  3.67    1.50
                0.83    4.65 |  1.83    5.55 |'  2.83    2.25 |  3.83    0.75
                1.00    9.60 |  2.00    4.35 |'  3.00    1.95 |  4.00    0.60

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--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   7.44
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.49         5.95
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=     222.71        40.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    2.40 | 1.083   33.60 | 2.083    3.45 |  3.08    1.65
               0.167    2.40 | 1.167   33.60 | 2.167    3.45 |  3.17    1.65
               0.250    1.95 | 1.250   38.10 | 2.250    3.00 |  3.25    1.80
               0.333    1.95 | 1.333   38.10 | 2.333    3.00 |  3.33    1.80
               0.417    2.40 | 1.417   13.80 | 2.417    2.70 |  3.42    1.50
               0.500    2.40 | 1.500   13.80 | 2.500    2.70 |  3.50    1.50
               0.583    2.85 | 1.583    7.35 | 2.583    2.25 |  3.58    1.50
               0.667    2.85 | 1.667    7.35 | 2.667    2.25 |  3.67    1.50
               0.750    4.65 | 1.750    5.55 | 2.750    2.25 |  3.75    0.75
               0.833    4.65 | 1.833    5.55 | 2.833    2.25 |  3.83    0.75
               0.917    9.60 | 1.917    4.35 | 2.917    1.95 |  3.92    0.60
               1.000    9.60 | 2.000    4.35 | 3.000    1.95 |  4.00    0.60

     Max.Eff.Inten.(mm/hr)=      38.10         3.96
               over (min)         5.00        35.00
     Storage Coeff.  (min)=       5.62 (ii)   34.84 (ii)
     Unit Hyd. Tpeak (min)=       5.00        35.00
     Unit Hyd. peak  (cms)=       0.20         0.03
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.15         0.04          0.158 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.92           1.33
     RUNOFF VOLUME    (mm)=      24.90         3.96           8.14
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       1.00         0.16           0.33
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***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (6043) |   Area    (ha)=   1.18
|ID= 1 DT= 5.0 min |   Total Imp(%)=  70.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.83         0.35
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       2.00         0.50
     Length            (m)=       6.00       620.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10         8.15
               over (min)        5.00       155.00
     Storage Coeff.  (min)=       0.56 (ii)  151.60 (ii)
     Unit Hyd. Tpeak (min)=       5.00       155.00
     Unit Hyd. peak  (cms)=       0.34         0.01
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.06         0.00          0.063 (iii)
     TIME TO PEAK    (hrs)=       1.33         4.00           1.33
     RUNOFF VOLUME    (mm)=      24.90         6.85          15.80
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       1.00         0.27           0.63

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0012) |   Area    (ha)=   6.29
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  75.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       5.66         0.63
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=     204.78        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10        35.70
               over (min)        5.00        20.00
     Storage Coeff.  (min)=       5.34 (ii)   17.47 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.21         0.06
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.48         0.04          0.503 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.58           1.33
     RUNOFF VOLUME    (mm)=      24.90         9.54          21.06
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       1.00         0.38           0.84


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0024) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0012):     6.29   0.503     1.33    21.06
        + ID2= 2 (6043):     1.18   0.063     1.33    15.80
          ================================================
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          ID = 3 (0024):     7.47   0.566     1.33    20.23

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0120) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.2910      0.2529
                         0.0140     0.0973   |   0.3130      0.2603
                         0.0170     0.1465   |   0.3140      0.2604
                         0.0710     0.1823   |   0.3750      0.2801
                         0.1480     0.2114   |   0.4380      0.2992
                         0.1490     0.2115   |   0.8880      0.3823
                         0.2180     0.2330   |   1.4300      0.4561

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0024)      7.470      0.566      1.33      20.23
     OUTFLOW: ID= 1 (0120)      7.470      0.016      3.92      19.99

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  2.85
                   TIME SHIFT OF PEAK FLOW         (min)=155.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.1320

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--------------------
| CALIB            |
| NASHYD    (0001) |   Area    (ha)=   0.68   Curve Number   (CN)= 75.8
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.20

     Unit Hyd Qpeak  (cms)=   0.130

     PEAK FLOW       (cms)=   0.007 (i)
     TIME TO PEAK    (hrs)=   1.500
     RUNOFF VOLUME    (mm)=   3.949
     TOTAL RAINFALL   (mm)=  25.000
     RUNOFF COEFFICIENT   =   0.158

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0003) |   Area    (ha)=   0.47
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------

                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.42         0.05
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      55.98        40.00
     Mannings n             =    0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10       125.61
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       2.45 (ii)    9.78 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.30         0.11
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01         0.036 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      24.00        14.32         19.15
     TOTAL RAINFALL   (mm)=      25.00        25.00         25.00
     RUNOFF COEFFICIENT   =       0.96         0.57          0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0027) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0413
```

```
                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0003)      0.470      0.036      1.33      19.15
     OUTFLOW: ID= 1 (0027)      0.470      0.002      2.92      17.68

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  6.88
                  TIME SHIFT OF PEAK FLOW         (min)= 95.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0069

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0004) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     0.68   0.007     1.50     3.95
        + ID2= 2 (0027):     0.47   0.002     2.92    17.68
          ================================================
          ID = 3 (0004):     1.15   0.009     1.50     9.56

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0120):     7.47   0.016     3.92    19.99
        + ID2= 2 (0004):     1.15   0.009     1.50     9.56
          ================================================
          ID = 3 (0005):     8.62   0.023     1.58    18.60

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0016) |   Area    (ha)=   0.47
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.42         0.05
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      55.98        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10       125.61
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       2.45 (ii)    9.78 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.30         0.11
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.01         0.036 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      24.00        14.32         19.15
     TOTAL RAINFALL   (mm)=      25.00        25.00         25.00
     RUNOFF COEFFICIENT   =       0.96         0.57          0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  75.8    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0015) |   Area    (ha)=   0.68   Curve Number   (CN)= 75.8
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=   0.20

     Unit Hyd Qpeak  (cms)=   0.130

     PEAK FLOW       (cms)=   0.007 (i)
     TIME TO PEAK    (hrs)=   1.500
     RUNOFF VOLUME    (mm)=   3.949
     TOTAL RAINFALL   (mm)=  25.000
     RUNOFF COEFFICIENT   =   0.158
```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0017)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0015):	0.68	0.007	1.50	3.95
	+ ID2= 2 (0016):	0.47	0.036	1.33	19.15
	ID = 3 (0017):	1.15	0.041	1.33	10.16

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB STANDHYD (0028)	Area (ha)= 1.18		
ID= 1 DT= 5.0 min	Total Imp(%)= 70.00	Dir. Conn.(%)= 50.00	
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.83	0.35	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	2.00	0.50	
Length (m)=	6.00	620.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	38.10	8.15	
over (min)	5.00	155.00	
Storage Coeff. (min)=	0.56 (ii)	151.60 (ii)	
Unit Hyd. Tpeak (min)=	5.00	155.00	
Unit Hyd. peak (cms)=	0.34	0.01	
			TOTALS
PEAK FLOW (cms)=	0.06	0.00	0.063 (iii)
TIME TO PEAK (hrs)=	1.33	4.00	1.33
RUNOFF VOLUME (mm)=	24.90	6.85	15.80
TOTAL RAINFALL (mm)=	25.00	25.00	25.00
RUNOFF COEFFICIENT =	1.00	0.27	0.63

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.8 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (0013)	Area (ha)= 6.29		
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00	Dir. Conn.(%)= 50.00	
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	5.66	0.63	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	1.30	1.30	
Length (m)=	204.78	40.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	38.10	125.61	
over (min)	5.00	15.00	
Storage Coeff. (min)=	5.34 (ii)	12.67 (ii)	
Unit Hyd. Tpeak (min)=	5.00	15.00	
Unit Hyd. peak (cms)=	0.21	0.08	
			TOTALS
PEAK FLOW (cms)=	0.32	0.14	0.434 (iii)
TIME TO PEAK (hrs)=	1.33	1.50	1.33
RUNOFF VOLUME (mm)=	24.90	14.32	19.61
TOTAL RAINFALL (mm)=	25.00	25.00	25.00
RUNOFF COEFFICIENT =	1.00	0.57	0.78

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 75.8 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0029)

```
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0013):     6.29   0.434     1.33    19.61
        + ID2= 2 (0028):     1.18   0.063     1.33    15.80
          ================================================
          ID = 3 (0029):     7.47   0.497     1.33    19.01

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0017):     1.15   0.041     1.33    10.16
        + ID2= 2 (0029):     7.47   0.497     1.33    19.01
          ================================================
          ID = 3 (0006):     8.62   0.538     1.33    17.83

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

 FINISH
================================================================================================================================
```

DONALD COUSENS PARKWAY STATION

407 ETR

REGRADING OF EXISTING POND REQUIRED
RETAINING WALL TO BE CONSTRUCTED TO SUIT PROPOSED 407 TWY GRADING

PROP CULV WC#16
SPAN x RISE= (6 x 2.5)m
L=25.5, S=0.4%
U/S INV=187.00m
D/S INV=186.90m

WC #16

A–1 | 0.27 | 90

A–2 | 1.84 | 90

A–3 | 0.55 | 90

A–4 | 0.58 | 90

A–5 | 0.19 | 90

A–6 | 0.78 | 90

POND INLET

PROP STM

PROP STM

PROP STM

100-yr WL 187.69
PERMANENT WL 186.58

OUTLET CONTROL STRUCTURE
(SEE DATAIL 2 IN THIS DWG)

PROP CULV#2
SPAN x RISE= (3 x 0.5)m
U/S INV=186.33m
D/S INV=186.2m

TWY FLOWS FROM DRAINAGE AREA 522-2 & 522-3
(STA. 7+780 TO STA. 8+600)
DRAINAGE AREA = 1.56ha
TO BE PUMPED TO SWMF-3

DONALD COUSENS PARKWAY

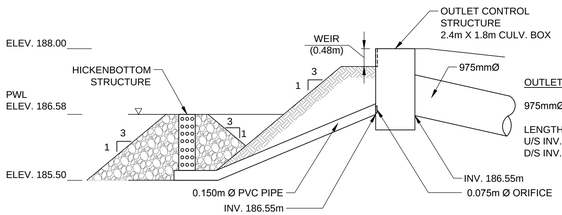
AREA TREATED BY ENCHANCED SWALE

POND OUTLET
MIN U/S INV=186.55m
MIN D/S INV=186.25m

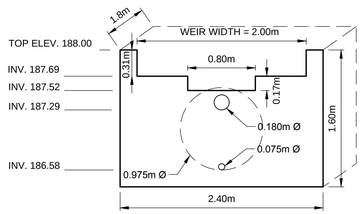
PROP CULV#3
SPAN x RISE= (3 x 0.5)m
U/S INV=186.13m
D/S INV=186.00m

REESOR ROAD

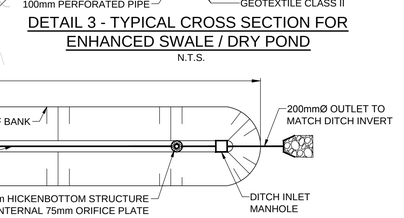
QUALITY CONTROL FOR THIS AREA TO BE PROVIDED BY ENHANCED SWALE



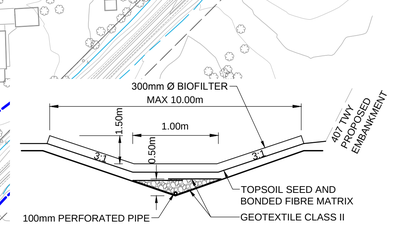
DETAIL 1 - HICKENBOTTOM DRAIN DETAIL
N.T.S.



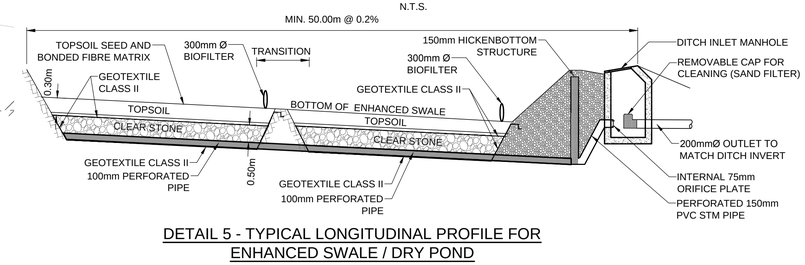
DETAIL 2 - SWMF 3 OUTLET CONTROL STRUCTURE
N.T.S.



DETAIL 4 - ENHANCED SWALE / DRY POND PLAN VIEW
N.T.S.



DETAIL 3 - TYPICAL CROSS SECTION FOR ENHANCED SWALE / DRY POND
N.T.S.



DETAIL 5 - TYPICAL LONGITUDINAL PROFILE FOR ENHANCED SWALE / DRY POND
N.T.S.

LEGEND

- PROPOSED 407 TWY
- PROPERTY LINES
- EXISTING DITCH
- EXISTING CREEK
- EXISTING CULVERT
- DRAINAGE AREA BOUNDARY
- EXISTING TRCA FLOODLINE
- SWALE AND FLOW DIRECTION
- FLOODLINE

AREA ID
A (ha)
% IMPERVIOUSNESS

SCALE HORIZONTAL 1:1000
5m 0m 10m 20m 30m

DATE: SEPTEMBER 2016
SCALE: 1:1000

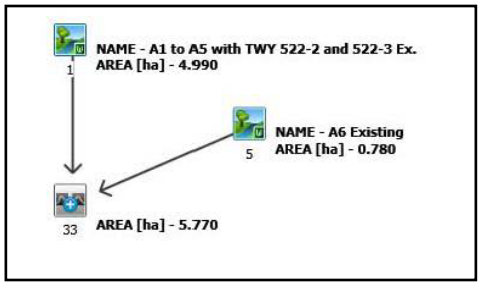
Ontario

PARSONS
625 COCHRANE DRIVE, SUITE 500
MARKHAM, ONTARIO L3R 9R9
TEL: 905-943-0500
FAX: 905-943-0400

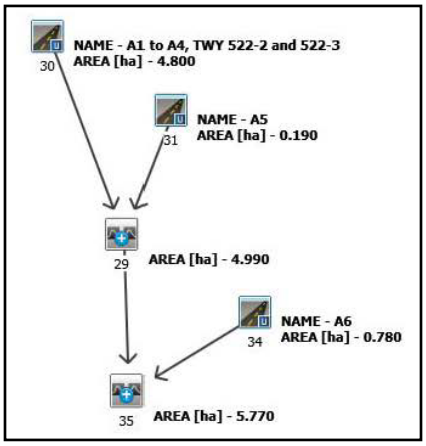
407 TRANSITWAY FROM KENNEDY RD TO BROCK RD

FIGURE 5.3 - PROPOSED STATION DONALD COUSENS PKWY AND SWMF - 3 DETAILS

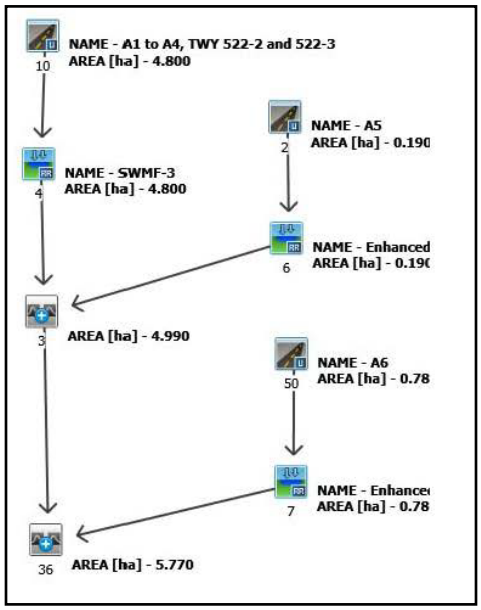
Visual OTTHYMO Modelling Schematic 5.3 – Donald Cousens Parkway Station



Existing Condition



Proposed (Uncontrolled) Condition



Proposed (Controlled) Condition

DONALD COUSENS PARKWAY STATION HYDROLOGIC ANALYSIS - EXISTING CONDITION

Input parameters

Proposed SWM Pond within subcatchment 511 - Rouge Watershed
Sub-watershed 511 - WillHYD

CN =	76.7	K=1.08 (hr)
Ia (mm)=	5	Tp= 0.916 (hr)
A tot-station (ha)=	5.77	

Table 5.3a: Donald Cousens Parkway Station Hydrologic Analysis - Existing Condition

Return Period	VO2 ID 33	
	EX Qp-12hr AES (m^3/s)	EX Qp-4hr CH (m^3/s)
2-yr	0.047	0.034
5-yr	0.078	0.061
10-yr	0.100	0.083
25-yr	0.131	0.113
50-yr	0.155	0.136
100-yr	0.179	0.162

DONALD COUSENS PARKWAY STATION HYDROLOGIC ANALYSIS - POST-DEVELOPMENT CONDITION

Table 5.3b: Donald Cousens Parkway Station SWMF-3 - Post-Development Condition Hydrologic Analysis (12 hr AES)

12hr AES	**Allowable Release Rates** VO2 ID 33 (A = 5.77 ha)	**Post-Development Condition (Uncontrolled)** VO2 ID 35 (A = 5.77 ha)	**Increase from Allowable to Post-Dev Uncontrolled**	**SWMF-3 POST-DEVELOPMENT CONDITION** VO2 ID 4 (A = 4.80 ha)		**Overall Post-Development (Controlled)** VO2 ID 36 (A = 5.77 ha)	**Decrease from Allowable to Post-Dev Controlled**
Return Period	**Qp** (m^3/s)	**Qp** (m^3/s)	**(%)**	**Storage Available** (m^3)	**Release Rate** (m^3/s)	**Qp** (m^3/s)	**(%)**
2-yr	0.047	0.278	491.49%	1483	0.010	0.018	-161.11%
5-yr	0.078	0.374	379.49%	1809	0.037	0.048	-62.50%
10-yr	0.100	0.437	337.00%	2050	0.046	0.059	-69.49%
25-yr	0.131	0.516	293.89%	2287	0.080	0.095	-37.89%
50-yr	0.155	0.574	270.32%	2439	0.113	0.130	-19.23%
100-yr	0.179	0.632	253.07%	2565	0.147	0.166	-7.83%

Table 5.3c: Donald Cousens Parkway Station SWMF-3 - Post-Development Condition Hydrologic Analysis (4 hr Chicago)

4hr Chicago	**Allowable Release Rates** VO2 ID 33 (A = 5.77 ha)	**Post-Development Condition (Uncontrolled)** VO2 ID 35 (A = 5.77 ha)	**Increase from Allowable to Post-Dev Uncontrolled**	**SWMF-3 POST-DEVELOPMENT CONDITION** VO2 ID 4 (A = 4.80 ha)		**Overall Post-Development (Controlled)** VO2 ID 36 (A = 5.77 ha)	**Decrease from Allowable to Post-Dev Controlled**
Return Period	**Qp** (m^3/s)	**Qp** (m^3/s)	**(%)**	**Storage Available** (m^3)	**Release Rate** (m^3/s)	**Qp** (m^3/s)	**(%)**
2-yr	0.034	0.887	2508.82%	1173	0.009	0.016	-112.50%
5-yr	0.061	1.294	2021.31%	1623	0.022	0.031	-96.77%
10-yr	0.083	1.551	1768.67%	1839	0.038	0.05	-66.00%
25-yr	0.113	1.902	1583.19%	2109	0.054	0.068	-66.18%
50-yr	0.136	2.226	1536.76%	2261	0.076	0.091	-49.45%
100-yr	0.162	2.498	1441.98%	2402	0.105	0.123	-31.71%

Table 5.3d: DONALD COUSENS PARKWAY STATION - Proposed SWMF-3 - Design Parameters

Pond Catchment Area 4.80 ha

Water Quality Storage Requirements

MOECC (2003, Table 3.2)

Level 1	265 m^3/ha	Interpolated from Table 3.2 (MOECC)		
Extended	40 m^3/ha	(or 25mm rainfall event whichever greater)	*192.00*	m^3
25 mm Event From OTTHYMO	19.75 mm		*948.00*	m^3
% imperviousness	90 %			
Permanent Volume Required			*1,080.00*	m^3

Quantity Control Required

Total Volume required up to and including the 100 yr storm		**2,565.00**	m^3
Total Pond Volume Required	(Permanent and Extended)	**3,645.00**	m^3

Settling Calculations MOECC Eq. 4.5

$$Dist = \sqrt{\frac{r \times Q_p}{V_s}}$$

Dist	6	Minimum Forebay length	m
r	1.57	Length to width ratio	-
Qp	0.01	Peak flow rate from the pond during design quality storm	m^3/s
Vs	0.0003	settling velocity'	m/s

Dispersion Length MOECC Eq. 4.6

$$Dist = \frac{8Q}{dV_f}$$

Minimum Width 1.91 m

Dist	15	Minimum Dispersion Length	
Q	0.310	Inlet Flow Rate	(5 year Storm)
d	1.1	Depth of the Permanent Pool	
Vf	0.15	Desired Velocity in the Forebay	

(0.15 m/s is the maximum permissible velocity before erosion occurs in a channel (MOECC))

Minimum Forebay Deep Zone Bottom Width MOECC Eq. 4.7

Width = Dist/8 Width 0.81 m

Design Quality Storm MOECC Eq 4.9

$$i_{25} = 43C + 5.9$$

A	4.8	Area	
C	90	Runoff Coefficient	
i	44.6	Intensity	mm/hr
Qp	0.54	Flow Rational Method	

Flow Velocity Check

Qd	0.31	Inlet Flow Rate	m^3/s
A	17.04	Crossectional Area	m^2
Vfb	0.018	Flow Velocity	m/s
	Yes	< 0.15	

Forebay Dimensions

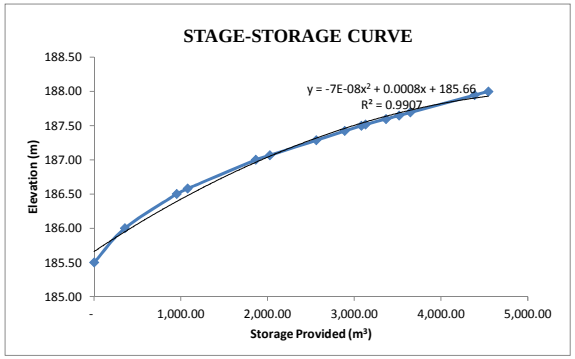
4:1	Average Side Slope	%
33.08	Top Length	m
16.45	Bottom Length	m
23.71	Average Top Width	m
7.84	Bottom Width	m
1.08	Average Depth of the Pool	m
296.18	Approximate Volume of the Pool	m^3
1080.00	Total Permanent Pool Volume	m^3
0.27	Forebay/Total Volume Ratio	
343.26	Forebay Area	m^2
1080.00	Total Permanent Pool Area	
0.32	Forebay/Total Area Ratio	
1.57	Average L/W Ratio Check	

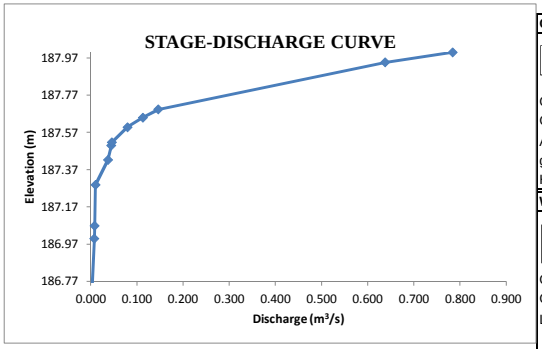
Forebay Cleanout Frequency

Ac	4.8	Contributing Area	(ha)
Ds	0.6	Maximum Sediment Depth	(m)
Vsf	295	Maximum Sediment Volume	(m^3)
a	30%	Impervious Level	%
da	0.6	Annual Sediment Loading	(m^3/ha/yr) (Table 6.3 MOECC Manual)
Fs	102.4	Forebay Cleanout Frequency	(years)
	75%	Target Maintenance TSS Removal Efficiency	

Table 5.3e: DONALD COUSENS PARKWAY STATION - Proposed SWMF-3 - Stage-Storage, Stage-Discharge Relationships and Outlet Structure Design

Elevation m	Forebay	Cell 2	Sec Area m^2	Avg Area m^2	Sec Volume m^3	Cumulative Volume	Fluctuation/ Extended Cum.Volume	Stage (m) Active	Storage (ha.m) Active	Discharge Orifice 1 186.58 0.075	Orifice 2 187.29 0.180	Weir 187.52 0.800	Overflow Weir 1.200	Total	Description
185.50		496.15	496.15		-	-									
186.00	113.00	924.47	924.47	710.3	355.15	355.15									
186.50	203.71	1265.16	1,468.88	1196.7	598.34	953.49									
186.58	343.26	1498.10	1,841.36	1655.1	132.41	***1,080.00***		0.00	0.0000	0.000				0.000	**Permanent Water Level**
187.00	435.48	1738.81	2,174.29	1821.6	910.79	1,864.28	784.28	0.42	0.0784	0.008				0.008	
187.07						2,028.00	948.00	0.49	0.0948	0.009				0.009	*25-mm*
187.29						2,563.00	1,483.00	0.71	0.1483	0.010	0.000			0.010	*2-yr*
187.42						2,889.00	1,809.00	0.84	0.1809	0.011	0.026			0.037	*5-yr*
187.50	594.45	2095.36	2,689.81	2432.0	1,216.02	3,080.31	2,000.31	0.92	0.2000	0.012	0.033			0.045	
187.52						3,130.00	2,050.00	0.94	0.2050	0.012	0.034	0.000		0.046	*10-yr*
187.60						3,367.00	2,287.00	1.02	0.2287	0.012	0.040	0.028		0.080	*25-yr*
187.65						3,518.00	2,438.00	1.07	0.2438	0.013	0.043	0.058		0.113	*50-yr*
187.69						3,645.00	2,565.00	1.11	0.2565	0.013	0.045	0.088	0.000	0.147	*100-yr*
187.95						4,386.00	3,306.00	1.37	0.3306	0.014	0.058	0.337	0.229	0.638	
188.00	728.68	2440.36	3,169.04	2929.4	1,464.71	4,545.02	3,465.02	1.42	0.3465	0.015	0.060	0.403	0.307	0.784	





Orifice Discharge

$$Q = C_d A\sqrt{2gH}$$

Q	Varies	Discharge	(m^3/s)
C_d	0.63	Discharge Coefficient	-
A	Varies	Area of Orifice	(m^2)
g	9.81	Gravitational Constant	(m/s^2)
H	Varies	Hydraulic Head	(m)

Weir Discharge

$$Q = C_d L H^{\frac{3}{2}}$$

Q	Varies	Discharge	(m^3/s)
C_d	1.5	Discharge Coefficient	-
L	0.800	Weir Length	(m)
			(m/s^2)
H	Varies	Hydraulic Head	m

Table 5.3f: DONALD COUSENS PARKWAY STATION - Proposed SWMF-3
25 mm Drawdown Time Calculations

Project: 407 TWY from Kennedy Rd. to Brock Rd.

C	0.63000		Extended Quality Volume:	948	m^3
Orifice	0.08400	m	Initial Head:	0.49	m
Area	0.00554	m^2	Detention:	48.00	hrs
				2,880.00	min

FALLING HEAD EQUATION

Time (min)	Head (m)	Q (m3/s)	Volume (m3)	Declining Volume Start	Declining Volume End
0	0.4873	0.0108	3.24	948.00	944.76
5	0.4857	0.0108	3.23	944.76	941.53
10	0.4840	0.0108	3.23	941.53	938.30
15	0.4823	0.0107	3.22	938.30	935.08
20	0.4807	0.0107	3.22	935.08	931.86
25	0.4790	0.0107	3.21	931.86	928.65
30	0.4774	0.0107	3.21	928.65	925.45
35	0.4757	0.0107	3.20	925.45	922.25
40	0.4741	0.0106	3.19	922.25	919.05
45	0.4724	0.0106	3.19	919.05	915.86
50	0.4708	0.0106	3.18	915.86	912.68
55	0.4692	0.0106	3.18	912.68	909.50
60	0.4675	0.0106	3.17	909.50	906.33
65	0.4659	0.0106	3.17	906.33	903.16
70	0.4643	0.0105	3.16	903.16	900.00
75	0.4626	0.0105	3.16	900.00	896.85
80	0.4610	0.0105	3.15	896.85	893.70
85	0.4594	0.0105	3.14	893.70	890.55
90	0.4578	0.0105	3.14	890.55	887.41
95	0.4562	0.0104	3.13	887.41	884.28
100	0.4546	0.0104	3.13	884.28	881.15
105	0.4530	0.0104	3.12	881.15	878.03
		-- B R E A K --			-
2860	0.0001	0.0001	0.04	7.33	7.29
2865	0.0000	0.0001	0.03	7.29	7.26
2870	0.0000	0.0001	0.03	7.26	7.23
2875	0.0000	0.0001	0.02	7.23	7.21
2880	0.0000			7.21	7.21

```
==========================================================================================================

       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat
  Output  filename: C:\Users\p004967b\AppData\Local\Temp\390aa3fa-fb13-4099-9d33-ada695760e90\Scenario.out
  Summary filename: C:\Users\p004967b\AppData\Local\Temp\390aa3fa-fb13-4099-9d33-ada695760e90\Scenario.sum


DATE: 10/06/2016                          TIME: 03:51:45

USER:


COMMENTS: _____________________________________________________________


----------------------------------------------------------------------------------------------------------
  ***************************
  ** SIMULATION NUMBER:   1 **
  ***************************


--------------------
|    READ STORM    |    Filename: C:\Users\p004967b\AppD
|                  |              ata\Local\Temp\
|                  |              390aa3fa-fb13-4099-9d33-ada695760e90\dfe01798
| Ptotal= 42.00 mm |    Comments: 2yr/12hr
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.25    0.00 |  3.50    7.14 |  6.75    2.94 | 10.00    0.42
                0.50    0.42 |  3.75    7.14 |  7.00    2.94 | 10.25    0.42
                0.75    0.42 |  4.00    7.14 |  7.25    2.94 | 10.50    0.42
                1.00    0.42 |  4.25    7.14 |  7.50    1.68 | 10.75    0.42
                1.25    0.42 |  4.50   19.32 |  7.75    1.68 | 11.00    0.42
                1.50    0.42 |  4.75   19.32 |  8.00    1.68 | 11.25    0.42
                1.75    0.42 |  5.00   19.32 |  8.25    1.68 | 11.50    0.42
                2.00    0.42 |  5.25   19.32 |  8.50    0.84 | 11.75    0.42
                2.25    0.42 |  5.50    5.46 |  8.75    0.84 | 12.00    0.42
                2.50    2.52 |  5.75    5.46 |  9.00    0.84 | 12.25    0.42
                2.75    2.52 |  6.00    5.46 |  9.25    0.84 |
                3.00    2.52 |  6.25    5.46 |  9.50    0.42 |
                3.25    2.52 |  6.50    2.94 |  9.75    0.42 |

----------------------------------------------------------------------------

--------------------
| CALIB            |
| WILHYD    (0001) |   Area    (ha)=   4.99   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 1.08
--------------------   U.H. Tp(hrs)=   0.92

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                           ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    0.00 | 3.167    2.52 | 6.250    5.46 |  9.33    0.42
               0.167    0.00 | 3.250    2.52 | 6.333    2.94 |  9.42    0.42
               0.250    0.00 | 3.333    7.14 | 6.417    2.94 |  9.50    0.42
               0.333    0.42 | 3.417    7.14 | 6.500    2.94 |  9.58    0.42
               0.417    0.42 | 3.500    7.14 | 6.583    2.94 |  9.67    0.42
               0.500    0.42 | 3.583    7.14 | 6.667    2.94 |  9.75    0.42
               0.583    0.42 | 3.667    7.14 | 6.750    2.94 |  9.83    0.42
               0.667    0.42 | 3.750    7.14 | 6.833    2.94 |  9.92    0.42
```

0.750	0.42	3.833	7.14	6.917	2.94	10.00	0.42
0.833	0.42	3.917	7.14	7.000	2.94	10.08	0.42
0.917	0.42	4.000	7.14	7.083	2.94	10.17	0.42
1.000	0.42	4.083	7.14	7.167	2.94	10.25	0.42
1.083	0.42	4.167	7.14	7.250	2.94	10.33	0.42
1.167	0.42	4.250	7.14	7.333	1.68	10.42	0.42
1.250	0.42	4.333	19.32	7.417	1.68	10.50	0.42
1.333	0.42	4.417	19.32	7.500	1.68	10.58	0.42
1.417	0.42	4.500	19.32	7.583	1.68	10.67	0.42
1.500	0.42	4.583	19.32	7.667	1.68	10.75	0.42
1.583	0.42	4.667	19.32	7.750	1.68	10.83	0.42
1.667	0.42	4.750	19.32	7.833	1.68	10.92	0.42
1.750	0.42	4.833	19.32	7.917	1.68	11.00	0.42
1.833	0.42	4.917	19.32	8.000	1.68	11.08	0.42
1.917	0.42	5.000	19.32	8.083	1.68	11.17	0.42
2.000	0.42	5.083	19.32	8.167	1.68	11.25	0.42
2.083	0.42	5.167	19.32	8.250	1.68	11.33	0.42
2.167	0.42	5.250	19.32	8.333	0.84	11.42	0.42
2.250	0.42	5.333	5.46	8.417	0.84	11.50	0.42
2.333	2.52	5.417	5.46	8.500	0.84	11.58	0.42
2.417	2.52	5.500	5.46	8.583	0.84	11.67	0.42
2.500	2.52	5.583	5.46	8.667	0.84	11.75	0.42
2.583	2.52	5.667	5.46	8.750	0.84	11.83	0.42
2.667	2.52	5.750	5.46	8.833	0.84	11.92	0.42
2.750	2.52	5.833	5.46	8.917	0.84	12.00	0.42
2.833	2.52	5.917	5.46	9.000	0.84	12.08	0.42
2.917	2.52	6.000	5.46	9.083	0.84	12.17	0.42
3.000	2.52	6.083	5.46	9.167	0.84	12.25	0.42
3.083	2.52	6.167	5.46	9.250	0.84		

U.H. peak (cms)= 0.17

PEAK FLOW (cms)= 0.04 (i)
TIME TO PEAK (hrs)= 6.08
RUNOFF VOLUME (mm)= 11.72
TOTAL RAINFALL (mm)= 42.00
RUNOFF COEFFICIENT = 0.28

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
WILHYD (0005)	Area (ha)=	0.78	Curve Number (CN)=	76.7
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	Recession const.(K)=	1.08
	U.H. Tp(hrs)=	0.92		

U.H. peak (cms)= 0.03

PEAK FLOW (cms)= 0.01 (i)
TIME TO PEAK (hrs)= 6.08
RUNOFF VOLUME (mm)= 10.59
TOTAL RAINFALL (mm)= 42.00
RUNOFF COEFFICIENT = 0.25

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0033)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0001):	4.99	0.041	6.08	11.72
	+ ID2= 2 (0005):	0.78	0.006	6.08	10.59
	ID = 3 (0033):	5.77	0.047	6.08	11.57

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB				
STANDHYD (0030)	Area (ha)=	4.80		
ID= 1 DT= 5.0 min	Total Imp(%)=	90.00	Dir. Conn.(%)=	50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	4.32	0.48
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.00	1.00
Length	(m)=	178.89	40.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		19.32	83.93
over (min)		5.00	20.00
Storage Coeff. (min)=		6.99 (ii)	16.31 (ii)

```
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.17         0.06
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.13         0.10          0.230 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25           5.25
     RUNOFF VOLUME    (mm)=      41.90        29.79          35.84
     TOTAL RAINFALL   (mm)=      42.00        42.00          42.00
     RUNOFF COEFFICIENT   =       1.00         0.71           0.85


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0031) |   Area    (ha)=   0.19
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.17         0.02
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      35.59        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        83.93
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       2.45 (ii)   11.07 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.30         0.09
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.009 (iii)
     TIME TO PEAK    (hrs)=       4.75         5.25           5.25
     RUNOFF VOLUME    (mm)=      41.00        29.79          35.36
     TOTAL RAINFALL   (mm)=      42.00        42.00          42.00
     RUNOFF COEFFICIENT   =       0.98         0.71           0.84

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0029) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0030):     4.80   0.230     5.25    35.84
       + ID2= 2 (0031):     0.19   0.009     5.25    35.36
         ================================================
         ID = 3 (0029):     4.99   0.240     5.25    35.82

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0034) |   Area    (ha)=   0.78
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.70         0.08
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      72.11        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        83.93
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       4.05 (ii)   13.37 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.24         0.08
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.02          0.038 (iii)
     TIME TO PEAK    (hrs)=       5.08         5.25           5.25
     RUNOFF VOLUME    (mm)=      41.00        29.79          35.39
```

```
     TOTAL RAINFALL   (mm)=      42.00        42.00          42.00
     RUNOFF COEFFICIENT   =       0.98         0.71           0.84

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0035) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0029):     4.99   0.240     5.25    35.82
        + ID2= 2 (0034):     0.78   0.038     5.25    35.39
          ================================================
          ID = 3 (0035):     5.77   0.278     5.25    35.76

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0010) |   Area    (ha)=   4.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.32         0.48
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     178.89        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        83.93
               over (min)        5.00        20.00
     Storage Coeff.  (min)=       6.99 (ii)   16.31 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.17         0.06
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.13         0.10          0.230 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25           5.25
     RUNOFF VOLUME    (mm)=      41.90        29.79          35.84
     TOTAL RAINFALL   (mm)=      42.00        42.00          42.00
     RUNOFF COEFFICIENT   =       1.00         0.71           0.85


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0004) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0800      0.2287
                         0.0080     0.0784   |   0.1130      0.2438
                         0.0090     0.0948   |   0.1470      0.2565
                         0.0100     0.1483   |   0.2210      0.2733
                         0.0370     0.1809   |   0.6370      0.3305
                         0.0450     0.2000   |   0.6380      0.3306
                         0.0460     0.2050   |   0.7840      0.3465
                         0.0790     0.2285   |   0.0000      0.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0010)      4.800      0.230      5.25      35.84
     OUTFLOW: ID= 1 (0004)      4.800      0.010      9.33      35.32

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  4.35
                   TIME SHIFT OF PEAK FLOW         (min)=245.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.1483

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   0.19
```

```
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
-------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.17         0.02
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      35.59        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        83.93
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       2.45 (ii)   11.07 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.30         0.09
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.00          0.009 (iii)
     TIME TO PEAK    (hrs)=       4.75         5.25           5.25
     RUNOFF VOLUME    (mm)=      41.00        29.79          35.36
     TOTAL RAINFALL   (mm)=      42.00        42.00          42.00
     RUNOFF COEFFICIENT   =       0.98         0.71           0.84

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0006) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0002)      0.190      0.009      5.25      35.36
     OUTFLOW: ID= 1 (0006)      0.190      0.002      6.67      31.71

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 17.38
                   TIME SHIFT OF PEAK FLOW         (min)= 85.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.0045

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--------------------
| ADD HYD   (0003) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0004):     4.80   0.010     9.33    35.32
        + ID2= 2 (0006):     0.19   0.002     6.67    31.71
          ================================================
          ID = 3 (0003):     4.99   0.012     7.83    35.19

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0050) |   Area    (ha)=   0.78
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.70         0.08
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      72.11        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        83.93
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       4.05 (ii)   13.37 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.24         0.08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.02         0.02          0.038 (iii)
     TIME TO PEAK    (hrs)=       5.08         5.25           5.25
     RUNOFF VOLUME    (mm)=      41.00        29.79          35.39
     TOTAL RAINFALL   (mm)=      42.00        42.00          42.00
     RUNOFF COEFFICIENT   =       0.98         0.71           0.84
```

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR (0007)
IN= 2---> OUT= 1
DT= 5.0 min

	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0150	0.0413

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0050)	0.780	0.038	5.25	35.39
OUTFLOW: ID= 1 (0007)	0.780	0.007	6.67	34.50

PEAK FLOW REDUCTION [Qout/Qin](%)= 17.48
TIME SHIFT OF PEAK FLOW (min)= 85.00
MAXIMUM STORAGE USED (ha.m.)= 0.0183

ADD HYD (0036)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0003):	4.99	0.012	7.83	35.19
+ ID2= 2 (0007):	0.78	0.007	6.67	34.50
ID = 3 (0036):	5.77	0.018	7.33	35.09

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

****
** SIMULATION NUMBER: 2 **
****

READ STORM
Ptotal= 54.38 mm

Filename: C:\Users\p004967b\AppData\Local\Temp\390aa3fa-fb13-4099-9d33-ada695760e90\f34ac046
Comments: 5yr/12hr

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	0.00	3.50	9.25	6.75	3.81	10.00	0.54
0.50	0.54	3.75	9.25	7.00	3.81	10.25	0.54
0.75	0.54	4.00	9.25	7.25	3.81	10.50	0.54
1.00	0.54	4.25	9.25	7.50	2.18	10.75	0.54
1.25	0.54	4.50	25.02	7.75	2.18	11.00	0.54
1.50	0.54	4.75	25.02	8.00	2.18	11.25	0.54
1.75	0.54	5.00	25.02	8.25	2.18	11.50	0.54
2.00	0.54	5.25	25.02	8.50	1.09	11.75	0.54
2.25	0.54	5.50	7.07	8.75	1.09	12.00	0.54
2.50	3.26	5.75	7.07	9.00	1.09	12.25	0.54
2.75	3.26	6.00	7.07	9.25	1.09		
3.00	3.26	6.25	7.07	9.50	0.54		
3.25	3.26	6.50	3.81	9.75	0.54		

CALIB
WILHYD (0001)
ID= 1 DT= 5.0 min

Area (ha)= 4.99 Curve Number (CN)= 76.7
Ia (mm)= 5.00 Recession const.(K)= 1.08
U.H. Tp(hrs)= 0.92

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	3.26	6.250	7.07	9.33	0.54
0.167	0.00	3.250	3.26	6.333	3.81	9.42	0.54
0.250	0.00	3.333	9.25	6.417	3.81	9.50	0.54
0.333	0.54	3.417	9.25	6.500	3.81	9.58	0.54

0.417	0.54	3.500	9.25	6.583	3.81	9.67	0.54
0.500	0.54	3.583	9.25	6.667	3.81	9.75	0.54
0.583	0.54	3.667	9.25	6.750	3.81	9.83	0.54
0.667	0.54	3.750	9.25	6.833	3.81	9.92	0.54
0.750	0.54	3.833	9.25	6.917	3.81	10.00	0.54
0.833	0.54	3.917	9.25	7.000	3.81	10.08	0.54
0.917	0.54	4.000	9.25	7.083	3.81	10.17	0.54
1.000	0.54	4.083	9.25	7.167	3.81	10.25	0.54
1.083	0.54	4.167	9.25	7.250	3.81	10.33	0.54
1.167	0.54	4.250	9.25	7.333	2.18	10.42	0.54
1.250	0.54	4.333	25.02	7.417	2.18	10.50	0.54
1.333	0.54	4.417	25.02	7.500	2.18	10.58	0.54
1.417	0.54	4.500	25.02	7.583	2.18	10.67	0.54
1.500	0.54	4.583	25.02	7.667	2.18	10.75	0.54
1.583	0.54	4.667	25.02	7.750	2.18	10.83	0.54
1.667	0.54	4.750	25.02	7.833	2.18	10.92	0.54
1.750	0.54	4.833	25.02	7.917	2.18	11.00	0.54
1.833	0.54	4.917	25.02	8.000	2.18	11.08	0.54
1.917	0.54	5.000	25.02	8.083	2.18	11.17	0.54
2.000	0.54	5.083	25.02	8.167	2.18	11.25	0.54
2.083	0.54	5.167	25.02	8.250	2.18	11.33	0.54
2.167	0.54	5.250	25.02	8.333	1.09	11.42	0.54
2.250	0.54	5.333	7.07	8.417	1.09	11.50	0.54
2.333	3.26	5.417	7.07	8.500	1.09	11.58	0.54
2.417	3.26	5.500	7.07	8.583	1.09	11.67	0.54
2.500	3.26	5.583	7.07	8.667	1.09	11.75	0.54
2.583	3.26	5.667	7.07	8.750	1.09	11.83	0.54
2.667	3.26	5.750	7.07	8.833	1.09	11.92	0.54
2.750	3.26	5.833	7.07	8.917	1.09	12.00	0.54
2.833	3.26	5.917	7.07	9.000	1.09	12.08	0.54
2.917	3.26	6.000	7.07	9.083	1.09	12.17	0.54
3.000	3.26	6.083	7.07	9.167	1.09	12.25	0.54
3.083	3.26	6.167	7.07	9.250	1.09		

U.H. peak (cms)= 0.17

PEAK FLOW (cms)= 0.07 (i)
TIME TO PEAK (hrs)= 6.00
RUNOFF VOLUME (mm)= 18.99
TOTAL RAINFALL (mm)= 54.38
RUNOFF COEFFICIENT = 0.35

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB				
WILHYD (0005)	Area (ha)= 0.78	Curve Number (CN)= 76.7		
ID= 1 DT= 5.0 min	Ia (mm)= 5.00	Recession const.(K)= 1.08		
	U.H. Tp(hrs)= 0.92			

U.H. peak (cms)= 0.03

PEAK FLOW (cms)= 0.01 (i)
TIME TO PEAK (hrs)= 6.00
RUNOFF VOLUME (mm)= 18.05
TOTAL RAINFALL (mm)= 54.38
RUNOFF COEFFICIENT = 0.33

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0033)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0001):	4.99	0.067	6.00	18.99
+ ID2= 2 (0005):	0.78	0.010	6.00	18.05
ID = 3 (0033):	5.77	0.078	6.00	18.86

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB			
STANDHYD (0030)	Area (ha)= 4.80		
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00	Dir. Conn.(%)= 50.00	

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	4.32	0.48
Dep. Storage (mm)=	0.10	5.00
Average Slope (%)=	1.00	1.00
Length (m)=	178.89	40.00
Mannings n =	0.013	0.250

```
     Max.Eff.Inten.(mm/hr)=      25.02       113.61
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       6.30 (ii)   14.56 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.19         0.08
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.17         0.14     0.310 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25      5.25
     RUNOFF VOLUME    (mm)=      54.28        41.41     47.84
     TOTAL RAINFALL   (mm)=      54.38        54.38     54.38
     RUNOFF COEFFICIENT   =       1.00         0.76      0.88


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0031) |   Area    (ha)=   0.19
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.17         0.02
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      35.59        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02       113.61
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       2.21 (ii)    9.84 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.30         0.11
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.01     0.012 (iii)
     TIME TO PEAK    (hrs)=       4.75         5.25      5.25
     RUNOFF VOLUME    (mm)=      53.38        41.41     47.37
     TOTAL RAINFALL   (mm)=      54.38        54.38     54.38
     RUNOFF COEFFICIENT   =       0.98         0.76      0.87

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0029) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0030):     4.80   0.310     5.25    47.84
        + ID2= 2 (0031):     0.19   0.012     5.25    47.37
          ================================================
          ID = 3 (0029):     4.99   0.323     5.25    47.82

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0034) |   Area    (ha)=   0.78
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.70         0.08
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      72.11        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02       113.61
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       3.65 (ii)   11.91 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.25         0.09
```

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                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.02          0.051 (iii)
     TIME TO PEAK    (hrs)=       5.00         5.25           5.25
     RUNOFF VOLUME    (mm)=      53.38        41.41          47.39
     TOTAL RAINFALL   (mm)=      54.38        54.38          54.38
     RUNOFF COEFFICIENT   =       0.98         0.76           0.87

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0035) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0029):     4.99   0.323     5.25    47.82
       + ID2= 2 (0034):     0.78   0.051     5.25    47.39
         ================================================
         ID = 3 (0035):     5.77   0.374     5.25    47.77

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0010) |   Area    (ha)=   4.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.32         0.48
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     178.89        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02       113.61
               over (min)        5.00         15.00
     Storage Coeff.  (min)=       6.30 (ii)   14.56 (ii)
     Unit Hyd. Tpeak (min)=       5.00         15.00
     Unit Hyd. peak  (cms)=       0.19         0.08
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.17         0.14          0.310 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25           5.25
     RUNOFF VOLUME    (mm)=      54.28        41.41          47.84
     TOTAL RAINFALL   (mm)=      54.38        54.38          54.38
     RUNOFF COEFFICIENT   =       1.00         0.76           0.88


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0004) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000    |   0.0800      0.2287
                         0.0080     0.0784    |   0.1130      0.2438
                         0.0090     0.0948    |   0.1470      0.2565
                         0.0100     0.1483    |   0.2210      0.2733
                         0.0370     0.1809    |   0.6370      0.3305
                         0.0450     0.2000    |   0.6380      0.3306
                         0.0460     0.2050    |   0.7840      0.3465
                         0.0790     0.2285    |   0.0000      0.0000

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0010)     4.800      0.310      5.25      47.84
     OUTFLOW: ID= 1 (0004)     4.800      0.037      7.42      47.32

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 11.91
                  TIME SHIFT OF PEAK FLOW         (min)=130.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.1809
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--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   0.19
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.17         0.02
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      35.59        40.00
     Mannings n            =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02       113.61
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.21 (ii)    9.84 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.30         0.11
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.01         0.012 (iii)
     TIME TO PEAK    (hrs)=       4.75         5.25          5.25
     RUNOFF VOLUME    (mm)=      53.38        41.41         47.37
     TOTAL RAINFALL   (mm)=      54.38        54.38         54.38
     RUNOFF COEFFICIENT   =       0.98         0.76          0.87

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0006) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0002)      0.190      0.012      5.25      47.37
     OUTFLOW: ID= 1 (0006)      0.190      0.002      6.50      43.71

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)= 17.48
                    TIME SHIFT OF PEAK FLOW         (min)= 75.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.0060

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--------------------
| ADD HYD   (0003) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0004):     4.80   0.037     7.42    47.32
        + ID2= 2 (0006):     0.19   0.002     6.50    43.71
          ================================================
          ID = 3 (0003):     4.99   0.039     7.42    47.19

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0050) |   Area    (ha)=   0.78
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.70         0.08
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      72.11        40.00
     Mannings n            =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02       113.61
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       3.65 (ii)   11.91 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.25         0.09
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.02         0.051 (iii)
     TIME TO PEAK    (hrs)=       5.00         5.25          5.25
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     RUNOFF VOLUME    (mm)=      53.38        41.41          47.39
     TOTAL RAINFALL   (mm)=      54.38        54.38          54.38
     RUNOFF COEFFICIENT   =       0.98         0.76           0.87

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0007) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0413

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0050)      0.780      0.051      5.25      47.39
     OUTFLOW: ID= 1 (0007)      0.780      0.009      6.58      46.49

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)= 17.60
                    TIME SHIFT OF PEAK FLOW         (min)= 80.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.0246

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--------------------
| ADD HYD   (0036) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0003):     4.99   0.039     7.42    47.19
        + ID2= 2 (0007):     0.78   0.009     6.58    46.49
          ================================================
          ID = 3 (0036):     5.77   0.048     7.42    47.09

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ***************************
  ** SIMULATION NUMBER:   3 **
  ***************************



--------------------
|    READ STORM    |    Filename: C:\Users\p004967b\AppD
|                  |              ata\Local\Temp\
|                  |              390aa3fa-fb13-4099-9d33-ada695760e90\1fd331e2
| Ptotal= 62.71 mm |    Comments: 10yr/12hr
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.25    0.00 |  3.50   10.66 |  6.75    4.39 | 10.00    0.63
                0.50    0.63 |  3.75   10.66 |  7.00    4.39 | 10.25    0.63
                0.75    0.63 |  4.00   10.66 |  7.25    4.39 | 10.50    0.63
                1.00    0.63 |  4.25   10.66 |  7.50    2.51 | 10.75    0.63
                1.25    0.63 |  4.50   28.84 |  7.75    2.51 | 11.00    0.63
                1.50    0.63 |  4.75   28.84 |  8.00    2.51 | 11.25    0.63
                1.75    0.63 |  5.00   28.84 |  8.25    2.51 | 11.50    0.63
                2.00    0.63 |  5.25   28.84 |  8.50    1.25 | 11.75    0.63
                2.25    0.63 |  5.50    8.15 |  8.75    1.25 | 12.00    0.63
                2.50    3.76 |  5.75    8.15 |  9.00    1.25 | 12.25    0.63
                2.75    3.76 |  6.00    8.15 |  9.25    1.25 |
                3.00    3.76 |  6.25    8.15 |  9.50    0.63 |
                3.25    3.76 |  6.50    4.39 |  9.75    0.63 |

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--------------------
| CALIB            |
| WILHYD    (0001) |   Area    (ha)=   4.99   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 1.08
--------------------   U.H. Tp(hrs)=   0.92

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                           ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
```

0.083	0.00	3.167	3.76	6.250	8.15	9.33	0.63
0.167	0.00	3.250	3.76	6.333	4.39	9.42	0.63
0.250	0.00	3.333	10.66	6.417	4.39	9.50	0.63
0.333	0.63	3.417	10.66	6.500	4.39	9.58	0.63
0.417	0.63	3.500	10.66	6.583	4.39	9.67	0.63
0.500	0.63	3.583	10.66	6.667	4.39	9.75	0.63
0.583	0.63	3.667	10.66	6.750	4.39	9.83	0.63
0.667	0.63	3.750	10.66	6.833	4.39	9.92	0.63
0.750	0.63	3.833	10.66	6.917	4.39	10.00	0.63
0.833	0.63	3.917	10.66	7.000	4.39	10.08	0.63
0.917	0.63	4.000	10.66	7.083	4.39	10.17	0.63
1.000	0.63	4.083	10.66	7.167	4.39	10.25	0.63
1.083	0.63	4.167	10.66	7.250	4.39	10.33	0.63
1.167	0.63	4.250	10.66	7.333	2.51	10.42	0.63
1.250	0.63	4.333	28.84	7.417	2.51	10.50	0.63
1.333	0.63	4.417	28.84	7.500	2.51	10.58	0.63
1.417	0.63	4.500	28.84	7.583	2.51	10.67	0.63
1.500	0.63	4.583	28.84	7.667	2.51	10.75	0.63
1.583	0.63	4.667	28.84	7.750	2.51	10.83	0.63
1.667	0.63	4.750	28.84	7.833	2.51	10.92	0.63
1.750	0.63	4.833	28.84	7.917	2.51	11.00	0.63
1.833	0.63	4.917	28.84	8.000	2.51	11.08	0.63
1.917	0.63	5.000	28.84	8.083	2.51	11.17	0.63
2.000	0.63	5.083	28.84	8.167	2.51	11.25	0.63
2.083	0.63	5.167	28.84	8.250	2.51	11.33	0.63
2.167	0.63	5.250	28.84	8.333	1.25	11.42	0.63
2.250	0.63	5.333	8.15	8.417	1.25	11.50	0.63
2.333	3.76	5.417	8.15	8.500	1.25	11.58	0.63
2.417	3.76	5.500	8.15	8.583	1.25	11.67	0.63
2.500	3.76	5.583	8.15	8.667	1.25	11.75	0.63
2.583	3.76	5.667	8.15	8.750	1.25	11.83	0.63
2.667	3.76	5.750	8.15	8.833	1.25	11.92	0.63
2.750	3.76	5.833	8.15	8.917	1.25	12.00	0.63
2.833	3.76	5.917	8.15	9.000	1.25	12.08	0.63
2.917	3.76	6.000	8.15	9.083	1.25	12.17	0.63
3.000	3.76	6.083	8.15	9.167	1.25	12.25	0.63
3.083	3.76	6.167	8.15	9.250	1.25		

U.H. peak (cms)= 0.17

PEAK FLOW (cms)= 0.09 (i)
TIME TO PEAK (hrs)= 6.00
RUNOFF VOLUME (mm)= 24.40
TOTAL RAINFALL (mm)= 62.71
RUNOFF COEFFICIENT = 0.39

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
WILHYD (0005)	Area (ha)=	0.78	Curve Number (CN)=	76.7
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	Recession const.(K)=	1.08
	U.H. Tp(hrs)=	0.92		

U.H. peak (cms)= 0.03

PEAK FLOW (cms)= 0.01 (i)
TIME TO PEAK (hrs)= 6.00
RUNOFF VOLUME (mm)= 23.37
TOTAL RAINFALL (mm)= 62.71
RUNOFF COEFFICIENT = 0.37

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0033)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0001):	4.99	0.087	6.00	24.40
+ ID2= 2 (0005):	0.78	0.014	6.00	23.37
ID = 3 (0033):	5.77	0.100	6.00	24.26

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB					
STANDHYD (0030)	Area (ha)=	4.80		
ID= 1 DT= 5.0 min	Total Imp(%)=	90.00	Dir. Conn.(%)=	50.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	4.32	0.48

```
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     178.89        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84       133.44
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       5.96 (ii)   13.70 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.19         0.08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.19         0.17       0.363 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25        5.25
     RUNOFF VOLUME    (mm)=      62.61        49.36       55.99
     TOTAL RAINFALL   (mm)=      62.71        62.71       62.71
     RUNOFF COEFFICIENT   =       1.00         0.79        0.89


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0031) |   Area    (ha)=   0.19
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.17         0.02
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      35.59        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84       133.44
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.09 (ii)    9.25 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.31         0.12
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.01       0.015 (iii)
     TIME TO PEAK    (hrs)=       4.75         5.25        5.25
     RUNOFF VOLUME    (mm)=      61.71        49.37       55.51
     TOTAL RAINFALL   (mm)=      62.71        62.71       62.71
     RUNOFF COEFFICIENT   =       0.98         0.79        0.89

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0029) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0030):     4.80   0.363     5.25    55.99
       + ID2= 2 (0031):     0.19   0.015     5.25    55.51
         ================================================
         ID = 3 (0029):     4.99   0.377     5.25    55.97

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0034) |   Area    (ha)=   0.78
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.70         0.08
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      72.11        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84       133.44
```

```
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       3.45 (ii)   11.19 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.26         0.09
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.03         0.059 (iii)
     TIME TO PEAK    (hrs)=       5.00         5.25          5.25
     RUNOFF VOLUME    (mm)=      61.71        49.37         55.53
     TOTAL RAINFALL   (mm)=      62.71        62.71         62.71
     RUNOFF COEFFICIENT   =       0.98         0.79          0.89

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0035) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0029):     4.99   0.377     5.25    55.97
        + ID2= 2 (0034):     0.78   0.059     5.25    55.53
          ================================================
          ID = 3 (0035):     5.77   0.437     5.25    55.91

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0010) |   Area    (ha)=   4.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.32         0.48
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     178.89        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84       133.44
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       5.96 (ii)   13.70 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.19         0.08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.19         0.17         0.363 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25          5.25
     RUNOFF VOLUME    (mm)=      62.61        49.36         55.99
     TOTAL RAINFALL   (mm)=      62.71        62.71         62.71
     RUNOFF COEFFICIENT   =       1.00         0.79          0.89


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0004) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0800      0.2287
                         0.0080     0.0784   |   0.1130      0.2438
                         0.0090     0.0948   |   0.1470      0.2565
                         0.0100     0.1483   |   0.2210      0.2733
                         0.0370     0.1809   |   0.6370      0.3305
                         0.0450     0.2000   |   0.6380      0.3306
                         0.0460     0.2050   |   0.7840      0.3465
                         0.0790     0.2285   |   0.0000      0.0000

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0010)     4.800      0.363      5.25      55.99
     OUTFLOW: ID= 1 (0004)     4.800      0.046      7.42      55.47
```

```
                    PEAK   FLOW   REDUCTION [Qout/Qin](%)= 12.67
                    TIME SHIFT OF PEAK FLOW         (min)=130.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.2050

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   0.19
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.17         0.02
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      35.59        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84       133.44
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.09 (ii)    9.25 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.31         0.12
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.01          0.015 (iii)
     TIME TO PEAK    (hrs)=       4.75         5.25           5.25
     RUNOFF VOLUME    (mm)=      61.71        49.37          55.51
     TOTAL RAINFALL   (mm)=      62.71        62.71          62.71
     RUNOFF COEFFICIENT   =       0.98         0.79           0.89

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0006) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0002)      0.190      0.015      5.25       55.51
     OUTFLOW: ID= 1 (0006)      0.190      0.003      6.50       51.88

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)= 17.59
                    TIME SHIFT OF PEAK FLOW         (min)= 75.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.0070

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0003) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0004):     4.80   0.046     7.42    55.47
        + ID2= 2 (0006):     0.19   0.003     6.50    51.88
          ================================================
          ID = 3 (0003):     4.99   0.049     7.33    55.33

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0050) |   Area    (ha)=   0.78
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.70         0.08
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      72.11        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84       133.44
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       3.45 (ii)   11.19 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
```

```
     Unit Hyd. peak  (cms)=       0.26         0.09
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.03          0.059 (iii)
     TIME TO PEAK    (hrs)=       5.00         5.25           5.25
     RUNOFF VOLUME    (mm)=      61.71        49.37          55.53
     TOTAL RAINFALL   (mm)=      62.71        62.71          62.71
     RUNOFF COEFFICIENT   =       0.98         0.79           0.89

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0007) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0050)      0.780      0.059      5.25       55.53
     OUTFLOW: ID= 1 (0007)      0.780      0.010      6.58       54.64

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)= 17.68
                    TIME SHIFT OF PEAK FLOW         (min)= 80.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.0288

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--------------------
| ADD HYD   (0036) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0003):     4.99   0.049     7.33    55.33
        + ID2= 2 (0007):     0.78   0.010     6.58    54.64
          ================================================
          ID = 3 (0036):     5.77   0.059     7.33    55.24

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ****************************
  ** SIMULATION NUMBER:   4 **
  ****************************



--------------------
|    READ STORM    |    Filename: C:\Users\p004967b\AppD
|                  |              ata\Local\Temp\
|                  |              390aa3fa-fb13-4099-9d33-ada695760e90\752e8fb9
| Ptotal= 73.10 mm |    Comments: 25yr/12hr
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.25    0.00 |  3.50   12.43 |  6.75    5.12 | 10.00    0.73
                0.50    0.73 |  3.75   12.43 |  7.00    5.12 | 10.25    0.73
                0.75    0.73 |  4.00   12.43 |  7.25    5.12 | 10.50    0.73
                1.00    0.73 |  4.25   12.43 |  7.50    2.92 | 10.75    0.73
                1.25    0.73 |  4.50   33.63 |  7.75    2.92 | 11.00    0.73
                1.50    0.73 |  4.75   33.63 |  8.00    2.92 | 11.25    0.73
                1.75    0.73 |  5.00   33.63 |  8.25    2.92 | 11.50    0.73
                2.00    0.73 |  5.25   33.63 |  8.50    1.46 | 11.75    0.73
                2.25    0.73 |  5.50    9.50 |  8.75    1.46 | 12.00    0.73
                2.50    4.39 |  5.75    9.50 |  9.00    1.46 | 12.25    0.73
                2.75    4.39 |  6.00    9.50 |  9.25    1.46 |
                3.00    4.39 |  6.25    9.50 |  9.50    0.73 |
                3.25    4.39 |  6.50    5.12 |  9.75    0.73 |

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--------------------
| CALIB            |
| WILHYD    (0001) |   Area    (ha)=   4.99   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 1.08
--------------------   U.H. Tp(hrs)=   0.92

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	4.39	6.250	9.50	9.33	0.73
0.167	0.00	3.250	4.39	6.333	5.12	9.42	0.73
0.250	0.00	3.333	12.43	6.417	5.12	9.50	0.73
0.333	0.73	3.417	12.43	6.500	5.12	9.58	0.73
0.417	0.73	3.500	12.43	6.583	5.12	9.67	0.73
0.500	0.73	3.583	12.43	6.667	5.12	9.75	0.73
0.583	0.73	3.667	12.43	6.750	5.12	9.83	0.73
0.667	0.73	3.750	12.43	6.833	5.12	9.92	0.73
0.750	0.73	3.833	12.43	6.917	5.12	10.00	0.73
0.833	0.73	3.917	12.43	7.000	5.12	10.08	0.73
0.917	0.73	4.000	12.43	7.083	5.12	10.17	0.73
1.000	0.73	4.083	12.43	7.167	5.12	10.25	0.73
1.083	0.73	4.167	12.43	7.250	5.12	10.33	0.73
1.167	0.73	4.250	12.43	7.333	2.92	10.42	0.73
1.250	0.73	4.333	33.63	7.417	2.92	10.50	0.73
1.333	0.73	4.417	33.63	7.500	2.92	10.58	0.73
1.417	0.73	4.500	33.63	7.583	2.92	10.67	0.73
1.500	0.73	4.583	33.63	7.667	2.92	10.75	0.73
1.583	0.73	4.667	33.63	7.750	2.92	10.83	0.73
1.667	0.73	4.750	33.63	7.833	2.92	10.92	0.73
1.750	0.73	4.833	33.63	7.917	2.92	11.00	0.73
1.833	0.73	4.917	33.63	8.000	2.92	11.08	0.73
1.917	0.73	5.000	33.63	8.083	2.92	11.17	0.73
2.000	0.73	5.083	33.63	8.167	2.92	11.25	0.73
2.083	0.73	5.167	33.63	8.250	2.92	11.33	0.73
2.167	0.73	5.250	33.63	8.333	1.46	11.42	0.73
2.250	0.73	5.333	9.50	8.417	1.46	11.50	0.73
2.333	4.39	5.417	9.50	8.500	1.46	11.58	0.73
2.417	4.39	5.500	9.50	8.583	1.46	11.67	0.73
2.500	4.39	5.583	9.50	8.667	1.46	11.75	0.73
2.583	4.39	5.667	9.50	8.750	1.46	11.83	0.73
2.667	4.39	5.750	9.50	8.833	1.46	11.92	0.73
2.750	4.39	5.833	9.50	8.917	1.46	12.00	0.73
2.833	4.39	5.917	9.50	9.000	1.46	12.08	0.73
2.917	4.39	6.000	9.50	9.083	1.46	12.17	0.73
3.000	4.39	6.083	9.50	9.167	1.46	12.25	0.73
3.083	4.39	6.167	9.50	9.250	1.46		

U.H. peak (cms)= 0.17

PEAK FLOW (cms)= 0.11 (i)
TIME TO PEAK (hrs)= 6.00
RUNOFF VOLUME (mm)= 31.61
TOTAL RAINFALL (mm)= 73.10
RUNOFF COEFFICIENT = 0.43

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
WILHYD (0005)	Area (ha)=	0.78	Curve Number (CN)= 76.7
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	Recession const.(K)= 1.08
	U.H. Tp(hrs)=	0.92	

U.H. peak (cms)= 0.03

PEAK FLOW (cms)= 0.02 (i)
TIME TO PEAK (hrs)= 6.00
RUNOFF VOLUME (mm)= 30.50
TOTAL RAINFALL (mm)= 73.10
RUNOFF COEFFICIENT = 0.42

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0033)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0001):	4.99	0.113	6.00	31.61
+ ID2= 2 (0005):	0.78	0.018	6.00	30.50
ID = 3 (0033):	5.77	0.131	6.00	31.46

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB		
STANDHYD (0030)	Area (ha)=	4.80

```
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.32         0.48
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     178.89        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63       158.21
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       5.60 (ii)   12.83 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.20         0.08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.22         0.20         0.428 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25          5.25
     RUNOFF VOLUME    (mm)=      73.00        59.39         66.19
     TOTAL RAINFALL   (mm)=      73.10        73.10         73.10
     RUNOFF COEFFICIENT   =       1.00         0.81          0.91


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0031) |   Area    (ha)=   0.19
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.17         0.02
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      35.59        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63       158.21
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       1.96 (ii)    8.65 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.31         0.12
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.01         0.017 (iii)
     TIME TO PEAK    (hrs)=       4.67         5.25          5.25
     RUNOFF VOLUME    (mm)=      72.10        59.39         65.71
     TOTAL RAINFALL   (mm)=      73.10        73.10         73.10
     RUNOFF COEFFICIENT   =       0.99         0.81          0.90

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0029) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0030):     4.80   0.428     5.25    66.19
        + ID2= 2 (0031):     0.19   0.017     5.25    65.71
          ================================================
          ID = 3 (0029):     4.99   0.446     5.25    66.17

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0034) |   Area    (ha)=   0.78
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.70         0.08
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         1.00
```

```
     Length           (m)=      72.11        40.00
     Mannings n          =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63       158.21
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       3.25 (ii)   10.48 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.27         0.09
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.03         0.070 (iii)
     TIME TO PEAK    (hrs)=       5.00         5.25          5.25
     RUNOFF VOLUME    (mm)=      72.10        59.39         65.74
     TOTAL RAINFALL   (mm)=      73.10        73.10         73.10
     RUNOFF COEFFICIENT   =       0.99         0.81          0.90

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0035) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0029):     4.99   0.446     5.25    66.17
        + ID2= 2 (0034):     0.78   0.070     5.25    65.74
          ================================================
          ID = 3 (0035):     5.77   0.516     5.25    66.12

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0010) |   Area    (ha)=   4.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.32         0.48
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     178.89        40.00
     Mannings n          =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63       158.21
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       5.60 (ii)   12.83 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.20         0.08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.22         0.20         0.428 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25          5.25
     RUNOFF VOLUME    (mm)=      73.00        59.39         66.19
     TOTAL RAINFALL   (mm)=      73.10        73.10         73.10
     RUNOFF COEFFICIENT   =       1.00         0.81          0.91


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0004) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000    |   0.0800      0.2287
                         0.0080     0.0784    |   0.1130      0.2438
                         0.0090     0.0948    |   0.1470      0.2565
                         0.0100     0.1483    |   0.2210      0.2733
                         0.0370     0.1809    |   0.6370      0.3305
                         0.0450     0.2000    |   0.6380      0.3306
                         0.0460     0.2050    |   0.7840      0.3465
                         0.0790     0.2285    |   0.0000      0.0000

                               AREA     QPEAK     TPEAK       R.V.
```

```
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0010)      4.800      0.428      5.25      66.19
     OUTFLOW: ID= 1 (0004)      4.800      0.080      6.58      65.67

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 18.62
                   TIME SHIFT OF PEAK FLOW        (min)= 80.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.2287

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--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   0.19
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.17         0.02
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      35.59        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63       158.21
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       1.96 (ii)    8.65 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.31         0.12
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.01          0.017 (iii)
     TIME TO PEAK    (hrs)=       4.67         5.25           5.25
     RUNOFF VOLUME    (mm)=      72.10        59.39          65.71
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       0.99         0.81           0.90

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0006) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000    |   0.0150      0.0413

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0002)     0.190      0.017      5.25      65.71
     OUTFLOW: ID= 1 (0006)     0.190      0.003      6.50      62.07

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 17.70
                   TIME SHIFT OF PEAK FLOW        (min)= 75.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.0083

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--------------------
| ADD HYD   (0003) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0004):     4.80   0.080     6.58    65.67
        + ID2= 2 (0006):     0.19   0.003     6.50    62.07
          ================================================
          ID = 3 (0003):     4.99   0.083     6.58    65.54

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0050) |   Area    (ha)=   0.78
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.70         0.08
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      72.11        40.00
     Mannings n           =      0.013        0.250
```

```
     Max.Eff.Inten.(mm/hr)=      33.63       158.21
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       3.25 (ii)   10.48 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.27         0.09
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.03          0.070 (iii)
     TIME TO PEAK    (hrs)=       5.00         5.25           5.25
     RUNOFF VOLUME    (mm)=      72.10        59.39          65.74
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       0.99         0.81           0.90

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0007) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0050)       0.780      0.070      5.25       65.74
     OUTFLOW: ID= 1 (0007)       0.780      0.012      6.58       64.85

                PEAK   FLOW   REDUCTION [Qout/Qin](%)= 17.77
                TIME SHIFT OF PEAK FLOW         (min)= 80.00
                MAXIMUM  STORAGE   USED       (ha.m.)=  0.0342

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--------------------
| ADD HYD   (0036) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0003):     4.99   0.083     6.58    65.54
        + ID2= 2 (0007):     0.78   0.012     6.58    64.85
          ================================================
          ID = 3 (0036):     5.77   0.095     6.58    65.44

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ***************************
  ** SIMULATION NUMBER:   5 **
  ***************************



--------------------
|    READ STORM    |    Filename: C:\Users\p004967b\AppD
|                  |              ata\Local\Temp\
|                  |              390aa3fa-fb13-4099-9d33-ada695760e90\53464306
| Ptotal= 80.82 mm |    Comments: 50yr/12hr
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.25    0.00 |  3.50   13.74 |  6.75    5.66 | 10.00    0.81
                0.50    0.81 |  3.75   13.74 |  7.00    5.66 | 10.25    0.81
                0.75    0.81 |  4.00   13.74 |  7.25    5.66 | 10.50    0.81
                1.00    0.81 |  4.25   13.74 |  7.50    3.23 | 10.75    0.81
                1.25    0.81 |  4.50   37.17 |  7.75    3.23 | 11.00    0.81
                1.50    0.81 |  4.75   37.17 |  8.00    3.23 | 11.25    0.81
                1.75    0.81 |  5.00   37.17 |  8.25    3.23 | 11.50    0.81
                2.00    0.81 |  5.25   37.17 |  8.50    1.62 | 11.75    0.81
                2.25    0.81 |  5.50   10.50 |  8.75    1.62 | 12.00    0.81
                2.50    4.85 |  5.75   10.50 |  9.00    1.62 | 12.25    0.81
                2.75    4.85 |  6.00   10.50 |  9.25    1.62 |
                3.00    4.85 |  6.25   10.50 |  9.50    0.81 |
                3.25    4.85 |  6.50    5.66 |  9.75    0.81 |

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| CALIB            |
| WILHYD    (0001) |   Area    (ha)=   4.99   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 1.08
```

---------- U.H. Tp(hrs)= 0.92

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	4.85	6.250	10.50	9.33	0.81
0.167	0.00	3.250	4.85	6.333	5.66	9.42	0.81
0.250	0.00	3.333	13.74	6.417	5.66	9.50	0.81
0.333	0.81	3.417	13.74	6.500	5.66	9.58	0.81
0.417	0.81	3.500	13.74	6.583	5.66	9.67	0.81
0.500	0.81	3.583	13.74	6.667	5.66	9.75	0.81
0.583	0.81	3.667	13.74	6.750	5.66	9.83	0.81
0.667	0.81	3.750	13.74	6.833	5.66	9.92	0.81
0.750	0.81	3.833	13.74	6.917	5.66	10.00	0.81
0.833	0.81	3.917	13.74	7.000	5.66	10.08	0.81
0.917	0.81	4.000	13.74	7.083	5.66	10.17	0.81
1.000	0.81	4.083	13.74	7.167	5.66	10.25	0.81
1.083	0.81	4.167	13.74	7.250	5.66	10.33	0.81
1.167	0.81	4.250	13.74	7.333	3.23	10.42	0.81
1.250	0.81	4.333	37.17	7.417	3.23	10.50	0.81
1.333	0.81	4.417	37.17	7.500	3.23	10.58	0.81
1.417	0.81	4.500	37.17	7.583	3.23	10.67	0.81
1.500	0.81	4.583	37.17	7.667	3.23	10.75	0.81
1.583	0.81	4.667	37.17	7.750	3.23	10.83	0.81
1.667	0.81	4.750	37.17	7.833	3.23	10.92	0.81
1.750	0.81	4.833	37.17	7.917	3.23	11.00	0.81
1.833	0.81	4.917	37.17	8.000	3.23	11.08	0.81
1.917	0.81	5.000	37.17	8.083	3.23	11.17	0.81
2.000	0.81	5.083	37.17	8.167	3.23	11.25	0.81
2.083	0.81	5.167	37.17	8.250	3.23	11.33	0.81
2.167	0.81	5.250	37.17	8.333	1.62	11.42	0.81
2.250	0.81	5.333	10.50	8.417	1.62	11.50	0.81
2.333	4.85	5.417	10.50	8.500	1.62	11.58	0.81
2.417	4.85	5.500	10.50	8.583	1.62	11.67	0.81
2.500	4.85	5.583	10.50	8.667	1.62	11.75	0.81
2.583	4.85	5.667	10.50	8.750	1.62	11.83	0.81
2.667	4.85	5.750	10.50	8.833	1.62	11.92	0.81
2.750	4.85	5.833	10.50	8.917	1.62	12.00	0.81
2.833	4.85	5.917	10.50	9.000	1.62	12.08	0.81
2.917	4.85	6.000	10.50	9.083	1.62	12.17	0.81
3.000	4.85	6.083	10.50	9.167	1.62	12.25	0.81
3.083	4.85	6.167	10.50	9.250	1.62		

U.H. peak (cms)= 0.17

PEAK FLOW (cms)= 0.13 (i)
TIME TO PEAK (hrs)= 5.92
RUNOFF VOLUME (mm)= 37.24
TOTAL RAINFALL (mm)= 80.82
RUNOFF COEFFICIENT = 0.46

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
WILHYD (0005)	Area	(ha)=	0.78	Curve Number (CN)=	76.7
ID= 1 DT= 5.0 min	Ia	(mm)=	5.00	Recession const.(K)=	1.08
	U.H. Tp(hrs)=		0.92		

U.H. peak (cms)= 0.03

PEAK FLOW (cms)= 0.02 (i)
TIME TO PEAK (hrs)= 5.92
RUNOFF VOLUME (mm)= 36.08
TOTAL RAINFALL (mm)= 80.82
RUNOFF COEFFICIENT = 0.45

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0033)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0001):	4.99	0.134	5.92	37.24
+ ID2= 2 (0005):	0.78	0.021	5.92	36.08
ID = 3 (0033):	5.77	0.155	5.92	37.09

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

```
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0030) |   Area    (ha)=   4.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.32         0.48
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     178.89        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17       176.46
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       5.38 (ii)   12.30 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.21         0.09
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.25         0.23         0.477 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25          5.25
     RUNOFF VOLUME    (mm)=      80.72        66.89         73.80
     TOTAL RAINFALL   (mm)=      80.82        80.82         80.82
     RUNOFF COEFFICIENT   =       1.00         0.83          0.91


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0031) |   Area    (ha)=   0.19
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.17         0.02
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      35.59        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17       176.46
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       1.89 (ii)    8.29 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.32         0.13
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.01         0.019 (iii)
     TIME TO PEAK    (hrs)=       4.67         5.25          5.25
     RUNOFF VOLUME    (mm)=      79.82        66.89         73.32
     TOTAL RAINFALL   (mm)=      80.82        80.82         80.82
     RUNOFF COEFFICIENT   =       0.99         0.83          0.91

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0029) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0030):     4.80   0.477     5.25    73.80
        + ID2= 2 (0031):     0.19   0.019     5.25    73.32
          ================================================
          ID = 3 (0029):     4.99   0.496     5.25    73.78

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0034) |   Area    (ha)=   0.78
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
```

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.70	0.08	
Dep. Storage (mm)=	1.00	5.00	
Average Slope (%)=	1.00	1.00	
Length (m)=	72.11	40.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	37.17	176.46	
over (min)	5.00	15.00	
Storage Coeff. (min)=	3.12 (ii)	10.04 (ii)	
Unit Hyd. Tpeak (min)=	5.00	15.00	
Unit Hyd. peak (cms)=	0.27	0.10	
			TOTALS
PEAK FLOW (cms)=	0.04	0.04	0.078 (iii)
TIME TO PEAK (hrs)=	5.00	5.25	5.25
RUNOFF VOLUME (mm)=	79.82	66.89	73.35
TOTAL RAINFALL (mm)=	80.82	80.82	80.82
RUNOFF COEFFICIENT =	0.99	0.83	0.91

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0035)		AREA	QPEAK	TPEAK	R.V.
		(ha)	(cms)	(hrs)	(mm)
1 + 2 = 3	ID1= 1 (0029):	4.99	0.496	5.25	73.78
	+ ID2= 2 (0034):	0.78	0.078	5.25	73.35
	ID = 3 (0035):	5.77	0.574	5.25	73.73

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB					
STANDHYD (0010)	Area (ha)= 4.80				
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00	Dir. Conn.(%)= 50.00			

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	4.32	0.48	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	1.00	1.00	
Length (m)=	178.89	40.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	37.17	176.46	
over (min)	5.00	15.00	
Storage Coeff. (min)=	5.38 (ii)	12.30 (ii)	
Unit Hyd. Tpeak (min)=	5.00	15.00	
Unit Hyd. peak (cms)=	0.21	0.09	
			TOTALS
PEAK FLOW (cms)=	0.25	0.23	0.477 (iii)
TIME TO PEAK (hrs)=	5.25	5.25	5.25
RUNOFF VOLUME (mm)=	80.72	66.89	73.80
TOTAL RAINFALL (mm)=	80.82	80.82	80.82
RUNOFF COEFFICIENT =	1.00	0.83	0.91

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR (0004)				
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0800	0.2287
	0.0080	0.0784	0.1130	0.2438
	0.0090	0.0948	0.1470	0.2565
	0.0100	0.1483	0.2210	0.2733
	0.0370	0.1809	0.6370	0.3305
	0.0450	0.2000	0.6380	0.3306

```
                        0.0460     0.2050   |   0.7840      0.3465
                        0.0790     0.2285   |   0.0000      0.0000

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0010)      4.800      0.477      5.25       73.80
     OUTFLOW: ID= 1 (0004)      4.800      0.113      6.33       73.28

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 23.67
                   TIME SHIFT OF PEAK FLOW        (min)= 65.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.2438

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   0.19
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.17         0.02
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      35.59        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17       176.46
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       1.89 (ii)    8.29 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.32         0.13
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.01          0.019 (iii)
     TIME TO PEAK    (hrs)=       4.67         5.25           5.25
     RUNOFF VOLUME    (mm)=      79.82        66.89          73.32
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       0.99         0.83           0.91

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0006) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0002)      0.190      0.019      5.25       73.32
     OUTFLOW: ID= 1 (0006)      0.190      0.003      6.42       69.69

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 17.78
                   TIME SHIFT OF PEAK FLOW        (min)= 70.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.0093

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--------------------
| ADD HYD   (0003) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0004):     4.80   0.113     6.33    73.28
        + ID2= 2 (0006):     0.19   0.003     6.42    69.69
          ================================================
          ID = 3 (0003):     4.99   0.116     6.33    73.15

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0050) |   Area    (ha)=   0.78
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.70         0.08
     Dep. Storage     (mm)=       1.00         5.00
```

```
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      72.11        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17       176.46
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       3.12 (ii)   10.04 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.27         0.10
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.04          0.078 (iii)
     TIME TO PEAK    (hrs)=       5.00         5.25           5.25
     RUNOFF VOLUME    (mm)=      79.82        66.89          73.35
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       0.99         0.83           0.91

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0007) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0050)      0.780      0.078      5.25       73.35
     OUTFLOW: ID= 1 (0007)      0.780      0.014      6.50       72.46

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 17.84
                  TIME SHIFT OF PEAK FLOW         (min)= 75.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0382

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--------------------
| ADD HYD   (0036) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0003):     4.99   0.116     6.33    73.15
        + ID2= 2 (0007):     0.78   0.014     6.50    72.46
          ================================================
          ID = 3 (0036):     5.77   0.130     6.33    73.05

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ***************************
  ** SIMULATION NUMBER:   6 **
  ***************************



--------------------
|    READ STORM    |    Filename: C:\Users\p004967b\AppD
|                  |              ata\Local\Temp\
|                  |              390aa3fa-fb13-4099-9d33-ada695760e90\3435d76f
| Ptotal= 88.54 mm |    Comments: 100yr/12hr
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.25    0.00 |  3.50   15.05 |'  6.75    6.20 | 10.00    0.89
                0.50    0.89 |  3.75   15.05 |  7.00    6.20 | 10.25    0.89
                0.75    0.89 |  4.00   15.05 |  7.25    6.20 | 10.50    0.89
                1.00    0.89 |  4.25   15.05 |  7.50    3.54 | 10.75    0.89
                1.25    0.89 |  4.50   40.71 |  7.75    3.54 | 11.00    0.89
                1.50    0.89 |  4.75   40.71 |  8.00    3.54 | 11.25    0.89
                1.75    0.89 |  5.00   40.71 |  8.25    3.54 | 11.50    0.89
                2.00    0.89 |  5.25   40.71 |  8.50    1.77 | 11.75    0.89
                2.25    0.89 |  5.50   11.51 |  8.75    1.77 | 12.00    0.89
                2.50    5.31 |  5.75   11.51 |  9.00    1.77 | 12.25    0.89
                2.75    5.31 |  6.00   11.51 |  9.25    1.77 |
                3.00    5.31 |  6.25   11.51 |  9.50    0.89 |
                3.25    5.31 |  6.50    6.20 |  9.75    0.89 |

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--------------------
| CALIB            |
| WILHYD    (0001) |   Area    (ha)=   4.99   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 1.08
--------------------   U.H. Tp(hrs)=   0.92

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	5.31	6.250	11.51	9.33	0.89
0.167	0.00	3.250	5.31	6.333	6.20	9.42	0.89
0.250	0.00	3.333	15.05	6.417	6.20	9.50	0.89
0.333	0.89	3.417	15.05	6.500	6.20	9.58	0.89
0.417	0.89	3.500	15.05	6.583	6.20	9.67	0.89
0.500	0.89	3.583	15.05	6.667	6.20	9.75	0.89
0.583	0.89	3.667	15.05	6.750	6.20	9.83	0.89
0.667	0.89	3.750	15.05	6.833	6.20	9.92	0.89
0.750	0.89	3.833	15.05	6.917	6.20	10.00	0.89
0.833	0.89	3.917	15.05	7.000	6.20	10.08	0.89
0.917	0.89	4.000	15.05	7.083	6.20	10.17	0.89
1.000	0.89	4.083	15.05	7.167	6.20	10.25	0.89
1.083	0.89	4.167	15.05	7.250	6.20	10.33	0.89
1.167	0.89	4.250	15.05	7.333	3.54	10.42	0.89
1.250	0.89	4.333	40.71	7.417	3.54	10.50	0.89
1.333	0.89	4.417	40.71	7.500	3.54	10.58	0.89
1.417	0.89	4.500	40.71	7.583	3.54	10.67	0.89
1.500	0.89	4.583	40.71	7.667	3.54	10.75	0.89
1.583	0.89	4.667	40.71	7.750	3.54	10.83	0.89
1.667	0.89	4.750	40.71	7.833	3.54	10.92	0.89
1.750	0.89	4.833	40.71	7.917	3.54	11.00	0.89
1.833	0.89	4.917	40.71	8.000	3.54	11.08	0.89
1.917	0.89	5.000	40.71	8.083	3.54	11.17	0.89
2.000	0.89	5.083	40.71	8.167	3.54	11.25	0.89
2.083	0.89	5.167	40.71	8.250	3.54	11.33	0.89
2.167	0.89	5.250	40.71	8.333	1.77	11.42	0.89
2.250	0.89	5.333	11.51	8.417	1.77	11.50	0.89
2.333	5.31	5.417	11.51	8.500	1.77	11.58	0.89
2.417	5.31	5.500	11.51	8.583	1.77	11.67	0.89
2.500	5.31	5.583	11.51	8.667	1.77	11.75	0.89
2.583	5.31	5.667	11.51	8.750	1.77	11.83	0.89
2.667	5.31	5.750	11.51	8.833	1.77	11.92	0.89
2.750	5.31	5.833	11.51	8.917	1.77	12.00	0.89
2.833	5.31	5.917	11.51	9.000	1.77	12.08	0.89
2.917	5.31	6.000	11.51	9.083	1.77	12.17	0.89
3.000	5.31	6.083	11.51	9.167	1.77	12.25	0.89
3.083	5.31	6.167	11.51	9.250	1.77		

```
     U.H. peak       (cms)=   0.17

     PEAK FLOW       (cms)=   0.16 (i)
     TIME TO PEAK    (hrs)=   5.92
     RUNOFF VOLUME    (mm)=  43.08
     TOTAL RAINFALL   (mm)=  88.54
     RUNOFF COEFFICIENT   =   0.49

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| WILHYD    (0005) |   Area    (ha)=   0.78   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 1.08
--------------------   U.H. Tp(hrs)=   0.92

     U.H. peak       (cms)=   0.03

     PEAK FLOW       (cms)=   0.02 (i)
     TIME TO PEAK    (hrs)=   5.92
     RUNOFF VOLUME    (mm)=  41.88
     TOTAL RAINFALL   (mm)=  88.54
     RUNOFF COEFFICIENT   =   0.47

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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--------------------
| ADD HYD   (0033) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     4.99   0.155     5.92    43.08
        + ID2= 2 (0005):     0.78   0.024     5.92    41.88
          ================================================
```

```
         ID = 3 (0033):     5.77   0.179     5.92    42.91

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0030) |   Area    (ha)=   4.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.32         0.48
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     178.89        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71       194.65
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       5.19 (ii)   11.85 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.21         0.09
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.27         0.25          0.525 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25           5.25
     RUNOFF VOLUME    (mm)=      88.44        74.42          81.43
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       1.00         0.84           0.92


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0031) |   Area    (ha)=   0.19
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.17         0.02
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      35.59        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71       194.65
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       1.82 (ii)    7.97 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.32         0.13
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.01          0.021 (iii)
     TIME TO PEAK    (hrs)=       4.67         5.25           5.25
     RUNOFF VOLUME    (mm)=      87.54        74.42          80.96
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       0.99         0.84           0.91

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0029) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0030):     4.80   0.525     5.25    81.43
       + ID2= 2 (0031):     0.19   0.021     5.25    80.96
         ================================================
         ID = 3 (0029):     4.99   0.546     5.25    81.41

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| CALIB |
| STANDHYD (0034) | Area (ha)= 0.78
|ID= 1 DT= 5.0 min | Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	0.70	0.08	
Dep. Storage (mm)=	1.00	5.00	
Average Slope (%)=	1.00	1.00	
Length (m)=	72.11	40.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	40.71	194.65	
over (min)	5.00	10.00	
Storage Coeff. (min)=	3.01 (ii)	9.66 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.28	0.11	
			TOTALS
PEAK FLOW (cms)=	0.04	0.04	0.086 (iii)
TIME TO PEAK (hrs)=	4.92	5.25	5.25
RUNOFF VOLUME (mm)=	87.54	74.42	80.97
TOTAL RAINFALL (mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT =	0.99	0.84	0.91

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD (0035) |
| 1 + 2 = 3 |

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0029):	4.99	0.546	5.25	81.41
+ ID2= 2 (0034):	0.78	0.086	5.25	80.97
ID = 3 (0035):	5.77	0.632	5.25	81.35

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

| CALIB |
| STANDHYD (0010) | Area (ha)= 4.80
|ID= 1 DT= 5.0 min | Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	4.32	0.48	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	1.00	1.00	
Length (m)=	178.89	40.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	40.71	194.65	
over (min)	5.00	15.00	
Storage Coeff. (min)=	5.19 (ii)	11.85 (ii)	
Unit Hyd. Tpeak (min)=	5.00	15.00	
Unit Hyd. peak (cms)=	0.21	0.09	
			TOTALS
PEAK FLOW (cms)=	0.27	0.25	0.525 (iii)
TIME TO PEAK (hrs)=	5.25	5.25	5.25
RUNOFF VOLUME (mm)=	88.44	74.42	81.43
TOTAL RAINFALL (mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT =	1.00	0.84	0.92

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| RESERVOIR (0004) |
| IN= 2---> OUT= 1 |
| DT= 5.0 min |

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0800	0.2287
0.0080	0.0784	0.1130	0.2438

```
                        0.0090     0.0948   |   0.1470      0.2565
                        0.0100     0.1483   |   0.2210      0.2733
                        0.0370     0.1809   |   0.6370      0.3305
                        0.0450     0.2000   |   0.6380      0.3306
                        0.0460     0.2050   |   0.7840      0.3465
                        0.0790     0.2285   |   0.0000      0.0000

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0010)      4.800      0.525      5.25      81.43
     OUTFLOW: ID= 1 (0004)      4.800      0.147      6.25      80.91

                PEAK   FLOW   REDUCTION [Qout/Qin](%)= 27.97
                TIME SHIFT OF PEAK FLOW        (min)= 60.00
                MAXIMUM  STORAGE   USED       (ha.m.)=  0.2565

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--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   0.19
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.17         0.02
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      35.59        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71       194.65
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       1.82 (ii)    7.97 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.32         0.13
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.01          0.021 (iii)
     TIME TO PEAK    (hrs)=       4.67         5.25           5.25
     RUNOFF VOLUME    (mm)=      87.54        74.42          80.96
     TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
     RUNOFF COEFFICIENT   =       0.99         0.84           0.91

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR (0006) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                        0.0000     0.0000   |   0.0150      0.0413

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0002)      0.190      0.021      5.25      80.96
     OUTFLOW: ID= 1 (0006)      0.190      0.004      6.42      77.33

                PEAK   FLOW   REDUCTION [Qout/Qin](%)= 17.86
                TIME SHIFT OF PEAK FLOW        (min)= 70.00
                MAXIMUM  STORAGE   USED       (ha.m.)=  0.0103

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| ADD HYD   (0003) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0004):     4.80   0.147     6.25    80.91
        + ID2= 2 (0006):     0.19   0.004     6.42    77.33
          ==============================================
          ID = 3 (0003):     4.99   0.151     6.25    80.77

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0050) |   Area    (ha)=   0.78
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
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                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.70         0.08
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      72.11        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71       194.65
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       3.01 (ii)    9.66 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.28         0.11
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.04         0.086 (iii)
     TIME TO PEAK    (hrs)=       4.92         5.25          5.25
     RUNOFF VOLUME    (mm)=      87.54        74.42         80.97
     TOTAL RAINFALL   (mm)=      88.54        88.54         88.54
     RUNOFF COEFFICIENT   =       0.99         0.84          0.91

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR (0007) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0413

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0050)      0.780      0.086      5.25       80.97
     OUTFLOW: ID= 1 (0007)      0.780      0.015      6.50       80.08

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 17.88
                  TIME SHIFT OF PEAK FLOW         (min)= 75.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0422

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| ADD HYD   (0036) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0003):     4.99   0.151     6.25    80.77
        + ID2= 2 (0007):     0.78   0.015     6.50    80.08
          ================================================
          ID = 3 (0036):     5.77   0.166     6.25    80.68

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ***************************
  ** SIMULATION NUMBER:   7 **
  ***************************



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|    READ STORM    |    Filename: C:\Users\p004967b\AppD
|                  |              ata\Local\Temp\
|                  |              390aa3fa-fb13-4099-9d33-ada695760e90\99492048
| Ptotal=212.00 mm |    Comments: HURRICANE HAZEL - FINAL 12 HOURS
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                1.00    6.00 |  4.00   13.00 |  7.00   23.00 | 10.00   53.00
                2.00    4.00 |  5.00   17.00 |  8.00   13.00 | 11.00   38.00
                3.00    6.00 |  6.00   13.00 |  9.00   13.00 | 12.00   13.00

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| CALIB            |
| WILHYD    (0001) |   Area    (ha)=   4.99   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 1.08
--------------------   U.H. Tp(hrs)=   0.92
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NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	6.00	3.083	13.00	6.083	23.00	9.08	53.00
0.167	6.00	3.167	13.00	6.167	23.00	9.17	53.00
0.250	6.00	3.250	13.00	6.250	23.00	9.25	53.00
0.333	6.00	3.333	13.00	6.333	23.00	9.33	53.00
0.417	6.00	3.417	13.00	6.417	23.00	9.42	53.00
0.500	6.00	3.500	13.00	6.500	23.00	9.50	53.00
0.583	6.00	3.583	13.00	6.583	23.00	9.58	53.00
0.667	6.00	3.667	13.00	6.667	23.00	9.67	53.00
0.750	6.00	3.750	13.00	6.750	23.00	9.75	53.00
0.833	6.00	3.833	13.00	6.833	23.00	9.83	53.00
0.917	6.00	3.917	13.00	6.917	23.00	9.92	53.00
1.000	6.00	4.000	13.00	7.000	23.00	10.00	53.00
1.083	4.00	4.083	17.00	7.083	13.00	10.08	38.00
1.167	4.00	4.167	17.00	7.167	13.00	10.17	38.00
1.250	4.00	4.250	17.00	7.250	13.00	10.25	38.00
1.333	4.00	4.333	17.00	7.333	13.00	10.33	38.00
1.417	4.00	4.417	17.00	7.417	13.00	10.42	38.00
1.500	4.00	4.500	17.00	7.500	13.00	10.50	38.00
1.583	4.00	4.583	17.00	7.583	13.00	10.58	38.00
1.667	4.00	4.667	17.00	7.667	13.00	10.67	38.00
1.750	4.00	4.750	17.00	7.750	13.00	10.75	38.00
1.833	4.00	4.833	17.00	7.833	13.00	10.83	38.00
1.917	4.00	4.917	17.00	7.917	13.00	10.92	38.00
2.000	4.00	5.000	17.00	8.000	13.00	11.00	38.00
2.083	6.00	5.083	13.00	8.083	13.00	11.08	13.00
2.167	6.00	5.167	13.00	8.167	13.00	11.17	13.00
2.250	6.00	5.250	13.00	8.250	13.00	11.25	13.00
2.333	6.00	5.333	13.00	8.333	13.00	11.33	13.00
2.417	6.00	5.417	13.00	8.417	13.00	11.42	13.00
2.500	6.00	5.500	13.00	8.500	13.00	11.50	13.00
2.583	6.00	5.583	13.00	8.583	13.00	11.58	13.00
2.667	6.00	5.667	13.00	8.667	13.00	11.67	13.00
2.750	6.00	5.750	13.00	8.750	13.00	11.75	13.00
2.833	6.00	5.833	13.00	8.833	13.00	11.83	13.00
2.917	6.00	5.917	13.00	8.917	13.00	11.92	13.00
3.000	6.00	6.000	13.00	9.000	13.00	12.00	13.00

U.H. peak (cms)= 0.17

PEAK FLOW (cms)= 0.42 (i)
TIME TO PEAK (hrs)= 11.17
RUNOFF VOLUME (mm)= 150.16
TOTAL RAINFALL (mm)= 212.00
RUNOFF COEFFICIENT = 0.71

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB WILHYD (0005)	ID= 1 DT= 5.0 min

Area (ha)= 0.78 Curve Number (CN)= 76.7
Ia (mm)= 5.00 Recession const.(K)= 1.08
U.H. Tp(hrs)= 0.92

U.H. peak (cms)= 0.03

PEAK FLOW (cms)= 0.06 (i)
TIME TO PEAK (hrs)= 11.17
RUNOFF VOLUME (mm)= 148.91
TOTAL RAINFALL (mm)= 212.00
RUNOFF COEFFICIENT = 0.70

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0033)	1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0001):	4.99	0.416	11.17	150.16
+ ID2= 2 (0005):	0.78	0.065	11.17	148.91
ID = 3 (0033):	5.77	0.481	11.17	149.99

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB

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| STANDHYD  (0030) |   Area    (ha)=   4.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.32         0.48
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     178.89        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      53.00       262.84
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       4.67 (ii)   10.57 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.22         0.09
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.35         0.35         0.702 (iii)
     TIME TO PEAK    (hrs)=      10.00        10.00         10.00
     RUNOFF VOLUME    (mm)=     211.90       196.62        204.26
     TOTAL RAINFALL   (mm)=     212.00       212.00        212.00
     RUNOFF COEFFICIENT   =       1.00         0.93          0.96

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0031) |   Area    (ha)=   0.19
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.17         0.02
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      35.59        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      53.00       262.84
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       1.64 (ii)    7.09 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.32         0.14
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.01         0.028 (iii)
     TIME TO PEAK    (hrs)=       9.42        10.00         10.00
     RUNOFF VOLUME    (mm)=     211.00       196.62        203.79
     TOTAL RAINFALL   (mm)=     212.00       212.00        212.00
     RUNOFF COEFFICIENT   =       1.00         0.93          0.96

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0029) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0030):     4.80   0.702    10.00   204.26
       + ID2= 2 (0031):     0.19   0.028    10.00   203.79
         ================================================
         ID = 3 (0029):     4.99   0.730    10.00   204.24

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0034) |   Area    (ha)=   0.78
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.70         0.08
```

```
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      72.11        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      53.00       262.84
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       2.71 (ii)    8.61 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.29         0.12
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.06         0.06         0.114 (iii)
     TIME TO PEAK    (hrs)=       9.67        10.00          10.00
     RUNOFF VOLUME    (mm)=     211.00       196.62         203.80
     TOTAL RAINFALL   (mm)=     212.00       212.00         212.00
     RUNOFF COEFFICIENT   =       1.00         0.93           0.96

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0035) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0029):     4.99   0.730    10.00   204.24
        + ID2= 2 (0034):     0.78   0.114    10.00   203.80
          ================================================
          ID = 3 (0035):     5.77   0.844    10.00   204.18

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0010) |   Area    (ha)=   4.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.32         0.48
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     178.89        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      53.00       262.84
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       4.67 (ii)   10.57 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.22         0.09
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.35         0.35         0.702 (iii)
     TIME TO PEAK    (hrs)=      10.00        10.00          10.00
     RUNOFF VOLUME    (mm)=     211.90       196.62         204.26
     TOTAL RAINFALL   (mm)=     212.00       212.00         212.00
     RUNOFF COEFFICIENT   =       1.00         0.93           0.96

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0004) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000    |   0.0800      0.2287
                         0.0080     0.0784    |   0.1130      0.2438
                         0.0090     0.0948    |   0.1470      0.2565
                         0.0100     0.1483    |   0.2210      0.2733
                         0.0370     0.1809    |   0.6370      0.3305
                         0.0450     0.2000    |   0.6380      0.3306
                         0.0460     0.2050    |   0.7840      0.3465
```

```
                        0.0790     0.2285   |   0.0000      0.0000

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0010)      4.800     0.702     10.00     204.26
     OUTFLOW: ID= 1 (0004)      4.800     0.636     10.08     203.74

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 90.70
                   TIME SHIFT OF PEAK FLOW         (min)=  5.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.3306

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   0.19
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                                 IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.17         0.02
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      35.59        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      53.00       262.84
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       1.64 (ii)    7.09 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.32         0.14
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.01          0.028 (iii)
     TIME TO PEAK    (hrs)=       9.42        10.00          10.00
     RUNOFF VOLUME    (mm)=     211.00       196.62         203.79
     TOTAL RAINFALL   (mm)=     212.00       212.00         212.00
     RUNOFF COEFFICIENT   =       1.00         0.93           0.96

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0006) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0413

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0002)      0.190     0.028     10.00     203.79
     OUTFLOW: ID= 1 (0006)      0.190     0.009     11.17     200.12

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 31.97
                   TIME SHIFT OF PEAK FLOW         (min)= 70.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.0245

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--------------------
| ADD HYD   (0003) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0004):     4.80   0.636    10.08   203.74
        + ID2= 2 (0006):     0.19   0.009    11.17   200.12
          ================================================
          ID = 3 (0003):     4.99   0.644    10.08   203.60

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0050) |   Area    (ha)=   0.78
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                                 IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.70         0.08
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         1.00
```

```
     Length           (m)=      72.11        40.00
     Mannings n          =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      53.00       262.84
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       2.71 (ii)    8.61 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.29         0.12
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.06         0.06         0.114 (iii)
     TIME TO PEAK    (hrs)=       9.67        10.00         10.00
     RUNOFF VOLUME    (mm)=     211.00       196.62        203.80
     TOTAL RAINFALL   (mm)=     212.00       212.00        212.00
     RUNOFF COEFFICIENT   =       1.00         0.93          0.96

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0007) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0413

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0050)      0.780     0.114     10.00     203.80
     OUTFLOW: ID= 1 (0007)      0.780     0.037     11.25     202.92

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 31.95
                  TIME SHIFT OF PEAK FLOW         (min)= 75.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.1004

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--------------------
| ADD HYD   (0036) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0003):     4.99   0.644    10.08   203.60
        + ID2= 2 (0007):     0.78   0.037    11.25   202.92
          ================================================
          ID = 3 (0036):     5.77   0.674    10.08   203.51

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ***************************
  ** SIMULATION NUMBER:   8 **
  ***************************



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|    READ STORM    |    Filename: C:\Users\p004967b\AppD
|                  |              ata\Local\Temp\
|                  |              390aa3fa-fb13-4099-9d33-ada695760e90\4f8f2923
| Ptotal= 25.00 mm |    Comments: 25 mm, 4 hr. chicago dist'n. - water qua
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.17    2.40 |  1.17   33.60 |  2.17    3.45 |  3.17    1.65
                0.33    1.95 |  1.33   38.10 |  2.33    3.00 |  3.33    1.80
                0.50    2.40 |  1.50   13.80 |  2.50    2.70 |  3.50    1.50
                0.67    2.85 |  1.67    7.35 |  2.67    2.25 |  3.67    1.50
                0.83    4.65 |  1.83    5.55 |  2.83    2.25 |  3.83    0.75
                1.00    9.60 |  2.00    4.35 |  3.00    1.95 |  4.00    0.60

--------------------------------------------------------------------------------

--------------------
| CALIB            |
| WILHYD    (0001) |   Area    (ha)=   4.99   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 1.08
--------------------   U.H. Tp(hrs)=   0.92

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.40	1.083	33.60	2.083	3.45	3.08	1.65
0.167	2.40	1.167	33.60	2.167	3.45	3.17	1.65
0.250	1.95	1.250	38.10	2.250	3.00	3.25	1.80
0.333	1.95	1.333	38.10	2.333	3.00	3.33	1.80
0.417	2.40	1.417	13.80	2.417	2.70	3.42	1.50
0.500	2.40	1.500	13.80	2.500	2.70	3.50	1.50
0.583	2.85	1.583	7.35	2.583	2.25	3.58	1.50
0.667	2.85	1.667	7.35	2.667	2.25	3.67	1.50
0.750	4.65	1.750	5.55	2.750	2.25	3.75	0.75
0.833	4.65	1.833	5.55	2.833	2.25	3.83	0.75
0.917	9.60	1.917	4.35	2.917	1.95	3.92	0.60
1.000	9.60	2.000	4.35	3.000	1.95	4.00	0.60

U.H. peak (cms)= 0.17

PEAK FLOW (cms)= 0.02 (i)
TIME TO PEAK (hrs)= 2.50
RUNOFF VOLUME (mm)= 3.87
TOTAL RAINFALL (mm)= 25.00
RUNOFF COEFFICIENT = 0.15

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
WILHYD (0005)	Area (ha)=	0.78	Curve Number (CN)=	76.7
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	Recession const.(K)=	1.08
	U.H. Tp(hrs)=	0.92		

U.H. peak (cms)= 0.03

PEAK FLOW (cms)= 0.00 (i)
TIME TO PEAK (hrs)= 2.50
RUNOFF VOLUME (mm)= 3.20
TOTAL RAINFALL (mm)= 25.00
RUNOFF COEFFICIENT = 0.13

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0033)		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
1 + 2 = 3	ID1= 1 (0001):	4.99	0.018	2.50	3.87
	+ ID2= 2 (0005):	0.78	0.003	2.50	3.20
	ID = 3 (0033):	5.77	0.021	2.50	3.78

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB					
STANDHYD (0030)	Area (ha)=	4.80			
ID= 1 DT= 5.0 min	Total Imp(%)=	90.00	Dir. Conn.(%)=	50.00	

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	4.32	0.48	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	178.89	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		38.10	128.25	
over (min)		5.00	15.00	
Storage Coeff.	(min)=	5.33 (ii)	13.19 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	15.00	
Unit Hyd. peak	(cms)=	0.21	0.08	
				TOTALS
PEAK FLOW	(cms)=	0.25	0.11	0.332 (iii)
TIME TO PEAK	(hrs)=	1.33	1.50	1.33
RUNOFF VOLUME	(mm)=	24.90	14.61	19.75
TOTAL RAINFALL	(mm)=	25.00	25.00	25.00
RUNOFF COEFFICIENT	=	1.00	0.58	0.79

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

```
          THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0031) |   Area    (ha)=   0.19
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.17         0.02
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      35.59        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10       128.25
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       1.87 (ii)    9.14 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.32         0.12
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.01          0.015 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42           1.33
     RUNOFF VOLUME    (mm)=      24.00        14.61          19.27
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       0.96         0.58           0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0029) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0030):     4.80   0.332     1.33    19.75
        + ID2= 2 (0031):     0.19   0.015     1.33    19.27
          ================================================
          ID = 3 (0029):     4.99   0.347     1.33    19.73

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0034) |   Area    (ha)=   0.78
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.70         0.08
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      72.11        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10       128.25
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       3.09 (ii)   10.95 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.27         0.09
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.02          0.056 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50           1.33
     RUNOFF VOLUME    (mm)=      24.00        14.61          19.29
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       0.96         0.58           0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0035) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0029):     4.99   0.347     1.33    19.73
        + ID2= 2 (0034):     0.78   0.056     1.33    19.29
          ================================================
          ID = 3 (0035):     5.77   0.403     1.33    19.67

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0010) |   Area    (ha)=   4.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.32         0.48
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     178.89        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10       128.25
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       5.33 (ii)   13.19 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.21         0.08
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.25         0.11          0.332 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50           1.33
     RUNOFF VOLUME    (mm)=      24.90        14.61          19.75
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       1.00         0.58           0.79


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0004) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0800      0.2287
                         0.0080     0.0784   |   0.1130      0.2438
                         0.0090     0.0948   |   0.1470      0.2565
                         0.0100     0.1483   |   0.2210      0.2733
                         0.0370     0.1809   |   0.6370      0.3305
                         0.0450     0.2000   |   0.6380      0.3306
                         0.0460     0.2050   |   0.7840      0.3465
                         0.0790     0.2285   |   0.0000      0.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0010)      4.800      0.332      1.33       19.75
     OUTFLOW: ID= 1 (0004)      4.800      0.008      4.00       19.23

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=  2.56
                    TIME SHIFT OF PEAK FLOW         (min)=160.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.0865

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   0.19
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.17         0.02
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      35.59        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10       128.25
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       1.87 (ii)    9.14 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
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     Unit Hyd. peak  (cms)=       0.32         0.12
                                                                *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.01           0.015 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42            1.33
     RUNOFF VOLUME    (mm)=      24.00        14.61           19.27
     TOTAL RAINFALL   (mm)=      25.00        25.00           25.00
     RUNOFF COEFFICIENT   =       0.96         0.58            0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR (0006) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0413

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0002)      0.190      0.015      1.33       19.27
     OUTFLOW: ID= 1 (0006)      0.190      0.001      2.92       15.62

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=  6.81
                    TIME SHIFT OF PEAK FLOW         (min)= 95.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.0028

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0003) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0004):     4.80   0.008     4.00    19.23
        + ID2= 2 (0006):     0.19   0.001     2.92    15.62
          ================================================
          ID = 3 (0003):     4.99   0.009     3.92    19.10

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0050) |   Area    (ha)=   0.78
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.70         0.08
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      72.11        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10       128.25
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       3.09 (ii)   10.95 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.27         0.09
                                                                *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.02           0.056 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50            1.33
     RUNOFF VOLUME    (mm)=      24.00        14.61           19.29
     TOTAL RAINFALL   (mm)=      25.00        25.00           25.00
     RUNOFF COEFFICIENT   =       0.96         0.58            0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0007) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
```

```
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                        0.0000     0.0000   |   0.0150      0.0413

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0050)      0.780      0.056      1.33      19.29
     OUTFLOW: ID= 1 (0007)      0.780      0.004      3.00      18.40

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=  7.39
                    TIME SHIFT OF PEAK FLOW         (min)=100.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.0115

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0036) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0003):     4.99   0.009     3.92    19.10
        + ID2= 2 (0007):     0.78   0.004     3.00    18.40
          ================================================
          ID = 3 (0036):     5.77   0.014     3.67    19.00

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

 FINISH
================================================================================================================
```

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==============================================================================================================

       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat
  Output  filename: C:\Users\p004967b\AppData\Local\Temp\806d7dd5-8f1d-4296-bb78-7158de124a9e\Scenario.out
  Summary filename: C:\Users\p004967b\AppData\Local\Temp\806d7dd5-8f1d-4296-bb78-7158de124a9e\Scenario.sum


DATE: 10/06/2016                          TIME: 03:45:26

USER:


COMMENTS: _____________________________________________________________


--------------------------------------------------------------------------------------------------------------
  ****************************
  ** SIMULATION NUMBER:   1 **
  ****************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 424.160
| Ptotal= 32.11 mm |                          B=   1.500
--------------------                          C=   0.723
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  4.00 hrs
                       Storm time step    =  5.00 min
                       Time to peak ratio =  0.33

                     The CORRELATION coefficient is = 0.9996

                      TIME       INPUT INT.           TAB. INT.
                     (min)        (mm/hr)              (mm/hr)
                        5.         118.10               109.60
                       10.          72.80                72.55
                       15.          54.80                55.88
                       30.          33.80                35.01
                       60.          20.80                21.59
                      120.          12.80                13.19
                      360.           5.90                 6.00
                      720.           3.70                 3.64
                     1440.           2.30                 2.21


                  TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                   hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                  0.08    2.39 |  1.08    8.35 |  2.08    5.74 |  3.08    3.07
                  0.17    2.51 |  1.17   11.90 |  2.17    5.31 |  3.17    2.96
                  0.25    2.66 |  1.25   24.99 |  2.25    4.94 |  3.25    2.87
                  0.33    2.82 |  1.33  109.60 |  2.33    4.63 |  3.33    2.78
                  0.42    3.01 |  1.42   31.83 |  2.42    4.37 |  3.42    2.70
                  0.50    3.24 |  1.50   18.18 |  2.50    4.13 |  3.50    2.62
                  0.58    3.50 |  1.58   13.23 |  2.58    3.93 |  3.58    2.55
                  0.67    3.83 |  1.67   10.60 |  2.67    3.75 |  3.67    2.48
                  0.75    4.25 |  1.75    8.94 |  2.75    3.58 |  3.75    2.42
                  0.83    4.78 |  1.83    7.78 |  2.83    3.43 |  3.83    2.36
                  0.92    5.52 |  1.92    6.93 |  2.92    3.30 |  3.92    2.31
                  1.00    6.59 |  2.00    6.27 |  3.00    3.18 |  4.00    2.25


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0034) |   Area    (ha)=   0.78
```

```
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
-------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.70         0.08
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      72.11        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     109.60     ********
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       2.02 (ii)    6.42 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.31         0.14
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.11         0.04         0.134 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      31.11        20.80         25.95
     TOTAL RAINFALL   (mm)=      32.11        32.11         32.11
     RUNOFF COEFFICIENT   =       0.97         0.65          0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-------------------
| CALIB             |
| STANDHYD  (0031) |   Area    (ha)=   0.19
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
-------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.17         0.02
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      35.59        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     109.60       239.95
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       1.22 (ii)    5.29 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.33         0.16
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01         0.035 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      31.11        20.80         25.94
     TOTAL RAINFALL   (mm)=      32.11        32.11         32.11
     RUNOFF COEFFICIENT   =       0.97         0.65          0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-------------------
| CALIB             |
| STANDHYD  (0030) |   Area    (ha)=   4.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
-------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.32         0.48
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     178.89        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     109.60       239.95
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       3.49 (ii)    7.89 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.26         0.13
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.59         0.23         0.719 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      32.01        20.80         26.41
```

```
     TOTAL RAINFALL   (mm)=      32.11        32.11          32.11
     RUNOFF COEFFICIENT   =       1.00         0.65           0.82

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0029) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0030):     4.80   0.719     1.33    26.41
        + ID2= 2 (0031):     0.19   0.035     1.33    25.94
          ================================================
          ID = 3 (0029):     4.99   0.753     1.33    26.39

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0035) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0029):     4.99   0.753     1.33    26.39
        + ID2= 2 (0034):     0.78   0.134     1.33    25.95
          ================================================
          ID = 3 (0035):     5.77   0.887     1.33    26.33

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| WILHYD    (0005) |   Area    (ha)=   0.78   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 1.08
--------------------   U.H. Tp(hrs)=   0.92

     U.H. peak       (cms)=   0.03

     PEAK FLOW       (cms)=   0.00 (i)
     TIME TO PEAK    (hrs)=   2.67
     RUNOFF VOLUME    (mm)=   5.91
     TOTAL RAINFALL   (mm)=  32.11
     RUNOFF COEFFICIENT   =   0.18

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| WILHYD    (0001) |   Area    (ha)=   4.99   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 1.08
--------------------   U.H. Tp(hrs)=   0.92

     U.H. peak       (cms)=   0.17

     PEAK FLOW       (cms)=   0.03 (i)
     TIME TO PEAK    (hrs)=   2.67
     RUNOFF VOLUME    (mm)=   6.80
     TOTAL RAINFALL   (mm)=  32.11
     RUNOFF COEFFICIENT   =   0.21

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0033) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     4.99   0.029     2.67     6.80
        + ID2= 2 (0005):     0.78   0.005     2.67     5.91
          ================================================
          ID = 3 (0033):     5.77   0.034     2.67     6.68

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
```

```
| CALIB             |
| STANDHYD  (0050) |   Area    (ha)=   0.78
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.70         0.08
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      72.11        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     109.60       239.95
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       2.02 (ii)    6.42 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.31         0.14
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.11         0.04         0.134 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      31.11        20.80         25.95
     TOTAL RAINFALL   (mm)=      32.11        32.11         32.11
     RUNOFF COEFFICIENT   =       0.97         0.65          0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0007) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0413

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0050)     0.780      0.134      1.33      25.95
     OUTFLOW: ID= 1 (0007)     0.780      0.006      3.50      25.06

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  4.12
                  TIME SHIFT OF PEAK FLOW         (min)=130.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0152

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD  (0002) |   Area    (ha)=   0.19
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.17         0.02
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      35.59        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     109.60       239.95
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       1.22 (ii)    5.29 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.33         0.16
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.03         0.01         0.035 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      31.11        20.80         25.94
     TOTAL RAINFALL   (mm)=      32.11        32.11         32.11
     RUNOFF COEFFICIENT   =       0.97         0.65          0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0006) |
```

```
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0002)      0.190      0.035      1.33      25.94
     OUTFLOW: ID= 1 (0006)      0.190      0.001      3.50      22.28

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  3.88
                   TIME SHIFT OF PEAK FLOW         (min)=130.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.0037

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0010) |   Area    (ha)=   4.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.32         0.48
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     178.89        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     109.60       239.95
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       3.49 (ii)    7.89 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.26         0.13
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.59         0.23        0.719 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42         1.33
     RUNOFF VOLUME    (mm)=      32.01        20.80        26.41
     TOTAL RAINFALL   (mm)=      32.11        32.11        32.11
     RUNOFF COEFFICIENT   =       1.00         0.65         0.82

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0004) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0800      0.2287
                         0.0080     0.0784   |   0.1130      0.2438
                         0.0090     0.0948   |   0.1470      0.2565
                         0.0100     0.1483   |   0.2210      0.2733
                         0.0370     0.1809   |   0.6370      0.3305
                         0.0450     0.2000   |   0.6380      0.3306
                         0.0460     0.2050   |   0.7840      0.3465
                         0.0790     0.2285   |   0.0000      0.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0010)      4.800      0.719      1.33      26.41
     OUTFLOW: ID= 1 (0004)      4.800      0.009      4.17      25.89

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  1.31
                   TIME SHIFT OF PEAK FLOW         (min)=170.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.1173

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0003) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
-------------------           (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0004):     4.80   0.009     4.17    25.89
        + ID2= 2 (0006):     0.19   0.001     3.50    22.28
          ================================================
          ID = 3 (0003):     4.99   0.011     4.08    25.75

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

ADD HYD (0036)		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
1 + 2 = 3	ID1= 1 (0003):	4.99	0.011	4.08	25.75
	+ ID2= 2 (0007):	0.78	0.006	3.50	25.06
	ID = 3 (0036):	5.77	0.016	4.00	25.66

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

****
** SIMULATION NUMBER: 2 **
****

CHICAGO STORM Ptotal= 42.88 mm

IDF curve parameters: A= 578.969
B= 1.508
C= 0.727
used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step = 5.00 min
Time to peak ratio = 0.33

The CORRELATION coefficient is = 0.9997

TIME (min)	INPUT INT. (mm/hr)	TAB. INT. (mm/hr)
5.	159.00	148.35
10.	98.00	98.02
15.	73.80	75.40
30.	45.50	47.13
60.	28.00	28.98
120.	17.20	17.67
360.	8.00	8.00
720.	4.90	4.84
1440.	3.00	2.93

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.08	3.15	1.08	11.09	2.08	7.60	3.08	4.04
0.17	3.31	1.17	15.85	2.17	7.02	3.17	3.91
0.25	3.50	1.25	33.48	2.25	6.54	3.25	3.78
0.33	3.72	1.33	148.35	2.33	6.13	3.33	3.66
0.42	3.97	1.42	42.72	2.42	5.77	3.42	3.56
0.50	4.27	1.50	24.29	2.50	5.46	3.50	3.46
0.58	4.63	1.58	17.63	2.58	5.19	3.58	3.36
0.67	5.06	1.67	14.10	2.67	4.95	3.67	3.27
0.75	5.61	1.75	11.87	2.75	4.73	3.75	3.19
0.83	6.33	1.83	10.33	2.83	4.53	3.83	3.11
0.92	7.30	1.92	9.19	2.92	4.36	3.92	3.04
1.00	8.74	2.00	8.31	3.00	4.19	4.00	2.97

CALIB STANDHYD (0034) ID= 1 DT= 5.0 min

Area (ha)= 0.78
Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.70	0.08	
Dep. Storage	(mm)=	1.00	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	72.11	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		148.35	362.29	
over (min)		5.00	10.00	
Storage Coeff.	(min)=	1.79 (ii)	5.69 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	10.00	
Unit Hyd. peak	(cms)=	0.32	0.15	
				TOTALS
PEAK FLOW	(cms)=	0.15	0.07	0.191 (iii)
TIME TO PEAK	(hrs)=	1.33	1.42	1.33
RUNOFF VOLUME	(mm)=	41.88	30.61	36.24
TOTAL RAINFALL	(mm)=	42.88	42.88	42.88
RUNOFF COEFFICIENT	=	0.98	0.71	0.85

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0031)	Area (ha)= 0.19
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.17	0.02	
Dep. Storage	(mm)=	1.00	5.00	
Average Slope	(%)=	1.30	1.30	
Length	(m)=	35.59	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		148.35	362.29	
over (min)		5.00	5.00	
Storage Coeff. (min)=		1.09 (ii)	4.69 (ii)	
Unit Hyd. Tpeak (min)=		5.00	5.00	
Unit Hyd. peak (cms)=		0.34	0.22	
				TOTALS
PEAK FLOW	(cms)=	0.04	0.02	0.059 (iii)
TIME TO PEAK	(hrs)=	1.33	1.33	1.33
RUNOFF VOLUME	(mm)=	41.88	30.61	36.22
TOTAL RAINFALL	(mm)=	42.88	42.88	42.88
RUNOFF COEFFICIENT	=	0.98	0.71	0.84

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0030)	Area (ha)= 4.80
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	4.32	0.48	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	178.89	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		148.35	362.29	
over (min)		5.00	10.00	
Storage Coeff. (min)=		3.09 (ii)	6.99 (ii)	
Unit Hyd. Tpeak (min)=		5.00	10.00	
Unit Hyd. peak (cms)=		0.27	0.14	
				TOTALS
PEAK FLOW	(cms)=	0.83	0.38	1.044 (iii)
TIME TO PEAK	(hrs)=	1.33	1.42	1.33
RUNOFF VOLUME	(mm)=	42.78	30.61	36.69
TOTAL RAINFALL	(mm)=	42.88	42.88	42.88
RUNOFF COEFFICIENT	=	1.00	0.71	0.86

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0029)					
1 + 2 = 3		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
	ID1= 1 (0030):	4.80	1.044	1.33	36.69
	+ ID2= 2 (0031):	0.19	0.059	1.33	36.22
	ID = 3 (0029):	4.99	1.103	1.33	36.68

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0035)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0029):	4.99	1.103	1.33	36.68
	+ ID2= 2 (0034):	0.78	0.191	1.33	36.24
	ID = 3 (0035):	5.77	1.294	1.33	36.62

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB					
WILHYD (0005)	Area (ha)=	0.78	Curve Number (CN)=	76.7	
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	Recession const.(K)=	1.08	
	U.H. Tp(hrs)=	0.92			

U.H. peak (cms)= 0.03

PEAK FLOW (cms)= 0.01 (i)
TIME TO PEAK (hrs)= 2.58
RUNOFF VOLUME (mm)= 11.05
TOTAL RAINFALL (mm)= 42.88
RUNOFF COEFFICIENT = 0.26

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
WILHYD (0001)	Area (ha)=	4.99	Curve Number (CN)=	76.7	
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	Recession const.(K)=	1.08	
	U.H. Tp(hrs)=	0.92			

U.H. peak (cms)= 0.17

PEAK FLOW (cms)= 0.05 (i)
TIME TO PEAK (hrs)= 2.58
RUNOFF VOLUME (mm)= 12.21
TOTAL RAINFALL (mm)= 42.88
RUNOFF COEFFICIENT = 0.28

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0033)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0001):	4.99	0.053	2.58	12.21
	+ ID2= 2 (0005):	0.78	0.008	2.58	11.05
	ID = 3 (0033):	5.77	0.061	2.58	12.05

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB					
STANDHYD (0050)	Area (ha)=	0.78			
ID= 1 DT= 5.0 min	Total Imp(%)=	90.00	Dir. Conn.(%)=	50.00	

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.70	0.08	
Dep. Storage	(mm)=	1.00	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	72.11	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		148.35	362.29	
over (min)		5.00	10.00	
Storage Coeff. (min)=		1.79 (ii)	5.69 (ii)	
Unit Hyd. Tpeak (min)=		5.00	10.00	
Unit Hyd. peak (cms)=		0.32	0.15	
				TOTALS
PEAK FLOW	(cms)=	0.15	0.07	0.191 (iii)
TIME TO PEAK	(hrs)=	1.33	1.42	1.33
RUNOFF VOLUME	(mm)=	41.88	30.61	36.24
TOTAL RAINFALL	(mm)=	42.88	42.88	42.88

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     RUNOFF COEFFICIENT   =       0.98         0.71           0.85

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR (0007) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0050)      0.780      0.191      1.33      36.24
     OUTFLOW: ID= 1 (0007)      0.780      0.008      3.33      35.35

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  4.04
                   TIME SHIFT OF PEAK FLOW         (min)=120.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.0212

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--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   0.19
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.17         0.02
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      35.59        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=     148.35       362.29
               over (min)         5.00         5.00
     Storage Coeff.  (min)=       1.09 (ii)    4.69 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.22
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.02          0.059 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33           1.33
     RUNOFF VOLUME    (mm)=      41.88        30.61          36.22
     TOTAL RAINFALL   (mm)=      42.88        42.88          42.88
     RUNOFF COEFFICIENT   =       0.98         0.71           0.84

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR (0006) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0002)      0.190      0.059      1.33      36.22
     OUTFLOW: ID= 1 (0006)      0.190      0.002      3.33      32.56

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  3.18
                   TIME SHIFT OF PEAK FLOW         (min)=120.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.0052

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--------------------
| CALIB            |
| STANDHYD  (0010) |   Area    (ha)=   4.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
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```
     Surface Area     (ha)=       4.32         0.48
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     178.89        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     148.35       362.29
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       3.09 (ii)    6.99 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.27         0.14
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.83         0.38         1.044 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      42.78        30.61         36.69
     TOTAL RAINFALL   (mm)=      42.88        42.88         42.88
     RUNOFF COEFFICIENT   =       1.00         0.71          0.86

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR (0004) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000    |   0.0800      0.2287
                         0.0080     0.0784    |   0.1130      0.2438
                         0.0090     0.0948    |   0.1470      0.2565
                         0.0100     0.1483    |   0.2210      0.2733
                         0.0370     0.1809    |   0.6370      0.3305
                         0.0450     0.2000    |   0.6380      0.3306
                         0.0460     0.2050    |   0.7840      0.3465
                         0.0790     0.2285    |   0.0000      0.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0010)      4.800      1.044      1.33      36.69
     OUTFLOW: ID= 1 (0004)      4.800      0.022      4.08      36.18

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  2.06
                   TIME SHIFT OF PEAK FLOW         (min)=165.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.1623

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--------------------
| ADD HYD   (0003) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0004):     4.80   0.022     4.08    36.18
        + ID2= 2 (0006):     0.19   0.002     3.33    32.56
          ================================================
          ID = 3 (0003):     4.99   0.023     4.08    36.04

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| ADD HYD   (0036) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0003):     4.99   0.023     4.08    36.04
        + ID2= 2 (0007):     0.78   0.008     3.33    35.35
          ================================================
          ID = 3 (0036):     5.77   0.031     4.08    35.94

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ***************************
  ** SIMULATION NUMBER:   3 **
  ***************************

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| CHICAGO STORM    |    IDF curve parameters: A= 665.492
| Ptotal= 50.39 mm |                          B=   1.500
```

C= 0.723

used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step = 5.00 min
Time to peak ratio = 0.33

The CORRELATION coefficient is = 0.9996

TIME (min)	INPUT INT. (mm/hr)	TAB. INT. (mm/hr)
5.	185.30	171.95
10.	114.20	113.83
15.	86.10	87.68
30.	53.00	54.94
60.	32.70	33.87
120.	20.20	20.70
360.	9.40	9.41
720.	5.80	5.71
1440.	3.60	3.46

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.08	3.75	1.08	13.10	2.08	9.01	3.08	4.81
0.17	3.94	1.17	18.68	2.17	8.32	3.17	4.65
0.25	4.17	1.25	39.21	2.25	7.75	3.25	4.50
0.33	4.43	1.33	171.95	2.33	7.27	3.33	4.36
0.42	4.73	1.42	49.94	2.42	6.85	3.42	4.23
0.50	5.08	1.50	28.53	2.50	6.49	3.50	4.11
0.58	5.50	1.58	20.76	2.58	6.16	3.58	4.00
0.67	6.01	1.67	16.63	2.67	5.88	3.67	3.90
0.75	6.66	1.75	14.02	2.75	5.62	3.75	3.80
0.83	7.50	1.83	12.21	2.83	5.39	3.83	3.70
0.92	8.66	1.92	10.87	2.92	5.18	3.92	3.62
1.00	10.34	2.00	9.83	3.00	4.99	4.00	3.53

CALIB	
STANDHYD (0034)	Area (ha)= 0.78
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.70	0.08	
Dep. Storage	(mm)=	1.00	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	72.11	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		171.95	442.21	
over (min)		5.00	10.00	
Storage Coeff.	(min)=	1.69 (ii)	5.37 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	10.00	
Unit Hyd. peak	(cms)=	0.32	0.16	
				TOTALS
PEAK FLOW	(cms)=	0.18	0.08	0.227 (iii)
TIME TO PEAK	(hrs)=	1.33	1.42	1.33
RUNOFF VOLUME	(mm)=	49.39	37.63	43.50
TOTAL RAINFALL	(mm)=	50.39	50.39	50.39
RUNOFF COEFFICIENT	=	0.98	0.75	0.86

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0031)	Area (ha)= 0.19
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.17	0.02
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.30	1.30
Length	(m)=	35.59	40.00
Mannings n	=	0.013	0.250

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     Max.Eff.Inten.(mm/hr)=     171.95       442.21
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       1.02 (ii)    4.42 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.23
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.03         0.071 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=      49.39        37.63         43.49
     TOTAL RAINFALL   (mm)=      50.39        50.39         50.39
     RUNOFF COEFFICIENT   =       0.98         0.75          0.86

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB            |
| STANDHYD  (0030) |   Area    (ha)=   4.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.32         0.48
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     178.89        40.00
     Mannings n             =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     171.95       442.21
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.92 (ii)    6.59 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.28         0.14
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.98         0.47         1.254 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      50.29        37.63         43.96
     TOTAL RAINFALL   (mm)=      50.39        50.39         50.39
     RUNOFF COEFFICIENT   =       1.00         0.75          0.87

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| ADD HYD   (0029) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0030):     4.80   1.254     1.33    43.96
        + ID2= 2 (0031):     0.19   0.071     1.33    43.49
          ================================================
          ID = 3 (0029):     4.99   1.324     1.33    43.94

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| ADD HYD   (0035) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0029):     4.99   1.324     1.33    43.94
        + ID2= 2 (0034):     0.78   0.227     1.33    43.50
          ================================================
          ID = 3 (0035):     5.77   1.551     1.33    43.88

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| WILHYD    (0005) |   Area    (ha)=   0.78   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 1.08
```

```
-------------------   U.H. Tp(hrs)=   0.92

     U.H. peak       (cms)=   0.03

     PEAK FLOW       (cms)=   0.01 (i)
     TIME TO PEAK    (hrs)=   2.58
     RUNOFF VOLUME    (mm)=  15.26
     TOTAL RAINFALL   (mm)=  50.39
     RUNOFF COEFFICIENT   =   0.30

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB             |
| WILHYD    (0001) |   Area    (ha)=   4.99   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 1.08
--------------------   U.H. Tp(hrs)=   0.92

     U.H. peak       (cms)=   0.17

     PEAK FLOW       (cms)=   0.07 (i)
     TIME TO PEAK    (hrs)=   2.58
     RUNOFF VOLUME    (mm)=  16.53
     TOTAL RAINFALL   (mm)=  50.39
     RUNOFF COEFFICIENT   =   0.33

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0033) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     4.99   0.072     2.58    16.53
        + ID2= 2 (0005):     0.78   0.011     2.58    15.26
          ================================================
          ID = 3 (0033):     5.77   0.083     2.58    16.36

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD  (0050) |   Area    (ha)=   0.78
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.70         0.08
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      72.11        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     171.95       442.21
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       1.69 (ii)    5.37 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.32         0.16
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.18         0.08          0.227 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42           1.33
     RUNOFF VOLUME    (mm)=      49.39        37.63          43.50
     TOTAL RAINFALL   (mm)=      50.39        50.39          50.39
     RUNOFF COEFFICIENT   =       0.98         0.75           0.86

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0007) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0050)      0.780      0.227      1.33      43.50
```

```
     OUTFLOW: ID= 1 (0007)      0.780      0.009      3.33      42.62

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  4.08
                  TIME SHIFT OF PEAK FLOW         (min)=120.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0254

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   0.19
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.17         0.02
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      35.59        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     171.95       442.21
               over (min)         5.00         5.00
     Storage Coeff.  (min)=       1.02 (ii)    4.42 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.23
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.03          0.071 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33           1.33
     RUNOFF VOLUME    (mm)=      49.39        37.63          43.49
     TOTAL RAINFALL   (mm)=      50.39        50.39          50.39
     RUNOFF COEFFICIENT   =       0.98         0.75           0.86

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0006) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0002)      0.190      0.071      1.33      43.49
     OUTFLOW: ID= 1 (0006)      0.190      0.002      3.33      39.84

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  3.19
                  TIME SHIFT OF PEAK FLOW         (min)=120.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0062

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0010) |   Area    (ha)=   4.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.32         0.48
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     178.89        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     171.95       442.21
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       2.92 (ii)    6.59 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.28         0.14
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.98         0.47          1.254 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42           1.33
     RUNOFF VOLUME    (mm)=      50.29        37.63          43.96
     TOTAL RAINFALL   (mm)=      50.39        50.39          50.39
     RUNOFF COEFFICIENT   =       1.00         0.75           0.87

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
```

```
           CN*  =  76.7    Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0004) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0800      0.2287
                          0.0080     0.0784   |   0.1130      0.2438
                          0.0090     0.0948   |   0.1470      0.2565
                          0.0100     0.1483   |   0.2210      0.2733
                          0.0370     0.1809   |   0.6370      0.3305
                          0.0450     0.2000   |   0.6380      0.3306
                          0.0460     0.2050   |   0.7840      0.3465
                          0.0790     0.2285   |   0.0000      0.0000

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
    INFLOW : ID= 2 (0010)      4.800      1.254      1.33      43.96
    OUTFLOW: ID= 1 (0004)      4.800      0.038      4.00      43.44

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  3.05
                  TIME SHIFT OF PEAK FLOW         (min)=160.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.1839

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--------------------
| ADD HYD   (0003) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0004):     4.80   0.038     4.00    43.44
       + ID2= 2 (0006):     0.19   0.002     3.33    39.84
         ================================================
         ID = 3 (0003):     4.99   0.040     4.00    43.30

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD   (0036) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0003):     4.99   0.040     4.00    43.30
       + ID2= 2 (0007):     0.78   0.009     3.33    42.62
         ================================================
         ID = 3 (0036):     5.77   0.050     4.00    43.21

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ****************************
  ** SIMULATION NUMBER:   4 **
  ****************************


--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 792.607
| Ptotal= 59.36 mm |                          B=   1.500
--------------------                          C=   0.725
                         used in:   INTENSITY =  A / (t + B)^C

                         Duration of storm  =  4.00 hrs
                         Storm time step    =  5.00 min
                         Time to peak ratio =  0.33

                    The CORRELATION coefficient is = 0.9997

                     TIME       INPUT INT.           TAB. INT.
                    (min)        (mm/hr)              (mm/hr)
                       5.         219.20               204.03
                      10.         135.10               134.91
                      15.         101.70               103.84
                      30.          62.70                64.98
                      60.          38.60                40.01
                     120.          23.80                24.42
                     360.          11.00                11.08
                     720.           6.80                 6.71
                    1440.           4.20                 4.06
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.08	4.38	1.08	15.39	2.08	10.56	3.08	5.63
0.17	4.62	1.17	21.96	2.17	9.76	3.17	5.44
0.25	4.88	1.25	46.25	2.25	9.09	3.25	5.27
0.33	5.18	1.33	204.03	2.33	8.52	3.33	5.11
0.42	5.53	1.42	58.96	2.42	8.03	3.42	4.95
0.50	5.94	1.50	33.61	2.50	7.60	3.50	4.81
0.58	6.44	1.58	24.43	2.58	7.22	3.58	4.68
0.67	7.05	1.67	19.55	2.67	6.88	3.67	4.56
0.75	7.81	1.75	16.47	2.75	6.58	3.75	4.44
0.83	8.80	1.83	14.34	2.83	6.31	3.83	4.33
0.92	10.15	1.92	12.76	2.92	6.06	3.92	4.23
1.00	12.14	2.00	11.54	3.00	5.84	4.00	4.13

CALIB	STANDHYD (0034)	ID= 1 DT= 5.0 min

Area (ha)= 0.78
Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.70	0.08	
Dep. Storage	(mm)=	1.00	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	72.11	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		204.03	547.34	
over (min)		5.00	10.00	
Storage Coeff.	(min)=	1.58 (ii)	5.01 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	10.00	
Unit Hyd. peak	(cms)=	0.33	0.16	
				TOTALS
PEAK FLOW	(cms)=	0.21	0.11	0.276 (iii)
TIME TO PEAK	(hrs)=	1.33	1.42	1.33
RUNOFF VOLUME	(mm)=	58.36	46.15	52.25
TOTAL RAINFALL	(mm)=	59.36	59.36	59.36
RUNOFF COEFFICIENT	=	0.98	0.78	0.88

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	STANDHYD (0031)	ID= 1 DT= 5.0 min

Area (ha)= 0.19
Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.17	0.02	
Dep. Storage	(mm)=	1.00	5.00	
Average Slope	(%)=	1.30	1.30	
Length	(m)=	35.59	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		204.03	547.34	
over (min)		5.00	5.00	
Storage Coeff.	(min)=	0.96 (ii)	4.13 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	5.00	
Unit Hyd. peak	(cms)=	0.34	0.24	
				TOTALS
PEAK FLOW	(cms)=	0.05	0.03	0.086 (iii)
TIME TO PEAK	(hrs)=	1.33	1.33	1.33
RUNOFF VOLUME	(mm)=	58.36	46.15	52.23
TOTAL RAINFALL	(mm)=	59.36	59.36	59.36
RUNOFF COEFFICIENT	=	0.98	0.78	0.88

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
--------------------
| CALIB            |
| STANDHYD  (0030) |   Area    (ha)=   4.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.32         0.48
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     178.89        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     204.03       547.34
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.72 (ii)    6.15 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.29         0.15
                                                        *TOTALS*
     PEAK FLOW       (cms)=       1.19         0.61         1.540 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      59.26        46.15         52.70
     TOTAL RAINFALL   (mm)=      59.36        59.36         59.36
     RUNOFF COEFFICIENT   =       1.00         0.78          0.89

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0029) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0030):     4.80   1.540     1.33    52.70
       + ID2= 2 (0031):     0.19   0.086     1.33    52.23
         ================================================
         ID = 3 (0029):     4.99   1.626     1.33    52.69

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD   (0035) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0029):     4.99   1.626     1.33    52.69
       + ID2= 2 (0034):     0.78   0.276     1.33    52.25
         ================================================
         ID = 3 (0035):     5.77   1.902     1.33    52.63

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| WILHYD    (0005) |   Area    (ha)=   0.78   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 1.08
--------------------   U.H. Tp(hrs)=   0.92

     U.H. peak       (cms)=   0.03

     PEAK FLOW       (cms)=   0.02 (i)
     TIME TO PEAK    (hrs)=   2.50
     RUNOFF VOLUME    (mm)=  20.91
     TOTAL RAINFALL   (mm)=  59.36
     RUNOFF COEFFICIENT   =   0.35

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| WILHYD    (0001) |   Area    (ha)=   4.99   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 1.08
--------------------   U.H. Tp(hrs)=   0.92

     U.H. peak       (cms)=   0.17

     PEAK FLOW       (cms)=   0.10 (i)
```

```
     TIME TO PEAK    (hrs)=   2.50
     RUNOFF VOLUME    (mm)=  22.17
     TOTAL RAINFALL   (mm)=  59.36
     RUNOFF COEFFICIENT   =   0.37

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0033) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     4.99   0.097     2.50    22.17
        + ID2= 2 (0005):     0.78   0.015     2.50    20.91
          ================================================
          ID = 3 (0033):     5.77   0.113     2.50    22.00

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0050) |   Area    (ha)=   0.78
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.70         0.08
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      72.11        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     204.03       547.34
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       1.58 (ii)    5.01 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.33         0.16
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.21         0.11          0.276 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42           1.33
     RUNOFF VOLUME    (mm)=      58.36        46.15          52.25
     TOTAL RAINFALL   (mm)=      59.36        59.36          59.36
     RUNOFF COEFFICIENT   =       0.98         0.78           0.88

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0007) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0050)      0.780      0.276      1.33       52.25
     OUTFLOW: ID= 1 (0007)      0.780      0.011      3.33       51.37

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=  4.03
                    TIME SHIFT OF PEAK FLOW         (min)=120.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.0306

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   0.19
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.17         0.02
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      35.59        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     204.03       547.34
               over (min)         5.00         5.00
```

```
     Storage Coeff.  (min)=       0.96 (ii)    4.13 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.24
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.05         0.03         0.086 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=      58.36        46.15         52.23
     TOTAL RAINFALL   (mm)=      59.36        59.36         59.36
     RUNOFF COEFFICIENT   =       0.98         0.78          0.88

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0006) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0002)      0.190      0.086      1.33      52.23
     OUTFLOW: ID= 1 (0006)      0.190      0.003      3.25      48.60

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  3.14
                  TIME SHIFT OF PEAK FLOW         (min)=115.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0074

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0010) |   Area    (ha)=   4.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.32         0.48
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     178.89        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=     204.03       547.34
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       2.72 (ii)    6.15 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.29         0.15
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.19         0.61         1.540 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      59.26        46.15         52.70
     TOTAL RAINFALL   (mm)=      59.36        59.36         59.36
     RUNOFF COEFFICIENT   =       1.00         0.78          0.89

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0004) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0800      0.2287
                         0.0080     0.0784   |   0.1130      0.2438
                         0.0090     0.0948   |   0.1470      0.2565
                         0.0100     0.1483   |   0.2210      0.2733
                         0.0370     0.1809   |   0.6370      0.3305
                         0.0450     0.2000   |   0.6380      0.3306
                         0.0460     0.2050   |   0.7840      0.3465
                         0.0790     0.2285   |   0.0000      0.0000

                                AREA     QPEAK     TPEAK       R.V.
```

	(ha)	(cms)	(hrs)	(mm)
INFLOW : ID= 2 (0010)	4.800	1.540	1.33	52.70
OUTFLOW: ID= 1 (0004)	4.800	0.054	4.00	52.18

PEAK FLOW REDUCTION [Qout/Qin](%)= 3.53
TIME SHIFT OF PEAK FLOW (min)=160.00
MAXIMUM STORAGE USED (ha.m.)= 0.2109

ADD HYD (0003)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0004):	4.80	0.054	4.00	52.18
+ ID2= 2 (0006):	0.19	0.003	3.25	48.60
ID = 3 (0003):	4.99	0.057	4.00	52.05

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0036)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0003):	4.99	0.057	4.00	52.05
+ ID2= 2 (0007):	0.78	0.011	3.33	51.37
ID = 3 (0036):	5.77	0.068	4.00	51.96

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

**** SIMULATION NUMBER: 5 ****

CHICAGO STORM
Ptotal= 66.15 mm

IDF curve parameters: A= 878.493
B= 1.500
C= 0.724
used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step = 5.00 min
Time to peak ratio = 0.33

The CORRELATION coefficient is = 0.9997

TIME (min)	INPUT INT. (mm/hr)	TAB. INT. (mm/hr)
5.	243.60	226.56
10.	150.20	149.90
15.	113.20	115.42
30.	69.80	72.27
60.	43.00	44.52
120.	26.50	27.20
360.	12.30	12.35
720.	7.60	7.49
1440.	4.70	4.54

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.08	4.90	1.08	17.18	2.08	11.80	3.08	6.30
0.17	5.16	1.17	24.50	2.17	10.90	3.17	6.09
0.25	5.46	1.25	51.51	2.25	10.16	3.25	5.89
0.33	5.79	1.33	226.56	2.33	9.52	3.33	5.71
0.42	6.18	1.42	65.63	2.42	8.97	3.42	5.54
0.50	6.65	1.50	37.45	2.50	8.49	3.50	5.38
0.58	7.20	1.58	27.24	2.58	8.07	3.58	5.24
0.67	7.87	1.67	21.81	2.67	7.69	3.67	5.10
0.75	8.72	1.75	18.38	2.75	7.36	3.75	4.97
0.83	9.83	1.83	16.01	2.83	7.05	3.83	4.85
0.92	11.34	1.92	14.25	2.92	6.78	3.92	4.73
1.00	13.55	2.00	12.89	3.00	6.53	4.00	4.62

CALIB
STANDHYD (0034) | Area (ha)= 0.78

```
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
-------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.70         0.08
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      72.11        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     226.56       623.35
               over (min)         5.00         5.00
     Storage Coeff.  (min)=       1.51 (ii)    4.80 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.33         0.22
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.24         0.14         0.382 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=      65.15        52.67         58.91
     TOTAL RAINFALL   (mm)=      66.15        66.15         66.15
     RUNOFF COEFFICIENT   =       0.98         0.80          0.89

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-------------------
| CALIB             |
| STANDHYD  (0031) |   Area    (ha)=   0.19
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
-------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.17         0.02
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      35.59        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     226.56       623.35
               over (min)         5.00         5.00
     Storage Coeff.  (min)=       0.92 (ii)    3.96 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.24
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.06         0.04         0.098 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=      65.15        52.67         58.89
     TOTAL RAINFALL   (mm)=      66.15        66.15         66.15
     RUNOFF COEFFICIENT   =       0.98         0.80          0.89

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-------------------
| CALIB             |
| STANDHYD  (0030) |   Area    (ha)=   4.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
-------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.32         0.48
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     178.89        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     226.56       623.35
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       2.61 (ii)    5.90 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.29         0.15
                                                        *TOTALS*
     PEAK FLOW       (cms)=       1.33         0.71         1.747 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      66.05        52.67         59.36
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     TOTAL RAINFALL   (mm)=      66.15        66.15          66.15
     RUNOFF COEFFICIENT   =       1.00         0.80           0.90

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0029) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0030):     4.80   1.747     1.33    59.36
        + ID2= 2 (0031):     0.19   0.098     1.33    58.89
          ================================================
          ID = 3 (0029):     4.99   1.844     1.33    59.34

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD   (0035) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0029):     4.99   1.844     1.33    59.34
        + ID2= 2 (0034):     0.78   0.382     1.33    58.91
          ================================================
          ID = 3 (0035):     5.77   2.226     1.33    59.28

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| WILHYD    (0005) |   Area    (ha)=   0.78   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 1.08
--------------------   U.H. Tp(hrs)=   0.92

     U.H. peak       (cms)=   0.03

     PEAK FLOW       (cms)=   0.02 (i)
     TIME TO PEAK    (hrs)=   2.50
     RUNOFF VOLUME    (mm)=  25.46
     TOTAL RAINFALL   (mm)=  66.15
     RUNOFF COEFFICIENT   =   0.38

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| WILHYD    (0001) |   Area    (ha)=   4.99   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 1.08
--------------------   U.H. Tp(hrs)=   0.92

     U.H. peak       (cms)=   0.17

     PEAK FLOW       (cms)=   0.12 (i)
     TIME TO PEAK    (hrs)=   2.50
     RUNOFF VOLUME    (mm)=  26.73
     TOTAL RAINFALL   (mm)=  66.15
     RUNOFF COEFFICIENT   =   0.40

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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--------------------
| ADD HYD   (0033) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     4.99   0.118     2.50    26.73
        + ID2= 2 (0005):     0.78   0.018     2.50    25.46
          ================================================
          ID = 3 (0033):     5.77   0.136     2.50    26.56

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| CALIB             |
| STANDHYD  (0050) |   Area    (ha)=   0.78
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.70         0.08
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      72.11        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     226.56       623.35
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       1.51 (ii)    4.80 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.33         0.22
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.24         0.14         0.382 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=      65.15        52.67         58.91
     TOTAL RAINFALL   (mm)=      66.15        66.15         66.15
     RUNOFF COEFFICIENT   =       0.98         0.80          0.89

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0007) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0050)      0.780      0.382      1.33       58.91
     OUTFLOW: ID= 1 (0007)      0.780      0.013      3.25       58.02

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  3.28
                   TIME SHIFT OF PEAK FLOW         (min)=115.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.0345

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD  (0002) |   Area    (ha)=   0.19
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.17         0.02
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      35.59        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     226.56       623.35
               over (min)        5.00         5.00
     Storage Coeff.  (min)=       0.92 (ii)    3.96 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.24
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.06         0.04         0.098 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=      65.15        52.67         58.89
     TOTAL RAINFALL   (mm)=      66.15        66.15         66.15
     RUNOFF COEFFICIENT   =       0.98         0.80          0.89

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR (0006) |
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```
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0002)      0.190      0.098      1.33      58.89
     OUTFLOW: ID= 1 (0006)      0.190      0.003      3.25      55.26

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  3.13
                   TIME SHIFT OF PEAK FLOW         (min)=115.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.0084

--------------------------------------------------------------------------------
-------------------
| CALIB             |
| STANDHYD  (0010)  |   Area    (ha)=   4.80
|ID= 1 DT= 5.0 min  |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
-------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.32         0.48
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     178.89        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     226.56       623.35
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       2.61 (ii)    5.90 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.29         0.15
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.33         0.71         1.747 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      66.05        52.67         59.36
     TOTAL RAINFALL   (mm)=      66.15        66.15         66.15
     RUNOFF COEFFICIENT   =       1.00         0.80          0.90

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-------------------
| RESERVOIR (0004) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0800      0.2287
                         0.0080     0.0784   |   0.1130      0.2438
                         0.0090     0.0948   |   0.1470      0.2565
                         0.0100     0.1483   |   0.2210      0.2733
                         0.0370     0.1809   |   0.6370      0.3305
                         0.0450     0.2000   |   0.6380      0.3306
                         0.0460     0.2050   |   0.7840      0.3465
                         0.0790     0.2285   |   0.0000      0.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0010)      4.800      1.747      1.33      59.36
     OUTFLOW: ID= 1 (0004)      4.800      0.076      3.33      58.84

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  4.33
                   TIME SHIFT OF PEAK FLOW         (min)=120.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.2261

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-------------------
| ADD HYD   (0003) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
-------------------           (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0004):     4.80   0.076     3.33    58.84
        + ID2= 2 (0006):     0.19   0.003     3.25    55.26
          ================================================
          ID = 3 (0003):     4.99   0.079     3.33    58.71

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

ADD HYD (0036)		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
1 + 2 = 3	ID1= 1 (0003):	4.99	0.079	3.33	58.71
	+ ID2= 2 (0007):	0.78	0.013	3.25	58.02
	ID = 3 (0036):	5.77	0.091	3.33	58.61

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

****
**** SIMULATION NUMBER: 6 ****
****

CHICAGO STORM	Ptotal= 73.18 mm

IDF curve parameters: A= 966.620
B= 1.507
C= 0.723
used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step = 5.00 min
Time to peak ratio = 0.33

The CORRELATION coefficient is = 0.9996

TIME (min)	INPUT INT. (mm/hr)	TAB. INT. (mm/hr)
5.	268.60	249.56
10.	165.50	165.26
15.	124.70	127.32
30.	76.90	79.78
60.	47.40	49.19
120.	29.20	30.07
360.	13.60	13.67
720.	8.40	8.29
1440.	5.20	5.03

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.08	5.44	1.08	19.04	2.08	13.08	3.08	6.99
0.17	5.73	1.17	27.14	2.17	12.09	3.17	6.75
0.25	6.06	1.25	56.99	2.25	11.27	3.25	6.54
0.33	6.43	1.33	249.56	2.33	10.56	3.33	6.34
0.42	6.86	1.42	72.58	2.42	9.95	3.42	6.15
0.50	7.37	1.50	41.46	2.50	9.42	3.50	5.98
0.58	7.99	1.58	30.17	2.58	8.95	3.58	5.81
0.67	8.74	1.67	24.16	2.67	8.54	3.67	5.66
0.75	9.68	1.75	20.37	2.75	8.16	3.75	5.52
0.83	10.90	1.83	17.74	2.83	7.83	3.83	5.38
0.92	12.57	1.92	15.79	2.92	7.52	3.92	5.25
1.00	15.03	2.00	14.29	3.00	7.24	4.00	5.13

CALIB	STANDHYD (0034)	ID= 1 DT= 5.0 min

Area (ha)= 0.78
Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.70	0.08	
Dep. Storage	(mm)=	1.00	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	72.11	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)	=	249.56	701.49	
over	(min)	5.00	5.00	
Storage Coeff.	(min)=	1.46 (ii)	4.62 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	5.00	
Unit Hyd. peak	(cms)=	0.33	0.22	
				TOTALS
PEAK FLOW	(cms)=	0.26	0.16	0.428 (iii)
TIME TO PEAK	(hrs)=	1.33	1.33	1.33
RUNOFF VOLUME	(mm)=	72.18	59.47	65.82
TOTAL RAINFALL	(mm)=	73.18	73.18	73.18
RUNOFF COEFFICIENT	=	0.99	0.81	0.90

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0031)	Area (ha)= 0.19
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.17	0.02	
Dep. Storage	(mm)=	1.00	5.00	
Average Slope	(%)=	1.30	1.30	
Length	(m)=	35.59	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		249.56	701.49	
over (min)		5.00	5.00	
Storage Coeff. (min)=		0.88 (ii)	3.81 (ii)	
Unit Hyd. Tpeak (min)=		5.00	5.00	
Unit Hyd. peak (cms)=		0.34	0.25	
				TOTALS
PEAK FLOW	(cms)=	0.07	0.04	0.109 (iii)
TIME TO PEAK	(hrs)=	1.33	1.33	1.33
RUNOFF VOLUME	(mm)=	72.18	59.47	65.81
TOTAL RAINFALL	(mm)=	73.18	73.18	73.18
RUNOFF COEFFICIENT	=	0.99	0.81	0.90

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0030)	Area (ha)= 4.80
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	4.32	0.48	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	178.89	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		249.56	701.49	
over (min)		5.00	10.00	
Storage Coeff. (min)=		2.51 (ii)	5.68 (ii)	
Unit Hyd. Tpeak (min)=		5.00	10.00	
Unit Hyd. peak (cms)=		0.29	0.15	
				TOTALS
PEAK FLOW	(cms)=	1.48	0.81	1.961 (iii)
TIME TO PEAK	(hrs)=	1.33	1.42	1.33
RUNOFF VOLUME	(mm)=	73.08	59.47	66.28
TOTAL RAINFALL	(mm)=	73.18	73.18	73.18
RUNOFF COEFFICIENT	=	1.00	0.81	0.91

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0029)					
1 + 2 = 3		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
	ID1= 1 (0030):	4.80	1.961	1.33	66.28
	+ ID2= 2 (0031):	0.19	0.109	1.33	65.81
	ID = 3 (0029):	4.99	2.070	1.33	66.26

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

ADD HYD (0035)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0029):	4.99	2.070	1.33	66.26
	+ ID2= 2 (0034):	0.78	0.428	1.33	65.82
	ID = 3 (0035):	5.77	2.498	1.33	66.20

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB					
WILHYD (0005)	Area (ha)=	0.78	Curve Number (CN)=	76.7	
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	Recession const.(K)=	1.08	
	U.H. Tp(hrs)=	0.92			

U.H. peak (cms)= 0.03

PEAK FLOW (cms)= 0.02 (i)
TIME TO PEAK (hrs)= 2.50
RUNOFF VOLUME (mm)= 30.42
TOTAL RAINFALL (mm)= 73.18
RUNOFF COEFFICIENT = 0.42

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB					
WILHYD (0001)	Area (ha)=	4.99	Curve Number (CN)=	76.7	
ID= 1 DT= 5.0 min	Ia (mm)=	5.00	Recession const.(K)=	1.08	
	U.H. Tp(hrs)=	0.92			

U.H. peak (cms)= 0.17

PEAK FLOW (cms)= 0.14 (i)
TIME TO PEAK (hrs)= 2.50
RUNOFF VOLUME (mm)= 31.67
TOTAL RAINFALL (mm)= 73.18
RUNOFF COEFFICIENT = 0.43

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0033)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0001):	4.99	0.140	2.50	31.67
	+ ID2= 2 (0005):	0.78	0.022	2.50	30.42
	ID = 3 (0033):	5.77	0.162	2.50	31.50

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB					
STANDHYD (0050)	Area (ha)=	0.78			
ID= 1 DT= 5.0 min	Total Imp(%)=	90.00	Dir. Conn.(%)=	50.00	

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	0.70	0.08	
Dep. Storage	(mm)=	1.00	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	72.11	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		249.56	701.49	
over (min)		5.00	5.00	
Storage Coeff. (min)=		1.46 (ii)	4.62 (ii)	
Unit Hyd. Tpeak (min)=		5.00	5.00	
Unit Hyd. peak (cms)=		0.33	0.22	
				TOTALS
PEAK FLOW	(cms)=	0.26	0.16	0.428 (iii)
TIME TO PEAK	(hrs)=	1.33	1.33	1.33
RUNOFF VOLUME	(mm)=	72.18	59.47	65.82
TOTAL RAINFALL	(mm)=	73.18	73.18	73.18

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     RUNOFF COEFFICIENT   =       0.99         0.81           0.90

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| RESERVOIR (0007) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0050)      0.780      0.428      1.33      65.82
     OUTFLOW: ID= 1 (0007)      0.780      0.014      3.25      64.93

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=  3.27
                    TIME SHIFT OF PEAK FLOW         (min)=115.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.0385

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--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   0.19
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.17         0.02
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      35.59        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=     249.56       701.49
               over (min)         5.00         5.00
     Storage Coeff.  (min)=       0.88 (ii)    3.81 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=       0.34         0.25
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.07         0.04          0.109 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33           1.33
     RUNOFF VOLUME    (mm)=      72.18        59.47          65.81
     TOTAL RAINFALL   (mm)=      73.18        73.18          73.18
     RUNOFF COEFFICIENT   =       0.99         0.81           0.90

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR (0006) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0002)      0.190      0.109      1.33      65.81
     OUTFLOW: ID= 1 (0006)      0.190      0.003      3.25      62.17

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=  3.12
                    TIME SHIFT OF PEAK FLOW         (min)=115.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.0094

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--------------------
| CALIB            |
| STANDHYD  (0010) |   Area    (ha)=   4.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
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```
     Surface Area     (ha)=       4.32         0.48
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     178.89        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     249.56       701.49
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.51 (ii)    5.68 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.29         0.15
                                                        *TOTALS*
     PEAK FLOW       (cms)=       1.48         0.81         1.961 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      73.08        59.47         66.28
     TOTAL RAINFALL   (mm)=      73.18        73.18         73.18
     RUNOFF COEFFICIENT   =       1.00         0.81          0.91

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| RESERVOIR (0004) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000    |   0.0800      0.2287
                         0.0080     0.0784    |   0.1130      0.2438
                         0.0090     0.0948    |   0.1470      0.2565
                         0.0100     0.1483    |   0.2210      0.2733
                         0.0370     0.1809    |   0.6370      0.3305
                         0.0450     0.2000    |   0.6380      0.3306
                         0.0460     0.2050    |   0.7840      0.3465
                         0.0790     0.2285    |   0.0000      0.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0010)      4.800      1.961      1.33      66.28
     OUTFLOW: ID= 1 (0004)      4.800      0.105      2.83      65.76

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  5.37
                   TIME SHIFT OF PEAK FLOW         (min)= 90.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.2402

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| ADD HYD   (0003) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0004):     4.80   0.105     2.83    65.76
        + ID2= 2 (0006):     0.19   0.003     3.25    62.17
          ================================================
          ID = 3 (0003):     4.99   0.109     2.83    65.62

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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| ADD HYD   (0036) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0003):     4.99   0.109     2.83    65.62
        + ID2= 2 (0007):     0.78   0.014     3.25    64.93
          ================================================
          ID = 3 (0036):     5.77   0.123     2.83    65.53

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ***************************
  ** SIMULATION NUMBER:   7 **
  ***************************



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|    READ STORM    |    Filename: C:\Users\p004967b\AppD
```

| | ata\Local\Temp\
| | 806d7dd5-8f1d-4296-bb78-7158de124a9e\1db3ca00
| Ptotal=212.00 mm | Comments: HURRICANE HAZEL - FINAL 12 HOURS

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
1.00	6.00	4.00	13.00	7.00	23.00	10.00	53.00
2.00	4.00	5.00	17.00	8.00	13.00	11.00	38.00
3.00	6.00	6.00	13.00	9.00	13.00	12.00	13.00

CALIB
STANDHYD (0034)
ID= 1 DT= 5.0 min

Area (ha)= 0.78
Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.70	0.08
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	1.00
Length	(m)=	72.11	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	6.00	3.083	13.00	6.083	23.00	9.08	53.00
0.167	6.00	3.167	13.00	6.167	23.00	9.17	53.00
0.250	6.00	3.250	13.00	6.250	23.00	9.25	53.00
0.333	6.00	3.333	13.00	6.333	23.00	9.33	53.00
0.417	6.00	3.417	13.00	6.417	23.00	9.42	53.00
0.500	6.00	3.500	13.00	6.500	23.00	9.50	53.00
0.583	6.00	3.583	13.00	6.583	23.00	9.58	53.00
0.667	6.00	3.667	13.00	6.667	23.00	9.67	53.00
0.750	6.00	3.750	13.00	6.750	23.00	9.75	53.00
0.833	6.00	3.833	13.00	6.833	23.00	9.83	53.00
0.917	6.00	3.917	13.00	6.917	23.00	9.92	53.00
1.000	6.00	4.000	13.00	7.000	23.00	10.00	53.00
1.083	4.00	4.083	17.00	7.083	13.00	10.08	38.00
1.167	4.00	4.167	17.00	7.167	13.00	10.17	38.00
1.250	4.00	4.250	17.00	7.250	13.00	10.25	38.00
1.333	4.00	4.333	17.00	7.333	13.00	10.33	38.00
1.417	4.00	4.417	17.00	7.417	13.00	10.42	38.00
1.500	4.00	4.500	17.00	7.500	13.00	10.50	38.00
1.583	4.00	4.583	17.00	7.583	13.00	10.58	38.00
1.667	4.00	4.667	17.00	7.667	13.00	10.67	38.00
1.750	4.00	4.750	17.00	7.750	13.00	10.75	38.00
1.833	4.00	4.833	17.00	7.833	13.00	10.83	38.00
1.917	4.00	4.917	17.00	7.917	13.00	10.92	38.00
2.000	4.00	5.000	17.00	8.000	13.00	11.00	38.00
2.083	6.00	5.083	13.00	8.083	13.00	11.08	13.00
2.167	6.00	5.167	13.00	8.167	13.00	11.17	13.00
2.250	6.00	5.250	13.00	8.250	13.00	11.25	13.00
2.333	6.00	5.333	13.00	8.333	13.00	11.33	13.00
2.417	6.00	5.417	13.00	8.417	13.00	11.42	13.00
2.500	6.00	5.500	13.00	8.500	13.00	11.50	13.00
2.583	6.00	5.583	13.00	8.583	13.00	11.58	13.00
2.667	6.00	5.667	13.00	8.667	13.00	11.67	13.00
2.750	6.00	5.750	13.00	8.750	13.00	11.75	13.00
2.833	6.00	5.833	13.00	8.833	13.00	11.83	13.00
2.917	6.00	5.917	13.00	8.917	13.00	11.92	13.00
3.000	6.00	6.000	13.00	9.000	13.00	12.00	13.00

Max.Eff.Inten.(mm/hr)=		53.00	262.84	
over (min)		5.00	10.00	
Storage Coeff. (min)=		2.71 (ii)	8.61 (ii)	
Unit Hyd. Tpeak (min)=		5.00	10.00	
Unit Hyd. peak (cms)=		0.29	0.12	
				TOTALS
PEAK FLOW	(cms)=	0.06	0.06	0.114 (iii)
TIME TO PEAK	(hrs)=	9.67	10.00	10.00
RUNOFF VOLUME	(mm)=	211.00	196.62	203.80
TOTAL RAINFALL	(mm)=	212.00	212.00	212.00
RUNOFF COEFFICIENT	=	1.00	0.93	0.96

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

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          THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB            |
| STANDHYD  (0031) |   Area    (ha)=   0.19
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.17         0.02
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      35.59        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      53.00       262.84
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       1.64 (ii)    7.09 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.32         0.14
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.01         0.028 (iii)
     TIME TO PEAK    (hrs)=       9.42        10.00         10.00
     RUNOFF VOLUME    (mm)=     211.00       196.62        203.79
     TOTAL RAINFALL   (mm)=     212.00       212.00        212.00
     RUNOFF COEFFICIENT   =       1.00         0.93          0.96

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0030) |   Area    (ha)=   4.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.32         0.48
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     178.89        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      53.00       262.84
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       4.67 (ii)   10.57 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.22         0.09
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.35         0.35         0.702 (iii)
     TIME TO PEAK    (hrs)=      10.00        10.00         10.00
     RUNOFF VOLUME    (mm)=     211.90       196.62        204.26
     TOTAL RAINFALL   (mm)=     212.00       212.00        212.00
     RUNOFF COEFFICIENT   =       1.00         0.93          0.96

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0029) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0030):     4.80   0.702    10.00   204.26
        + ID2= 2 (0031):     0.19   0.028    10.00   203.79
          ================================================
          ID = 3 (0029):     4.99   0.730    10.00   204.24

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD   (0035) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0029):     4.99   0.730    10.00   204.24
        + ID2= 2 (0034):     0.78   0.114    10.00   203.80
          ================================================
          ID = 3 (0035):     5.77   0.844    10.00   204.18

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| WILHYD    (0005) |   Area    (ha)=   0.78   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 1.08
--------------------   U.H. Tp(hrs)=   0.92

     U.H. peak       (cms)=   0.03

     PEAK FLOW       (cms)=   0.06 (i)
     TIME TO PEAK    (hrs)=  11.17
     RUNOFF VOLUME    (mm)= 148.91
     TOTAL RAINFALL   (mm)= 212.00
     RUNOFF COEFFICIENT   =   0.70

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| WILHYD    (0001) |   Area    (ha)=   4.99   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 1.08
--------------------   U.H. Tp(hrs)=   0.92

     U.H. peak       (cms)=   0.17

     PEAK FLOW       (cms)=   0.42 (i)
     TIME TO PEAK    (hrs)=  11.17
     RUNOFF VOLUME    (mm)= 150.16
     TOTAL RAINFALL   (mm)= 212.00
     RUNOFF COEFFICIENT   =   0.71

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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--------------------
| ADD HYD   (0033) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     4.99   0.416    11.17   150.16
        + ID2= 2 (0005):     0.78   0.065    11.17   148.91
          ================================================
          ID = 3 (0033):     5.77   0.481    11.17   149.99

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0050) |   Area    (ha)=   0.78
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------

                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.70         0.08
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      72.11        40.00
     Mannings n             =    0.013        0.250

     Max.Eff.Inten.(mm/hr)=      53.00       262.84
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       2.71 (ii)    8.61 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.29         0.12
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.06         0.06         0.114 (iii)
     TIME TO PEAK    (hrs)=       9.67        10.00         10.00
     RUNOFF VOLUME    (mm)=     211.00       196.62        203.80
     TOTAL RAINFALL   (mm)=     212.00       212.00        212.00
     RUNOFF COEFFICIENT   =       1.00         0.93          0.96

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
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```
           CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0007) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0050)      0.780      0.114     10.00     203.80
     OUTFLOW: ID= 1 (0007)      0.780      0.037     11.25     202.92

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)= 31.95
                    TIME SHIFT OF PEAK FLOW        (min)= 75.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.1004

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   0.19
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.17         0.02
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      35.59        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      53.00       262.84
                over (min)        5.00        10.00
     Storage Coeff.  (min)=       1.64 (ii)    7.09 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.32         0.14
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.01         0.028 (iii)
     TIME TO PEAK    (hrs)=       9.42        10.00         10.00
     RUNOFF VOLUME    (mm)=     211.00       196.62        203.79
     TOTAL RAINFALL   (mm)=     212.00       212.00        212.00
     RUNOFF COEFFICIENT   =       1.00         0.93          0.96

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR (0006) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0150      0.0413

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0002)      0.190      0.028     10.00     203.79
     OUTFLOW: ID= 1 (0006)      0.190      0.009     11.17     200.12

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)= 31.97
                    TIME SHIFT OF PEAK FLOW        (min)= 70.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.0245

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--------------------
| CALIB            |
| STANDHYD  (0010) |   Area    (ha)=   4.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.32         0.48
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     178.89        40.00
     Mannings n           =      0.013        0.250
```

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     Max.Eff.Inten.(mm/hr)=      53.00       262.84
                over (min)        5.00        15.00
     Storage Coeff.  (min)=       4.67 (ii)   10.57 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.22         0.09
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.35         0.35         0.702 (iii)
     TIME TO PEAK    (hrs)=      10.00        10.00         10.00
     RUNOFF VOLUME    (mm)=     211.90       196.62        204.26
     TOTAL RAINFALL   (mm)=     212.00       212.00        212.00
     RUNOFF COEFFICIENT   =       1.00         0.93          0.96

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0004) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0800      0.2287
                         0.0080     0.0784   |   0.1130      0.2438
                         0.0090     0.0948   |   0.1470      0.2565
                         0.0100     0.1483   |   0.2210      0.2733
                         0.0370     0.1809   |   0.6370      0.3305
                         0.0450     0.2000   |   0.6380      0.3306
                         0.0460     0.2050   |   0.7840      0.3465
                         0.0790     0.2285   |   0.0000      0.0000

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0010)     4.800      0.702     10.00     204.26
     OUTFLOW: ID= 1 (0004)     4.800      0.636     10.08     203.74

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)= 90.70
                  TIME SHIFT OF PEAK FLOW         (min)=  5.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.3306

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--------------------
| ADD HYD   (0003) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0004):     4.80   0.636    10.08   203.74
        + ID2= 2 (0006):     0.19   0.009    11.17   200.12
          ================================================
          ID = 3 (0003):     4.99   0.644    10.08   203.60

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD   (0036) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0003):     4.99   0.644    10.08   203.60
        + ID2= 2 (0007):     0.78   0.037    11.25   202.92
          ================================================
          ID = 3 (0036):     5.77   0.674    10.08   203.51

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  **************************
  ** SIMULATION NUMBER:   8 **
  **************************



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|    READ STORM    |    Filename: C:\Users\p004967b\AppD
|                  |              ata\Local\Temp\
|                  |              806d7dd5-8f1d-4296-bb78-7158de124a9e\1ef9c01a
| Ptotal= 25.00 mm |    Comments: 25 mm, 4 hr. chicago dist'n. - water qua
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
```

hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
0.17	2.40	1.17	33.60	2.17	3.45	3.17	1.65
0.33	1.95	1.33	38.10	2.33	3.00	3.33	1.80
0.50	2.40	1.50	13.80	2.50	2.70	3.50	1.50
0.67	2.85	1.67	7.35	2.67	2.25	3.67	1.50
0.83	4.65	1.83	5.55	2.83	2.25	3.83	0.75
1.00	9.60	2.00	4.35	3.00	1.95	4.00	0.60

CALIB STANDHYD (0034)	Area (ha)= 0.78
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.70	0.08
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	1.00
Length	(m)=	72.11	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.40	1.083	33.60	2.083	3.45	3.08	1.65
0.167	2.40	1.167	33.60	2.167	3.45	3.17	1.65
0.250	1.95	1.250	38.10	2.250	3.00	3.25	1.80
0.333	1.95	1.333	38.10	2.333	3.00	3.33	1.80
0.417	2.40	1.417	13.80	2.417	2.70	3.42	1.50
0.500	2.40	1.500	13.80	2.500	2.70	3.50	1.50
0.583	2.85	1.583	7.35	2.583	2.25	3.58	1.50
0.667	2.85	1.667	7.35	2.667	2.25	3.67	1.50
0.750	4.65	1.750	5.55	2.750	2.25	3.75	0.75
0.833	4.65	1.833	5.55	2.833	2.25	3.83	0.75
0.917	9.60	1.917	4.35	2.917	1.95	3.92	0.60
1.000	9.60	2.000	4.35	3.000	1.95	4.00	0.60

Max.Eff.Inten.(mm/hr)=		38.10	128.25	
over (min)		5.00	15.00	
Storage Coeff. (min)=		3.09 (ii)	10.95 (ii)	
Unit Hyd. Tpeak (min)=		5.00	15.00	
Unit Hyd. peak (cms)=		0.27	0.09	
				TOTALS
PEAK FLOW	(cms)=	0.04	0.02	0.056 (iii)
TIME TO PEAK	(hrs)=	1.33	1.50	1.33
RUNOFF VOLUME	(mm)=	24.00	14.61	19.29
TOTAL RAINFALL	(mm)=	25.00	25.00	25.00
RUNOFF COEFFICIENT	=	0.96	0.58	0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.7 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (0031)	Area (ha)= 0.19
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	0.17	0.02
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.30	1.30
Length	(m)=	35.59	40.00
Mannings n	=	0.013	0.250

Max.Eff.Inten.(mm/hr)=		38.10	128.25	
over (min)		5.00	10.00	
Storage Coeff. (min)=		1.87 (ii)	9.14 (ii)	
Unit Hyd. Tpeak (min)=		5.00	10.00	
Unit Hyd. peak (cms)=		0.32	0.12	
				TOTALS
PEAK FLOW	(cms)=	0.01	0.01	0.015 (iii)
TIME TO PEAK	(hrs)=	1.33	1.42	1.33
RUNOFF VOLUME	(mm)=	24.00	14.61	19.27
TOTAL RAINFALL	(mm)=	25.00	25.00	25.00

```
     RUNOFF COEFFICIENT   =       0.96         0.58           0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0030) |   Area    (ha)=   4.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.32         0.48
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     178.89        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10       128.25
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       5.33 (ii)   13.19 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.21         0.08
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.25         0.11          0.332 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50           1.33
     RUNOFF VOLUME    (mm)=      24.90        14.61          19.75
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       1.00         0.58           0.79


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0029) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0030):     4.80   0.332     1.33    19.75
       + ID2= 2 (0031):     0.19   0.015     1.33    19.27
         ================================================
         ID = 3 (0029):     4.99   0.347     1.33    19.73

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| ADD HYD   (0035) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0029):     4.99   0.347     1.33    19.73
       + ID2= 2 (0034):     0.78   0.056     1.33    19.29
         ================================================
         ID = 3 (0035):     5.77   0.403     1.33    19.67

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| WILHYD    (0005) |   Area    (ha)=   0.78   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 1.08
--------------------   U.H. Tp(hrs)=   0.92

     U.H. peak       (cms)=   0.03

     PEAK FLOW       (cms)=   0.00 (i)
     TIME TO PEAK    (hrs)=   2.50
     RUNOFF VOLUME    (mm)=   3.20
     TOTAL RAINFALL   (mm)=  25.00
     RUNOFF COEFFICIENT   =   0.13

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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--------------------------------------------------------------------------------
--------------------
| CALIB             |
| WILHYD    (0001) |   Area    (ha)=   4.99   Curve Number   (CN)= 76.7
|ID= 1 DT= 5.0 min |   Ia      (mm)=   5.00   Recession const.(K)= 1.08
--------------------   U.H. Tp(hrs)=   0.92

     U.H. peak       (cms)=   0.17

     PEAK FLOW       (cms)=   0.02 (i)
     TIME TO PEAK    (hrs)=   2.50
     RUNOFF VOLUME    (mm)=   3.87
     TOTAL RAINFALL   (mm)=  25.00
     RUNOFF COEFFICIENT   =   0.15

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0033) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0001):     4.99   0.018     2.50     3.87
        + ID2= 2 (0005):     0.78   0.003     2.50     3.20
          ================================================
          ID = 3 (0033):     5.77   0.021     2.50     3.78

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB             |
| STANDHYD  (0050) |   Area    (ha)=   0.78
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.70         0.08
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=      72.11        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10       128.25
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       3.09 (ii)   10.95 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.27         0.09
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.04         0.02          0.056 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50           1.33
     RUNOFF VOLUME    (mm)=      24.00        14.61          19.29
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       0.96         0.58           0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0007) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0413

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0050)      0.780      0.056      1.33      19.29
     OUTFLOW: ID= 1 (0007)      0.780      0.004      3.00      18.40

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=  7.39
                    TIME SHIFT OF PEAK FLOW         (min)=100.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.0115

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD  (0002) |   Area    (ha)=   0.19
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
```

```
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       0.17         0.02
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.30         1.30
     Length            (m)=      35.59        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10       128.25
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       1.87 (ii)    9.14 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.32         0.12
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.01         0.01         0.015 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      24.00        14.61         19.27
     TOTAL RAINFALL   (mm)=      25.00        25.00         25.00
     RUNOFF COEFFICIENT   =       0.96         0.58          0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0006) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0150      0.0413

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0002)       0.190      0.015      1.33       19.27
     OUTFLOW: ID= 1 (0006)       0.190      0.001      2.92       15.62

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=  6.81
                    TIME SHIFT OF PEAK FLOW         (min)= 95.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.0028

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0010) |   Area    (ha)=   4.80
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.32         0.48
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     178.89        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10       128.25
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       5.33 (ii)   13.19 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.21         0.08
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.25         0.11         0.332 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50          1.33
     RUNOFF VOLUME    (mm)=      24.90        14.61         19.75
     TOTAL RAINFALL   (mm)=      25.00        25.00         25.00
     RUNOFF COEFFICIENT   =       1.00         0.58          0.79


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  76.7    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0004) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0800      0.2287
```

```
                          0.0080     0.0784   |   0.1130      0.2438
                          0.0090     0.0948   |   0.1470      0.2565
                          0.0100     0.1483   |   0.2210      0.2733
                          0.0370     0.1809   |   0.6370      0.3305
                          0.0450     0.2000   |   0.6380      0.3306
                          0.0460     0.2050   |   0.7840      0.3465
                          0.0790     0.2285   |   0.0000      0.0000

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0010)      4.800      0.332      1.33       19.75
     OUTFLOW: ID= 1 (0004)      4.800      0.008      4.00       19.23

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  2.56
                  TIME SHIFT OF PEAK FLOW         (min)=160.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.0865

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0003) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0004):     4.80   0.008     4.00    19.23
        + ID2= 2 (0006):     0.19   0.001     2.92    15.62
          ================================================
          ID = 3 (0003):     4.99   0.009     3.92    19.10

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0036) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0003):     4.99   0.009     3.92    19.10
        + ID2= 2 (0007):     0.78   0.004     3.00    18.40
          ================================================
          ID = 3 (0036):     5.77   0.014     3.67    19.00

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

 FINISH
================================================================================================================================
```

WHITES ROAD STATION

407 ETR

TWY FLOWS FROM DRAINAGE AREA 34-1 & 34-2 (STA. 14+800 TO STA. 14+468.2) DRAINAGE AREA = 1.29ha TO DRAIN TO SWMF-4

WC #36

SWMF - 4

100yr WL 214.51m

PERMANENT WL 213.50m

OUTLET CONTROL STRUCTURE (SEE DETAIL 2 IN THIS DRAWING)

POND OUTLET (100 YR UNCONTROLLED)

0.975Ø

A–1 0.28 90

A–2 0.53 90

A–3 0.66 90

A–4 1.87 90

A–5 2.46 90

A–6 0.34 90

100yr WL 212.13m

PERMANENT WL 211.00m

SWMF - 5

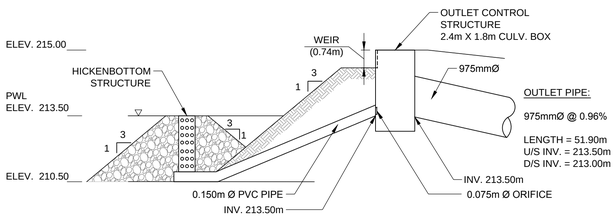
OUTLET CONTROL STRUCTURE (SEE DETAIL 4 IN THIS DRAWING)

POND OUTLET (100 YR UNCONTROLLED)

FUTURE WHITES ROAD

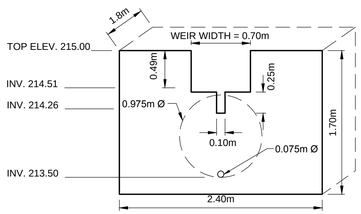
SOUTH EMPLOYMENT COLLECTOR

14+600 14+700 14+800 14+900 15+000 15+100 15+200 15+300



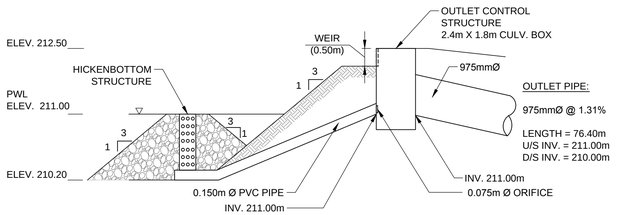
DETAIL 1 - HICKENBOTTOM DRAIN DETAIL

N.T.S.



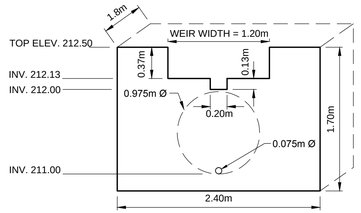
DETAIL 2 - SWMF 4 OUTLET CONTROL STRUCTURE

N.T.S.



DETAIL 3 - HICKENBOTTOM DRAIN DETAIL

N.T.S.



DETAIL 4 - SWMF 5 OUTLET CONTROL STRUCTURE

N.T.S.

LEGEND

- PROPOSED 407 TWY
- EXISTING DITCH
- EXISTING CREEK
- PROPERTY LINES
- EXISTING CULVERT
- DRAINAGE AREA BOUNDARY
- SWALE AND FLOW DIRECTION
- FLOODLINE

AREA ID
A–2 0.29 90
A (ha)
% IMPERVIOUSNESS

SCALE HORIZONTAL 1:1000

5m 0m 10m 20m 30m

DATE: SEPTEMBER 2016

SCALE: 1:1000

Ontario

PARSONS

625 COCHRANE DRIVE, SUITE 500
MARKHAM, ONTARIO L3R 9R9
TEL: 905-943-0500
FAX: 905-943-0400

407 TRANSITWAY FROM KENNEDY RD TO BROCK RD

FIGURE 5.4 - PROPOSED STATION WHITES AND SWMF - 4 & 5 DETAILS

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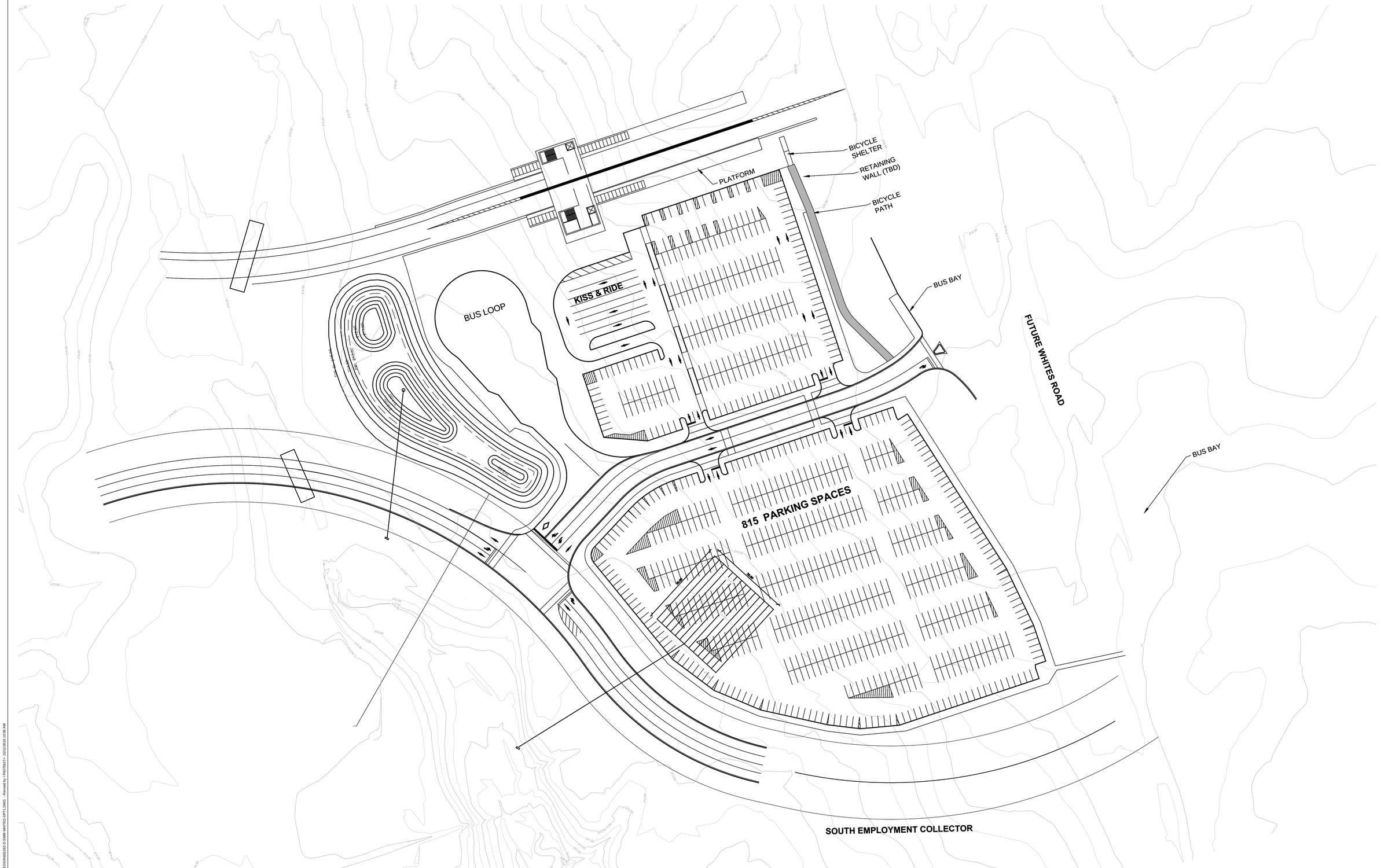

	DATE: SEPTEMBER 2016	Ontario	PARSONS	407 TRANSITWAY FROM KENNEDY RD TO BROCK RD
	SCALE: N.T.S.		625 COCHRANE DRIVE, SUITE 500 MARKHAM, ONTARIO L3R 9R9 TEL: 905-943-0500 FAX: 905-943-0400	SKETCH E1 - WHITES ROAD STATION SOUTH SWMF OPTION 1 (UNDERGROUND TANK)

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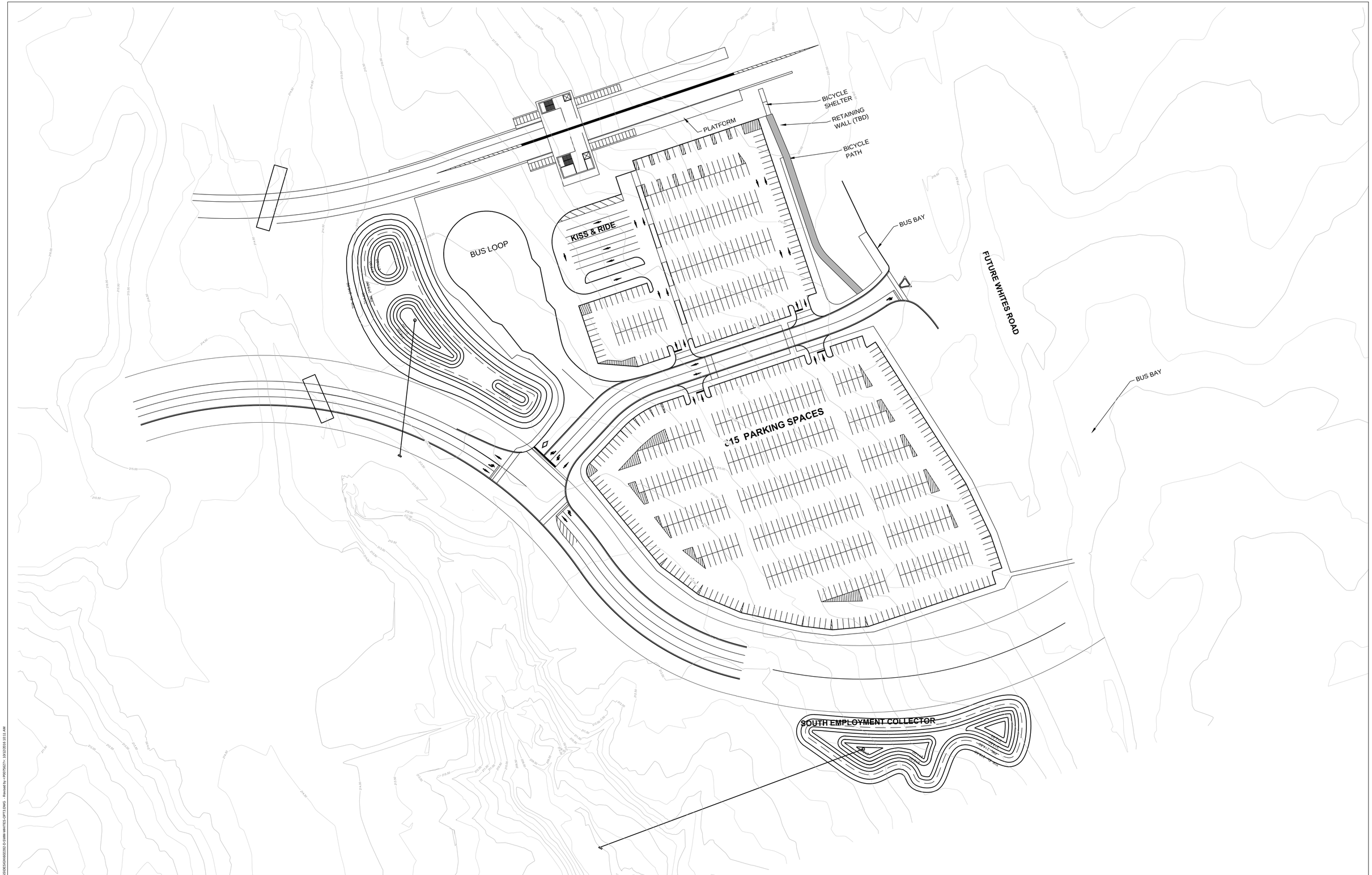
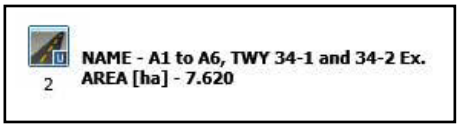
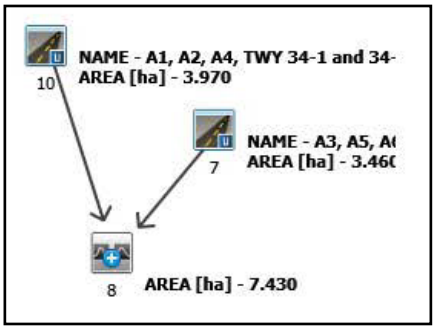


	DATE: SEPTEMBER 2016	Ontario	PARSONS	407 TRANSITWAY FROM KENNEDY RD TO BROCK RD
	SCALE: N.T.S.		625 COCHRANE DRIVE, SUITE 500 MARKHAM, ONTARIO L3R 9R9 TEL: 905-943-0500 FAX: 905-943-0400	SKETCH E2 - WHITES ROAD STATION SOUTH SWMF OPTION 2 (WET POND)

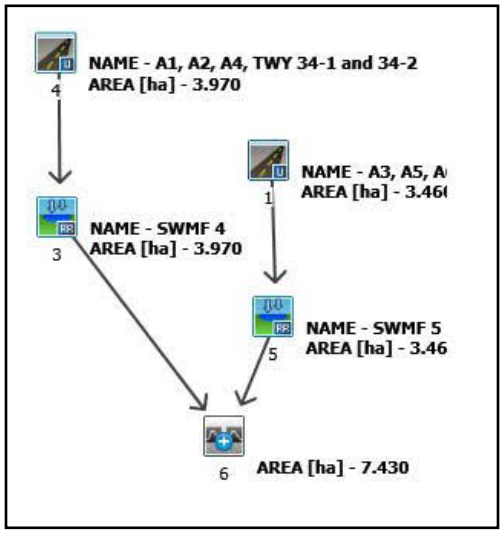
Visual OTTHYMO Modelling Schematic 5.4 – Whites Road Station



Existing Condition



Proposed (Uncontrolled) Condition



Proposed (Controlled) Condition

WHITES ROAD STATION HYDROLOGIC ANALYSIS - EXISTING CONDITION

Input parameters

Proposed Whites Road Station is located within subcatchment 31 - Duffins Watershed
Sub-watershed 31 (Whitevale Creek East Branch)
CN (unadjusted)= 72
Ia (mm)= 5
A north (ha)= 3.97

Table 5.4a: Whites Road Station SWMF 4 - Allowable Release Rates and Storage Required

Unit Flow Rates 2012 Study, TRCA - Sub-catchment 31

Return Period	Q allowable (L/s/ha)	Q allowable (m^3/s)	Storage required (m^3/ha)	Storage required (m^3)
2-yr	2.38	0.009	302	1199
5-yr	3.80	0.015	391	1552
10-yr	4.80	0.019	445	1767
25-yr	6.19	0.025	517	2052
50-yr	7.27	0.029	569	2259
100-yr	8.42	0.033	620	2461

WHITES ROAD STATION HYDROLOGIC ANALYSIS - POST-DEVELOPMENT CONDITION

Table 5.4b: Whites Road Station - Post-Development Condition Hydrologic Analysis - SWMF-4 (12 hr AES)

12hr AES	**Allowable Release Rates** Unit Rates - SubWatershed 31	**Post-Development Condition (Uncontrolled)** VO2 ID10 (A = 3.97 ha)	**Increase from Allowable to Post-Dev Uncontrolled**	**SWMF-4 POST-DEVELOPMENT CONDITION** VO2 ID 3 (A = 3.97 ha)			**Decrease from Allowable to Post-Dev Controlled**
Return Period	**Qp** (m^3/s)	**Qp** (m^3/s)	**(%)**	**Storage Provided** (m^3)	**Storage Required** (m^3)	**Release Rate** (m^3/s)	**(%)**
2-yr	0.009	0.449	4888.89%	1150	1199	0.009	0.00%
5-yr	0.015	0.647	4188.74%	1576	1552	0.010	-50.86%
10-yr	0.019	0.767	3924.98%	1871	1767	0.011	-73.24%
25-yr	0.025	0.916	3627.47%	2174	2052	0.017	-44.55%
50-yr	0.029	1.026	3454.86%	2372	2259	0.024	-20.26%
100-yr	0.033	1.137	3301.40%	2553	2461	0.031	-7.83%

Table 5.4c: Whites Road Station - Post-Development Condition Hydrologic Analysis - SWMF-4 (4 hr Chicago)

4hr Chicago	**Allowable Release Rates** Unit Rates - SubWatershed 31	**Post-Dev Cond Uncontrolled** VO2 ID10 (A = 3.97 ha)	**Increase from Allowable to Post-Dev Uncontrolled**	**SWMF-4 POST-DEVELOPMENT CONDITION** VO2 ID 3 (A = 3.97 ha)			**Decrease from Allowable to Post-Dev Controlled**
Return Period	**Qp** (m^3/s)	**Qp** (m^3/s)	**(%)**	**Storage Provided** (m^3)	**Storage Required** (m^3)	**Release Rate** (m^3/s)	**(%)**
2-yr	0.009	0.131	1286.45%	904	-	0.007	-34.98%
5-yr	0.015	0.177	1073.27%	1289	-	0.009	-67.62%
10-yr	0.019	0.208	991.52%	1563	-	0.010	-90.56%
25-yr	0.025	0.246	901.05%	1896	-	0.011	-123.40%
50-yr	0.029	0.275	852.81%	2136	-	0.016	-80.39%
100-yr	0.033	0.303	806.44%	2367	-	0.024	-39.28%

Table 5.4d: WHITES ROAD STATION Proposed SWMF-4 - Design Parameters

Pond Catchment Area 3.97 ha

Water Quality Storage Requirements

MOECC (2003, Table 3.2)

Level 1	265 m^3/ha	Interpolated from Table 3.2 (MOECC)		
Extended	40 m^3/ha	(or 25mm rainfall event whichever greater)	*158.80*	m^3
25 mm Event From OTTHYMO	18.08 mm		*717.78*	m^3
% imperviousness	90 %			
Permanent Volume Required			*893.25*	m^3

Quantity Control Required

Total Volume required up to and including the 100 yr storm **2,461.40** m^3

Total Pond Volume Required (Permanent and Extended) **3,354.65** m^3

Settling Calculations MOECC Eq. 4.5

$$Dist = \sqrt{\frac{r \times Q_p}{V_s}}$$

Dist	6	Minimum Forebay length	m
r	1.69	Length to width ratio	-
Qp	0.01	Peak flow rate from the pond during design quality storm	m^3/s
Vs	0.0003	settling velocity'	m/s

Dispersion Length MOECC Eq. 4.6

$$Dist = \frac{8Q}{dV_f}$$

Minimum Width 1 m

Dist	12	Minimum Dispersion Length	
Q	0.65	Inlet Flow Rate	(5 year Storm)
d	3.0	Depth of the Permanent Pool	
Vf	0.15	Desired Velocity in the Forebay	

(0.15 m/s is the maximum permissible velocity before erosion occurs in a channel (MOECC))

Minimum Forebay Deep Zone Bottom Width MOECC Eq. 4.7

Width = Dist/8 Width 0.73 m

Design Quality Storm MOECC Eq 4.9

$$i_{25} = 43C + 5.9$$

A	3.97	Area	
C	90	Runoff Coefficient	
i	44.6	Intensity	mm/hr
Qp	0.45	Flow Rational Method	

Flow Velocity Check

Qd	0.65	Inlet Flow Rate	m^3/s
A	29.92	Crossectional Area	m^2
Vfb	0.022	Flow Velocity	m/s
	Yes	< 0.15	

Forebay Dimensions

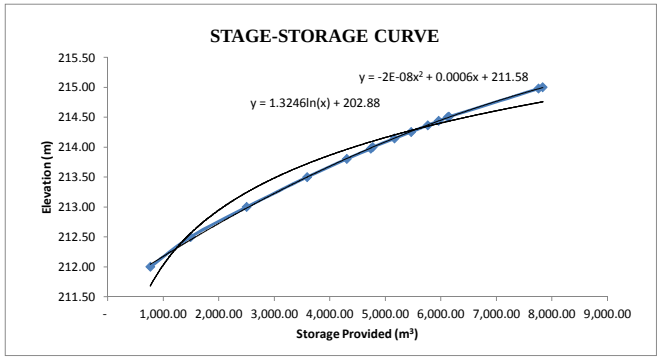
4:1	Average Side Slope	%
35.79	Top Length	m
14.85	Bottom Length	m
24.42	Average Top Width	m
5.50	Bottom Width	m
2.00	Average Depth of the Pool	m
767.57	Approximate Volume of the Pool	m^3
3590.50	Total Permanent Pool Volume	m^3
0.21	Forebay/Total Volume Ratio	
616.69	Forebay Area	m^2
2349.24	Total Permanent Pool Area	
0.26	Forebay/Total Area Ratio	
1.69	Average L/W Ratio Check	

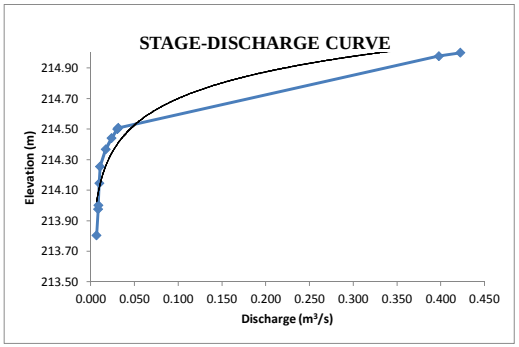
Forebay Cleanout Frequency

Ac	3.97	Contributing Area	(ha)
Ds	0.6	Maximum Sediment Depth	(m)
Vsf	295	Maximum Sediment Volume	(m^3)
a	30%	Impervious Level	%
da	0.6	Annual Sediment Loading	(m^3/ha/yr) (Table 6.3 MOECC Manual)
Fs	123.8	Forebay Cleanout Frequency	(years)
	75%	Target Maintenance TSS Removal Efficiency	

Table 5.4e: WHITES ROAD STATION - Proposed SWMF-4 - Stage-Storage, Stage-Discharge Relationships and Outlet Structure Design

Elevation m	Forebay	Forebay 2	Cell 2	Sec Area m^2	Avg Area m^2	Sec Volume m^3	Cumulative Volume	Fluctuation/ Extended Cum.Volume	Stage (m) Active	Storage (ha.m) Active	Discharge Orifice 1 213.50 0.075	Discharge Weir 214.26 0.100	Discharge Overflow Weir 0.600	Discharge Total	Description
210.50			207.70	207.70											
211.00	84.37		323.62	407.99	307.8	153.92	153.92								
211.50	144.10		453.72	597.82	502.9	251.45	405.38								
212.00	218.11	34.88	597.96	850.95	724.4	362.19	767.57								
212.50	306.31	90.78	1645.15	2,042.25	1446.6	723.30	1,490.87								
213.00	486.12	231.93	1285.48	2,003.53	2022.9	1,011.44	2,502.31								
213.50	584.10	32.59	1732.55	2,349.24	2176.4	1,088.19	***3,590.50***	-	0.00	0.0000	0.000				**Permanent Water Level**
213.80							4,308.28	717.78	0.30	0.0718	0.007			0.007	*25-mm*
213.98							4,740.50	1,150.00	0.48	0.1150	0.009			0.009	*2-yr*
214.00	688.72	429.92	1257.46	2,376.10	2362.7	1,181.33	4,771.83	1,181.33	0.50	0.1181	0.009			0.009	
214.15							5,166.50	1,576.00	0.65	0.1576	0.010			0.010	*5-yr*
214.26							5,461.50	1,871.00	0.76	0.1871	0.011	0.000		0.011	*10-yr*
214.37				-			5,764.50	2,174.00	0.87	0.2174	0.011	0.006		0.017	*25-yr*
214.44				-			5,962.50	2,372.00	0.94	0.2372	0.012	0.012		0.024	*50-yr*
214.50	877.97	615.28	1535.33	3,028.58	2702.3	1,351.17	6,123.00	2,532.50	1.00	0.2533	0.012	0.018		0.030	
214.51				-			6,143.50	2,553.00	1.01	0.2553	0.012	0.019	0.000	0.031	*100-yr*
214.98							7,760.50	4,170.00	1.48	0.4170	0.015	0.092	0.291	0.398	
215.00	1089.20	823.35	1906.45	3,819.00	3423.8	1,711.89	7,834.90	4,244.40	1.50	0.4244	0.015	0.096	0.311	0.422	





Orifice Discharge

$$Q = C_d A \sqrt{2gH}$$

Q	Varies	Discharge	(m^3/s)
C_d	0.63	Discharge Coefficient	-
A	Varies	Area of Orifice	(m^2)
g	9.81	Gravitational Constant	(m/s^2)
H	Varies	Hydraulic Head	(m)

Weir Discharge

$$Q = C_d L H^{\frac{3}{2}}$$

Q	Varies	Discharge	(m^3/s)
C_d	1.5	Discharge Coefficient	-
L	0.100	Weir Length	(m)
			(m/s^2)
H	Varies	Hydraulic Head	m

Table 5.4f: WHITES ROAD STATION - Proposed SWMF-4
25mm Drawdown Time Calculations

Project: 407 TWY from Kennedy Rd. to Brock Rd.

C	0.63000		Extended Quality Volume:	718	m^3
Orifice	0.05213	m	Initial Head:	0.30	m
Area	0.00213	m^2	Detention:	120.00	hrs
				7,200.00	min

FALLING HEAD EQUATION

Time (min)	Head (m)	Q (m3/s)	Volume (m3)	Declining Volume Start	Declining Volume End
0	0.3038	0.0033	0.98	717.78	716.79
5	0.3034	0.0033	0.98	716.79	715.81
10	0.3030	0.0033	0.98	715.81	714.82
15	0.3025	0.0033	0.98	714.82	713.84
20	0.3021	0.0033	0.98	713.84	712.86
25	0.3017	0.0033	0.98	712.86	711.88
30	0.3013	0.0033	0.98	711.88	710.90
35	0.3009	0.0033	0.98	710.90	709.92
40	0.3005	0.0033	0.98	709.92	708.94
45	0.3001	0.0033	0.98	708.94	707.96
50	0.2996	0.0033	0.98	707.96	706.98
55	0.2992	0.0033	0.98	706.98	706.00
60	0.2988	0.0033	0.98	706.00	705.03
65	0.2984	0.0033	0.98	705.03	704.05
70	0.2980	0.0033	0.98	704.05	703.08
75	0.2976	0.0032	0.97	703.08	702.10
80	0.2972	0.0032	0.97	702.10	701.13
85	0.2968	0.0032	0.97	701.13	700.15
90	0.2963	0.0032	0.97	700.15	699.18
95	0.2959	0.0032	0.97	699.18	698.21
100	0.2955	0.0032	0.97	698.21	697.24
105	0.2951	0.0032	0.97	697.24	696.27
		-- B R E A K --			-
7180	0.0000	0.0000	0.01	7.34	7.33
7185	0.0000	0.0000	0.01	7.33	7.33
7190	0.0000	0.0000	0.01	7.33	7.32
7195	0.0000	0.0000	0.00	7.32	7.32
7200	0.0000	0.0000	0.00	7.32	7.31
7205	0.0000	-	-	7.31	7.31

WHITES ROAD STATION HYDROLOGIC ANALYSIS - EXISTING CONDITION

Input parameters

Proposed Whites Road Station is located within subcatchment 31 - Duffins Watershed
Sub-watershed 31 (Whitevale Creek East Branch)
CN (unadjusted)= 72
Ia (mm)= 5
A south (ha)= 3.46

Table 5.5a: Whites Road Station SWMF 5 - Allowable Release Rates and Storage Required

Unit Flow Rates 2012 Study, TRCA - Sub-catchment 31

Return Period	Q allowable (L/s/ha)	Q allowable (m^3/s)	Storage required (m^3/ha)	Storage required (m^3)
2-yr	2.38	0.008	302	1045
5-yr	3.80	0.013	391	1353
10-yr	4.80	0.017	445	1540
25-yr	6.19	0.021	517	1789
50-yr	7.27	0.025	569	1969
100-yr	8.42	0.029	620	2145

WHITES ROAD STATION HYDROLOGIC ANALYSIS - POST-DEVELOPMENT CONDITION

Table 5.5b: Whites Road Station - Post-Development Condition Hydrologic Analysis - SWMF-5 (12 hr AES)

12hr AES Return Period	Allowable Release Rates Unit Rates - Subwatershed 31	Post-Development Condition (Uncontrolled) VO2 ID 7 (A = 3.46 ha)	Increase from Allowable to Post-Dev Uncontrolled	SWMF-5 POST-DEVELOPMENT CONDITION VO2 ID 5 (A = 3.46 ha)			Decrease from Allowable to Post-Dev Controlled
	Qp (m^3/s)	**Qp** (m^3/s)	**(%)**	**Storage Provided** (m^3)	**Storage Required** (m^3)	**Release Rates** (m^3/s)	**(%)**
2-yr	0.008	0.393	4672.43%	966	1045	0.009	8.50%
5-yr	0.013	0.566	4204.84%	1337	1353	0.010	-31.48%
10-yr	0.017	0.671	3940.22%	1592	1540	0.011	-50.98%
25-yr	0.021	0.801	3639.95%	1900	1789	0.013	-64.75%
50-yr	0.025	0.897	3466.00%	2083	1969	0.019	-32.39%
100-yr	0.029	0.994	3311.91%	2226	2145	0.027	-7.90%

Table 5.5c: Whites Road Station - Post-Development Condition Hydrologic Analysis - SWMF-5 (4 hr Chicago)

4hr Chicago Return Period	Allowable Release Rates Unit Rates - Subwatershed 31	Post-Development Condition (Uncontrolled) VO2 ID 7 (A = 3.46 ha)	Increase from Allowable to Post-Dev Uncontrolled	SWMF-5 POST-DEVELOPMENT CONDITION VO2 ID 5 (A = 3.46 ha)			Decrease from Allowable to Post-Dev Controlled
	Qp (m^3/s)	**Qp** (m^3/s)	**(%)**	**Storage Provided** (m^3)	**Storage Required** (m^3)	**Release Rates** (m^3/s)	**(%)**
2-yr	0.008	0.523	6251.10%	769	-	0.008	-2.94%
5-yr	0.013	0.757	5657.53%	1106	-	0.009	-46.09%
10-yr	0.017	0.909	5373.27%	1346	-	0.010	-66.08%
25-yr	0.021	1.115	5106.05%	1636	-	0.011	-94.70%
50-yr	0.025	1.265	4928.98%	1854	-	0.013	-93.49%
100-yr	0.029	1.419	4770.73%	2069	-	0.019	-53.33%

Table 5.5d: WHITES ROAD STATION - Proposed SWMF-5 - Design Parameters

Pond Catchment Area 3.46 ha

Water Quality Storage Requirements

MOECC (2003, Table 3.2)

Level 1	265 m^3/ha	Interpolated from Table 3.2 (MOECC)		
Extended	40 m^3/ha	(or 25mm rainfall event whichever greater)	*138.40*	m^3
25 mm Event From OTTHYMO	18.08 mm		*625.57*	m^3
% imperviousness	90 %			
Permanent Volume Required			*778.50*	m^3

Quantity Control Required

Total Volume required up to and including the 100 yr storm **2,145.20** m^3

Total Pond Volume Required (Permanent and Extended) **2,923.70** m^3

Settling Calculations MOECC Eq. 4.5

$$Dist = \sqrt{\frac{r \times Q_p}{V_s}}$$

Dist	6	Minimum Forebay length	m
r	1.55	Length to width ratio	-
Qp	0.007	Peak flow rate from the pond during design quality storm	m^3/s
Vs	0.0003	settling velocity'	m/s

Dispersion Length MOECC Eq. 4.6

$$Dist = \frac{8Q}{dV_f}$$

Minimum Width 2 m

Dist	12	Minimum Dispersion Length	
Q	0.57	Inlet Flow Rate	(5 year Storm)
d	2.5	Depth of the Permanent Pool	
Vf	0.15	Desired Velocity in the Forebay	

(0.15 m/s is the maximum permissible velocity before erosion occurs in a channel (MOECC))

Minimum Forebay Deep Zone Bottom Width MOECC Eq. 4.7

Width = Dist/8 Width 0.75 m

Design Quality Storm MOECC Eq 4.9

$$i_{25} = 43C + 5.9$$

A	3.46	Area	
C	90	Runoff Coefficient	
i	44.6	Intensity	mm/hr
Qp	0.39	Flow Rational Method	

Flow Velocity Check

Qd	0.57	Inlet Flow Rate	m^3/s
A	31.35	Crossectional Area	m^2
Vfb	0.018	Flow Velocity	m/s
	Yes	< 0.15	

Forebay Dimensions

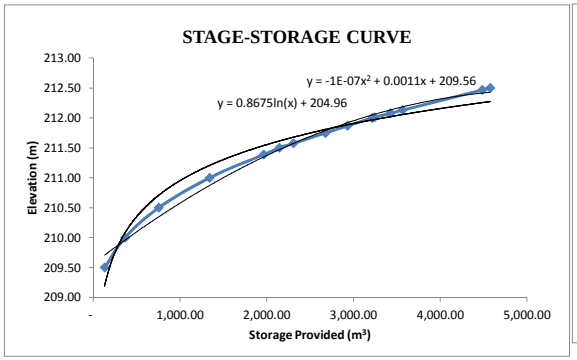
3:1	Average Side Slope	%
31.86	Top Length	m
7.05	Bottom Length	m
20.93	Average Top Width	m
4.15	Bottom Width	m
2.50	Average Depth of the Pool	m
641.52	Approximate Volume of the Pool	m^3
1340.95	Total Permanent Pool Volume	m^3
0.48	Forebay/Total Volume Ratio	
476.09	Forebay Area	m^2
1170.51	Total Permanent Pool Area	
0.41	Forebay/Total Area Ratio	
1.55	Average L/W Ratio Check	

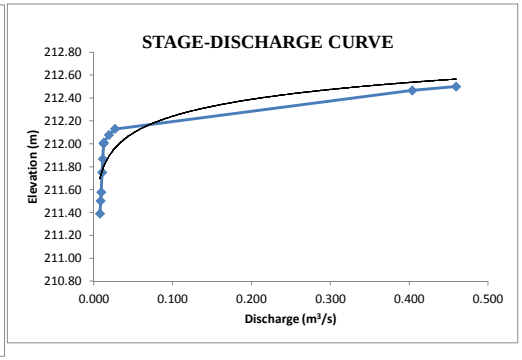
Forebay Cleanout Frequency

Ac	3.46	Contributing Area	(ha)
Ds	0.6	Maximum Sediment Depth	(m)
Vsf	295	Maximum Sediment Volume	(m^3)
a	30%	Impervious Level	%
da	0.6	Annual Sediment Loading	(m^3/ha/yr) (Table 6.3 MOECC Manual)
Fs	142.1	Forebay Cleanout Frequency	(years)
	75%	Target Maintenance TSS Removal Efficiency	

Table 5.5e: WHITES ROAD STATION - Proposed SWMF-5 - Stage-Storage, Stage-Discharge Relationships and Outlet Structure Design

Elevation m	Forebay	Cell 2	Sec Area m^2	Avg Area m^2	Sec Volume m^3	Cumulative Volume	Fluctuation/ Extended Cum.Volume	Stage (m) Active	Storage (ha.m) Active	Discharge Orifice 1 211.00 0.075	Weir 212.00 0.200	Overflow Weir 1.000	Total	Description
208.50		20.62												
209.00	37.12	130.95	168.07	84.0	42.02	42.02								
209.50	90.05	265.86	355.92	262.0	131.00	131.00								
210.00	168.19	414.91	583.10	469.5	234.75	365.75								
210.50	372.50	604.17	976.67	779.9	389.94	755.69								
211.00	476.09	888.26	1,364.35	1170.5	585.26	1,340.95	-							**Permanent Water Level**
211.39			-			1,966.51	625.57	0.39	0.0626	0.008			0.008	*25mm*
211.50	687.17	1169.00	1,856.17	1610.3	805.13	2,146.08	805.13	0.50	0.0805	0.009			0.009	
211.58			-		966.00	2,306.95	966.00	0.58	0.0966	0.009			0.009	*2-yr*
211.75			-		1,337.00	2,677.95	1,337.00	0.75	0.1337	0.011			0.011	*5-yr*
211.87			-		1,592.00	2,932.95	1,592.00	0.87	0.1592	0.011			0.011	*10-yr*
212.00	948.56	1469.68	2,418.24	2137.2	1,068.60	3,214.68	1,873.73	1.00	0.1874	0.012	0.000		0.012	
212.01			-		1,900.00	3,240.95	1,900.00	1.01	0.1900	0.012	0.000		0.013	*25-yr*
212.08			-		2,083.00	3,423.95	2,083.00	1.08	0.2083	0.013	0.006		0.019	*50-yr*
212.13			-		2,226.00	3,566.95	2,226.00	1.13	0.2226	0.013	0.014	0.000	0.027	*100-yr*
212.47					3,143.00	4,483.95	3,143.00	1.47	0.3143	0.015	0.096	0.293	0.404	
212.50	1234.21	1790.11	3,024.31	2721.3	1,360.64	4,575.32	3,234.37	1.50	0.3234	0.015	0.106	0.338	0.460	





Orifice Discharge

$$Q = C_d A\sqrt{2gH}$$

Q	Varies	Discharge	(m^3/s)
C_d	0.63	Discharge Coefficient	-
A	Varies	Area of Orifice	(m^2)
g	9.81	Gravitational Constant	(m/s^2)
H	Varies	Hydraulic Head	(m)

Weir Discharge

$$Q = C_d LH^{\frac{3}{2}}$$

Q	Varies	Discharge	(m^3/s)
C_d	1.5	Discharge Coefficient	-
L	0.200	Weir Length	(m)
			(m/s^2)
H	Varies	Hydraulic Head	m

Table 5.5f: WHITES ROAD STATION - Proposed SWMF-5 - 25 mm Drawdown Time Calculations

Project: 407 TWY from Kennedy Rd. to Brock Rd.

C	0.63000		Extended Quality Volume:	626	m^3
Orifice	0.04528	m	Initial Head:	0.39	m
Area	0.00161	m^2	Detention:	120.00	hrs
				7,200.00	min

F A L L I N G H E A D E Q U A T I O N

Time (min)	Head (m)	Q (m3/s)	Volume (m3)	Declining Volume Start	Declining Volume End
0	0.3885	0.0028	0.84	625.57	624.73
5	0.3880	0.0028	0.84	624.73	623.89
10	0.3874	0.0028	0.84	623.89	623.05
15	0.3869	0.0028	0.84	623.05	622.21
20	0.3864	0.0028	0.84	622.21	621.37
25	0.3859	0.0028	0.84	621.37	620.54
30	0.3854	0.0028	0.84	620.54	619.70
35	0.3848	0.0028	0.84	619.70	618.86
40	0.3843	0.0028	0.84	618.86	618.03
45	0.3838	0.0028	0.84	618.03	617.19
50	0.3833	0.0028	0.83	617.19	616.36
55	0.3828	0.0028	0.83	616.36	615.52
60	0.3823	0.0028	0.83	615.52	614.69
65	0.3817	0.0028	0.83	614.69	613.86
70	0.3812	0.0028	0.83	613.86	613.02
75	0.3807	0.0028	0.83	613.02	612.19
80	0.3802	0.0028	0.83	612.19	611.36
85	0.3797	0.0028	0.83	611.36	610.53
90	0.3791	0.0028	0.83	610.53	609.70
95	0.3786	0.0028	0.83	609.70	608.87
100	0.3781	0.0028	0.83	608.87	608.04
105	0.3776	0.0028	0.83	608.04	607.21
		-- B R E A K --			-
7180	0.0004	0.0001	0.03	4.88	4.85
7185	0.0003	0.0001	0.02	4.85	4.83
7190	0.0003	0.0001	0.02	4.83	4.80
7195	0.0003	0.0001	0.02	4.80	4.78
7200	0.0003	0.0001	0.02	4.78	4.76
7205	0.0003			4.76	4.76

```
       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
```


***** D E T A I L E D O U T P U T *****

Input filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat
Output filename: C:\Users\p004967b\AppData\Local\Temp\c9b46bab-423d-4536-80c9-0ccbb89c7139\Scenario.out
Summary filename: C:\Users\p004967b\AppData\Local\Temp\c9b46bab-423d-4536-80c9-0ccbb89c7139\Scenario.sum

DATE: 10/06/2016 TIME: 05:40:59

USER:

COMMENTS: _____

****
** SIMULATION NUMBER: 1 **
****

READ STORM	Filename: C:\Users\p004967b\AppData\Local\Temp\c9b46bab-423d-4536-80c9-0ccbb89c7139\d923f12e
Ptotal= 42.00 mm	Comments: 2-Year 12-Hour SCS II Design Storm

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	1.05	3.25	1.68	6.25	7.56	9.25	1.47
0.50	1.05	3.50	1.68	6.50	7.56	9.50	1.47
0.75	1.05	3.75	1.68	6.75	3.36	9.75	1.47
1.00	1.05	4.00	1.68	7.00	3.36	10.00	1.47
1.25	1.05	4.25	2.52	7.25	2.52	10.25	0.84
1.50	1.05	4.50	2.52	7.50	2.52	10.50	0.84
1.75	1.05	4.75	3.36	7.75	2.52	10.75	0.84
2.00	1.05	5.00	3.36	8.00	2.52	11.00	0.84
2.25	1.26	5.25	5.04	8.25	1.47	11.25	0.84
2.50	1.26	5.50	5.04	8.50	1.47	11.50	0.84
2.75	1.26	5.75	20.16	8.75	1.47	11.75	0.84
3.00	1.26	6.00	55.44	9.00	1.47	12.00	0.84

CALIB STANDHYD (0002) ID= 1 DT= 5.0 min	Area (ha)= 7.43 Total Imp(%)= 20.00 Dir. Conn.(%)= 20.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.49	5.94
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	1.00
Length	(m)=	222.56	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.05	3.083	1.68	6.083	7.56	9.08	1.47
0.167	1.05	3.167	1.68	6.167	7.56	9.17	1.47
0.250	1.05	3.250	1.68	6.250	7.56	9.25	1.47

0.333	1.05	3.333	1.68	6.333	7.56	9.33	1.47
0.417	1.05	3.417	1.68	6.417	7.56	9.42	1.47
0.500	1.05	3.500	1.68	6.500	7.56	9.50	1.47
0.583	1.05	3.583	1.68	6.583	3.36	9.58	1.47
0.667	1.05	3.667	1.68	6.667	3.36	9.67	1.47
0.750	1.05	3.750	1.68	6.750	3.36	9.75	1.47
0.833	1.05	3.833	1.68	6.833	3.36	9.83	1.47
0.917	1.05	3.917	1.68	6.917	3.36	9.92	1.47
1.000	1.05	4.000	1.68	7.000	3.36	10.00	1.47
1.083	1.05	4.083	2.52	7.083	2.52	10.08	0.84
1.167	1.05	4.167	2.52	7.167	2.52	10.17	0.84
1.250	1.05	4.250	2.52	7.250	2.52	10.25	0.84
1.333	1.05	4.333	2.52	7.333	2.52	10.33	0.84
1.417	1.05	4.417	2.52	7.417	2.52	10.42	0.84
1.500	1.05	4.500	2.52	7.500	2.52	10.50	0.84
1.583	1.05	4.583	3.36	7.583	2.52	10.58	0.84
1.667	1.05	4.667	3.36	7.667	2.52	10.67	0.84
1.750	1.05	4.750	3.36	7.750	2.52	10.75	0.84
1.833	1.05	4.833	3.36	7.833	2.52	10.83	0.84
1.917	1.05	4.917	3.36	7.917	2.52	10.92	0.84
2.000	1.05	5.000	3.36	8.000	2.52	11.00	0.84
2.083	1.26	5.083	5.04	8.083	1.47	11.08	0.84
2.167	1.26	5.167	5.04	8.167	1.47	11.17	0.84
2.250	1.26	5.250	5.04	8.250	1.47	11.25	0.84
2.333	1.26	5.333	5.04	8.333	1.47	11.33	0.84
2.417	1.26	5.417	5.04	8.417	1.47	11.42	0.84
2.500	1.26	5.500	5.04	8.500	1.47	11.50	0.84
2.583	1.26	5.583	20.16	8.583	1.47	11.58	0.84
2.667	1.26	5.667	20.16	8.667	1.47	11.67	0.84
2.750	1.26	5.750	20.16	8.750	1.47	11.75	0.84
2.833	1.26	5.833	55.44	8.833	1.47	11.83	0.84
2.917	1.26	5.917	55.44	8.917	1.47	11.92	0.84
3.000	1.26	6.000	55.44	9.000	1.47	12.00	0.84

Max.Eff.Inten.(mm/hr)=	55.44	10.43	
over (min)	5.00	30.00	
Storage Coeff. (min)=	5.23 (ii)	26.69 (ii)	
Unit Hyd. Tpeak (min)=	5.00	30.00	
Unit Hyd. peak (cms)=	0.21	0.04	
			TOTALS
PEAK FLOW (cms)=	0.22	0.10	0.266 (iii)
TIME TO PEAK (hrs)=	6.00	6.42	6.00
RUNOFF VOLUME (mm)=	41.00	10.08	16.26
TOTAL RAINFALL (mm)=	42.00	42.00	42.00
RUNOFF COEFFICIENT =	0.98	0.24	0.39

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB		
STANDHYD (0001)	Area (ha)=	3.46
ID= 1 DT= 5.0 min	Total Imp(%)=	90.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	3.11	0.35
Dep. Storage (mm)=	2.00	5.00
Average Slope (%)=	1.00	1.00
Length (m)=	151.88	40.00
Mannings n =	0.013	0.250

Max.Eff.Inten.(mm/hr)=	55.44	219.47	
over (min)	5.00	15.00	
Storage Coeff. (min)=	4.16 (ii)	10.50 (ii)	
Unit Hyd. Tpeak (min)=	5.00	15.00	
Unit Hyd. peak (cms)=	0.24	0.09	
			TOTALS
PEAK FLOW (cms)=	0.26	0.14	0.393 (iii)
TIME TO PEAK (hrs)=	6.00	6.08	6.00
RUNOFF VOLUME (mm)=	40.00	27.67	33.83
TOTAL RAINFALL (mm)=	42.00	42.00	42.00
RUNOFF COEFFICIENT =	0.95	0.66	0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)

```
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0005) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0270      0.2226
                          0.0080     0.0626   |   0.4030      0.3142
                          0.0090     0.0966   |   0.4040      0.3143
                          0.0110     0.1592   |   0.4050      0.3145
                          0.0130     0.1900   |   0.4600      0.3234
                          0.0190     0.2083   |   0.0000      0.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0001)      3.460      0.393      6.00      33.83
     OUTFLOW: ID= 1 (0005)      3.460      0.009     10.25      33.26

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=  2.29
                    TIME SHIFT OF PEAK FLOW         (min)=255.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.0966

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0004) |   Area    (ha)=   3.97
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.57         0.40
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     162.69        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      55.44       219.47
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       4.33 (ii)   10.68 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.23         0.09
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.30         0.17         0.449 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.08          6.00
     RUNOFF VOLUME    (mm)=      40.00        27.67         33.83
     TOTAL RAINFALL   (mm)=      42.00        42.00         42.00
     RUNOFF COEFFICIENT   =       0.95         0.66          0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0003) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0170      0.2174
                          0.0070     0.0718   |   0.0240      0.2372
                          0.0080     0.1149   |   0.0300      0.2532
                          0.0090     0.1150   |   0.0310      0.2553
                          0.0100     0.1576   |   0.3980      0.4170
                          0.0110     0.1871   |   0.4230      0.4244

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0004)      3.970      0.449      6.00      33.83
     OUTFLOW: ID= 1 (0003)      3.970      0.009     10.83      33.18

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=  1.96
                    TIME SHIFT OF PEAK FLOW         (min)=290.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.1150

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| ADD HYD   (0006) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0003):     3.97   0.009    10.83    33.18
       + ID2= 2 (0005):     3.46   0.009    10.25    33.26
         ================================================
         ID = 3 (0006):     7.43   0.018    10.83    33.21

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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-------------------
| CALIB             |
| STANDHYD  (0007)  |   Area    (ha)=   3.46
|ID= 1 DT= 5.0 min  |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
-------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.11         0.35
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     151.88        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      55.44       219.47
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       4.16 (ii)   10.50 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.24         0.09
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.26         0.14       0.393 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.08        6.00
     RUNOFF VOLUME    (mm)=      40.00        27.67       33.83
     TOTAL RAINFALL   (mm)=      42.00        42.00       42.00
     RUNOFF COEFFICIENT   =       0.95         0.66        0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-------------------
| CALIB             |
| STANDHYD  (0010)  |   Area    (ha)=   3.97
|ID= 1 DT= 5.0 min  |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
-------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.57         0.40
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     162.69        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      55.44       219.47
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       4.33 (ii)   10.68 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.23         0.09
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.30         0.17       0.449 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.08        6.00
     RUNOFF VOLUME    (mm)=      40.00        27.67       33.83
     TOTAL RAINFALL   (mm)=      42.00        42.00       42.00
     RUNOFF COEFFICIENT   =       0.95         0.66        0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-------------------
| ADD HYD   (0008) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0010):     3.97   0.449     6.00    33.83
       + ID2= 2 (0007):     3.46   0.393     6.00    33.83
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          ================================================
          ID = 3 (0008):     7.43   0.842     6.00    33.83

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ***************************
  ** SIMULATION NUMBER:   2 **
  ***************************


--------------------
|    READ STORM    |    Filename: C:\Users\p004967b\AppD
|                  |              ata\Local\Temp\
|                  |              c9b46bab-423d-4536-80c9-0ccbb89c7139\157f689d
| Ptotal= 54.40 mm |    Comments: 5-Year 12-Hour SCS II Design Storm
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	1.36	3.25	2.18	6.25	9.79	9.25	1.90
0.50	1.36	3.50	2.18	6.50	9.79	9.50	1.90
0.75	1.36	3.75	2.18	6.75	4.35	9.75	1.90
1.00	1.36	4.00	2.18	7.00	4.35	10.00	1.90
1.25	1.36	4.25	3.26	7.25	3.26	10.25	1.09
1.50	1.36	4.50	3.26	7.50	3.26	10.50	1.09
1.75	1.36	4.75	4.35	7.75	3.26	10.75	1.09
2.00	1.36	5.00	4.35	8.00	3.26	11.00	1.09
2.25	1.63	5.25	6.53	8.25	1.90	11.25	1.09
2.50	1.63	5.50	6.53	8.50	1.90	11.50	1.09
2.75	1.63	5.75	26.11	8.75	1.90	11.75	1.09
3.00	1.63	6.00	71.81	9.00	1.90	12.00	1.09

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| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   7.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.49         5.94
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     222.56        40.00
     Mannings n             =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.
```

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.36	3.083	2.18	6.083	9.79	9.08	1.90
0.167	1.36	3.167	2.18	6.167	9.79	9.17	1.90
0.250	1.36	3.250	2.18	6.250	9.79	9.25	1.90
0.333	1.36	3.333	2.18	6.333	9.79	9.33	1.90
0.417	1.36	3.417	2.18	6.417	9.79	9.42	1.90
0.500	1.36	3.500	2.18	6.500	9.79	9.50	1.90
0.583	1.36	3.583	2.18	6.583	4.35	9.58	1.90
0.667	1.36	3.667	2.18	6.667	4.35	9.67	1.90
0.750	1.36	3.750	2.18	6.750	4.35	9.75	1.90
0.833	1.36	3.833	2.18	6.833	4.35	9.83	1.90
0.917	1.36	3.917	2.18	6.917	4.35	9.92	1.90
1.000	1.36	4.000	2.18	7.000	4.35	10.00	1.90
1.083	1.36	4.083	3.26	7.083	3.26	10.08	1.09
1.167	1.36	4.167	3.26	7.167	3.26	10.17	1.09
1.250	1.36	4.250	3.26	7.250	3.26	10.25	1.09
1.333	1.36	4.333	3.26	7.333	3.26	10.33	1.09
1.417	1.36	4.417	3.26	7.417	3.26	10.42	1.09
1.500	1.36	4.500	3.26	7.500	3.26	10.50	1.09
1.583	1.36	4.583	4.35	7.583	3.26	10.58	1.09
1.667	1.36	4.667	4.35	7.667	3.26	10.67	1.09
1.750	1.36	4.750	4.35	7.750	3.26	10.75	1.09
1.833	1.36	4.833	4.35	7.833	3.26	10.83	1.09
1.917	1.36	4.917	4.35	7.917	3.26	10.92	1.09
2.000	1.36	5.000	4.35	8.000	3.26	11.00	1.09
2.083	1.63	5.083	6.53	8.083	1.90	11.08	1.09
2.167	1.63	5.167	6.53	8.167	1.90	11.17	1.09
2.250	1.63	5.250	6.53	8.250	1.90	11.25	1.09
2.333	1.63	5.333	6.53	8.333	1.90	11.33	1.09
2.417	1.63	5.417	6.53	8.417	1.90	11.42	1.09
2.500	1.63	5.500	6.53	8.500	1.90	11.50	1.09
2.583	1.63	5.583	26.11	8.583	1.90	11.58	1.09
2.667	1.63	5.667	26.11	8.667	1.90	11.67	1.09

```
              2.750    1.63 | 5.750   26.11 | 8.750    1.90 | 11.75    1.09
              2.833    1.63 | 5.833   71.81 | 8.833    1.90 | 11.83    1.09
              2.917    1.63 | 5.917   71.81 | 8.917    1.90 | 11.92    1.09
              3.000    1.63 | 6.000   71.81 | 9.000    1.90 | 12.00    1.09

     Max.Eff.Inten.(mm/hr)=      71.81        20.39
               over (min)        5.00        25.00
     Storage Coeff.  (min)=      4.71 (ii)   21.13 (ii)
     Unit Hyd. Tpeak (min)=      5.00        25.00
     Unit Hyd. peak  (cms)=      0.22         0.05
                                                        *TOTALS*
     PEAK FLOW       (cms)=      0.29         0.20         0.397 (iii)
     TIME TO PEAK    (hrs)=      6.00         6.25          6.00
     RUNOFF VOLUME    (mm)=     53.40        16.47         23.85
     TOTAL RAINFALL   (mm)=     54.40        54.40         54.40
     RUNOFF COEFFICIENT   =      0.98         0.30          0.44

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
             YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   3.46
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.11         0.35
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     151.88        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      71.81       304.09
               over (min)        5.00        10.00
     Storage Coeff.  (min)=      3.75 (ii)    9.32 (ii)
     Unit Hyd. Tpeak (min)=      5.00        10.00
     Unit Hyd. peak  (cms)=      0.25         0.12
                                                        *TOTALS*
     PEAK FLOW       (cms)=      0.34         0.22         0.566 (iii)
     TIME TO PEAK    (hrs)=      6.00         6.00          6.00
     RUNOFF VOLUME    (mm)=     52.40        38.98         45.69
     TOTAL RAINFALL   (mm)=     54.40        54.40         54.40
     RUNOFF COEFFICIENT   =      0.96         0.72          0.84

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0005) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0270      0.2226
                         0.0080     0.0626   |   0.4030      0.3142
                         0.0090     0.0966   |   0.4040      0.3143
                         0.0110     0.1592   |   0.4050      0.3145
                         0.0130     0.1900   |   0.4600      0.3234
                         0.0190     0.2083   |   0.0000      0.0000

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0001)     3.460      0.566      6.00      45.69
     OUTFLOW: ID= 1 (0005)     3.460      0.010     10.58      45.11

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  1.80
                   TIME SHIFT OF PEAK FLOW         (min)=275.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.1337

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```
| CALIB             |
| STANDHYD  (0004) |   Area    (ha)=   3.97
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.57         0.40
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     162.69        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      71.81       304.09
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       3.91 (ii)    9.47 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.25         0.12
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.39         0.26          0.647 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.00           6.00
     RUNOFF VOLUME    (mm)=      52.40        38.98          45.69
     TOTAL RAINFALL   (mm)=      54.40        54.40          54.40
     RUNOFF COEFFICIENT   =       0.96         0.72           0.84

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0003) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0170      0.2174
                          0.0070     0.0718   |   0.0240      0.2372
                          0.0080     0.1149   |   0.0300      0.2532
                          0.0090     0.1150   |   0.0310      0.2553
                          0.0100     0.1576   |   0.3980      0.4170
                          0.0110     0.1871   |   0.4230      0.4244

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0004)      3.970      0.647      6.00      45.69
     OUTFLOW: ID= 1 (0003)      3.970      0.010     12.00      45.03

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=  1.55
                    TIME SHIFT OF PEAK FLOW         (min)=360.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.1576

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--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0003):     3.97   0.010    12.00    45.03
        + ID2= 2 (0005):     3.46   0.010    10.58    45.11
          ================================================
          ID = 3 (0006):     7.43   0.020    12.00    45.07

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD  (0007) |   Area    (ha)=   3.46
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.11         0.35
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     151.88        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      71.81       304.09
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       3.75 (ii)    9.32 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.25         0.12
```

```
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.34         0.22          0.566 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.00           6.00
     RUNOFF VOLUME    (mm)=      52.40        38.98          45.69
     TOTAL RAINFALL   (mm)=      54.40        54.40          54.40
     RUNOFF COEFFICIENT   =       0.96         0.72           0.84

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0010) |   Area    (ha)=   3.97
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.57         0.40
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     162.69        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      71.81       304.09
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       3.91 (ii)    9.47 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.25         0.12
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.39         0.26          0.647 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.00           6.00
     RUNOFF VOLUME    (mm)=      52.40        38.98          45.69
     TOTAL RAINFALL   (mm)=      54.40        54.40          54.40
     RUNOFF COEFFICIENT   =       0.96         0.72           0.84

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0008) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0010):     3.97   0.647     6.00    45.69
       + ID2= 2 (0007):     3.46   0.566     6.00    45.69
         ================================================
         ID = 3 (0008):     7.43   1.212     6.00    45.69

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ***************************
  ** SIMULATION NUMBER:   3 **
  ***************************



--------------------
|    READ STORM    |    Filename: C:\Users\p004967b\AppD
|                  |              ata\Local\Temp\
|                  |              c9b46bab-423d-4536-80c9-0ccbb89c7139\cddafd6f
| Ptotal= 62.70 mm |    Comments: 10-Year 12-Hour SCS II Design Storm
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.25    1.57 |  3.25    2.51 |  6.25   11.29 |  9.25    2.19
                0.50    1.57 |  3.50    2.51 |  6.50   11.29 |  9.50    2.19
                0.75    1.57 |  3.75    2.51 |  6.75    5.02 |  9.75    2.19
                1.00    1.57 |  4.00    2.51 |  7.00    5.02 | 10.00    2.19
                1.25    1.57 |  4.25    3.76 |  7.25    3.76 | 10.25    1.25
                1.50    1.57 |  4.50    3.76 |  7.50    3.76 | 10.50    1.25
                1.75    1.57 |  4.75    5.02 |  7.75    3.76 | 10.75    1.25
                2.00    1.57 |  5.00    5.02 |  8.00    3.76 | 11.00    1.25
                2.25    1.88 |  5.25    7.52 |  8.25    2.19 | 11.25    1.25
```

2.50	1.88	5.50	7.52	8.50	2.19	11.50	1.25
2.75	1.88	5.75	30.10	8.75	2.19	11.75	1.25
3.00	1.88	6.00	82.76	9.00	2.19	12.00	1.25

CALIB	
STANDHYD (0002)	Area (ha)= 7.43
ID= 1 DT= 5.0 min	Total Imp(%)= 20.00 Dir. Conn.(%)= 20.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.49	5.94
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	1.00
Length	(m)=	222.56	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	1.57	3.083	2.51	6.083	11.29	9.08	2.19
0.167	1.57	3.167	2.51	6.167	11.29	9.17	2.19
0.250	1.57	3.250	2.51	6.250	11.29	9.25	2.19
0.333	1.57	3.333	2.51	6.333	11.29	9.33	2.19
0.417	1.57	3.417	2.51	6.417	11.29	9.42	2.19
0.500	1.57	3.500	2.51	6.500	11.29	9.50	2.19
0.583	1.57	3.583	2.51	6.583	5.02	9.58	2.19
0.667	1.57	3.667	2.51	6.667	5.02	9.67	2.19
0.750	1.57	3.750	2.51	6.750	5.02	9.75	2.19
0.833	1.57	3.833	2.51	6.833	5.02	9.83	2.19
0.917	1.57	3.917	2.51	6.917	5.02	9.92	2.19
1.000	1.57	4.000	2.51	7.000	5.02	10.00	2.19
1.083	1.57	4.083	3.76	7.083	3.76	10.08	1.25
1.167	1.57	4.167	3.76	7.167	3.76	10.17	1.25
1.250	1.57	4.250	3.76	7.250	3.76	10.25	1.25
1.333	1.57	4.333	3.76	7.333	3.76	10.33	1.25
1.417	1.57	4.417	3.76	7.417	3.76	10.42	1.25
1.500	1.57	4.500	3.76	7.500	3.76	10.50	1.25
1.583	1.57	4.583	5.02	7.583	3.76	10.58	1.25
1.667	1.57	4.667	5.02	7.667	3.76	10.67	1.25
1.750	1.57	4.750	5.02	7.750	3.76	10.75	1.25
1.833	1.57	4.833	5.02	7.833	3.76	10.83	1.25
1.917	1.57	4.917	5.02	7.917	3.76	10.92	1.25
2.000	1.57	5.000	5.02	8.000	3.76	11.00	1.25
2.083	1.88	5.083	7.52	8.083	2.19	11.08	1.25
2.167	1.88	5.167	7.52	8.167	2.19	11.17	1.25
2.250	1.88	5.250	7.52	8.250	2.19	11.25	1.25
2.333	1.88	5.333	7.52	8.333	2.19	11.33	1.25
2.417	1.88	5.417	7.52	8.417	2.19	11.42	1.25
2.500	1.88	5.500	7.52	8.500	2.19	11.50	1.25
2.583	1.88	5.583	30.10	8.583	2.19	11.58	1.25
2.667	1.88	5.667	30.10	8.667	2.19	11.67	1.25
2.750	1.88	5.750	30.10	8.750	2.19	11.75	1.25
2.833	1.88	5.833	82.76	8.833	2.19	11.83	1.25
2.917	1.88	5.917	82.76	8.917	2.19	11.92	1.25
3.000	1.88	6.000	82.76	9.000	2.19	12.00	1.25

Max.Eff.Inten.(mm/hr)=		82.76	32.62	
over (min)		5.00	20.00	
Storage Coeff. (min)=		4.45 (ii)	18.05 (ii)	
Unit Hyd. Tpeak (min)=		5.00	20.00	
Unit Hyd. peak (cms)=		0.23	0.06	
				TOTALS
PEAK FLOW	(cms)=	0.33	0.28	0.525 (iii)
TIME TO PEAK	(hrs)=	6.00	6.17	6.00
RUNOFF VOLUME	(mm)=	61.70	21.28	29.36
TOTAL RAINFALL	(mm)=	62.70	62.70	62.70
RUNOFF COEFFICIENT	=	0.98	0.34	0.47

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   3.46
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.11         0.35
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     151.88        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      82.76       361.04
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       3.54 (ii)    8.46 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.26         0.12
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.39         0.28          0.671 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.00           6.00
     RUNOFF VOLUME    (mm)=      60.70        46.74          53.72
     TOTAL RAINFALL   (mm)=      62.70        62.70          62.70
     RUNOFF COEFFICIENT   =       0.97         0.75           0.86

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0005) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0270      0.2226
                         0.0080     0.0626   |   0.4030      0.3142
                         0.0090     0.0966   |   0.4040      0.3143
                         0.0110     0.1592   |   0.4050      0.3145
                         0.0130     0.1900   |   0.4600      0.3234
                         0.0190     0.2083   |   0.0000      0.0000

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0001)     3.460     0.671      6.00       53.72
     OUTFLOW: ID= 1 (0005)     3.460     0.011     12.00       53.14

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  1.64
                  TIME SHIFT OF PEAK FLOW         (min)=360.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.1592

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--------------------
| CALIB            |
| STANDHYD  (0004) |   Area    (ha)=   3.97
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.57         0.40
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     162.69        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      82.76       361.04
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       3.69 (ii)    8.61 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.25         0.12
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.45         0.32          0.767 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.00           6.00
     RUNOFF VOLUME    (mm)=      60.70        46.74          53.72
     TOTAL RAINFALL   (mm)=      62.70        62.70          62.70
     RUNOFF COEFFICIENT   =       0.97         0.75           0.86

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
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```
          THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0003) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0170      0.2174
                          0.0070     0.0718   |   0.0240      0.2372
                          0.0080     0.1149   |   0.0300      0.2532
                          0.0090     0.1150   |   0.0310      0.2553
                          0.0100     0.1576   |   0.3980      0.4170
                          0.0110     0.1871   |   0.4230      0.4244

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0004)      3.970      0.767      6.00      53.72
     OUTFLOW: ID= 1 (0003)      3.970      0.011     12.00      53.06

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  1.43
                   TIME SHIFT OF PEAK FLOW         (min)=360.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.1871

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--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0003):     3.97   0.011    12.00    53.06
        + ID2= 2 (0005):     3.46   0.011    12.00    53.14
          ================================================
          ID = 3 (0006):     7.43   0.022    12.00    53.10

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0007) |   Area    (ha)=   3.46
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.11         0.35
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     151.88        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      82.76       361.04
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       3.54 (ii)    8.46 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.26         0.12
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.39         0.28          0.671 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.00           6.00
     RUNOFF VOLUME    (mm)=      60.70        46.74          53.72
     TOTAL RAINFALL   (mm)=      62.70        62.70          62.70
     RUNOFF COEFFICIENT   =       0.97         0.75           0.86

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0010) |   Area    (ha)=   3.97
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.57         0.40
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     162.69        40.00
     Mannings n           =      0.013        0.250
```

```
     Max.Eff.Inten.(mm/hr)=      82.76       361.04
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       3.69 (ii)    8.61 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.25         0.12
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.45         0.32       0.767 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.00        6.00
     RUNOFF VOLUME    (mm)=      60.70        46.74       53.72
     TOTAL RAINFALL   (mm)=      62.70        62.70       62.70
     RUNOFF COEFFICIENT   =       0.97         0.75        0.86

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0008) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0010):     3.97   0.767     6.00    53.72
       + ID2= 2 (0007):     3.46   0.671     6.00    53.72
         ================================================
         ID = 3 (0008):     7.43   1.439     6.00    53.72

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ***************************
  ** SIMULATION NUMBER:   4 **
  ***************************


--------------------
|    READ STORM    |    Filename: C:\Users\p004967b\AppD
|                  |              ata\Local\Temp\
|                  |              c9b46bab-423d-4536-80c9-0ccbb89c7139\24157212
| Ptotal= 73.10 mm |    Comments: 25-Year 12-Hour SCS II Design Storm
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.25    1.83 |  3.25    2.92 |'  6.25   13.16 |  9.25    2.56
                0.50    1.83 |  3.50    2.92 |  6.50   13.16 |  9.50    2.56
                0.75    1.83 |  3.75    2.92 |  6.75    5.85 |  9.75    2.56
                1.00    1.83 |  4.00    2.92 |  7.00    5.85 | 10.00    2.56
                1.25    1.83 |  4.25    4.39 |  7.25    4.39 | 10.25    1.46
                1.50    1.83 |  4.50    4.39 |  7.50    4.39 | 10.50    1.46
                1.75    1.83 |  4.75    5.85 |  7.75    4.39 | 10.75    1.46
                2.00    1.83 |  5.00    5.85 |  8.00    4.39 | 11.00    1.46
                2.25    2.19 |  5.25    8.77 |  8.25    2.56 | 11.25    1.46
                2.50    2.19 |  5.50    8.77 |  8.50    2.56 | 11.50    1.46
                2.75    2.19 |  5.75   35.09 |  8.75    2.56 | 11.75    1.46
                3.00    2.19 |  6.00   96.49 |  9.00    2.56 | 12.00    1.46

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--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   7.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.49         5.94
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     222.56        40.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.083    1.83 | 3.083    2.92 | 6.083   13.16 |  9.08    2.56
                0.167    1.83 | 3.167    2.92 | 6.167   13.16 |  9.17    2.56
                0.250    1.83 | 3.250    2.92 | 6.250   13.16 |  9.25    2.56
                0.333    1.83 | 3.333    2.92 | 6.333   13.16 |  9.33    2.56
```

0.417	1.83	3.417	2.92	6.417	13.16	9.42	2.56
0.500	1.83	3.500	2.92	6.500	13.16	9.50	2.56
0.583	1.83	3.583	2.92	6.583	5.85	9.58	2.56
0.667	1.83	3.667	2.92	6.667	5.85	9.67	2.56
0.750	1.83	3.750	2.92	6.750	5.85	9.75	2.56
0.833	1.83	3.833	2.92	6.833	5.85	9.83	2.56
0.917	1.83	3.917	2.92	6.917	5.85	9.92	2.56
1.000	1.83	4.000	2.92	7.000	5.85	10.00	2.56
1.083	1.83	4.083	4.39	7.083	4.39	10.08	1.46
1.167	1.83	4.167	4.39	7.167	4.39	10.17	1.46
1.250	1.83	4.250	4.39	7.250	4.39	10.25	1.46
1.333	1.83	4.333	4.39	7.333	4.39	10.33	1.46
1.417	1.83	4.417	4.39	7.417	4.39	10.42	1.46
1.500	1.83	4.500	4.39	7.500	4.39	10.50	1.46
1.583	1.83	4.583	5.85	7.583	4.39	10.58	1.46
1.667	1.83	4.667	5.85	7.667	4.39	10.67	1.46
1.750	1.83	4.750	5.85	7.750	4.39	10.75	1.46
1.833	1.83	4.833	5.85	7.833	4.39	10.83	1.46
1.917	1.83	4.917	5.85	7.917	4.39	10.92	1.46
2.000	1.83	5.000	5.85	8.000	4.39	11.00	1.46
2.083	2.19	5.083	8.77	8.083	2.56	11.08	1.46
2.167	2.19	5.167	8.77	8.167	2.56	11.17	1.46
2.250	2.19	5.250	8.77	8.250	2.56	11.25	1.46
2.333	2.19	5.333	8.77	8.333	2.56	11.33	1.46
2.417	2.19	5.417	8.77	8.417	2.56	11.42	1.46
2.500	2.19	5.500	8.77	8.500	2.56	11.50	1.46
2.583	2.19	5.583	35.09	8.583	2.56	11.58	1.46
2.667	2.19	5.667	35.09	8.667	2.56	11.67	1.46
2.750	2.19	5.750	35.09	8.750	2.56	11.75	1.46
2.833	2.19	5.833	96.49	8.833	2.56	11.83	1.46
2.917	2.19	5.917	96.49	8.917	2.56	11.92	1.46
3.000	2.19	6.000	96.49	9.000	2.56	12.00	1.46

Max.Eff.Inten.(mm/hr)=	96.49	42.73	
over (min)	5.00	20.00	
Storage Coeff. (min)=	4.19 (ii)	16.40 (ii)	
Unit Hyd. Tpeak (min)=	5.00	20.00	
Unit Hyd. peak (cms)=	0.24	0.06	
			TOTALS
PEAK FLOW (cms)=	0.39	0.39	0.659 (iii)
TIME TO PEAK (hrs)=	6.00	6.17	6.00
RUNOFF VOLUME (mm)=	72.10	27.79	36.65
TOTAL RAINFALL (mm)=	73.10	73.10	73.10
RUNOFF COEFFICIENT =	0.99	0.38	0.50

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0001) | Area (ha)= 3.46
ID= 1 DT= 5.0 min | Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	3.11	0.35
Dep. Storage (mm)=	2.00	5.00
Average Slope (%)=	1.00	1.00
Length (m)=	151.88	40.00
Mannings n =	0.013	0.250

Max.Eff.Inten.(mm/hr)=	96.49	432.44	
over (min)	5.00	10.00	
Storage Coeff. (min)=	3.33 (ii)	7.96 (ii)	
Unit Hyd. Tpeak (min)=	5.00	10.00	
Unit Hyd. peak (cms)=	0.26	0.13	
			TOTALS
PEAK FLOW (cms)=	0.46	0.34	0.801 (iii)
TIME TO PEAK (hrs)=	6.00	6.00	6.00
RUNOFF VOLUME (mm)=	71.10	56.59	63.85
TOTAL RAINFALL (mm)=	73.10	73.10	73.10
RUNOFF COEFFICIENT =	0.97	0.77	0.87

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)

```
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR (0005) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0270      0.2226
                          0.0080     0.0626   |   0.4030      0.3142
                          0.0090     0.0966   |   0.4040      0.3143
                          0.0110     0.1592   |   0.4050      0.3145
                          0.0130     0.1900   |   0.4600      0.3234
                          0.0190     0.2083   |   0.0000      0.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0001)      3.460      0.801      6.00      63.85
     OUTFLOW: ID= 1 (0005)      3.460      0.013     12.00      63.27

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=  1.62
                    TIME SHIFT OF PEAK FLOW         (min)=360.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.1900

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0004) |   Area    (ha)=   3.97
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.57         0.40
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     162.69        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      96.49       432.44
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       3.47 (ii)    8.10 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.26         0.13
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.53         0.39          0.916 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.00           6.00
     RUNOFF VOLUME    (mm)=      71.10        56.59          63.85
     TOTAL RAINFALL   (mm)=      73.10        73.10          73.10
     RUNOFF COEFFICIENT   =       0.97         0.77           0.87

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0003) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0170      0.2174
                          0.0070     0.0718   |   0.0240      0.2372
                          0.0080     0.1149   |   0.0300      0.2532
                          0.0090     0.1150   |   0.0310      0.2553
                          0.0100     0.1576   |   0.3980      0.4170
                          0.0110     0.1871   |   0.4230      0.4244

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0004)      3.970      0.916      6.00      63.85
     OUTFLOW: ID= 1 (0003)      3.970      0.017     10.25      63.19

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=  1.86
                    TIME SHIFT OF PEAK FLOW         (min)=255.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.2174

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| ADD HYD   (0006) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0003):     3.97   0.017    10.25    63.19
       + ID2= 2 (0005):     3.46   0.013    12.00    63.27
         ================================================
         ID = 3 (0006):     7.43   0.030    10.33    63.23

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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-------------------
| CALIB             |
| STANDHYD  (0007)  |   Area    (ha)=   3.46
|ID= 1 DT= 5.0 min  |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
-------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.11         0.35
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     151.88        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      96.49       432.44
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       3.33 (ii)    7.96 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.26         0.13
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.46         0.34         0.801 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.00          6.00
     RUNOFF VOLUME    (mm)=      71.10        56.59         63.85
     TOTAL RAINFALL   (mm)=      73.10        73.10         73.10
     RUNOFF COEFFICIENT   =       0.97         0.77          0.87

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-------------------
| CALIB             |
| STANDHYD  (0010)  |   Area    (ha)=   3.97
|ID= 1 DT= 5.0 min  |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
-------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.57         0.40
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     162.69        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      96.49       432.44
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       3.47 (ii)    8.10 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.26         0.13
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.53         0.39         0.916 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.00          6.00
     RUNOFF VOLUME    (mm)=      71.10        56.59         63.85
     TOTAL RAINFALL   (mm)=      73.10        73.10         73.10
     RUNOFF COEFFICIENT   =       0.97         0.77          0.87

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-------------------
| ADD HYD   (0008) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0010):     3.97   0.916     6.00    63.85
       + ID2= 2 (0007):     3.46   0.801     6.00    63.85
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          ================================================
          ID = 3 (0008):     7.43   1.717     6.00    63.85

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ***************************
  ** SIMULATION NUMBER:   5 **
  ***************************


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|    READ STORM    |    Filename: C:\Users\p004967b\AppD
|                  |              ata\Local\Temp\
|                  |              c9b46bab-423d-4536-80c9-0ccbb89c7139\956ffff7
| Ptotal= 80.80 mm |    Comments: 50-Year 12-Hour SCS II Design Storm
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.25	2.02	3.25	3.23	6.25	14.54	9.25	2.83
0.50	2.02	3.50	3.23	6.50	14.54	9.50	2.83
0.75	2.02	3.75	3.23	6.75	6.46	9.75	2.83
1.00	2.02	4.00	3.23	7.00	6.46	10.00	2.83
1.25	2.02	4.25	4.85	7.25	4.85	10.25	1.62
1.50	2.02	4.50	4.85	7.50	4.85	10.50	1.62
1.75	2.02	4.75	6.46	7.75	4.85	10.75	1.62
2.00	2.02	5.00	6.46	8.00	4.85	11.00	1.62
2.25	2.42	5.25	9.70	8.25	2.83	11.25	1.62
2.50	2.42	5.50	9.70	8.50	2.83	11.50	1.62
2.75	2.42	5.75	38.78	8.75	2.83	11.75	1.62
3.00	2.42	6.00	106.66	9.00	2.83	12.00	1.62

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| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   7.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
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```

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.49	5.94
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	1.00
Length	(m)=	222.56	40.00
Mannings n	=	0.013	0.250

```
        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.

                        ---- TRANSFORMED HYETOGRAPH ----
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.02	3.083	3.23	6.083	14.54	9.08	2.83
0.167	2.02	3.167	3.23	6.167	14.54	9.17	2.83
0.250	2.02	3.250	3.23	6.250	14.54	9.25	2.83
0.333	2.02	3.333	3.23	6.333	14.54	9.33	2.83
0.417	2.02	3.417	3.23	6.417	14.54	9.42	2.83
0.500	2.02	3.500	3.23	6.500	14.54	9.50	2.83
0.583	2.02	3.583	3.23	6.583	6.46	9.58	2.83
0.667	2.02	3.667	3.23	6.667	6.46	9.67	2.83
0.750	2.02	3.750	3.23	6.750	6.46	9.75	2.83
0.833	2.02	3.833	3.23	6.833	6.46	9.83	2.83
0.917	2.02	3.917	3.23	6.917	6.46	9.92	2.83
1.000	2.02	4.000	3.23	7.000	6.46	10.00	2.83
1.083	2.02	4.083	4.85	7.083	4.85	10.08	1.62
1.167	2.02	4.167	4.85	7.167	4.85	10.17	1.62
1.250	2.02	4.250	4.85	7.250	4.85	10.25	1.62
1.333	2.02	4.333	4.85	7.333	4.85	10.33	1.62
1.417	2.02	4.417	4.85	7.417	4.85	10.42	1.62
1.500	2.02	4.500	4.85	7.500	4.85	10.50	1.62
1.583	2.02	4.583	6.46	7.583	4.85	10.58	1.62
1.667	2.02	4.667	6.46	7.667	4.85	10.67	1.62
1.750	2.02	4.750	6.46	7.750	4.85	10.75	1.62
1.833	2.02	4.833	6.46	7.833	4.85	10.83	1.62
1.917	2.02	4.917	6.46	7.917	4.85	10.92	1.62
2.000	2.02	5.000	6.46	8.000	4.85	11.00	1.62
2.083	2.42	5.083	9.70	8.083	2.83	11.08	1.62
2.167	2.42	5.167	9.70	8.167	2.83	11.17	1.62
2.250	2.42	5.250	9.70	8.250	2.83	11.25	1.62
2.333	2.42	5.333	9.70	8.333	2.83	11.33	1.62
2.417	2.42	5.417	9.70	8.417	2.83	11.42	1.62
2.500	2.42	5.500	9.70	8.500	2.83	11.50	1.62
2.583	2.42	5.583	38.78	8.583	2.83	11.58	1.62
2.667	2.42	5.667	38.78	8.667	2.83	11.67	1.62

```
              2.750    2.42 | 5.750   38.79 | 8.750    2.83 | 11.75    1.62
              2.833    2.42 | 5.833  106.66 | 8.833    2.83 | 11.83    1.62
              2.917    2.42 | 5.917  106.66 | 8.917    2.83 | 11.92    1.62
              3.000    2.42 | 6.000  106.65 | 9.000    2.83 | 12.00    1.62

     Max.Eff.Inten.(mm/hr)=     106.66        50.69
               over (min)        5.00        20.00
     Storage Coeff.  (min)=       4.02 (ii)   15.43 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.24         0.07
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.43         0.48          0.765 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.17           6.00
     RUNOFF VOLUME    (mm)=      79.80        32.91          42.29
     TOTAL RAINFALL   (mm)=      80.80        80.80          80.80
     RUNOFF COEFFICIENT   =       0.99         0.41           0.52

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
             YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   3.46
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.11         0.35
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     151.88        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     106.66       485.25
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       3.20 (ii)    7.65 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.27         0.13
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.51         0.39          0.897 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.00           6.00
     RUNOFF VOLUME    (mm)=      78.80        63.96          71.38
     TOTAL RAINFALL   (mm)=      80.80        80.80          80.80
     RUNOFF COEFFICIENT   =       0.98         0.79           0.88

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0005) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0270      0.2226
                         0.0080     0.0626   |   0.4030      0.3142
                         0.0090     0.0966   |   0.4040      0.3143
                         0.0110     0.1592   |   0.4050      0.3145
                         0.0130     0.1900   |   0.4600      0.3234
                         0.0190     0.2083   |   0.0000      0.0000

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0001)     3.460      0.897      6.00      71.38
     OUTFLOW: ID= 1 (0005)     3.460      0.019     10.17      70.81

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  2.12
                  TIME SHIFT OF PEAK FLOW         (min)=250.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.2083

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CALIB	
STANDHYD (0004)	Area (ha)= 3.97
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	3.57	0.40	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	162.69	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		106.66	485.25	
over (min)		5.00	10.00	
Storage Coeff. (min)=		3.33 (ii)	7.78 (ii)	
Unit Hyd. Tpeak (min)=		5.00	10.00	
Unit Hyd. peak (cms)=		0.26	0.13	
				TOTALS
PEAK FLOW	(cms)=	0.58	0.44	1.026 (iii)
TIME TO PEAK	(hrs)=	6.00	6.00	6.00
RUNOFF VOLUME	(mm)=	78.80	63.96	71.38
TOTAL RAINFALL	(mm)=	80.80	80.80	80.80
RUNOFF COEFFICIENT	=	0.98	0.79	0.88

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR (0003)				
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0170	0.2174
	0.0070	0.0718	0.0240	0.2372
	0.0080	0.1149	0.0300	0.2532
	0.0090	0.1150	0.0310	0.2553
	0.0100	0.1576	0.3980	0.4170
	0.0110	0.1871	0.4230	0.4244

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0004)	3.970	1.026	6.00	71.38
OUTFLOW: ID= 1 (0003)	3.970	0.024	10.08	70.72

PEAK FLOW REDUCTION [Qout/Qin](%)= 2.34
TIME SHIFT OF PEAK FLOW (min)=245.00
MAXIMUM STORAGE USED (ha.m.)= 0.2372

ADD HYD (0006)		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
1 + 2 = 3	ID1= 1 (0003):	3.97	0.024	10.08	70.72
	+ ID2= 2 (0005):	3.46	0.019	10.17	70.81
	ID = 3 (0006):	7.43	0.043	10.08	70.76

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB	
STANDHYD (0007)	Area (ha)= 3.46
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	3.11	0.35
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	1.00
Length	(m)=	151.88	40.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		106.66	485.25
over (min)		5.00	10.00
Storage Coeff. (min)=		3.20 (ii)	7.65 (ii)
Unit Hyd. Tpeak (min)=		5.00	10.00
Unit Hyd. peak (cms)=		0.27	0.13

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                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.51         0.39          0.897 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.00           6.00
     RUNOFF VOLUME    (mm)=      78.80        63.96          71.38
     TOTAL RAINFALL   (mm)=      80.80        80.80          80.80
     RUNOFF COEFFICIENT   =       0.98         0.79           0.88

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0010) |   Area    (ha)=   3.97
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.57         0.40
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     162.69        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     106.66       485.25
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       3.33 (ii)    7.78 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.26         0.13
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.58         0.44          1.026 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.00           6.00
     RUNOFF VOLUME    (mm)=      78.80        63.96          71.38
     TOTAL RAINFALL   (mm)=      80.80        80.80          80.80
     RUNOFF COEFFICIENT   =       0.98         0.79           0.88

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0008) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0010):     3.97   1.026     6.00    71.38
       + ID2= 2 (0007):     3.46   0.897     6.00    71.38
         ================================================
         ID = 3 (0008):     7.43   1.923     6.00    71.38

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ***************************
  ** SIMULATION NUMBER:   6 **
  ***************************



--------------------
|    READ STORM    |    Filename: C:\Users\p004967b\AppD
|                  |              ata\Local\Temp\
|                  |              c9b46bab-423d-4536-80c9-0ccbb89c7139\5d686345
| Ptotal= 88.50 mm |    Comments: 100-Year 12-Hour SCS II Design Storm
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.25    2.21 |  3.25    3.54 |  6.25   15.93 |  9.25    3.10
                0.50    2.21 |  3.50    3.54 |  6.50   15.93 |  9.50    3.10
                0.75    2.21 |  3.75    3.54 |  6.75    7.08 |  9.75    3.10
                1.00    2.21 |  4.00    3.54 |  7.00    7.08 | 10.00    3.10
                1.25    2.21 |  4.25    5.31 |  7.25    5.31 | 10.25    1.77
                1.50    2.21 |  4.50    5.31 |  7.50    5.31 | 10.50    1.77
                1.75    2.21 |  4.75    7.08 |  7.75    5.31 | 10.75    1.77
                2.00    2.21 |  5.00    7.08 |  8.00    5.31 | 11.00    1.77
                2.25    2.65 |  5.25   10.62 |  8.25    3.10 | 11.25    1.77
```

2.50	2.65	5.50	10.62	8.50	3.10	11.50	1.77
2.75	2.65	5.75	42.48	8.75	3.10	11.75	1.77
3.00	2.65	6.00	116.82	9.00	3.10	12.00	1.77

CALIB	
STANDHYD (0002)	Area (ha)= 7.43
ID= 1 DT= 5.0 min	Total Imp(%)= 20.00 Dir. Conn.(%)= 20.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	1.49	5.94
Dep. Storage	(mm)=	1.00	5.00
Average Slope	(%)=	1.00	1.00
Length	(m)=	222.56	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.21	3.083	3.54	6.083	15.93	9.08	3.10
0.167	2.21	3.167	3.54	6.167	15.93	9.17	3.10
0.250	2.21	3.250	3.54	6.250	15.93	9.25	3.10
0.333	2.21	3.333	3.54	6.333	15.93	9.33	3.10
0.417	2.21	3.417	3.54	6.417	15.93	9.42	3.10
0.500	2.21	3.500	3.54	6.500	15.93	9.50	3.10
0.583	2.21	3.583	3.54	6.583	7.08	9.58	3.10
0.667	2.21	3.667	3.54	6.667	7.08	9.67	3.10
0.750	2.21	3.750	3.54	6.750	7.08	9.75	3.10
0.833	2.21	3.833	3.54	6.833	7.08	9.83	3.10
0.917	2.21	3.917	3.54	6.917	7.08	9.92	3.10
1.000	2.21	4.000	3.54	7.000	7.08	10.00	3.10
1.083	2.21	4.083	5.31	7.083	5.31	10.08	1.77
1.167	2.21	4.167	5.31	7.167	5.31	10.17	1.77
1.250	2.21	4.250	5.31	7.250	5.31	10.25	1.77
1.333	2.21	4.333	5.31	7.333	5.31	10.33	1.77
1.417	2.21	4.417	5.31	7.417	5.31	10.42	1.77
1.500	2.21	4.500	5.31	7.500	5.31	10.50	1.77
1.583	2.21	4.583	7.08	7.583	5.31	10.58	1.77
1.667	2.21	4.667	7.08	7.667	5.31	10.67	1.77
1.750	2.21	4.750	7.08	7.750	5.31	10.75	1.77
1.833	2.21	4.833	7.08	7.833	5.31	10.83	1.77
1.917	2.21	4.917	7.08	7.917	5.31	10.92	1.77
2.000	2.21	5.000	7.08	8.000	5.31	11.00	1.77
2.083	2.65	5.083	10.62	8.083	3.10	11.08	1.77
2.167	2.65	5.167	10.62	8.167	3.10	11.17	1.77
2.250	2.65	5.250	10.62	8.250	3.10	11.25	1.77
2.333	2.65	5.333	10.62	8.333	3.10	11.33	1.77
2.417	2.65	5.417	10.62	8.417	3.10	11.42	1.77
2.500	2.65	5.500	10.62	8.500	3.10	11.50	1.77
2.583	2.65	5.583	42.48	8.583	3.10	11.58	1.77
2.667	2.65	5.667	42.48	8.667	3.10	11.67	1.77
2.750	2.65	5.750	42.48	8.750	3.10	11.75	1.77
2.833	2.65	5.833	116.82	8.833	3.10	11.83	1.77
2.917	2.65	5.917	116.82	8.917	3.10	11.92	1.77
3.000	2.65	6.000	116.82	9.000	3.10	12.00	1.77

				TOTALS
Max.Eff.Inten.(mm/hr)=		116.82	58.97	
over (min)		5.00	15.00	
Storage Coeff. (min)=		3.88 (ii)	14.61 (ii)	
Unit Hyd. Tpeak (min)=		5.00	15.00	
Unit Hyd. peak (cms)=		0.25	0.08	
PEAK FLOW	(cms)=	0.48	0.60	0.987 (iii)
TIME TO PEAK	(hrs)=	6.00	6.08	6.00
RUNOFF VOLUME	(mm)=	87.50	38.25	48.10
TOTAL RAINFALL	(mm)=	88.50	88.50	88.50
RUNOFF COEFFICIENT	=	0.99	0.43	0.54

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   3.46
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.11         0.35
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     151.88        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     116.82       537.97
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       3.08 (ii)    7.37 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.27         0.13
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.56         0.44         0.994 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.00          6.00
     RUNOFF VOLUME    (mm)=      86.50        71.38         78.94
     TOTAL RAINFALL   (mm)=      88.50        88.50         88.50
     RUNOFF COEFFICIENT   =       0.98         0.81          0.89

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0005) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0270      0.2226
                         0.0080     0.0626   |   0.4030      0.3142
                         0.0090     0.0966   |   0.4040      0.3143
                         0.0110     0.1592   |   0.4050      0.3145
                         0.0130     0.1900   |   0.4600      0.3234
                         0.0190     0.2083   |   0.0000      0.0000

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0001)     3.460      0.994      6.00      78.94
     OUTFLOW: ID= 1 (0005)     3.460      0.027     10.00      78.37

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  2.72
                   TIME SHIFT OF PEAK FLOW         (min)=240.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.2226

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0004) |   Area    (ha)=   3.97
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.57         0.40
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     162.69        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     116.82       537.97
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       3.21 (ii)    7.50 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.27         0.13
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.64         0.50         1.137 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.00          6.00
     RUNOFF VOLUME    (mm)=      86.50        71.38         78.94
     TOTAL RAINFALL   (mm)=      88.50        88.50         88.50
     RUNOFF COEFFICIENT   =       0.98         0.81          0.89

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
```

```
          THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0003) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0170      0.2174
                          0.0070     0.0718   |   0.0240      0.2372
                          0.0080     0.1149   |   0.0300      0.2532
                          0.0090     0.1150   |   0.0310      0.2553
                          0.0100     0.1576   |   0.3980      0.4170
                          0.0110     0.1871   |   0.4230      0.4244

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0004)      3.970     1.137      6.00       78.94
     OUTFLOW: ID= 1 (0003)      3.970     0.031     10.00       78.28

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  2.73
                   TIME SHIFT OF PEAK FLOW         (min)=240.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.2553

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0003):     3.97   0.031    10.00    78.28
        + ID2= 2 (0005):     3.46   0.027    10.00    78.37
          ================================================
          ID = 3 (0006):     7.43   0.058    10.00    78.32

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0007) |   Area    (ha)=   3.46
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.11         0.35
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     151.88        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     116.82       537.97
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       3.08 (ii)    7.37 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.27         0.13
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.56         0.44        0.994 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.00         6.00
     RUNOFF VOLUME    (mm)=      86.50        71.38        78.94
     TOTAL RAINFALL   (mm)=      88.50        88.50        88.50
     RUNOFF COEFFICIENT   =       0.98         0.81         0.89

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0010) |   Area    (ha)=   3.97
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.57         0.40
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     162.69        40.00
     Mannings n           =      0.013        0.250
```

```
     Max.Eff.Inten.(mm/hr)=     116.82       537.97
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       3.21 (ii)    7.50 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.27         0.13
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.64         0.50          1.137 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.00           6.00
     RUNOFF VOLUME    (mm)=      86.50        71.38          78.94
     TOTAL RAINFALL   (mm)=      88.50        88.50          88.50
     RUNOFF COEFFICIENT   =       0.98         0.81           0.89

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0008) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0010):     3.97   1.137     6.00    78.94
       + ID2= 2 (0007):     3.46   0.994     6.00    78.94
         ================================================
         ID = 3 (0008):     7.43   2.131     6.00    78.94

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ****************************
  ** SIMULATION NUMBER:   7 **
  ****************************



--------------------
|    READ STORM    |    Filename: C:\Users\p004967b\AppD
|                  |              ata\Local\Temp\
|                  |              c9b46bab-423d-4536-80c9-0ccbb89c7139\575a80e5
| Ptotal=212.00 mm |    Comments: * REGIONAL DESIGN STORM
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.20    6.00 |  3.20   13.00 |'  6.20   23.00 |  9.20   53.00
                0.40    6.00 |  3.40   13.00 |'  6.40   23.00 |  9.40   53.00
                0.60    6.00 |  3.60   13.00 |'  6.60   23.00 |  9.60   53.00
                0.80    6.00 |  3.80   13.00 |'  6.80   23.00 |  9.80   53.00
                1.00    6.00 |  4.00   13.00 |'  7.00   23.00 | 10.00   53.00
                1.20    4.00 |  4.20   17.00 |'  7.20   13.00 | 10.20   38.00
                1.40    4.00 |  4.40   17.00 |'  7.40   13.00 | 10.40   38.00
                1.60    4.00 |  4.60   17.00 |'  7.60   13.00 | 10.60   38.00
                1.80    4.00 |  4.80   17.00 |'  7.80   13.00 | 10.80   38.00
                2.00    4.00 |  5.00   17.00 |'  8.00   13.00 | 11.00   38.00
                2.20    6.00 |  5.20   13.00 |'  8.20   13.00 | 11.20   13.00
                2.40    6.00 |  5.40   13.00 |'  8.40   13.00 | 11.40   13.00
                2.60    6.00 |  5.60   13.00 |'  8.60   13.00 | 11.60   13.00
                2.80    6.00 |  5.80   13.00 |'  8.80   13.00 | 11.80   13.00
                3.00    6.00 |  6.00   13.00 |'  9.00   13.00 | 12.00   13.00

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--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   7.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.49         5.94
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     222.56        40.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                              ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    6.00 | 3.083   13.00 | 6.083   23.00 |  9.08   53.00
```

0.167	6.00	3.167	13.00	6.167	23.00	9.17	53.00
0.250	6.00	3.250	13.00	6.250	23.00	9.25	53.00
0.333	6.00	3.333	13.00	6.333	23.00	9.33	53.00
0.417	6.00	3.417	13.00	6.417	23.00	9.42	53.00
0.500	6.00	3.500	13.00	6.500	23.00	9.50	53.00
0.583	6.00	3.583	13.00	6.583	23.00	9.58	53.00
0.667	6.00	3.667	13.00	6.667	23.00	9.67	53.00
0.750	6.00	3.750	13.00	6.750	23.00	9.75	53.00
0.833	6.00	3.833	13.00	6.833	23.00	9.83	53.00
0.917	6.00	3.917	13.00	6.917	23.00	9.92	53.00
1.000	6.00	4.000	13.00	7.000	23.00	10.00	53.00
1.083	4.00	4.083	17.00	7.083	13.00	10.08	38.00
1.167	4.00	4.167	17.00	7.167	13.00	10.17	38.00
1.250	4.00	4.250	17.00	7.250	13.00	10.25	38.00
1.333	4.00	4.333	17.00	7.333	13.00	10.33	38.00
1.417	4.00	4.417	17.00	7.417	13.00	10.42	38.00
1.500	4.00	4.500	17.00	7.500	13.00	10.50	38.00
1.583	4.00	4.583	17.00	7.583	13.00	10.58	38.00
1.667	4.00	4.667	17.00	7.667	13.00	10.67	38.00
1.750	4.00	4.750	17.00	7.750	13.00	10.75	38.00
1.833	4.00	4.833	17.00	7.833	13.00	10.83	38.00
1.917	4.00	4.917	17.00	7.917	13.00	10.92	38.00
2.000	4.00	5.000	17.00	8.000	13.00	11.00	38.00
2.083	6.00	5.083	13.00	8.083	13.00	11.08	13.00
2.167	6.00	5.167	13.00	8.167	13.00	11.17	13.00
2.250	6.00	5.250	13.00	8.250	13.00	11.25	13.00
2.333	6.00	5.333	13.00	8.333	13.00	11.33	13.00
2.417	6.00	5.417	13.00	8.417	13.00	11.42	13.00
2.500	6.00	5.500	13.00	8.500	13.00	11.50	13.00
2.583	6.00	5.583	13.00	8.583	13.00	11.58	13.00
2.667	6.00	5.667	13.00	8.667	13.00	11.67	13.00
2.750	6.00	5.750	13.00	8.750	13.00	11.75	13.00
2.833	6.00	5.833	13.00	8.833	13.00	11.83	13.00
2.917	6.00	5.917	13.00	8.917	13.00	11.92	13.00
3.000	6.00	6.000	13.00	9.000	13.00	12.00	13.00

Max.Eff.Inten.(mm/hr)=	53.00	44.60	
over (min)	5.00	20.00	
Storage Coeff. (min)=	5.32 (ii)	17.32 (ii)	
Unit Hyd. Tpeak (min)=	5.00	20.00	
Unit Hyd. peak (cms)=	0.21	0.06	
			TOTALS
PEAK FLOW (cms)=	0.22	0.69	0.907 (iii)
TIME TO PEAK (hrs)=	10.00	10.08	10.00
RUNOFF VOLUME (mm)=	211.00	140.13	154.30
TOTAL RAINFALL (mm)=	212.00	212.00	212.00
RUNOFF COEFFICIENT =	1.00	0.66	0.73

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB		
STANDHYD (0001)	Area (ha)=	3.46
ID= 1 DT= 5.0 min	Total Imp(%)=	90.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=		3.11	0.35
Dep. Storage (mm)=		2.00	5.00
Average Slope (%)=		1.00	1.00
Length (m)=		151.88	40.00
Mannings n =		0.013	0.250
Max.Eff.Inten.(mm/hr)=		53.00	261.63
over (min)		5.00	15.00
Storage Coeff. (min)=		4.23 (ii)	10.15 (ii)
Unit Hyd. Tpeak (min)=		5.00	15.00
Unit Hyd. peak (cms)=		0.24	0.10
			TOTALS
PEAK FLOW (cms)=		0.25	0.25 0.505 (iii)
TIME TO PEAK (hrs)=		10.00	10.00 10.00
RUNOFF VOLUME (mm)=		210.00	192.94 201.47
TOTAL RAINFALL (mm)=		212.00	212.00 212.00
RUNOFF COEFFICIENT =		0.99	0.91 0.95

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

```
       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR (0005) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0270      0.2226
                          0.0080     0.0626   |   0.4030      0.3142
                          0.0090     0.0966   |   0.4040      0.3143
                          0.0110     0.1592   |   0.4050      0.3145
                          0.0130     0.1900   |   0.4600      0.3234
                          0.0190     0.2083   |   0.0000      0.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0001)      3.460      0.505     10.00     201.47
     OUTFLOW: ID= 1 (0005)      3.460      0.403     10.25     200.89

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 79.82
                   TIME SHIFT OF PEAK FLOW         (min)= 15.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.3143

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--------------------
| CALIB            |
| STANDHYD  (0004) |   Area    (ha)=   3.97
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.57         0.40
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     162.69        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      53.00       261.63
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       4.41 (ii)   10.32 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.23         0.09
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.29         0.29          0.579 (iii)
     TIME TO PEAK    (hrs)=      10.00        10.00          10.00
     RUNOFF VOLUME    (mm)=     210.00       192.94         201.47
     TOTAL RAINFALL   (mm)=     212.00       212.00         212.00
     RUNOFF COEFFICIENT   =       0.99         0.91           0.95

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR (0003) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0170      0.2174
                          0.0070     0.0718   |   0.0240      0.2372
                          0.0080     0.1149   |   0.0300      0.2532
                          0.0090     0.1150   |   0.0310      0.2553
                          0.0100     0.1576   |   0.3980      0.4170
                          0.0110     0.1871   |   0.4230      0.4244

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0004)      3.970      0.579     10.00     201.47
     OUTFLOW: ID= 1 (0003)      3.970      0.397     11.00     200.81

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 68.63
                   TIME SHIFT OF PEAK FLOW         (min)= 60.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.4170

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| ADD HYD   (0006) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0003):     3.97   0.397    11.00   200.81
        + ID2= 2 (0005):     3.46   0.403    10.25   200.89
          ================================================
          ID = 3 (0006):     7.43   0.782    10.42   200.85

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0007) |   Area    (ha)=   3.46
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.11         0.35
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     151.88        40.00
     Mannings n             =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      53.00       261.63
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       4.23 (ii)   10.15 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.24         0.10
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.25         0.25         0.505 (iii)
     TIME TO PEAK    (hrs)=      10.00        10.00         10.00
     RUNOFF VOLUME    (mm)=     210.00       192.94        201.47
     TOTAL RAINFALL   (mm)=     212.00       212.00        212.00
     RUNOFF COEFFICIENT   =       0.99         0.91          0.95

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0010) |   Area    (ha)=   3.97
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.57         0.40
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     162.69        40.00
     Mannings n             =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      53.00       261.63
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       4.41 (ii)   10.32 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.23         0.09
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.29         0.29         0.579 (iii)
     TIME TO PEAK    (hrs)=      10.00        10.00         10.00
     RUNOFF VOLUME    (mm)=     210.00       192.94        201.47
     TOTAL RAINFALL   (mm)=     212.00       212.00        212.00
     RUNOFF COEFFICIENT   =       0.99         0.91          0.95

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| ADD HYD   (0008) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
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          ID1= 1 (0010):     3.97   0.579    10.00   201.47
        + ID2= 2 (0007):     3.46   0.505    10.00   201.47
          ================================================
          ID = 3 (0008):     7.43   1.084    10.00   201.47

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ***************************
  ** SIMULATION NUMBER:   8 **
  ***************************


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|    READ STORM    |    Filename: C:\Users\p004967b\AppD
|                  |              ata\Local\Temp\
|                  |              c9b46bab-423d-4536-80c9-0ccbb89c7139\edd07e46
| Ptotal= 25.00 mm |    Comments: 25 mm, 4 hr. chicago dist'n. - water qua
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.17    2.40 |  1.17   33.60 |  2.17    3.45 |  3.17    1.65
                0.33    1.95 |  1.33   38.10 |  2.33    3.00 |  3.33    1.80
                0.50    2.40 |  1.50   13.80 |  2.50    2.70 |  3.50    1.50
                0.67    2.85 |  1.67    7.35 |  2.67    2.25 |  3.67    1.50
                0.83    4.65 |  1.83    5.55 |  2.83    2.25 |  3.83    0.75
                1.00    9.60 |  2.00    4.35 |  3.00    1.95 |  4.00    0.60

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| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   7.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.49         5.94
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     222.56        40.00
     Mannings n             =     0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                              ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    2.40 | 1.083   33.60 | 2.083    3.45 |  3.08    1.65
               0.167    2.40 | 1.167   33.60 | 2.167    3.45 |  3.17    1.65
               0.250    1.95 | 1.250   38.10 | 2.250    3.00 |  3.25    1.80
               0.333    1.95 | 1.333   38.10 | 2.333    3.00 |  3.33    1.80
               0.417    2.40 | 1.417   13.80 | 2.417    2.70 |  3.42    1.50
               0.500    2.40 | 1.500   13.80 | 2.500    2.70 |  3.50    1.50
               0.583    2.85 | 1.583    7.35 | 2.583    2.25 |  3.58    1.50
               0.667    2.85 | 1.667    7.35 | 2.667    2.25 |  3.67    1.50
               0.750    4.65 | 1.750    5.55 | 2.750    2.25 |  3.75    0.75
               0.833    4.65 | 1.833    5.55 | 2.833    2.25 |  3.83    0.75
               0.917    9.60 | 1.917    4.35 | 2.917    1.95 |  3.92    0.60
               1.000    9.60 | 2.000    4.35 | 3.000    1.95 |  4.00    0.60

     Max.Eff.Inten.(mm/hr)=      38.10         3.11
                 over (min)        5.00        45.00
     Storage Coeff.  (min)=       6.07 (ii)   40.91 (ii)
     Unit Hyd. Tpeak (min)=       5.00        45.00
     Unit Hyd. peak  (cms)=       0.19         0.03
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.15         0.03          0.153 (iii)
     TIME TO PEAK    (hrs)=       1.33         2.08           1.33
     RUNOFF VOLUME    (mm)=      24.00         3.37           7.49
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       0.96         0.13           0.30

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB |
| STANDHYD (0001) | Area (ha)= 3.46
|ID= 1 DT= 5.0 min | Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	3.11	0.35
Dep. Storage (mm)=	2.00	5.00
Average Slope (%)=	1.00	1.00
Length (m)=	151.88	40.00
Mannings n =	0.013	0.250
Max.Eff.Inten.(mm/hr)=	38.10	114.83
over (min)	5.00	15.00
Storage Coeff. (min)=	4.83 (ii)	13.05 (ii)
Unit Hyd. Tpeak (min)=	5.00	15.00
Unit Hyd. peak (cms)=	0.22	0.08

		TOTALS
PEAK FLOW (cms)=	0.18	0.07	0.233 (iii)
TIME TO PEAK (hrs)=	1.33	1.50	1.33
RUNOFF VOLUME (mm)=	23.00	13.16	18.08
TOTAL RAINFALL (mm)=	25.00	25.00	25.00
RUNOFF COEFFICIENT =	0.92	0.53	0.72

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| RESERVOIR (0005) |
| IN= 2---> OUT= 1 |
| DT= 5.0 min |

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0270	0.2226
0.0080	0.0626	0.4030	0.3142
0.0090	0.0966	0.4040	0.3143
0.0110	0.1592	0.4050	0.3145
0.0130	0.1900	0.4600	0.3234
0.0190	0.2083	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0001)	3.460	0.233	1.33	18.08
OUTFLOW: ID= 1 (0005)	3.460	0.007	4.00	17.51

PEAK FLOW REDUCTION [Qout/Qin](%)= 3.07
TIME SHIFT OF PEAK FLOW (min)=160.00
MAXIMUM STORAGE USED (ha.m.)= 0.0559

| CALIB |
| STANDHYD (0004) | Area (ha)= 3.97
|ID= 1 DT= 5.0 min | Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	3.57	0.40
Dep. Storage (mm)=	2.00	5.00
Average Slope (%)=	1.00	1.00
Length (m)=	162.69	40.00
Mannings n =	0.013	0.250
Max.Eff.Inten.(mm/hr)=	38.10	114.83
over (min)	5.00	15.00
Storage Coeff. (min)=	5.03 (ii)	13.25 (ii)
Unit Hyd. Tpeak (min)=	5.00	15.00
Unit Hyd. peak (cms)=	0.21	0.08

		TOTALS
PEAK FLOW (cms)=	0.20	0.08	0.266 (iii)
TIME TO PEAK (hrs)=	1.33	1.50	1.33
RUNOFF VOLUME (mm)=	23.00	13.16	18.08
TOTAL RAINFALL (mm)=	25.00	25.00	25.00
RUNOFF COEFFICIENT =	0.92	0.53	0.72

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR (0003) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0170      0.2174
                          0.0070     0.0718   |   0.0240      0.2372
                          0.0080     0.1149   |   0.0300      0.2532
                          0.0090     0.1150   |   0.0310      0.2553
                          0.0100     0.1576   |   0.3980      0.4170
                          0.0110     0.1871   |   0.4230      0.4244

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0004)      3.970      0.266      1.33      18.08
     OUTFLOW: ID= 1 (0003)      3.970      0.006      4.08      17.42

                PEAK   FLOW   REDUCTION [Qout/Qin](%)=  2.41
                TIME SHIFT OF PEAK FLOW        (min)=165.00
                MAXIMUM  STORAGE   USED       (ha.m.)=  0.0658

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| ADD HYD   (0006) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0003):     3.97   0.006     4.08    17.42
        + ID2= 2 (0005):     3.46   0.007     4.00    17.51
          ================================================
          ID = 3 (0006):     7.43   0.014     4.00    17.46

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0007) |   Area    (ha)=   3.46
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.11         0.35
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     151.88        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10       114.83
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       4.83 (ii)   13.05 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.22         0.08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.18         0.07          0.233 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50           1.33
     RUNOFF VOLUME    (mm)=      23.00        13.16          18.08
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       0.92         0.53           0.72

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| CALIB            |
| STANDHYD  (0010) |   Area    (ha)=   3.97
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.57         0.40
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     162.69        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10       114.83
               over (min)         5.00        15.00
```

```
     Storage Coeff.  (min)=       5.03 (ii)   13.25 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.21         0.08
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.20         0.08          0.266 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50           1.33
     RUNOFF VOLUME    (mm)=      23.00        13.16          18.08
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       0.92         0.53           0.72


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0008) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0010):     3.97   0.266     1.33    18.08
        + ID2= 2 (0007):     3.46   0.233     1.33    18.08
          ================================================
          ID = 3 (0008):     7.43   0.499     1.33    18.08

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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 FINISH
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==========================================================================================================

       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat
  Output  filename: C:\Users\p004967b\AppData\Local\Temp\2ecf7440-b8cc-4123-a886-9eded77cfc64\Scenario.out
  Summary filename: C:\Users\p004967b\AppData\Local\Temp\2ecf7440-b8cc-4123-a886-9eded77cfc64\Scenario.sum


DATE: 10/06/2016                          TIME: 05:52:57

USER:


COMMENTS: _____________________________________________________________


----------------------------------------------------------------------------------------------------------
  ***************************
  ** SIMULATION NUMBER:   1 **
  ***************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 424.160
| Ptotal= 32.11 mm |                          B=   1.500
--------------------                          C=   0.723
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  4.00 hrs
                       Storm time step    =  5.00 min
                       Time to peak ratio =  0.33

                     The CORRELATION coefficient is = 0.9996

                      TIME       INPUT INT.           TAB. INT.
                     (min)        (mm/hr)              (mm/hr)
                        5.         118.10               109.60
                       10.          72.80                72.55
                       15.          54.80                55.88
                       30.          33.80                35.01
                       60.          20.80                21.59
                      120.          12.80                13.19
                      360.           5.90                 6.00
                      720.           3.70                 3.64
                     1440.           2.30                 2.21


                  TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                   hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                  0.08    2.39 |  1.08    8.35 |  2.08    5.74 |  3.08    3.07
                  0.17    2.51 |  1.17   11.90 |  2.17    5.31 |  3.17    2.96
                  0.25    2.66 |  1.25   24.99 |  2.25    4.94 |  3.25    2.87
                  0.33    2.82 |  1.33  109.60 |  2.33    4.63 |  3.33    2.78
                  0.42    3.01 |  1.42   31.83 |  2.42    4.37 |  3.42    2.70
                  0.50    3.24 |  1.50   18.18 |  2.50    4.13 |  3.50    2.62
                  0.58    3.50 |  1.58   13.23 |  2.58    3.93 |  3.58    2.55
                  0.67    3.83 |  1.67   10.60 |  2.67    3.75 |  3.67    2.48
                  0.75    4.25 |  1.75    8.94 |  2.75    3.58 |  3.75    2.42
                  0.83    4.78 |  1.83    7.78 |  2.83    3.43 |  3.83    2.36
                  0.92    5.52 |  1.92    6.93 |  2.92    3.30 |  3.92    2.31
                  1.00    6.59 |  2.00    6.27 |  3.00    3.18 |  4.00    2.25


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   3.46
```

```
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.11         0.35
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     151.88        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     109.60       215.67
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       3.16 (ii)    7.56 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.27         0.13
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.44         0.15          0.523 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42           1.33
     RUNOFF VOLUME    (mm)=      30.11        19.03          24.57
     TOTAL RAINFALL   (mm)=      32.11        32.11          32.11
     RUNOFF COEFFICIENT   =       0.94         0.59           0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0005) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0270      0.2226
                         0.0080     0.0626   |   0.4030      0.3142
                         0.0090     0.0966   |   0.4040      0.3143
                         0.0110     0.1592   |   0.4050      0.3145
                         0.0130     0.1900   |   0.4600      0.3234
                         0.0190     0.2083   |   0.0000      0.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0001)      3.460      0.523      1.33      24.57
     OUTFLOW: ID= 1 (0005)      3.460      0.008      4.08      24.00

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  1.61
                   TIME SHIFT OF PEAK FLOW         (min)=165.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.0769

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0004) |   Area    (ha)=   3.97
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.57         0.40
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     162.69        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     109.60       215.67
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       3.30 (ii)    7.70 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.27         0.13
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.50         0.17          0.592 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42           1.33
     RUNOFF VOLUME    (mm)=      30.11        19.03          24.57
     TOTAL RAINFALL   (mm)=      32.11        32.11          32.11
     RUNOFF COEFFICIENT   =       0.94         0.59           0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0003) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0170      0.2174
                          0.0070     0.0718   |   0.0240      0.2372
                          0.0080     0.1149   |   0.0300      0.2532
                          0.0090     0.1150   |   0.0310      0.2553
                          0.0100     0.1576   |   0.3980      0.4170
                          0.0110     0.1871   |   0.4230      0.4244

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0004)      3.970      0.592      1.33      24.57
     OUTFLOW: ID= 1 (0003)      3.970      0.007      4.17      23.92

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  1.25
                   TIME SHIFT OF PEAK FLOW         (min)=170.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.0904

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0003):     3.97   0.007     4.17    23.92
        + ID2= 2 (0005):     3.46   0.008     4.08    24.00
          ================================================
          ID = 3 (0006):     7.43   0.016     4.08    23.95

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0007) |   Area    (ha)=   3.46
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=         3.11          0.35
     Dep. Storage     (mm)=         2.00          5.00
     Average Slope     (%)=         1.00          1.00
     Length            (m)=       151.88         40.00
     Mannings n           =        0.013         0.250

     Max.Eff.Inten.(mm/hr)=       109.60        215.67
               over (min)           5.00         10.00
     Storage Coeff.  (min)=         3.16 (ii)     7.56 (ii)
     Unit Hyd. Tpeak (min)=         5.00         10.00
     Unit Hyd. peak  (cms)=         0.27          0.13
                                                          *TOTALS*
     PEAK FLOW       (cms)=         0.44          0.15          0.523 (iii)
     TIME TO PEAK    (hrs)=         1.33          1.42           1.33
     RUNOFF VOLUME    (mm)=        30.11         19.03          24.57
     TOTAL RAINFALL   (mm)=        32.11         32.11          32.11
     RUNOFF COEFFICIENT   =         0.94          0.59           0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0010) |   Area    (ha)=   3.97
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=         3.57          0.40
     Dep. Storage     (mm)=         2.00          5.00
     Average Slope     (%)=         1.00          1.00
     Length            (m)=       162.69         40.00
     Mannings n           =        0.013         0.250

     Max.Eff.Inten.(mm/hr)=       109.60        215.67
               over (min)           5.00         10.00
     Storage Coeff.  (min)=         3.30 (ii)     7.70 (ii)
```

```
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.27         0.13
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.50         0.17          0.592 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42           1.33
     RUNOFF VOLUME    (mm)=      30.11        19.03          24.57
     TOTAL RAINFALL   (mm)=      32.11        32.11          32.11
     RUNOFF COEFFICIENT   =       0.94         0.59           0.77

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0008) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0010):     3.97   0.592     1.33    24.57
        + ID2= 2 (0007):     3.46   0.523     1.33    24.57
          ================================================
          ID = 3 (0008):     7.43   1.115     1.33    24.57

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   7.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.49         5.94
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     222.56        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=     109.60         5.75
               over (min)          5.00        35.00
     Storage Coeff.  (min)=       3.98 (ii)   31.22 (ii)
     Unit Hyd. Tpeak (min)=       5.00        35.00
     Unit Hyd. peak  (cms)=       0.24         0.03
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.35         0.05          0.352 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.92           1.33
     RUNOFF VOLUME    (mm)=      31.11         5.84          10.89
     TOTAL RAINFALL   (mm)=      32.11        32.11          32.11
     RUNOFF COEFFICIENT   =       0.97         0.18           0.34

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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  ***************************
  ** SIMULATION NUMBER:   2 **
  ***************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 578.969
| Ptotal= 42.88 mm |                          B=   1.508
--------------------                          C=   0.727
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  =  4.00 hrs
                        Storm time step    =  5.00 min
                        Time to peak ratio =  0.33

                    The CORRELATION coefficient is = 0.9997

                     TIME       INPUT INT.           TAB. INT.
                    (min)        (mm/hr)              (mm/hr)
```

5.	159.00	148.35
10.	98.00	98.02
15.	73.80	75.40
30.	45.50	47.13
60.	28.00	28.98
120.	17.20	17.67
360.	8.00	8.00
720.	4.90	4.84
1440.	3.00	2.93

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.08	3.15	1.08	11.09	2.08	7.60	3.08	4.04
0.17	3.31	1.17	15.85	2.17	7.02	3.17	3.91
0.25	3.50	1.25	33.48	2.25	6.54	3.25	3.78
0.33	3.72	1.33	148.35	2.33	6.13	3.33	3.66
0.42	3.97	1.42	42.72	2.42	5.77	3.42	3.56
0.50	4.27	1.50	24.29	2.50	5.46	3.50	3.46
0.58	4.63	1.58	17.63	2.58	5.19	3.58	3.36
0.67	5.06	1.67	14.10	2.67	4.95	3.67	3.27
0.75	5.61	1.75	11.87	2.75	4.73	3.75	3.19
0.83	6.33	1.83	10.33	2.83	4.53	3.83	3.11
0.92	7.30	1.92	9.19	2.92	4.36	3.92	3.04
1.00	8.74	2.00	8.31	3.00	4.19	4.00	2.97

CALIB STANDHYD (0001) ID= 1 DT= 5.0 min	Area (ha)= 3.46 Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	3.11	0.35	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	151.88	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		148.35	332.56	
over (min)		5.00	10.00	
Storage Coeff. (min)=		2.80 (ii)	6.70 (ii)	
Unit Hyd. Tpeak (min)=		5.00	10.00	
Unit Hyd. peak (cms)=		0.28	0.14	
				TOTALS
PEAK FLOW	(cms)=	0.62	0.25	0.757 (iii)
TIME TO PEAK	(hrs)=	1.33	1.42	1.33
RUNOFF VOLUME	(mm)=	40.88	28.46	34.67
TOTAL RAINFALL	(mm)=	42.88	42.88	42.88
RUNOFF COEFFICIENT	=	0.95	0.66	0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR (0005) IN= 2---> OUT= 1 DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0270	0.2226
	0.0080	0.0626	0.4030	0.3142
	0.0090	0.0966	0.4040	0.3143
	0.0110	0.1592	0.4050	0.3145
	0.0130	0.1900	0.4600	0.3234
	0.0190	0.2083	0.0000	0.0000

		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2	(0001)	3.460	0.757	1.33	34.67
OUTFLOW: ID= 1	(0005)	3.460	0.009	4.08	34.10

PEAK FLOW REDUCTION [Qout/Qin](%)= 1.25
TIME SHIFT OF PEAK FLOW (min)=165.00
MAXIMUM STORAGE USED (ha.m.)= 0.1106

CALIB	
STANDHYD (0004)	Area (ha)= 3.97
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	3.57	0.40	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	162.69	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		148.35	332.56	
over (min)		5.00	10.00	
Storage Coeff. (min)=		2.92 (ii)	6.82 (ii)	
Unit Hyd. Tpeak (min)=		5.00	10.00	
Unit Hyd. peak (cms)=		0.28	0.14	
				TOTALS
PEAK FLOW	(cms)=	0.70	0.29	0.859 (iii)
TIME TO PEAK	(hrs)=	1.42	1.42	1.33
RUNOFF VOLUME	(mm)=	40.88	28.46	34.67
TOTAL RAINFALL	(mm)=	42.88	42.88	42.88
RUNOFF COEFFICIENT	=	0.95	0.66	0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR (0003)				
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0170	0.2174
	0.0070	0.0718	0.0240	0.2372
	0.0080	0.1149	0.0300	0.2532
	0.0090	0.1150	0.0310	0.2553
	0.0100	0.1576	0.3980	0.4170
	0.0110	0.1871	0.4230	0.4244

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0004)	3.970	0.859	1.33	34.67
OUTFLOW: ID= 1 (0003)	3.970	0.009	4.17	34.01

PEAK FLOW REDUCTION [Qout/Qin](%)= 1.09
TIME SHIFT OF PEAK FLOW (min)=170.00
MAXIMUM STORAGE USED (ha.m.)= 0.1289

ADD HYD (0006)					
1 + 2 = 3		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
	ID1= 1 (0003):	3.97	0.009	4.17	34.01
	+ ID2= 2 (0005):	3.46	0.009	4.08	34.10
	ID = 3 (0006):	7.43	0.019	4.17	34.05

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB	
STANDHYD (0007)	Area (ha)= 3.46
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	3.11	0.35
Dep. Storage	(mm)=	2.00	5.00
Average Slope	(%)=	1.00	1.00
Length	(m)=	151.88	40.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		148.35	332.56
over (min)		5.00	10.00
Storage Coeff. (min)=		2.80 (ii)	6.70 (ii)
Unit Hyd. Tpeak (min)=		5.00	10.00
Unit Hyd. peak (cms)=		0.28	0.14

```
                                                                  *TOTALS*
     PEAK FLOW       (cms)=       0.62         0.25          0.757 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42           1.33
     RUNOFF VOLUME    (mm)=      40.88        28.46          34.67
     TOTAL RAINFALL   (mm)=      42.88        42.88          42.88
     RUNOFF COEFFICIENT   =       0.95         0.66           0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0010) |   Area    (ha)=   3.97
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.57         0.40
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     162.69        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     148.35       332.56
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.92 (ii)    6.82 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.28         0.14
                                                                  *TOTALS*
     PEAK FLOW       (cms)=       0.70         0.29          0.859 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42           1.33
     RUNOFF VOLUME    (mm)=      40.88        28.46          34.67
     TOTAL RAINFALL   (mm)=      42.88        42.88          42.88
     RUNOFF COEFFICIENT   =       0.95         0.66           0.81

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0008) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0010):     3.97   0.859     1.33    34.67
       + ID2= 2 (0007):     3.46   0.757     1.33    34.67
         ================================================
         ID = 3 (0008):     7.43   1.617     1.33    34.67

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   7.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.49         5.94
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     222.56        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     148.35        13.79
               over (min)        5.00        25.00
     Storage Coeff.  (min)=       3.53 (ii)   22.72 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=       0.26         0.05
                                                                  *TOTALS*
     PEAK FLOW       (cms)=       0.49         0.12          0.509 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.75           1.33
     RUNOFF VOLUME    (mm)=      41.88        10.50          16.78
     TOTAL RAINFALL   (mm)=      42.88        42.88          42.88
```

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     RUNOFF COEFFICIENT   =       0.98         0.24           0.39

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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  ***************************
  ** SIMULATION NUMBER:   3 **
  ***************************


--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 665.492
| Ptotal= 50.39 mm |                          B=   1.500
--------------------                          C=   0.723
                         used in:   INTENSITY =  A / (t + B)^C

                         Duration of storm  =  4.00 hrs
                         Storm time step    =  5.00 min
                         Time to peak ratio =  0.33

                      The CORRELATION coefficient is = 0.9996

                       TIME       INPUT INT.           TAB. INT.
                      (min)        (mm/hr)              (mm/hr)
                         5.         185.30               171.95
                        10.         114.20               113.83
                        15.          86.10                87.68
                        30.          53.00                54.94
                        60.          32.70                33.87
                       120.          20.20                20.70
                       360.           9.40                 9.41
                       720.           5.80                 5.71
                      1440.           3.60                 3.46


                  TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                   hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                  0.08    3.75 |  1.08   13.10 |  2.08    9.01 |  3.08    4.81
                  0.17    3.94 |  1.17   18.68 |  2.17    8.32 |  3.17    4.65
                  0.25    4.17 |  1.25   39.21 |  2.25    7.75 |  3.25    4.50
                  0.33    4.43 |  1.33  171.95 |  2.33    7.27 |  3.33    4.36
                  0.42    4.73 |  1.42   49.94 |  2.42    6.85 |  3.42    4.23
                  0.50    5.08 |  1.50   28.53 |  2.50    6.49 |  3.50    4.11
                  0.58    5.50 |  1.58   20.76 |  2.58    6.16 |  3.58    4.00
                  0.67    6.01 |  1.67   16.63 |  2.67    5.88 |  3.67    3.90
                  0.75    6.66 |  1.75   14.02 |  2.75    5.62 |  3.75    3.80
                  0.83    7.50 |  1.83   12.21 |  2.83    5.39 |  3.83    3.70
                  0.92    8.66 |  1.92   10.87 |  2.92    5.18 |  3.92    3.62
                  1.00   10.34 |  2.00    9.83 |  3.00    4.99 |  4.00    3.53


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--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   3.46
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.11          0.35
     Dep. Storage     (mm)=       2.00          5.00
     Average Slope     (%)=       1.00          1.00
     Length            (m)=     151.88         40.00
     Mannings n             =     0.013         0.250

     Max.Eff.Inten.(mm/hr)=     171.95        410.36
                 over (min)        5.00         10.00
     Storage Coeff.  (min)=       2.64 (ii)     6.32 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.29          0.15
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.73          0.32          0.909 (iii)
     TIME TO PEAK    (hrs)=       1.33          1.42           1.33
     RUNOFF VOLUME    (mm)=      48.39         35.28          41.83
     TOTAL RAINFALL   (mm)=      50.39         50.39          50.39
     RUNOFF COEFFICIENT   =       0.96          0.70           0.83

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
```

```
       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0005) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0270      0.2226
                         0.0080     0.0626   |   0.4030      0.3142
                         0.0090     0.0966   |   0.4040      0.3143
                         0.0110     0.1592   |   0.4050      0.3145
                         0.0130     0.1900   |   0.4600      0.3234
                         0.0190     0.2083   |   0.0000      0.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0001)      3.460      0.909      1.33      41.83
     OUTFLOW: ID= 1 (0005)      3.460      0.010      4.17      41.26

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  1.12
                   TIME SHIFT OF PEAK FLOW         (min)=170.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.1346

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0004) |   Area    (ha)=   3.97
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.57         0.40
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     162.69        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     171.95       410.36
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       2.75 (ii)    6.43 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.28         0.14
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.83         0.37        1.032 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42         1.33
     RUNOFF VOLUME    (mm)=      48.39        35.28        41.83
     TOTAL RAINFALL   (mm)=      50.39        50.39        50.39
     RUNOFF COEFFICIENT   =       0.96         0.70         0.83

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0003) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0170      0.2174
                         0.0070     0.0718   |   0.0240      0.2372
                         0.0080     0.1149   |   0.0300      0.2532
                         0.0090     0.1150   |   0.0310      0.2553
                         0.0100     0.1576   |   0.3980      0.4170
                         0.0110     0.1871   |   0.4230      0.4244

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0004)      3.970      1.032      1.33      41.83
     OUTFLOW: ID= 1 (0003)      3.970      0.010      4.17      41.17

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  0.97
                   TIME SHIFT OF PEAK FLOW         (min)=170.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.1563
```

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--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0003):     3.97   0.010     4.17    41.17
       + ID2= 2 (0005):     3.46   0.010     4.17    41.26
         ================================================
         ID = 3 (0006):     7.43   0.020     4.17    41.21

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0007) |   Area    (ha)=   3.46
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.11         0.35
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     151.88        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     171.95       410.36
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       2.64 (ii)    6.32 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.29         0.15
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.73         0.32          0.909 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42           1.33
     RUNOFF VOLUME    (mm)=      48.39        35.28          41.83
     TOTAL RAINFALL   (mm)=      50.39        50.39          50.39
     RUNOFF COEFFICIENT   =       0.96         0.70           0.83

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0010) |   Area    (ha)=   3.97
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.57         0.40
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     162.69        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     171.95       410.36
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       2.75 (ii)    6.43 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.28         0.14
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.83         0.37          1.032 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42           1.33
     RUNOFF VOLUME    (mm)=      48.39        35.28          41.83
     TOTAL RAINFALL   (mm)=      50.39        50.39          50.39
     RUNOFF COEFFICIENT   =       0.96         0.70           0.83

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0008) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
```

```
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0010):     3.97   1.032     1.33    41.83
        + ID2= 2 (0007):     3.46   0.909     1.33    41.83
          ================================================
          ID = 3 (0008):     7.43   1.941     1.33    41.83

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   7.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.49         5.94
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     222.56        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     171.95        18.93
               over (min)          5.00        25.00
     Storage Coeff.  (min)=       3.32 (ii)   20.23 (ii)
     Unit Hyd. Tpeak (min)=       5.00        25.00
     Unit Hyd. peak  (cms)=       0.26         0.05
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.58         0.17          0.610 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.75           1.33
     RUNOFF VOLUME    (mm)=      49.39        14.29          21.31
     TOTAL RAINFALL   (mm)=      50.39        50.39          50.39
     RUNOFF COEFFICIENT   =       0.98         0.28           0.42

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
  ***************************
  ** SIMULATION NUMBER:   4 **
  ***************************


--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 792.607
| Ptotal= 59.36 mm |                          B=   1.500
--------------------                          C=   0.725
                         used in:   INTENSITY =  A / (t + B)^C

                         Duration of storm  =  4.00 hrs
                         Storm time step    =  5.00 min
                         Time to peak ratio =  0.33

                    The CORRELATION coefficient is = 0.9997

                     TIME       INPUT INT.           TAB. INT.
                    (min)        (mm/hr)              (mm/hr)
                       5.         219.20               204.03
                      10.         135.10               134.91
                      15.         101.70               103.84
                      30.          62.70                64.98
                      60.          38.60                40.01
                     120.          23.80                24.42
                     360.          11.00                11.08
                     720.           6.80                 6.71
                    1440.           4.20                 4.06


                  TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                   hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                  0.08    4.38 |  1.08   15.39 |'  2.08   10.56 |  3.08    5.63
                  0.17    4.62 |  1.17   21.96 |'  2.17    9.76 |  3.17    5.44
                  0.25    4.88 |  1.25   46.25 |'  2.25    9.09 |  3.25    5.27
                  0.33    5.18 |  1.33  204.03 |'  2.33    8.52 |  3.33    5.11
                  0.42    5.53 |  1.42   58.96 |'  2.42    8.03 |  3.42    4.95
                  0.50    5.94 |  1.50   33.61 |'  2.50    7.60 |  3.50    4.81
                  0.58    6.44 |  1.58   24.43 |'  2.58    7.22 |  3.58    4.68
                  0.67    7.05 |  1.67   19.55 |'  2.67    6.88 |  3.67    4.56
                  0.75    7.81 |  1.75   16.47 |'  2.75    6.58 |  3.75    4.44
```

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              0.83    8.80 |  1.83   14.34 |  2.83    6.31 |  3.83    4.33
              0.92   10.15 |  1.92   12.76 |  2.92    6.06 |  3.92    4.23
              1.00   12.14 |  2.00   11.54 |  3.00    5.84 |  4.00    4.13


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   3.46
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.11         0.35
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     151.88        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     204.03       513.32
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.47 (ii)    5.90 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.29         0.15
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.88         0.42          1.115 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42           1.33
     RUNOFF VOLUME    (mm)=      57.36        43.60          50.48
     TOTAL RAINFALL   (mm)=      59.36        59.36          59.36
     RUNOFF COEFFICIENT   =       0.97         0.73           0.85

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0005) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0270      0.2226
                          0.0080     0.0626   |   0.4030      0.3142
                          0.0090     0.0966   |   0.4040      0.3143
                          0.0110     0.1592   |   0.4050      0.3145
                          0.0130     0.1900   |   0.4600      0.3234
                          0.0190     0.2083   |   0.0000      0.0000

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0001)      3.460     1.115      1.33      50.48
     OUTFLOW: ID= 1 (0005)      3.460     0.011      4.17      49.90

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=  1.01
                    TIME SHIFT OF PEAK FLOW         (min)=170.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.1636

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0004) |   Area    (ha)=   3.97
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.57         0.40
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     162.69        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     204.03       513.32
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.57 (ii)    6.00 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.29         0.15
                                                        *TOTALS*
     PEAK FLOW       (cms)=       1.00         0.47          1.267 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42           1.33
     RUNOFF VOLUME    (mm)=      57.36        43.60          50.48
     TOTAL RAINFALL   (mm)=      59.36        59.36          59.36
     RUNOFF COEFFICIENT   =       0.97         0.73           0.85
```

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR (0003)
IN= 2---> OUT= 1
DT= 5.0 min

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0170	0.2174
0.0070	0.0718	0.0240	0.2372
0.0080	0.1149	0.0300	0.2532
0.0090	0.1150	0.0310	0.2553
0.0100	0.1576	0.3980	0.4170
0.0110	0.1871	0.4230	0.4244

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0004)	3.970	1.267	1.33	50.48
OUTFLOW: ID= 1 (0003)	3.970	0.011	4.17	49.82

PEAK FLOW REDUCTION [Qout/Qin](%)= 0.91
TIME SHIFT OF PEAK FLOW (min)=170.00
MAXIMUM STORAGE USED (ha.m.)= 0.1896

ADD HYD (0006)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0003):	3.97	0.011	4.17	49.82
+ ID2= 2 (0005):	3.46	0.011	4.17	49.90
ID = 3 (0006):	7.43	0.023	4.17	49.86

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB
STANDHYD (0007)
ID= 1 DT= 5.0 min

Area (ha)= 3.46
Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	3.11	0.35	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	151.88	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		204.03	513.32	
over (min)		5.00	10.00	
Storage Coeff. (min)=		2.47 (ii)	5.90 (ii)	
Unit Hyd. Tpeak (min)=		5.00	10.00	
Unit Hyd. peak (cms)=		0.29	0.15	
				TOTALS
PEAK FLOW	(cms)=	0.88	0.42	1.115 (iii)
TIME TO PEAK	(hrs)=	1.33	1.42	1.33
RUNOFF VOLUME	(mm)=	57.36	43.60	50.48
TOTAL RAINFALL	(mm)=	59.36	59.36	59.36
RUNOFF COEFFICIENT	=	0.97	0.73	0.85

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0010)
ID= 1 DT= 5.0 min

Area (ha)= 3.97
Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)

```
     Surface Area     (ha)=       3.57         0.40
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     162.69        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     204.03       513.32
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.57 (ii)    6.00 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.29         0.15
                                                        *TOTALS*
     PEAK FLOW       (cms)=       1.00         0.47         1.267 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      57.36        43.60         50.48
     TOTAL RAINFALL   (mm)=      59.36        59.36         59.36
     RUNOFF COEFFICIENT   =       0.97         0.73          0.85

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0008) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0010):     3.97   1.267     1.33    50.48
        + ID2= 2 (0007):     3.46   1.115     1.33    50.48
          ================================================
          ID = 3 (0008):     7.43   2.383     1.33    50.48

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   7.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.49         5.94
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     222.56        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     204.03        31.17
               over (min)        5.00        20.00
     Storage Coeff.  (min)=       3.10 (ii)   16.95 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.27         0.06
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.71         0.27         0.766 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.58          1.33
     RUNOFF VOLUME    (mm)=      58.36        19.29         27.11
     TOTAL RAINFALL   (mm)=      59.36        59.36         59.36
     RUNOFF COEFFICIENT   =       0.98         0.33          0.46

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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  ***************************
  ** SIMULATION NUMBER:   5 **
  ***************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 878.493
| Ptotal= 66.15 mm |                          B=   1.500
--------------------                          C=   0.724
                       used in:   INTENSITY =  A / (t + B)^C
```

Duration of storm = 4.00 hrs
Storm time step = 5.00 min
Time to peak ratio = 0.33

The CORRELATION coefficient is = 0.9997

TIME (min)	INPUT INT. (mm/hr)	TAB. INT. (mm/hr)
5.	243.60	226.56
10.	150.20	149.90
15.	113.20	115.42
30.	69.80	72.27
60.	43.00	44.52
120.	26.50	27.20
360.	12.30	12.35
720.	7.60	7.49
1440.	4.70	4.54

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.08	4.90	1.08	17.18	2.08	11.80	3.08	6.30
0.17	5.16	1.17	24.50	2.17	10.90	3.17	6.09
0.25	5.46	1.25	51.51	2.25	10.16	3.25	5.89
0.33	5.79	1.33	226.56	2.33	9.52	3.33	5.71
0.42	6.18	1.42	65.63	2.42	8.97	3.42	5.54
0.50	6.65	1.50	37.45	2.50	8.49	3.50	5.38
0.58	7.20	1.58	27.24	2.58	8.07	3.58	5.24
0.67	7.87	1.67	21.81	2.67	7.69	3.67	5.10
0.75	8.72	1.75	18.38	2.75	7.36	3.75	4.97
0.83	9.83	1.83	16.01	2.83	7.05	3.83	4.85
0.92	11.34	1.92	14.25	2.92	6.78	3.92	4.73
1.00	13.55	2.00	12.89	3.00	6.53	4.00	4.62

CALIB STANDHYD (0001) | ID= 1 DT= 5.0 min	Area (ha)= 3.46 Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	3.11	0.35	
Dep. Storage	(mm)=	2.00	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	151.88	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)	=	226.56	588.39	
over (min)		5.00	10.00	
Storage Coeff.	(min)=	2.37 (ii)	5.66 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	10.00	
Unit Hyd. peak	(cms)=	0.30	0.15	
				TOTALS
PEAK FLOW	(cms)=	0.99	0.49	1.265 (iii)
TIME TO PEAK	(hrs)=	1.33	1.42	1.33
RUNOFF VOLUME	(mm)=	64.15	49.99	57.07
TOTAL RAINFALL	(mm)=	66.15	66.15	66.15
RUNOFF COEFFICIENT	=	0.97	0.76	0.86

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR (0005) | IN= 2---> OUT= 1 | DT= 5.0 min

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0270	0.2226
0.0080	0.0626	0.4030	0.3142
0.0090	0.0966	0.4040	0.3143
0.0110	0.1592	0.4050	0.3145
0.0130	0.1900	0.4600	0.3234
0.0190	0.2083	0.0000	0.0000

AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)

```
     INFLOW : ID= 2 (0001)      3.460      1.265      1.33      57.07
     OUTFLOW: ID= 1 (0005)      3.460      0.013      4.17      56.50

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  1.00
                   TIME SHIFT OF PEAK FLOW         (min)=170.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.1854

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0004) |   Area    (ha)=   3.97
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.57         0.40
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     162.69        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     226.56       588.39
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       2.47 (ii)    5.76 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.30         0.15
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.12         0.55          1.438 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42           1.33
     RUNOFF VOLUME    (mm)=      64.15        49.99          57.07
     TOTAL RAINFALL   (mm)=      66.15        66.15          66.15
     RUNOFF COEFFICIENT   =       0.97         0.76           0.86

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR (0003) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0170      0.2174
                          0.0070     0.0718   |   0.0240      0.2372
                          0.0080     0.1149   |   0.0300      0.2532
                          0.0090     0.1150   |   0.0310      0.2553
                          0.0100     0.1576   |   0.3980      0.4170
                          0.0110     0.1871   |   0.4230      0.4244

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0004)     3.970      1.438      1.33      57.07
     OUTFLOW: ID= 1 (0003)     3.970      0.016      4.08      56.41

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  1.13
                   TIME SHIFT OF PEAK FLOW         (min)=165.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.2136

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--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0003):     3.97   0.016     4.08    56.41
        + ID2= 2 (0005):     3.46   0.013     4.17    56.50
          ================================================
          ID = 3 (0006):     7.43   0.029     4.08    56.45

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0007) |   Area    (ha)=   3.46
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.11         0.35
     Dep. Storage     (mm)=       2.00         5.00
```

```
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     151.88        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     226.56       588.39
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       2.37 (ii)    5.66 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.30         0.15
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.99         0.49         1.265 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      64.15        49.99         57.07
     TOTAL RAINFALL   (mm)=      66.15        66.15         66.15
     RUNOFF COEFFICIENT   =       0.97         0.76          0.86

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0010) |   Area    (ha)=   3.97
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.57         0.40
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     162.69        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     226.56       588.39
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       2.47 (ii)    5.76 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.30         0.15
                                                        *TOTALS*
     PEAK FLOW       (cms)=       1.12         0.55         1.438 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      64.15        49.99         57.07
     TOTAL RAINFALL   (mm)=      66.15        66.15         66.15
     RUNOFF COEFFICIENT   =       0.97         0.76          0.86

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0008) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0010):     3.97   1.438     1.33    57.07
       + ID2= 2 (0007):     3.46   1.265     1.33    57.07
         ================================================
         ID = 3 (0008):     7.43   2.703     1.33    57.07

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   7.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.49         5.94
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     222.56        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     226.56        38.12
```

```
                over (min)        5.00        20.00
     Storage Coeff.  (min)=       2.98 (ii)   15.76 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.28         0.07
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.80         0.35         0.875 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.58          1.33
     RUNOFF VOLUME    (mm)=      65.15        23.38         31.73
     TOTAL RAINFALL   (mm)=      66.15        66.15         66.15
     RUNOFF COEFFICIENT   =       0.98         0.35          0.48

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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  ***************************
  ** SIMULATION NUMBER:   6 **
  ***************************


--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 966.620
| Ptotal= 73.18 mm |                          B=   1.507
--------------------                          C=   0.723
                         used in:   INTENSITY =  A / (t + B)^C

                         Duration of storm  =  4.00 hrs
                         Storm time step    =  5.00 min
                         Time to peak ratio =  0.33

                    The CORRELATION coefficient is = 0.9996

                     TIME       INPUT INT.           TAB. INT.
                    (min)        (mm/hr)              (mm/hr)
                       5.         268.60               249.56
                      10.         165.50               165.26
                      15.         124.70               127.32
                      30.          76.90                79.78
                      60.          47.40                49.19
                     120.          29.20                30.07
                     360.          13.60                13.67
                     720.           8.40                 8.29
                    1440.           5.20                 5.03


                  TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                   hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                  0.08    5.44 |  1.08   19.04 |  2.08   13.08 |  3.08    6.99
                  0.17    5.73 |  1.17   27.14 |  2.17   12.09 |  3.17    6.75
                  0.25    6.06 |  1.25   56.99 |  2.25   11.27 |  3.25    6.54
                  0.33    6.43 |  1.33  249.56 |  2.33   10.56 |  3.33    6.34
                  0.42    6.86 |  1.42   72.58 |  2.42    9.95 |  3.42    6.15
                  0.50    7.37 |  1.50   41.46 |  2.50    9.42 |  3.50    5.98
                  0.58    7.99 |  1.58   30.17 |  2.58    8.95 |  3.58    5.81
                  0.67    8.74 |  1.67   24.16 |  2.67    8.54 |  3.67    5.66
                  0.75    9.68 |  1.75   20.37 |  2.75    8.16 |  3.75    5.52
                  0.83   10.90 |  1.83   17.74 |  2.83    7.83 |  3.83    5.38
                  0.92   12.57 |  1.92   15.79 |  2.92    7.52 |  3.92    5.25
                  1.00   15.03 |  2.00   14.29 |  3.00    7.24 |  4.00    5.13


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--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   3.46
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=         3.11          0.35
     Dep. Storage     (mm)=         2.00          5.00
     Average Slope     (%)=         1.00          1.00
     Length            (m)=       151.88         40.00
     Mannings n             =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=       249.56        665.94
               over (min)          5.00         10.00
     Storage Coeff.  (min)=         2.28 (ii)     5.44 (ii)
     Unit Hyd. Tpeak (min)=         5.00         10.00
```

```
     Unit Hyd. peak  (cms)=       0.30         0.16
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.09         0.56          1.419 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42           1.33
     RUNOFF VOLUME    (mm)=      71.18        56.67          63.93
     TOTAL RAINFALL   (mm)=      73.18        73.18          73.18
     RUNOFF COEFFICIENT   =       0.97         0.77           0.87

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0005) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0270      0.2226
                         0.0080     0.0626   |   0.4030      0.3142
                         0.0090     0.0966   |   0.4040      0.3143
                         0.0110     0.1592   |   0.4050      0.3145
                         0.0130     0.1900   |   0.4600      0.3234
                         0.0190     0.2083   |   0.0000      0.0000

                                  AREA     QPEAK     TPEAK       R.V.
                                  (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0001)      3.460      1.419      1.33      63.93
     OUTFLOW: ID= 1 (0005)      3.460      0.019      4.08      63.35

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  1.30
                  TIME SHIFT OF PEAK FLOW         (min)=165.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.2069

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0004) |   Area    (ha)=   3.97
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.57         0.40
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     162.69        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     249.56       665.94
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       2.37 (ii)    5.54 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.30         0.16
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.24         0.64          1.615 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42           1.33
     RUNOFF VOLUME    (mm)=      71.18        56.67          63.93
     TOTAL RAINFALL   (mm)=      73.18        73.18          73.18
     RUNOFF COEFFICIENT   =       0.97         0.77           0.87

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0003) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0170      0.2174
                         0.0070     0.0718   |   0.0240      0.2372
                         0.0080     0.1149   |   0.0300      0.2532
                         0.0090     0.1150   |   0.0310      0.2553
                         0.0100     0.1576   |   0.3980      0.4170
                         0.0110     0.1871   |   0.4230      0.4244
```

```
                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0004)      3.970      1.615      1.33      63.93
     OUTFLOW: ID= 1 (0003)      3.970      0.024      4.08      63.27

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  1.48
                   TIME SHIFT OF PEAK FLOW         (min)=165.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.2367

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--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0003):     3.97   0.024     4.08    63.27
        + ID2= 2 (0005):     3.46   0.019     4.08    63.35
          ================================================
          ID = 3 (0006):     7.43   0.042     4.08    63.31

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0007) |   Area    (ha)=   3.46
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.11         0.35
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     151.88        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     249.56       665.94
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       2.28 (ii)    5.44 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.30         0.16
                                                      *TOTALS*
     PEAK FLOW       (cms)=       1.09         0.56       1.419 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42        1.33
     RUNOFF VOLUME    (mm)=      71.18        56.67       63.93
     TOTAL RAINFALL   (mm)=      73.18        73.18       73.18
     RUNOFF COEFFICIENT   =       0.97         0.77        0.87

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0010) |   Area    (ha)=   3.97
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.57         0.40
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     162.69        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     249.56       665.94
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       2.37 (ii)    5.54 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.30         0.16
                                                      *TOTALS*
     PEAK FLOW       (cms)=       1.24         0.64       1.615 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42        1.33
     RUNOFF VOLUME    (mm)=      71.18        56.67       63.93
     TOTAL RAINFALL   (mm)=      73.18        73.18       73.18
     RUNOFF COEFFICIENT   =       0.97         0.77        0.87

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
```

```
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0008) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0010):     3.97   1.615     1.33    63.93
        + ID2= 2 (0007):     3.46   1.419     1.33    63.93
          ================================================
          ID = 3 (0008):     7.43   3.034     1.33    63.93

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   7.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.49         5.94
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     222.56        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     249.56        45.73
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       2.86 (ii)   14.75 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.28         0.08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.89         0.45       1.032 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50        1.33
     RUNOFF VOLUME    (mm)=      72.18        27.85       36.71
     TOTAL RAINFALL   (mm)=      73.18        73.18       73.18
     RUNOFF COEFFICIENT   =       0.99         0.38        0.50

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
             YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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  ****************************
  ** SIMULATION NUMBER:   7 **
  ****************************



--------------------
|    READ STORM    |    Filename: C:\Users\p004967b\AppD
|                  |              ata\Local\Temp\
|                  |              2ecf7440-b8cc-4123-a886-9eded77cfc64\46010a27
| Ptotal=212.00 mm |    Comments: HURRICANE HAZEL - FINAL 12 HOURS
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                1.00    6.00 |  4.00   13.00 |  7.00   23.00 | 10.00   53.00
                2.00    4.00 |  5.00   17.00 |  8.00   13.00 | 11.00   38.00
                3.00    6.00 |  6.00   13.00 |  9.00   13.00 | 12.00   13.00

--------------------------------------------------------------------------------

--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   3.46
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.11         0.35
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     151.88        40.00
     Mannings n           =      0.013        0.250
```

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	6.00	3.083	13.00	6.083	23.00	9.08	53.00
0.167	6.00	3.167	13.00	6.167	23.00	9.17	53.00
0.250	6.00	3.250	13.00	6.250	23.00	9.25	53.00
0.333	6.00	3.333	13.00	6.333	23.00	9.33	53.00
0.417	6.00	3.417	13.00	6.417	23.00	9.42	53.00
0.500	6.00	3.500	13.00	6.500	23.00	9.50	53.00
0.583	6.00	3.583	13.00	6.583	23.00	9.58	53.00
0.667	6.00	3.667	13.00	6.667	23.00	9.67	53.00
0.750	6.00	3.750	13.00	6.750	23.00	9.75	53.00
0.833	6.00	3.833	13.00	6.833	23.00	9.83	53.00
0.917	6.00	3.917	13.00	6.917	23.00	9.92	53.00
1.000	6.00	4.000	13.00	7.000	23.00	10.00	53.00
1.083	4.00	4.083	17.00	7.083	13.00	10.08	38.00
1.167	4.00	4.167	17.00	7.167	13.00	10.17	38.00
1.250	4.00	4.250	17.00	7.250	13.00	10.25	38.00
1.333	4.00	4.333	17.00	7.333	13.00	10.33	38.00
1.417	4.00	4.417	17.00	7.417	13.00	10.42	38.00
1.500	4.00	4.500	17.00	7.500	13.00	10.50	38.00
1.583	4.00	4.583	17.00	7.583	13.00	10.58	38.00
1.667	4.00	4.667	17.00	7.667	13.00	10.67	38.00
1.750	4.00	4.750	17.00	7.750	13.00	10.75	38.00
1.833	4.00	4.833	17.00	7.833	13.00	10.83	38.00
1.917	4.00	4.917	17.00	7.917	13.00	10.92	38.00
2.000	4.00	5.000	17.00	8.000	13.00	11.00	38.00
2.083	6.00	5.083	13.00	8.083	13.00	11.08	13.00
2.167	6.00	5.167	13.00	8.167	13.00	11.17	13.00
2.250	6.00	5.250	13.00	8.250	13.00	11.25	13.00
2.333	6.00	5.333	13.00	8.333	13.00	11.33	13.00
2.417	6.00	5.417	13.00	8.417	13.00	11.42	13.00
2.500	6.00	5.500	13.00	8.500	13.00	11.50	13.00
2.583	6.00	5.583	13.00	8.583	13.00	11.58	13.00
2.667	6.00	5.667	13.00	8.667	13.00	11.67	13.00
2.750	6.00	5.750	13.00	8.750	13.00	11.75	13.00
2.833	6.00	5.833	13.00	8.833	13.00	11.83	13.00
2.917	6.00	5.917	13.00	8.917	13.00	11.92	13.00
3.000	6.00	6.000	13.00	9.000	13.00	12.00	13.00

Max.Eff.Inten.(mm/hr)=	53.00	261.63		
over (min)	5.00	15.00		
Storage Coeff. (min)=	4.23 (ii)	10.15 (ii)		
Unit Hyd. Tpeak (min)=	5.00	15.00		
Unit Hyd. peak (cms)=	0.24	0.10		
			TOTALS	
PEAK FLOW (cms)=	0.25	0.25	0.505 (iii)	
TIME TO PEAK (hrs)=	10.00	10.00	10.00	
RUNOFF VOLUME (mm)=	210.00	192.94	201.47	
TOTAL RAINFALL (mm)=	212.00	212.00	212.00	
RUNOFF COEFFICIENT =	0.99	0.91	0.95	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR (0005)
IN= 2---> OUT= 1
DT= 5.0 min

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0270	0.2226
0.0080	0.0626	0.4030	0.3142
0.0090	0.0966	0.4040	0.3143
0.0110	0.1592	0.4050	0.3145
0.0130	0.1900	0.4600	0.3234
0.0190	0.2083	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0001)	3.460	0.505	10.00	201.47
OUTFLOW: ID= 1 (0005)	3.460	0.403	10.25	200.89

PEAK FLOW REDUCTION [Qout/Qin](%)= 79.82
TIME SHIFT OF PEAK FLOW (min)= 15.00
MAXIMUM STORAGE USED (ha.m.)= 0.3143

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--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0004) |   Area    (ha)=   3.97
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.57         0.40
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     162.69        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      53.00       261.63
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       4.41 (ii)   10.32 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.23         0.09
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.29         0.29         0.579 (iii)
     TIME TO PEAK    (hrs)=      10.00        10.00         10.00
     RUNOFF VOLUME    (mm)=     210.00       192.94        201.47
     TOTAL RAINFALL   (mm)=     212.00       212.00        212.00
     RUNOFF COEFFICIENT   =       0.99         0.91          0.95

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0003) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0170      0.2174
                          0.0070     0.0718   |   0.0240      0.2372
                          0.0080     0.1149   |   0.0300      0.2532
                          0.0090     0.1150   |   0.0310      0.2553
                          0.0100     0.1576   |   0.3980      0.4170
                          0.0110     0.1871   |   0.4230      0.4244

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0004)      3.970      0.579     10.00     201.47
     OUTFLOW: ID= 1 (0003)      3.970      0.397     11.00     200.81

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)= 68.63
                    TIME SHIFT OF PEAK FLOW         (min)= 60.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.4170

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--------------------
| ADD HYD   (0006) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0003):     3.97   0.397    11.00   200.81
        + ID2= 2 (0005):     3.46   0.403    10.25   200.89
          ================================================
          ID = 3 (0006):     7.43   0.782    10.42   200.85

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0007) |   Area    (ha)=   3.46
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.11         0.35
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     151.88        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      53.00       261.63
               over (min)        5.00        15.00
```

```
     Storage Coeff.  (min)=       4.23 (ii)   10.15 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.24         0.10
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.25         0.25         0.505 (iii)
     TIME TO PEAK    (hrs)=      10.00        10.00         10.00
     RUNOFF VOLUME    (mm)=     210.00       192.94        201.47
     TOTAL RAINFALL   (mm)=     212.00       212.00        212.00
     RUNOFF COEFFICIENT   =       0.99         0.91          0.95

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0010) |   Area    (ha)=   3.97
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.57         0.40
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     162.69        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      53.00       261.63
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       4.41 (ii)   10.32 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.23         0.09
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.29         0.29         0.579 (iii)
     TIME TO PEAK    (hrs)=      10.00        10.00         10.00
     RUNOFF VOLUME    (mm)=     210.00       192.94        201.47
     TOTAL RAINFALL   (mm)=     212.00       212.00        212.00
     RUNOFF COEFFICIENT   =       0.99         0.91          0.95

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0008) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0010):     3.97   0.579    10.00   201.47
        + ID2= 2 (0007):     3.46   0.505    10.00   201.47
          ================================================
          ID = 3 (0008):     7.43   1.084    10.00   201.47

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   7.43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.49         5.94
     Dep. Storage     (mm)=       1.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     222.56        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      53.00        44.60
               over (min)        5.00        20.00
     Storage Coeff.  (min)=       5.32 (ii)   17.32 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.21         0.06
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.22         0.69         0.907 (iii)
```

```
     TIME TO PEAK    (hrs)=      10.00        10.08          10.00
     RUNOFF VOLUME    (mm)=     211.00       140.13         154.30
     TOTAL RAINFALL   (mm)=     212.00       212.00         212.00
     RUNOFF COEFFICIENT   =       1.00         0.66           0.73

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
  ***************************
  ** SIMULATION NUMBER:   8 **
  ***************************


--------------------
|    READ STORM    |    Filename: C:\Users\p004967b\AppD
|                  |              ata\Local\Temp\
|                  |              2ecf7440-b8cc-4123-a886-9eded77cfc64\7f87aee5
| Ptotal= 25.00 mm |    Comments: 25 mm, 4 hr. chicago dist'n. - water qua
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.17    2.40 |  1.17   33.60 |  2.17    3.45 |  3.17    1.65
                0.33    1.95 |  1.33   38.10 |  2.33    3.00 |  3.33    1.80
                0.50    2.40 |  1.50   13.80 |  2.50    2.70 |  3.50    1.50
                0.67    2.85 |  1.67    7.35 |  2.67    2.25 |  3.67    1.50
                0.83    4.65 |  1.83    5.55 |  2.83    2.25 |  3.83    0.75
                1.00    9.60 |  2.00    4.35 |  3.00    1.95 |  4.00    0.60

--------------------------------------------------------------------------------

--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   3.46
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.11         0.35
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     151.88        40.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                              ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    2.40 | 1.083   33.60 | 2.083    3.45 |  3.08    1.65
               0.167    2.40 | 1.167   33.60 | 2.167    3.45 |  3.17    1.65
               0.250    1.95 | 1.250   38.10 | 2.250    3.00 |  3.25    1.80
               0.333    1.95 | 1.333   38.10 | 2.333    3.00 |  3.33    1.80
               0.417    2.40 | 1.417   13.80 | 2.417    2.70 |  3.42    1.50
               0.500    2.40 | 1.500   13.80 | 2.500    2.70 |  3.50    1.50
               0.583    2.85 | 1.583    7.35 | 2.583    2.25 |  3.58    1.50
               0.667    2.85 | 1.667    7.35 | 2.667    2.25 |  3.67    1.50
               0.750    4.65 | 1.750    5.55 | 2.750    2.25 |  3.75    0.75
               0.833    4.65 | 1.833    5.55 | 2.833    2.25 |  3.83    0.75
               0.917    9.60 | 1.917    4.35 | 2.917    1.95 |  3.92    0.60
               1.000    9.60 | 2.000    4.35 | 3.000    1.95 |  4.00    0.60

     Max.Eff.Inten.(mm/hr)=      38.10       114.83
               over (min)        5.00        15.00
     Storage Coeff.  (min)=      4.83 (ii)   13.05 (ii)
     Unit Hyd. Tpeak (min)=      5.00        15.00
     Unit Hyd. peak  (cms)=      0.22         0.08
                                                    *TOTALS*
     PEAK FLOW       (cms)=      0.18         0.07          0.233 (iii)
     TIME TO PEAK    (hrs)=      1.33         1.50           1.33
     RUNOFF VOLUME    (mm)=     23.00        13.16          18.08
     TOTAL RAINFALL   (mm)=     25.00        25.00          25.00
     RUNOFF COEFFICIENT   =      0.92         0.53           0.72

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
```

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR (0005)
IN= 2---> OUT= 1
DT= 5.0 min

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0270	0.2226
0.0080	0.0626	0.4030	0.3142
0.0090	0.0966	0.4040	0.3143
0.0110	0.1592	0.4050	0.3145
0.0130	0.1900	0.4600	0.3234
0.0190	0.2083	0.0000	0.0000

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0001)	3.460	0.233	1.33	18.08
OUTFLOW: ID= 1 (0005)	3.460	0.007	4.00	17.51

PEAK FLOW REDUCTION [Qout/Qin](%)= 3.07
TIME SHIFT OF PEAK FLOW (min)=160.00
MAXIMUM STORAGE USED (ha.m.)= 0.0559

CALIB
STANDHYD (0004)
ID= 1 DT= 5.0 min

Area (ha)= 3.97
Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	3.57	0.40	
Dep. Storage (mm)=	2.00	5.00	
Average Slope (%)=	1.00	1.00	
Length (m)=	162.69	40.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	38.10	114.83	
over (min)	5.00	15.00	
Storage Coeff. (min)=	5.03 (ii)	13.25 (ii)	
Unit Hyd. Tpeak (min)=	5.00	15.00	
Unit Hyd. peak (cms)=	0.21	0.08	
			TOTALS
PEAK FLOW (cms)=	0.20	0.08	0.266 (iii)
TIME TO PEAK (hrs)=	1.33	1.50	1.33
RUNOFF VOLUME (mm)=	23.00	13.16	18.08
TOTAL RAINFALL (mm)=	25.00	25.00	25.00
RUNOFF COEFFICIENT =	0.92	0.53	0.72

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR (0003)
IN= 2---> OUT= 1
DT= 5.0 min

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0170	0.2174
0.0070	0.0718	0.0240	0.2372
0.0080	0.1149	0.0300	0.2532
0.0090	0.1150	0.0310	0.2553
0.0100	0.1576	0.3980	0.4170
0.0110	0.1871	0.4230	0.4244

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0004)	3.970	0.266	1.33	18.08
OUTFLOW: ID= 1 (0003)	3.970	0.006	4.08	17.42

PEAK FLOW REDUCTION [Qout/Qin](%)= 2.41
TIME SHIFT OF PEAK FLOW (min)=165.00
MAXIMUM STORAGE USED (ha.m.)= 0.0658

ADD HYD (0006)

```
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0003):     3.97   0.006     4.08    17.42
       + ID2= 2 (0005):     3.46   0.007     4.00    17.51
         ================================================
         ID = 3 (0006):     7.43   0.014     4.00    17.46

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0007) |   Area    (ha)=   3.46
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.11         0.35
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     151.88        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10       114.83
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       4.83 (ii)   13.05 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.22         0.08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.18         0.07         0.233 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50          1.33
     RUNOFF VOLUME    (mm)=      23.00        13.16         18.08
     TOTAL RAINFALL   (mm)=      25.00        25.00         25.00
     RUNOFF COEFFICIENT   =       0.92         0.53          0.72

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0010) |   Area    (ha)=   3.97
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.57         0.40
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     162.69        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10       114.83
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       5.03 (ii)   13.25 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.21         0.08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.20         0.08         0.266 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50          1.33
     RUNOFF VOLUME    (mm)=      23.00        13.16         18.08
     TOTAL RAINFALL   (mm)=      25.00        25.00         25.00
     RUNOFF COEFFICIENT   =       0.92         0.53          0.72


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  72.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0008) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0010):     3.97   0.266     1.33    18.08
       + ID2= 2 (0007):     3.46   0.233     1.33    18.08
         ================================================
         ID = 3 (0008):     7.43   0.499     1.33    18.08
```

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB					
STANDHYD (0002)	Area (ha)= 7.43				
ID= 1 DT= 5.0 min	Total Imp(%)= 20.00	Dir. Conn.(%)= 20.00			

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	1.49	5.94	
Dep. Storage	(mm)=	1.00	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	222.56	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		38.10	3.11	
over (min)		5.00	45.00	
Storage Coeff.	(min)=	6.07 (ii)	40.91 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	45.00	
Unit Hyd. peak	(cms)=	0.19	0.03	
				TOTALS
PEAK FLOW	(cms)=	0.15	0.03	0.153 (iii)
TIME TO PEAK	(hrs)=	1.33	2.08	1.33
RUNOFF VOLUME	(mm)=	24.00	3.37	7.49
TOTAL RAINFALL	(mm)=	25.00	25.00	25.00
RUNOFF COEFFICIENT	=	0.96	0.13	0.30

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 72.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

FINISH

==========

BROCK ROAD STATION

TWY FLOWS FROM DRAINAGE AREA 37-1
(STA. 17+965 TO STA. 18+680)
DRAINAGE AREA = 1.36ha
TO DRAIN TO SWMF-6

WC #45

WC #46

BROCK ROAD

OUTLET CONTROL STRUCTURE
(SEE DETAIL 2 IN THIS DRAWING)

POND OUTLET
(100 YR UNCONTROLLED)

0.975Ø

3:1 SLOPE TO MATCH
EXISTING ELEVATION

REGRADE POND EMBANKMENT
TO SUIT PROPOSED GRADING
OF THE TWY

PERMANENT WL 182.45m

100yr WL 183.56m

SWMF - 6

POND INLET

BROUGHAM CREEK

PROPOSED 407 TWY

OUTLET CONTROL STRUCTURE
(SEE DETAIL 2 IN THIS DRAWING)

POND OUTLET
(100 YR UNCONTROLLED)

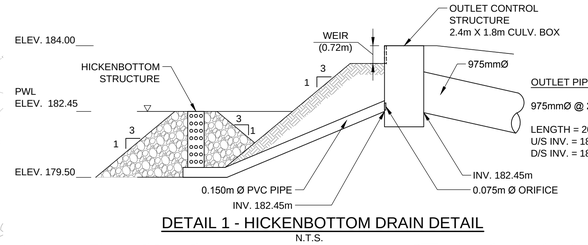
100yr WL 173.02m

PERMANENT WL 171.16m

SWMF - 7

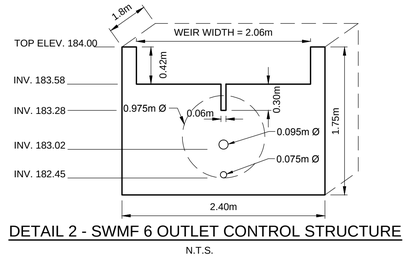
REALIGNED BROCK ROAD

A31	0.90	1.83ha
A32	0.90	0.38ha
A30	0.90	0.21ha
A27	0.90	0.80ha
A24	0.90	0.63ha
A23	0.90	1.61ha
A28	0.90	2.83ha
A29	0.90	0.70ha
A25	0.90	2.22ha
A22	0.90	1.06ha
A26	0.90	0.43ha



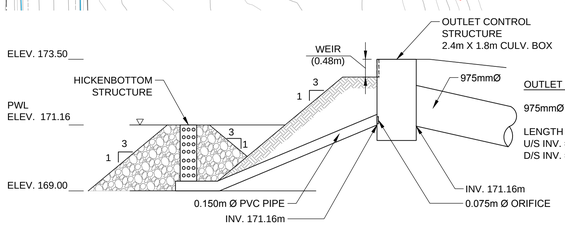
DETAIL 1 - HICKENBOTTOM DRAIN DETAIL

N.T.S.



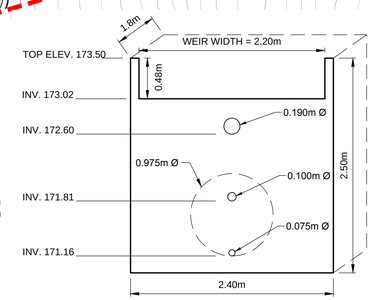
DETAIL 2 - SWMF 6 OUTLET CONTROL STRUCTURE

N.T.S.



DETAIL 3 - HICKENBOTTOM DRAIN DETAIL

N.T.S.



DETAIL 4 - SWMF 7 OUTLET CONTROL STRUCTURE

N.T.S.

LEGEND

- PROPOSED 407 TWY
- EXISTING DITCH
- EXISTING CREEK
- PROPERTY LINES
- EXISTING CULVERT
- DRAINAGE AREA BOUNDARY
- SWALE AND FLOW DIRECTION
- AREA ID
- A (ha)
- % IMPERVIOUSNESS

SCALE HORIZONTAL
1:1000

5m 0m 10m 20m 30m

DATE: SEPTEMBER 2016

SCALE: 1:1000

Ontario

PARSONS

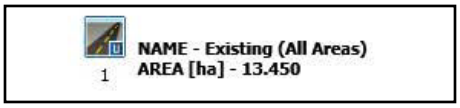
625 COCHRANE DRIVE, SUITE 500
MARKHAM, ONTARIO L3R 9R9
TEL: 905-943-0500
FAX: 905-943-0400

407 TRANSITWAY FROM KENNEDY RD TO BROCK RD

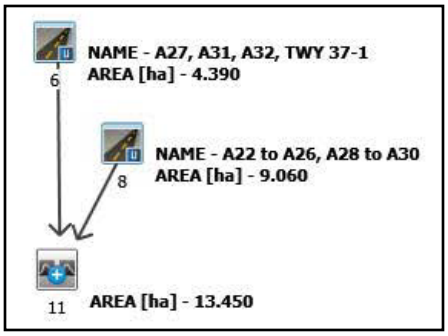
FIGURE 5.5 - PROPOSED STATION BROCK AND SWMF 6 & 7 DETAILS

File: C:\TT402\2\DRAWINGS\GENERAL\SHEETS\60293\5-5-STA-BROCK.DWG - Revised by: <RKP/RGZ> - 10/7/2016 1:49 PM

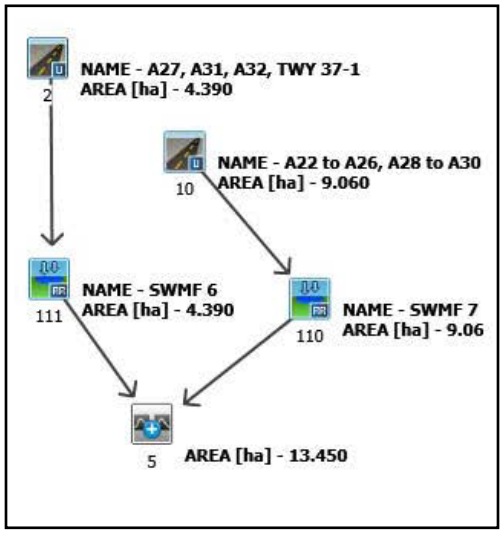
Visual OTTHYMO Modelling Schematic 5.5 – Brock Road Station



Existing Condition



Proposed (Uncontrolled) Condition



Proposed (Controlled) Condition

BROCK ROAD STATION HYDROLOGIC ANALYSIS - EXISTING CONDITION

Input parameters

Proposed Brock Station is located within subcatchment 44 - Duffins Watershed

A-total (ha)	4.39
CN (unadjusted)=	71
Ia (mm)=	5

Table 5.6a: Brock Road Station SWMF 6 - Allowable Release Rates and Storage Required

Unit Flow Rates 2012 Study, TRCA - Sub-catchment 44

Return Period	Q allowable (L/s/ha)	Q allowable (m^3/s)	Storage Required (m^3/ha)	Storage Required (m^3)
2-yr	2.96	0.013	282	1238
5-yr	4.78	0.021	364	1598
10-yr	6.07	0.027	415	1822
25-yr	7.89	0.035	480	2107
50-yr	9.32	0.041	528	2318
100-yr	10.84	0.048	575	2524

BROCK ROAD STATION HYDROLOGIC ANALYSIS - POST-DEVELOPMENT CONDITION

Table 5.6b: Brock Road Station - Post-Development Condition Hydrologic Analysis - SWMF-6 (12hr AES)

12hr AES Return Period	Allowable Release Rates Unit Rates - Subwatershed 44	Post-Development Condition (Uncontrolled) VO2 ID 2 (A = 4.39 ha)	Increase from Allowable to Post-Dev Uncontrolled	SWMF-6 POST-DEVELOPMENT CONDITION VO2 ID 111 (A = 4.39 ha)			Decrease from Allowable to Post-Dev Controlled
	Qp (m^3/s)	**Qp** (m^3/s)	**(%)**	**Storage Provided** (m^3)	**Storage Required** (m^3)	**Release Rate** (m^3/s)	**(%)**
2-yr	0.013	0.203	1461.54%	1297	1238	0.009	-44.44%
5-yr	0.021	0.276	1214.29%	1702	1598	0.018	-16.67%
10-yr	0.027	0.324	1115.88%	1985	1822	0.021	-26.89%
25-yr	0.035	0.384	1008.64%	2324	2107	0.029	-19.44%
50-yr	0.041	0.428	946.08%	2562	2318	0.036	-13.65%
100-yr	0.048	0.473	885.42%	2800	2524	0.042	-14.29%

Table 5.6c: Brock Road Station - Post-Development Condition Hydrologic Analysis - SWMF 6 (4hr Chicago)

4hr Chicago Return Period	Allowable Release Rates Unit Rates - Subwatershed 44	Post-Development Condition (Uncontrolled) VO2 ID 2 (A = 4.39 ha)	Increase from Allowable to Post-Dev Uncontrolled	SWMF-6 POST-DEVELOPMENT CONDITION VO2 ID 111 (A = 4.39 ha)			Decrease from Allowable to Post-Dev Controlled
	Qp (m^3/s)	**Qp** (m^3/s)	**(%)**	**Storage Provided** (m^3)	**Storage Required** (m^3)	**Release Rate** (m^3/s)	**(%)**
2-yr	0.013	0.646	4869.23%	1029	-	0.008	-62.50%
5-yr	0.021	0.938	4366.67%	1447	-	0.012	-75.00%
10-yr	0.027	1.127	4129.32%	1717	-	0.018	-48.04%
25-yr	0.035	1.386	3901.49%	2050	-	0.023	-50.60%
50-yr	0.041	1.573	3744.57%	2297	-	0.028	-46.12%
100-yr	0.048	1.767	3581.25%	2545	-	0.035	-37.14%

Table 5.6d: BROCK ROAD STATION - Proposed SWMF-6 - Design Parameters

Pond Catchment Area 4.39 ha

Water Quality Storage Requirements

MOECC (2003, Table 3.2)

Level 1	265	m^3/ha	Interpolated from Table 3.2 (MOECC)		
Extended	40	m^3/ha	(or 25mm rainfall event whichever greater)	*175.60*	m^3
25 mm Event From OTTHYMO	18.88	mm		*828.83*	m^3
% imperviousness	90	%			
Permanent Volume Required				*987.75*	m^3

Quantity Control Required

Total Volume required up to and including the 100 yr storm **2,524.25** m^3

Total Pond Volume Required (Permanent and Extended) **3,512.00** m^3

Settling Calculations MOECC Eq. 4.5

$$Dist = \sqrt{\frac{r \times Q_p}{V_s}}$$

Dist	7	Minimum Forebay length	m
r	2	Length to width ratio	-
Qp	0.01	Peak flow rate from the pond during design quality storm	m^3/s
Vs	0.0003	settling velocity'	m/s

Dispersion Length MOECC Eq. 4.6

$$Dist = \frac{8Q}{dV_f}$$

Minimum Width 1 m

Dist	5	Minimum Dispersion Length	
Q	0.28	Inlet Flow Rate	(5 year Storm)
d	3.0	Depth of the Permanent Pool	
Vf	0.15	Desired Velocity in the Forebay	

(0.15 m/s is the maximum permissible velocity before erosion occurs in a channel (MOECC))

Minimum Forebay Deep Zone Bottom Width MOECC Eq. 4.7

Width = Dist/8 Width 0.85 m

Design Quality Storm MOECC Eq 4.9

$$i_{25} = 43C + 5.9$$

A	4.39	Area		
C	90	Runoff Coefficient		
i	44.6	Intensity	mm/hr	
Qp	0.45	Flow Rational Method		< OTTHYMO = USE OTTHYMO

Flow Velocity Check

Qd	0.28	Inlet Flow Rate	m^3/s
A	41.91	Crossectional Area	m^2
Vfb	0.007	Flow Velocity	m/s
	Yes	< 0.15	

Forebay Dimensions

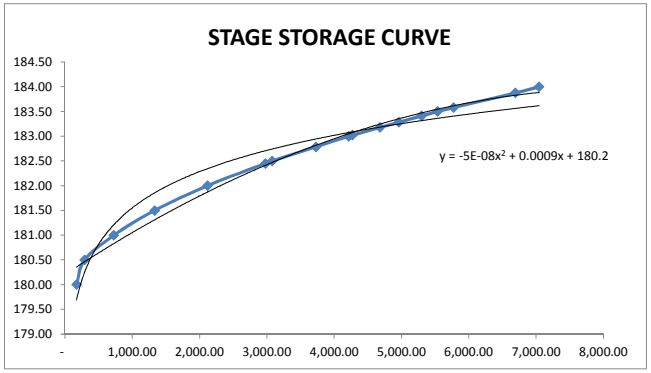
4:1	Average Side Slope	%
42.79	Top Length	m
12.32	Bottom Length	m
20.23	Average Top Width	m
8.19	Bottom Width	m
2.95	Average Depth of the Pool	m
931.50	Approximate Volume of the Pool	m^3
2975.75	Total Permanent Pool Volume	m^3
0.31	Forebay/Total Volume Ratio	
567.12	Forebay Area	m^2
2058.11	Total Permanent Pool Area	
0.28	Forebay/Total Area Ratio	
1.94	Average L/W Ratio Check	

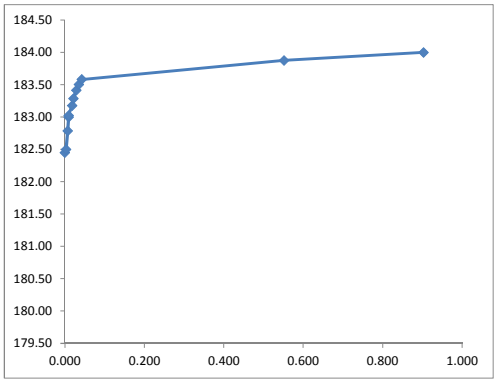
Forebay Cleanout Frequency

Ac	4.39	Contributing Area	(ha)
Ds	0.6	Maximum Sediment Depth	(m)
Vsf	295	Maximum Sediment Volume	(m^3)
a	30%	Impervious Level	%
da	0.6	Annual Sediment Loading	(m^3/ha/yr) (Table 6.3 MOECC Manual)
Fs	112.0	Forebay Cleanout Frequency	(years)
	75%	Target Maintenance TSS Removal Efficiency	

Table 5.6e: BROCK ROAD STATION - Proposed SWMF 6 - Stage-Storage, Stage-Discharge Relationships and Outlet Structure Design

Elevation	Sec Area	Avg Area	Sec Volume	Cumulative	Fluctuation	Stage	Storage	Discharge					Description
m	m^2	m^2	m^3	Volume	Volume	(m)	(ha.m)	Orifice 1	Orifice 2	Weir 1	Overflow		
								182.45	183.02	183.28	Weir		
						Active	Active	0.075	0.095	0.060	2.000	Total	
179.50	229.57												
180.00	458.53	344.1	172.03	172.03									
180.50	705.91	582.2	291.11	291.11									
181.00	1035.71	870.8	435.40	726.52									
181.50	1385.23	1210.5	605.23	1,331.75									
182.00	1757.10	1571.2	785.58	2,117.33									
182.45	2058.11	1907.6	858.42	2,975.75	0.00	0.00	0.0000	0.000				0.000	**Permanent Water Level**
182.50	2092.04	2075.1	103.75	3,079.51	103.75	0.05	0.0104	0.003				0.003	
182.79				3,730.75	755.00	0.34	0.0755	0.007				0.007	25 mm
183.00	2442.80	2267.4	1,133.71	4,213.22	1237.46	0.55	0.1237	0.009				0.009	
183.02				4,272.75	1297.00	0.57	0.1297	0.009	0.000			0.009	2-yr
183.18				4,677.75	1702.00	0.73	0.1702	0.011	0.008			0.018	5-yr
183.28				4,960.75	1985.00	0.83	0.1985	0.011	0.010	0.000		0.021	10-yr
183.41				5,299.75	2324.00	0.96	0.2324	0.012	0.012	0.004		0.029	25-yr
183.50				5,537.75	2562.00	1.05	0.2562	0.013	0.014	0.009		0.036	50-yr
183.58				5,775.75	2800.00	1.13	0.2800	0.013	0.015	0.015	0.000	0.042	100-yr
183.87				6,690.75	3715.00	1.42	0.3715	0.015	0.018	0.041	0.478	0.552	
184.00	3221.02	2831.9	2,831.91	7,045.13	4069.37	1.55	0.4069	0.015	0.020	0.055	0.814	0.903	





Orifice Discha

$$Q = C_d A\sqrt{2gH}$$

Q	Varies	Discharge	(m^3/s)
C_d	0.63	Discharge Coefficient	-
A	Varies	Area of Orifice	(m^2)
g	9.81	Gravitational Constant	(m/s^2)
H	Varies	Hydraulic Head	(m)

Weir Discharge

$$Q = C_d LH^{\frac{3}{2}}$$

Q	Varies	Discharge	(m^3/s)
C_d	1.5	Discharge Coefficient	-
L	0.060	Weir Length	(m)
			(m/s^2)
H	Varies	Hydraulic Head	m

Table 5.6f: BROCK ROAD STATION - Proposed SWMF 6 -
25 mm Drawdown Time Calculations

Project: 407 TWY from Kennedy Rd. to Brock Rd.

Ref:

C	0.63000		Extended Quality Volume:	755	m^3
Orifice	0.05217	m	Initial Head:	0.34	m
Area	0.00214	m^2	Detention:	120.00	hrs
				7,200.00	min

FALLING HEAD EQUATION

Time (min)	Head (m)	Q (m3/s)	Volume (m3)	Declining Volume Start	Declining Volume End
0	0.3372	0.0035	1.04	755.00	753.96
5	0.3368	0.0035	1.04	753.96	752.92
10	0.3363	0.0035	1.04	752.92	751.88
15	0.3358	0.0035	1.04	751.88	750.85
20	0.3354	0.0035	1.04	750.85	749.81
25	0.3349	0.0035	1.04	749.81	748.78
30	0.3344	0.0034	1.03	748.78	747.74
35	0.3340	0.0034	1.03	747.74	746.71
40	0.3335	0.0034	1.03	746.71	745.67
45	0.3331	0.0034	1.03	745.67	744.64
50	0.3326	0.0034	1.03	744.64	743.61
55	0.3321	0.0034	1.03	743.61	742.58
60	0.3317	0.0034	1.03	742.58	741.55
65	0.3312	0.0034	1.03	741.55	740.52
70	0.3308	0.0034	1.03	740.52	739.49
75	0.3303	0.0034	1.03	739.49	738.46
80	0.3298	0.0034	1.03	738.46	737.43
85	0.3294	0.0034	1.03	737.43	736.41
90	0.3289	0.0034	1.03	736.41	735.38
95	0.3285	0.0034	1.03	735.38	734.35
100	0.3280	0.0034	1.02	734.35	733.33
			-- B R E A K --		
7170	0.0000	0.0000	0.01	6.64	6.63
7175	0.0000	0.0000	0.01	6.63	6.62
7180	0.0000	0.0000	0.00	6.62	6.62
7185	0.0000	0.0000	0.00	6.62	6.62
7190	0.0000	0.0000	0.00	6.62	6.61
7195	0.0000	0.0000	0.00	6.61	6.61
7200	0.0000	0.0000	0.00	6.61	6.61
7205	0.0000	0.0000	(0.00)	6.61	6.61

BROCK ROAD STATION HYDROLOGIC ANALYSIS - EXISTING CONDITION

Input parameters

Proposed Brock Station is located within subcatchment 44 - Duffins Watershed

A-total (ha)	9.06
CN (unadjusted)=	71
Ia (mm)=	5

Table 5.7a: Brock Road Station SWMF 7- Allowable Release Rates and Storage Required

Unit Flow Rates 2012 Study, TRCA - Sub-catchment 44

Return Period	Q allowable (L/s/ha)	Q allowable (m^3/s)	Storage Required (m^3/ha)	Storage Required (m^3)
2-yr	2.96	0.027	282	2555
5-yr	4.78	0.043	364	3298
10-yr	6.07	0.055	415	3760
25-yr	7.89	0.071	480	4349
50-yr	9.32	0.084	528	4784
100-yr	10.84	0.098	575	5210

BROCK ROAD STATION HYDROLOGIC ANALYSIS - POST-DEVELOPMENT CONDITION

Table 5.7b: Brock Road Station - Post-Development Condition Hydrologic Analysis - SWMF-7 (12hr AES)

12hr AES Return Period	Allowable Release Rates Unit Rates - SubWatershed 44	Post-Development Condition (Uncontrolled) VO2 ID 10 (A = 9.06 ha)	Increase from Allowable to Post-Dev Uncontrolled	SWMF-7 POST-DEVELOPMENT CONDITION VO2 ID 110 (A = 9.06 ha)			Decrease from Allowable to Post-Dev Controlled
	Qp (m^3/s)	**Qp** (m^3/s)	**(%)**	**Storage Provided** (m^3)	**Storage Required** (m^3)	**Release Rate** (m^3/s)	**(%)**
2-yr	0.027	0.416	1451.22%	2642	2555	0.026	-3.14%
5-yr	0.043	0.562	1197.72%	3558	3298	0.031	-39.70%
10-yr	0.055	0.661	1101.94%	4199	3760	0.034	-61.75%
25-yr	0.071	0.789	1003.75%	4796	4349	0.069	-3.60%
50-yr	0.084	0.881	943.35%	5250	4784	0.082	-2.97%
100-yr	0.098	0.972	889.71%	5741	5210	0.093	-5.60%

Table 5.7c: Brock Road Station - Post-Development Condition Hydrologic Analysis - SWMF-7 (4hr Chicago)

4hr Chicago Return Period	Allowable Release Rates Unit Rates - SubWatershed 44	Post-Development Condition (Uncontrolled) VO2 ID 10 (A = 9.06 ha)	Increase from Allowable to Post-Dev Uncontrolled	SWMF-7 POST-DEVELOPMENT CONDITION VO2 ID 110 (A = 9.06 ha)			Decrease from Allowable to Post-Dev Controlled
	Qp (m^3/s)	**Qp** (m^3/s)	**(%)**	**Storage Provided** (m^3)	**Storage Required** (m^3)	**Release Rate** (m^3/s)	**(%)**
2-yr	0.027	1.233	4497.73%	2144	-	0.019	-41.15%
5-yr	0.043	1.805	4067.94%	2956	-	0.028	-54.67%
10-yr	0.055	2.179	3862.24%	3561	-	0.031	-77.40%
25-yr	0.071	2.691	3664.51%	4299	-	0.040	-78.71%
50-yr	0.084	3.063	3527.46%	4763	-	0.067	-26.03%
100-yr	0.098	3.450	3412.87%	5226	-	0.081	-21.25%

Table 5.7d: BROCK ROAD STATION - Proposed SWMF-7 - Design Parameters

Pond Catchment Area 9.06 ha

Water Quality Storage Requirements

MOECC (2003, Table 3.2)

Level 1	265	m^3/ha	Interpolated from Table 3.2 (MOECC)		
Extended	40	m^3/ha	(or 25mm rainfall event whichever greater)	*362.40*	m^3
25 mm Event From OTTHYMO	18.88	mm		*1,710.53*	m^3
% imperviousness	90	%			
Permanent Volume Required				*2,038.50*	m^3

Quantity Control Required

Total Volume required up to and including the 100 yr storm **5,209.50** m^3

Total Pond Volume Required (Permanent and Extended) **7,248.00** m^3

Settling Calculations MOECC Eq. 4.5

$$Dist = \sqrt{\frac{r \times Q_p}{V_s}}$$

Dist	8	Minimum Forebay length	m
r	1.89	Length to width ratio	-
Qp	0.01	Peak flow rate from the pond during design quality storm	m^3/s
Vs	0.0003	settling velocity'	m/s

Dispersion Length MOECC Eq. 4.6

$$Dist = \frac{8Q}{dV_f}$$

Minimum Width 2 m

Dist	14	Minimum Dispersion Length	
Q	0.56	Inlet Flow Rate	(5 year Storm)
d	2.2	Depth of the Permanent Pool	
Vf	0.15	Desired Velocity in the Forebay	

(0.15 m/s is the maximum permissible velocity before erosion occurs in a channel (MOECC))

Minimum Forebay Deep Zone Bottom Width MOECC Eq. 4.7

Width = Dist/8 Width 0.99 m

Design Quality Storm MOECC Eq 4.9

$$i_{25} = 43C + 5.9$$

A	9.06	Area	
C	90	Runoff Coefficient	
i	44.6	Intensity mm/hr	
Qp	0.45	Flow Rational Method	< OTTHYMO = USE OTTHYMO

Flow Velocity Check

Qd	0.56	Inlet Flow Rate	m^3/s
A	32.88	Crossectional Area	m^2
Vfb	0.017	Flow Velocity	m/s
	Yes	< 0.15	

Forebay Dimensions

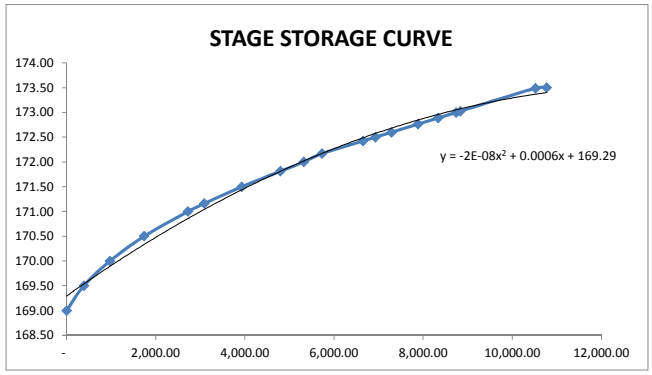
4:1	Average Side Slope	%
34.09	Top Length	m
23.54	Bottom Length	m
20.20	Average Top Width	m
10.24	Bottom Width	m
2.16	Average Depth of the Pool	m
991.21	Approximate Volume of the Pool	m^3
3089.57	Total Permanent Pool Volume	m^3
0.32	Forebay/Total Volume Ratio	
686.05	Forebay Area	m^2
2330.44	Total Permanent Pool Area	
0.29	Forebay/Total Area Ratio	
1.89	Average L/W Ratio Check	

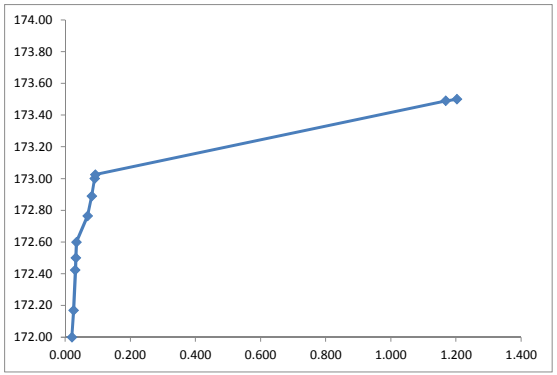
Forebay Cleanout Frequency

Ac	9.06	Contributing Area	(ha)
Ds	0.6	Maximum Sediment Depth	(m)
Vsf	295	Maximum Sediment Volume	(m^3)
a	30%	Impervious Level	%
da	0.6	Annual Sediment Loading	(m^3/ha/yr) (Table 6.3 MOECC Manual)
Fs	54.3	Forebay Cleanout Frequency	(years)
	75%	Target Maintenance TSS Removal Efficiency	

Table 5.7e: BROCK ROAD STATION - Proposed SWMF 7 - Stage-Storage, Stage-Discharge Relationships and Outlet Structure Design

Elevation	Sec Area	Avg Area	Sec Volume	Cumulative	Fluctuation	Stage	Storage	Discharge					Description
						(m)	(ha.m)	Orifice 1	Orifice 2	Orifice 3	Overflow		
m	m^2	m^2	m^3	Volume	Volume			171.16	171.81	172.60	Weir		
						Active	Active	0.075	0.100	0.190	2.200	Total	
169.00	547.37			-									
169.50	1,000.05	773.7	386.85	386.85									
170.00	1346.83	1173.4	586.72	973.57									
170.50	1728.19	1537.5	768.75	1,742.33									
171.00	2208.36	1968.3	984.14	2,726.46									
171.16	**2330.44**	**2269.4**	**363.10**	**3,089.57**		0.00	0.0000	0.000				0.000	**Permanent Water Level**
171.50	2595.63	2402.0	1,201.00	3,927.46	837.89	0.34	0.0838	0.007				0.007	
171.81	2800.00	2565.2	1,672.79	4,800.10	1,710.53	0.65	0.1711	0.010	0.00			0.010	25 mm
172.00	2996.31	2796.0	1,397.99	5,325.45	2,235.88	0.84	0.2236	0.011	0.01			0.021	
172.17				5,731.57	2,642.00	1.01	0.2642	0.012	0.01			0.026	2-yr
172.42				6,647.57	3,558.00	1.26	0.3558	0.014	0.02			0.031	5-yr
172.50	3,411.24	3203.8	1,601.89	6,927.33	3,837.77	1.34	0.3838	0.014	0.02			0.032	
172.60				7,288.57	4,199.00	1.44	0.4199	0.015	0.02	0.00		0.034	10-yr
172.76				7,885.57	4,796.00	1.60	0.4796	0.016	0.02	0.03		0.069	25-yr
172.89				8,339.57	5,250.00	1.73	0.5250	0.016	0.02	0.04		0.082	50-yr
173.00	3840.41	3625.8	1,812.91	8,740.25	5,650.68	1.84	0.5651	0.017	0.02	0.05		0.091	
173.02				8,830.57	5,741.00	1.86	0.5741	0.017	0.02	0.05	0.000	0.093	100-yr
173.49				10,516.57	7,427.00	2.33	0.7427	0.019	0.03	0.07	1.046	1.168	
173.50	4,283.83	4062.1	2,031.06	10,771.31	7,681.74	2.34	0.7682	0.019	0.03	0.08	1.081	1.203	





Orifice Discha

$$Q = C_d A\sqrt{2gH}$$

Q	Varies	Discharge	(m^3/s)
C_d	0.63	Discharge Coefficient	-
A	Varies	Area of Orifice	(m^2)
g	9.81	Gravitational Constant	(m/s^2)
H	Varies	Hydraulic Head	(m)

Weir Discharge

$$Q = C_d L H^{\frac{3}{2}}$$

Q	Varies	Discharge	(m^3/s)
C_d	1.5	Discharge Coefficient	-
L	2.200	Weir Length	(m)
			(m/s^2)
H	Varies	Hydraulic Head	m

Table 5.5f: BROCK ROAD STATION - Proposed SWMF 7 -
25 mm Drawdown Time Calculations

Project: 407 TWY from Kennedy Rd. to Brock Rd.

Ref:

C	0.63000		Extended Quality Volume:	1,711	m^3
Orifice	0.07500	m	Initial Head:	0.40	m
Area	0.00442	m^2	Detention:	120.00	hrs
				7,200.00	min

FALLING HEAD EQUATION

Time (min)	Head (m)	Q (m3/s)	Volume (m3)	Declining Volume Start	Declining Volume End
0	0.4000	0.0078	2.34	1,710.53	1,708.19
5	0.3995	0.0078	2.34	1,708.19	1,705.85
10	0.3989	0.0078	2.34	1,705.85	1,703.52
15	0.3984	0.0078	2.33	1,703.52	1,701.18
20	0.3978	0.0078	2.33	1,701.18	1,698.85
25	0.3973	0.0078	2.33	1,698.85	1,696.52
30	0.3967	0.0078	2.33	1,696.52	1,694.19
35	0.3962	0.0078	2.33	1,694.19	1,691.86
40	0.3956	0.0078	2.33	1,691.86	1,689.53
45	0.3951	0.0077	2.32	1,689.53	1,687.21
50	0.3945	0.0077	2.32	1,687.21	1,684.89
55	0.3940	0.0077	2.32	1,684.89	1,682.56
60	0.3935	0.0077	2.32	1,682.56	1,680.24
65	0.3929	0.0077	2.32	1,680.24	1,677.93
70	0.3924	0.0077	2.32	1,677.93	1,675.61
75	0.3918	0.0077	2.32	1,675.61	1,673.29
80	0.3913	0.0077	2.31	1,673.29	1,670.98
85	0.3908	0.0077	2.31	1,670.98	1,668.67
90	0.3902	0.0077	2.31	1,668.67	1,666.36
95	0.3897	0.0077	2.31	1,666.36	1,664.05
100	0.3891	0.0077	2.31	1,664.05	1,661.74
105	0.3886	0.0077	2.31	1,661.74	1,659.44
110	0.3881	0.0077	2.30	1,659.44	1,657.13
115	0.3875	0.0077	2.30	1,657.13	1,654.83
120	0.3870	0.0077	2.30	1,654.83	1,652.53
			-- B R E A K --		
7175	0.0001	0.0001	0.03	11.68	11.65
7180	0.0001	0.0001	0.03	11.65	11.62
7185	0.0001	0.0001	0.03	11.62	11.59
7190	0.0000	0.0001	0.03	11.59	11.56
7195	0.0000	0.0001	0.02	11.56	11.54
7200	0.0000			11.54	11.54

```
==========================================================================================================

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        V  V    I     SS    U   U  AAAAA  L
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         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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COMMENTS: _____________________________________________________________


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|    READ STORM    |    Filename: C:\Users\p004967b\AppD
|                  |              ata\Local\Temp\
|                  |              c2142e63-c4e1-4cb3-9aae-d2566f8a26c9\ce1467d0
| Ptotal= 42.00 mm |    Comments: 2yr/12hr
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.25    0.00 |  3.50    7.14 |  6.75    2.94 | 10.00    0.42
                0.50    0.42 |  3.75    7.14 |  7.00    2.94 | 10.25    0.42
                0.75    0.42 |  4.00    7.14 |  7.25    2.94 | 10.50    0.42
                1.00    0.42 |  4.25    7.14 |  7.50    1.68 | 10.75    0.42
                1.25    0.42 |  4.50   19.32 |  7.75    1.68 | 11.00    0.42
                1.50    0.42 |  4.75   19.32 |  8.00    1.68 | 11.25    0.42
                1.75    0.42 |  5.00   19.32 |  8.25    1.68 | 11.50    0.42
                2.00    0.42 |  5.25   19.32 |  8.50    0.84 | 11.75    0.42
                2.25    0.42 |  5.50    5.46 |  8.75    0.84 | 12.00    0.42
                2.50    2.52 |  5.75    5.46 |  9.00    0.84 | 12.25    0.42
                2.75    2.52 |  6.00    5.46 |  9.25    0.84 |
                3.00    2.52 |  6.25    5.46 |  9.50    0.42 |
                3.25    2.52 |  6.50    2.94 |  9.75    0.42 |

------------------------------------------------------------------------------

--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=  13.45
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.69        10.76
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     299.44        40.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
                 TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                  hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.083    0.00 | 3.167    2.52 | 6.250    5.46 |  9.33    0.42
                0.167    0.00 | 3.250    2.52 | 6.333    2.94 |  9.42    0.42
```

0.250	0.00	3.333	7.14	6.417	2.94	9.50	0.42
0.333	0.42	3.417	7.14	6.500	2.94	9.58	0.42
0.417	0.42	3.500	7.14	6.583	2.94	9.67	0.42
0.500	0.42	3.583	7.14	6.667	2.94	9.75	0.42
0.583	0.42	3.667	7.14	6.750	2.94	9.83	0.42
0.667	0.42	3.750	7.14	6.833	2.94	9.92	0.42
0.750	0.42	3.833	7.14	6.917	2.94	10.00	0.42
0.833	0.42	3.917	7.14	7.000	2.94	10.08	0.42
0.917	0.42	4.000	7.14	7.083	2.94	10.17	0.42
1.000	0.42	4.083	7.14	7.167	2.94	10.25	0.42
1.083	0.42	4.167	7.14	7.250	2.94	10.33	0.42
1.167	0.42	4.250	7.14	7.333	1.68	10.42	0.42
1.250	0.42	4.333	19.32	7.417	1.68	10.50	0.42
1.333	0.42	4.417	19.32	7.500	1.68	10.58	0.42
1.417	0.42	4.500	19.32	7.583	1.68	10.67	0.42
1.500	0.42	4.583	19.32	7.667	1.68	10.75	0.42
1.583	0.42	4.667	19.32	7.750	1.68	10.83	0.42
1.667	0.42	4.750	19.32	7.833	1.68	10.92	0.42
1.750	0.42	4.833	19.32	7.917	1.68	11.00	0.42
1.833	0.42	4.917	19.32	8.000	1.68	11.08	0.42
1.917	0.42	5.000	19.32	8.083	1.68	11.17	0.42
2.000	0.42	5.083	19.32	8.167	1.68	11.25	0.42
2.083	0.42	5.167	19.32	8.250	1.68	11.33	0.42
2.167	0.42	5.250	19.32	8.333	0.84	11.42	0.42
2.250	0.42	5.333	5.46	8.417	0.84	11.50	0.42
2.333	2.52	5.417	5.46	8.500	0.84	11.58	0.42
2.417	2.52	5.500	5.46	8.583	0.84	11.67	0.42
2.500	2.52	5.583	5.46	8.667	0.84	11.75	0.42
2.583	2.52	5.667	5.46	8.750	0.84	11.83	0.42
2.667	2.52	5.750	5.46	8.833	0.84	11.92	0.42
2.750	2.52	5.833	5.46	8.917	0.84	12.00	0.42
2.833	2.52	5.917	5.46	9.000	0.84	12.08	0.42
2.917	2.52	6.000	5.46	9.083	0.84	12.17	0.42
3.000	2.52	6.083	5.46	9.167	0.84	12.25	0.42
3.083	2.52	6.167	5.46	9.250	0.84		

Max.Eff.Inten.(mm/hr)=	19.32	5.72	
over (min)	10.00	40.00	
Storage Coeff. (min)=	9.52 (ii)	36.82 (ii)	
Unit Hyd. Tpeak (min)=	10.00	40.00	
Unit Hyd. peak (cms)=	0.12	0.03	
			TOTALS
PEAK FLOW (cms)=	0.14	0.11	0.228 (iii)
TIME TO PEAK (hrs)=	5.25	5.67	5.25
RUNOFF VOLUME (mm)=	41.90	9.73	16.16
TOTAL RAINFALL (mm)=	42.00	42.00	42.00
RUNOFF COEFFICIENT =	1.00	0.23	0.38

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0010)	Area (ha)= 9.06		
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00	Dir. Conn.(%)= 50.00	
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	8.15	0.91	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	1.00	1.00	
Length (m)=	245.76	40.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	19.32	78.50	
over (min)	10.00	20.00	
Storage Coeff. (min)=	8.46 (ii)	18.03 (ii)	
Unit Hyd. Tpeak (min)=	10.00	20.00	
Unit Hyd. peak (cms)=	0.12	0.06	
			TOTALS
PEAK FLOW (cms)=	0.24	0.17	0.416 (iii)
TIME TO PEAK (hrs)=	5.25	5.25	5.25
RUNOFF VOLUME (mm)=	41.90	27.22	34.56
TOTAL RAINFALL (mm)=	42.00	42.00	42.00
RUNOFF COEFFICIENT =	1.00	0.65	0.82

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

```
           CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR (0110) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0340      0.4199
                          0.0010     0.0025   |   0.0690      0.4796
                          0.0070     0.0838   |   0.0820      0.5250
                          0.0100     0.1711   |   0.0910      0.5651
                          0.0210     0.2236   |   0.0930      0.5741
                          0.0250     0.2641   |   1.1670      0.7426
                          0.0260     0.2642   |   1.1680      0.7427
                          0.0310     0.3558   |   1.1690      0.7428
                          0.0320     0.3838   |   1.2030      0.7682

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0010)      9.060      0.416      5.25      34.56
     OUTFLOW: ID= 1 (0110)      9.060      0.026      8.67      34.49

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  6.17
                   TIME SHIFT OF PEAK FLOW         (min)=205.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.2642

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        78.50
               over (min)         5.00        20.00
     Storage Coeff.  (min)=       6.81 (ii)   16.38 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.18         0.06
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.12         0.09        0.203 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25         5.25
     RUNOFF VOLUME    (mm)=      41.90        27.22        34.56
     TOTAL RAINFALL   (mm)=      42.00        42.00        42.00
     RUNOFF COEFFICIENT   =       1.00         0.65         0.82


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR (0111) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0290      0.2324
                          0.0030     0.0104   |   0.0360      0.2562
                          0.0070     0.0755   |   0.0420      0.2800
                          0.0090     0.1297   |   0.0430      0.2801
                          0.0180     0.1702   |   0.5520      0.3715
                          0.0210     0.1985   |   0.9030      0.4069

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0002)      4.390      0.203      5.25      34.56
     OUTFLOW: ID= 1 (0111)      4.390      0.009      9.33      34.36

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  4.44
                   TIME SHIFT OF PEAK FLOW         (min)=245.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.1297
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--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0110):     9.06   0.026     8.67    34.49
       + ID2= 2 (0111):     4.39   0.009     9.33    34.36
         ================================================
         ID = 3 (0005):    13.45   0.035     8.67    34.45

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0006) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        78.50
               over (min)        5.00        20.00
     Storage Coeff.  (min)=       6.81 (ii)   16.38 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.18         0.06
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.12         0.09         0.203 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25          5.25
     RUNOFF VOLUME    (mm)=      41.90        27.22         34.56
     TOTAL RAINFALL   (mm)=      42.00        42.00         42.00
     RUNOFF COEFFICIENT   =       1.00         0.65          0.82


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0008) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.15         0.91
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     245.76        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      19.32        78.50
               over (min)       10.00        20.00
     Storage Coeff.  (min)=       8.46 (ii)   18.03 (ii)
     Unit Hyd. Tpeak (min)=      10.00        20.00
     Unit Hyd. peak  (cms)=       0.12         0.06
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.24         0.17         0.416 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25          5.25
     RUNOFF VOLUME    (mm)=      41.90        27.22         34.56
     TOTAL RAINFALL   (mm)=      42.00        42.00         42.00
     RUNOFF COEFFICIENT   =       1.00         0.65          0.82


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0011) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0006):     4.39   0.203     5.25    34.56
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```
       + ID2= 2 (0008):     9.06   0.416     5.25    34.56
         ================================================
         ID = 3 (0011):    13.45   0.619     5.25    34.56

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ***************************
  ** SIMULATION NUMBER:   2 **
  ***************************


--------------------
|    READ STORM    |    Filename: C:\Users\p004967b\AppD
|                  |              ata\Local\Temp\
|                  |              c2142e63-c4e1-4cb3-9aae-d2566f8a26c9\cdb8431f
| Ptotal= 54.38 mm |    Comments: 5yr/12hr
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.25    0.00 |  3.50    9.25 |  6.75    3.81 | 10.00    0.54
                0.50    0.54 |  3.75    9.25 |  7.00    3.81 | 10.25    0.54
                0.75    0.54 |  4.00    9.25 |  7.25    3.81 | 10.50    0.54
                1.00    0.54 |  4.25    9.25 |  7.50    2.18 | 10.75    0.54
                1.25    0.54 |  4.50   25.02 |  7.75    2.18 | 11.00    0.54
                1.50    0.54 |  4.75   25.02 |  8.00    2.18 | 11.25    0.54
                1.75    0.54 |  5.00   25.02 |  8.25    2.18 | 11.50    0.54
                2.00    0.54 |  5.25   25.02 |  8.50    1.09 | 11.75    0.54
                2.25    0.54 |  5.50    7.07 |  8.75    1.09 | 12.00    0.54
                2.50    3.26 |  5.75    7.07 |  9.00    1.09 | 12.25    0.54
                2.75    3.26 |  6.00    7.07 |  9.25    1.09 |
                3.00    3.26 |  6.25    7.07 |  9.50    0.54 |
                3.25    3.26 |  6.50    3.81 |  9.75    0.54 |

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--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=  13.45
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       2.69        10.76
    Dep. Storage     (mm)=       0.10         5.00
    Average Slope     (%)=       1.00         1.00
    Length            (m)=     299.44        40.00
    Mannings n           =      0.013        0.250

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                        ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    0.00 | 3.167    3.26 | 6.250    7.07 |  9.33    0.54
               0.167    0.00 | 3.250    3.26 | 6.333    3.81 |  9.42    0.54
               0.250    0.00 | 3.333    9.25 | 6.417    3.81 |  9.50    0.54
               0.333    0.54 | 3.417    9.25 | 6.500    3.81 |  9.58    0.54
               0.417    0.54 | 3.500    9.25 | 6.583    3.81 |  9.67    0.54
               0.500    0.54 | 3.583    9.25 | 6.667    3.81 |  9.75    0.54
               0.583    0.54 | 3.667    9.25 | 6.750    3.81 |  9.83    0.54
               0.667    0.54 | 3.750    9.25 | 6.833    3.81 |  9.92    0.54
               0.750    0.54 | 3.833    9.25 | 6.917    3.81 | 10.00    0.54
               0.833    0.54 | 3.917    9.25 | 7.000    3.81 | 10.08    0.54
               0.917    0.54 | 4.000    9.25 | 7.083    3.81 | 10.17    0.54
               1.000    0.54 | 4.083    9.25 | 7.167    3.81 | 10.25    0.54
               1.083    0.54 | 4.167    9.25 | 7.250    3.81 | 10.33    0.54
               1.167    0.54 | 4.250    9.25 | 7.333    2.18 | 10.42    0.54
               1.250    0.54 | 4.333   25.02 | 7.417    2.18 | 10.50    0.54
               1.333    0.54 | 4.417   25.02 | 7.500    2.18 | 10.58    0.54
               1.417    0.54 | 4.500   25.02 | 7.583    2.18 | 10.67    0.54
               1.500    0.54 | 4.583   25.02 | 7.667    2.18 | 10.75    0.54
               1.583    0.54 | 4.667   25.02 | 7.750    2.18 | 10.83    0.54
               1.667    0.54 | 4.750   25.02 | 7.833    2.18 | 10.92    0.54
               1.750    0.54 | 4.833   25.02 | 7.917    2.18 | 11.00    0.54
               1.833    0.54 | 4.917   25.02 | 8.000    2.18 | 11.08    0.54
               1.917    0.54 | 5.000   25.02 | 8.083    2.18 | 11.17    0.54
               2.000    0.54 | 5.083   25.02 | 8.167    2.18 | 11.25    0.54
               2.083    0.54 | 5.167   25.02 | 8.250    2.18 | 11.33    0.54
               2.167    0.54 | 5.250   25.02 | 8.333    1.09 | 11.42    0.54
               2.250    0.54 | 5.333    7.07 | 8.417    1.09 | 11.50    0.54
               2.333    3.26 | 5.417    7.07 | 8.500    1.09 | 11.58    0.54
               2.417    3.26 | 5.500    7.07 | 8.583    1.09 | 11.67    0.54
               2.500    3.26 | 5.583    7.07 | 8.667    1.09 | 11.75    0.54
```

2.583	3.26	5.667	7.07	8.750	1.09	11.83	0.54
2.667	3.26	5.750	7.07	8.833	1.09	11.92	0.54
2.750	3.26	5.833	7.07	8.917	1.09	12.00	0.54
2.833	3.26	5.917	7.07	9.000	1.09	12.08	0.54
2.917	3.26	6.000	7.07	9.083	1.09	12.17	0.54
3.000	3.26	6.083	7.07	9.167	1.09	12.25	0.54
3.083	3.26	6.167	7.07	9.250	1.09		

Max.Eff.Inten.(mm/hr)=	25.02	9.57	
over (min)	10.00	35.00	
Storage Coeff. (min)=	8.59 (ii)	30.80 (ii)	
Unit Hyd. Tpeak (min)=	10.00	35.00	
Unit Hyd. peak (cms)=	0.12	0.04	
			TOTALS
PEAK FLOW (cms)=	0.19	0.20	0.354 (iii)
TIME TO PEAK (hrs)=	5.25	5.58	5.25
RUNOFF VOLUME (mm)=	54.28	15.92	23.59
TOTAL RAINFALL (mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT =	1.00	0.29	0.43

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB
STANDHYD (0010)
ID= 1 DT= 5.0 min

Area (ha)= 9.06
Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=		8.15	0.91
Dep. Storage (mm)=		0.10	5.00
Average Slope (%)=		1.00	1.00
Length (m)=		245.76	40.00
Mannings n =		0.013	0.250

Max.Eff.Inten.(mm/hr)=	25.02	108.07	
over (min)	10.00	20.00	
Storage Coeff. (min)=	7.63 (ii)	16.05 (ii)	
Unit Hyd. Tpeak (min)=	10.00	20.00	
Unit Hyd. peak (cms)=	0.13	0.06	
			TOTALS
PEAK FLOW (cms)=	0.31	0.25	0.562 (iii)
TIME TO PEAK (hrs)=	5.25	5.25	5.25
RUNOFF VOLUME (mm)=	54.28	38.44	46.36
TOTAL RAINFALL (mm)=	54.38	54.38	54.38
RUNOFF COEFFICIENT =	1.00	0.71	0.85

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR (0110)
IN= 2---> OUT= 1
DT= 5.0 min

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0340	0.4199
0.0010	0.0025	0.0690	0.4796
0.0070	0.0838	0.0820	0.5250
0.0100	0.1711	0.0910	0.5651
0.0210	0.2236	0.0930	0.5741
0.0250	0.2641	1.1670	0.7426
0.0260	0.2642	1.1680	0.7427
0.0310	0.3558	1.1690	0.7428
0.0320	0.3838	1.2030	0.7682

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0010)	9.060	0.562	5.25	46.36
OUTFLOW: ID= 1 (0110)	9.060	0.031	8.75	46.29

PEAK FLOW REDUCTION [Qout/Qin](%)= 5.51
TIME SHIFT OF PEAK FLOW (min)=210.00

```
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.3558

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02       108.07
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       6.14 (ii)   14.56 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.19         0.08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.15         0.12          0.276 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25           5.25
     RUNOFF VOLUME    (mm)=      54.28        38.44          46.36
     TOTAL RAINFALL   (mm)=      54.38        54.38          54.38
     RUNOFF COEFFICIENT   =       1.00         0.71           0.85


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0111) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0290      0.2324
                          0.0030     0.0104   |   0.0360      0.2562
                          0.0070     0.0755   |   0.0420      0.2800
                          0.0090     0.1297   |   0.0430      0.2801
                          0.0180     0.1702   |   0.5520      0.3715
                          0.0210     0.1985   |   0.9030      0.4069

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0002)      4.390      0.276      5.25      46.36
     OUTFLOW: ID= 1 (0111)      4.390      0.018      8.42      46.16

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  6.52
                  TIME SHIFT OF PEAK FLOW         (min)=190.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.1702

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--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0110):     9.06   0.031     8.75    46.29
       + ID2= 2 (0111):     4.39   0.018     8.42    46.16
         ================================================
         ID = 3 (0005):    13.45   0.049     8.50    46.25

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0006) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02       108.07
               over (min)        5.00        15.00
```

```
     Storage Coeff.  (min)=       6.14 (ii)   14.56 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.19         0.08
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.15         0.12          0.276 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25           5.25
     RUNOFF VOLUME    (mm)=      54.28        38.44          46.36
     TOTAL RAINFALL   (mm)=      54.38        54.38          54.38
     RUNOFF COEFFICIENT   =       1.00         0.71           0.85


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0008) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.15         0.91
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     245.76        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      25.02       108.07
               over (min)        10.00        20.00
     Storage Coeff.  (min)=       7.63 (ii)   16.05 (ii)
     Unit Hyd. Tpeak (min)=      10.00        20.00
     Unit Hyd. peak  (cms)=       0.13         0.06
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.31         0.25          0.562 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25           5.25
     RUNOFF VOLUME    (mm)=      54.28        38.44          46.36
     TOTAL RAINFALL   (mm)=      54.38        54.38          54.38
     RUNOFF COEFFICIENT   =       1.00         0.71           0.85


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0011) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0006):     4.39   0.276     5.25    46.36
       + ID2= 2 (0008):     9.06   0.562     5.25    46.36
         ================================================
         ID = 3 (0011):    13.45   0.838     5.25    46.36

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ***************************
  ** SIMULATION NUMBER:   3 **
  ***************************



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|    READ STORM    |    Filename: C:\Users\p004967b\AppD
|                  |              ata\Local\Temp\
|                  |              c2142e63-c4e1-4cb3-9aae-d2566f8a26c9\29d7434a
| Ptotal= 62.71 mm |    Comments: 10yr/12hr
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.25    0.00 |  3.50   10.66 |  6.75    4.39 | 10.00    0.63
                0.50    0.63 |  3.75   10.66 |  7.00    4.39 | 10.25    0.63
                0.75    0.63 |  4.00   10.66 |  7.25    4.39 | 10.50    0.63
                1.00    0.63 |  4.25   10.66 |  7.50    2.51 | 10.75    0.63
                1.25    0.63 |  4.50   28.84 |  7.75    2.51 | 11.00    0.63
                1.50    0.63 |  4.75   28.84 |  8.00    2.51 | 11.25    0.63
                1.75    0.63 |  5.00   28.84 |  8.25    2.51 | 11.50    0.63
                2.00    0.63 |  5.25   28.84 |  8.50    1.25 | 11.75    0.63
```

2.25	0.63	5.50	8.15	8.75	1.25	12.00	0.63
2.50	3.76	5.75	8.15	9.00	1.25	12.25	0.63
2.75	3.76	6.00	8.15	9.25	1.25		
3.00	3.76	6.25	8.15	9.50	0.63		
3.25	3.76	6.50	4.39	9.75	0.63		

CALIB
STANDHYD (0001)
ID= 1 DT= 5.0 min

Area (ha)= 13.45
Total Imp(%)= 20.00 Dir. Conn.(%)= 20.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	2.69	10.76
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.00	1.00
Length	(m)=	299.44	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	3.76	6.250	8.15	9.33	0.63
0.167	0.00	3.250	3.76	6.333	4.39	9.42	0.63
0.250	0.00	3.333	10.66	6.417	4.39	9.50	0.63
0.333	0.63	3.417	10.66	6.500	4.39	9.58	0.63
0.417	0.63	3.500	10.66	6.583	4.39	9.67	0.63
0.500	0.63	3.583	10.66	6.667	4.39	9.75	0.63
0.583	0.63	3.667	10.66	6.750	4.39	9.83	0.63
0.667	0.63	3.750	10.66	6.833	4.39	9.92	0.63
0.750	0.63	3.833	10.66	6.917	4.39	10.00	0.63
0.833	0.63	3.917	10.66	7.000	4.39	10.08	0.63
0.917	0.63	4.000	10.66	7.083	4.39	10.17	0.63
1.000	0.63	4.083	10.66	7.167	4.39	10.25	0.63
1.083	0.63	4.167	10.66	7.250	4.39	10.33	0.63
1.167	0.63	4.250	10.66	7.333	2.51	10.42	0.63
1.250	0.63	4.333	28.84	7.417	2.51	10.50	0.63
1.333	0.63	4.417	28.84	7.500	2.51	10.58	0.63
1.417	0.63	4.500	28.84	7.583	2.51	10.67	0.63
1.500	0.63	4.583	28.84	7.667	2.51	10.75	0.63
1.583	0.63	4.667	28.84	7.750	2.51	10.83	0.63
1.667	0.63	4.750	28.84	7.833	2.51	10.92	0.63
1.750	0.63	4.833	28.84	7.917	2.51	11.00	0.63
1.833	0.63	4.917	28.84	8.000	2.51	11.08	0.63
1.917	0.63	5.000	28.84	8.083	2.51	11.17	0.63
2.000	0.63	5.083	28.84	8.167	2.51	11.25	0.63
2.083	0.63	5.167	28.84	8.250	2.51	11.33	0.63
2.167	0.63	5.250	28.84	8.333	1.25	11.42	0.63
2.250	0.63	5.333	8.15	8.417	1.25	11.50	0.63
2.333	3.76	5.417	8.15	8.500	1.25	11.58	0.63
2.417	3.76	5.500	8.15	8.583	1.25	11.67	0.63
2.500	3.76	5.583	8.15	8.667	1.25	11.75	0.63
2.583	3.76	5.667	8.15	8.750	1.25	11.83	0.63
2.667	3.76	5.750	8.15	8.833	1.25	11.92	0.63
2.750	3.76	5.833	8.15	8.917	1.25	12.00	0.63
2.833	3.76	5.917	8.15	9.000	1.25	12.08	0.63
2.917	3.76	6.000	8.15	9.083	1.25	12.17	0.63
3.000	3.76	6.083	8.15	9.167	1.25	12.25	0.63
3.083	3.76	6.167	8.15	9.250	1.25		

				TOTALS
Max.Eff.Inten.(mm/hr)=		28.84	12.63	
	over (min)	10.00	30.00	
Storage Coeff. (min)=		8.11 (ii)	27.99 (ii)	
Unit Hyd. Tpeak (min)=		10.00	30.00	
Unit Hyd. peak (cms)=		0.13	0.04	
PEAK FLOW	(cms)=	0.22	0.27	0.458 (iii)
TIME TO PEAK	(hrs)=	5.25	5.50	5.25
RUNOFF VOLUME	(mm)=	62.61	20.63	29.02
TOTAL RAINFALL	(mm)=	62.71	62.71	62.71
RUNOFF COEFFICIENT	=	1.00	0.33	0.46

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0010) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.15         0.91
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     245.76        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84       127.95
               over (min)         5.00        20.00
     Storage Coeff.  (min)=       7.21 (ii)   15.08 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.17         0.07
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.36         0.30         0.661 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25          5.25
     RUNOFF VOLUME    (mm)=      62.61        46.18         54.39
     TOTAL RAINFALL   (mm)=      62.71        62.71         62.71
     RUNOFF COEFFICIENT   =       1.00         0.74          0.87


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0110) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000    |   0.0340      0.4199
                         0.0010     0.0025    |   0.0690      0.4796
                         0.0070     0.0838    |   0.0820      0.5250
                         0.0100     0.1711    |   0.0910      0.5651
                         0.0210     0.2236    |   0.0930      0.5741
                         0.0250     0.2641    |   1.1670      0.7426
                         0.0260     0.2642    |   1.1680      0.7427
                         0.0310     0.3558    |   1.1690      0.7428
                         0.0320     0.3838    |   1.2030      0.7682

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0010)     9.060      0.661      5.25      54.39
     OUTFLOW: ID= 1 (0110)     9.060      0.034      8.75      54.33

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  5.15
                  TIME SHIFT OF PEAK FLOW         (min)=210.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.4199

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84       127.95
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       5.80 (ii)   13.67 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.20         0.08
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.18         0.15         0.324 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25          5.25
     RUNOFF VOLUME    (mm)=      62.61        46.18         54.39
     TOTAL RAINFALL   (mm)=      62.71        62.71         62.71
     RUNOFF COEFFICIENT   =       1.00         0.74          0.87
```

```
       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0111) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0290      0.2324
                          0.0030     0.0104   |   0.0360      0.2562
                          0.0070     0.0755   |   0.0420      0.2800
                          0.0090     0.1297   |   0.0430      0.2801
                          0.0180     0.1702   |   0.5520      0.3715
                          0.0210     0.1985   |   0.9030      0.4069

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0002)      4.390      0.324      5.25      54.39
     OUTFLOW: ID= 1 (0111)      4.390      0.021      8.42      54.19

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  6.48
                   TIME SHIFT OF PEAK FLOW         (min)=190.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.1985

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--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0110):     9.06   0.034     8.75    54.33
        + ID2= 2 (0111):     4.39   0.021     8.42    54.19
          ================================================
          ID = 3 (0005):    13.45   0.055     8.58    54.28

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0006) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84       127.95
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       5.80 (ii)   13.67 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.20         0.08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.18         0.15         0.324 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25          5.25
     RUNOFF VOLUME    (mm)=      62.61        46.18         54.39
     TOTAL RAINFALL   (mm)=      62.71        62.71         62.71
     RUNOFF COEFFICIENT   =       1.00         0.74          0.87


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0008) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.15         0.91
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     245.76        40.00
```

```
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      28.84       127.95
               over (min)         5.00        20.00
     Storage Coeff.  (min)=       7.21 (ii)   15.08 (ii)
     Unit Hyd. Tpeak (min)=       5.00        20.00
     Unit Hyd. peak  (cms)=       0.17         0.07
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.36         0.30          0.661 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25           5.25
     RUNOFF VOLUME    (mm)=      62.61        46.18          54.39
     TOTAL RAINFALL   (mm)=      62.71        62.71          62.71
     RUNOFF COEFFICIENT   =       1.00         0.74           0.87


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0011) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0006):     4.39   0.324     5.25    54.39
       + ID2= 2 (0008):     9.06   0.661     5.25    54.39
         ================================================
         ID = 3 (0011):    13.45   0.985     5.25    54.39

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ****************************
  ** SIMULATION NUMBER:   4 **
  ****************************



--------------------
|    READ STORM    |    Filename: C:\Users\p004967b\AppD
|                  |              ata\Local\Temp\
|                  |              c2142e63-c4e1-4cb3-9aae-d2566f8a26c9\9542bed4
| Ptotal= 73.10 mm |    Comments: 25yr/12hr
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'    hrs   mm/hr |    hrs   mm/hr
                0.25    0.00 |  3.50   12.43 |  6.75    5.12 | 10.00    0.73
                0.50    0.73 |  3.75   12.43 |  7.00    5.12 | 10.25    0.73
                0.75    0.73 |  4.00   12.43 |  7.25    5.12 | 10.50    0.73
                1.00    0.73 |  4.25   12.43 |  7.50    2.92 | 10.75    0.73
                1.25    0.73 |  4.50   33.63 |  7.75    2.92 | 11.00    0.73
                1.50    0.73 |  4.75   33.63 |  8.00    2.92 | 11.25    0.73
                1.75    0.73 |  5.00   33.63 |  8.25    2.92 | 11.50    0.73
                2.00    0.73 |  5.25   33.63 |  8.50    1.46 | 11.75    0.73
                2.25    0.73 |  5.50    9.50 |  8.75    1.46 | 12.00    0.73
                2.50    4.39 |  5.75    9.50 |  9.00    1.46 | 12.25    0.73
                2.75    4.39 |  6.00    9.50 |  9.25    1.46 |
                3.00    4.39 |  6.25    9.50 |  9.50    0.73 |
                3.25    4.39 |  6.50    5.12 |  9.75    0.73 |

--------------------------------------------------------------------------------

--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=  13.45
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.69         10.76
     Dep. Storage     (mm)=       0.10          5.00
     Average Slope     (%)=       1.00          1.00
     Length            (m)=     299.44         40.00
     Mannings n           =      0.013        0.250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'    hrs   mm/hr |    hrs   mm/hr
               0.083    0.00 | 3.167    4.39 | 6.250    9.50 |  9.33    0.73
               0.167    0.00 | 3.250    4.39 | 6.333    5.12 |  9.42    0.73
```

0.250	0.00	3.333	12.43	6.417	5.12	9.50	0.73
0.333	0.73	3.417	12.43	6.500	5.12	9.58	0.73
0.417	0.73	3.500	12.43	6.583	5.12	9.67	0.73
0.500	0.73	3.583	12.43	6.667	5.12	9.75	0.73
0.583	0.73	3.667	12.43	6.750	5.12	9.83	0.73
0.667	0.73	3.750	12.43	6.833	5.12	9.92	0.73
0.750	0.73	3.833	12.43	6.917	5.12	10.00	0.73
0.833	0.73	3.917	12.43	7.000	5.12	10.08	0.73
0.917	0.73	4.000	12.43	7.083	5.12	10.17	0.73
1.000	0.73	4.083	12.43	7.167	5.12	10.25	0.73
1.083	0.73	4.167	12.43	7.250	5.12	10.33	0.73
1.167	0.73	4.250	12.43	7.333	2.92	10.42	0.73
1.250	0.73	4.333	33.63	7.417	2.92	10.50	0.73
1.333	0.73	4.417	33.63	7.500	2.92	10.58	0.73
1.417	0.73	4.500	33.63	7.583	2.92	10.67	0.73
1.500	0.73	4.583	33.63	7.667	2.92	10.75	0.73
1.583	0.73	4.667	33.63	7.750	2.92	10.83	0.73
1.667	0.73	4.750	33.63	7.833	2.92	10.92	0.73
1.750	0.73	4.833	33.63	7.917	2.92	11.00	0.73
1.833	0.73	4.917	33.63	8.000	2.92	11.08	0.73
1.917	0.73	5.000	33.63	8.083	2.92	11.17	0.73
2.000	0.73	5.083	33.63	8.167	2.92	11.25	0.73
2.083	0.73	5.167	33.63	8.250	2.92	11.33	0.73
2.167	0.73	5.250	33.63	8.333	1.46	11.42	0.73
2.250	0.73	5.333	9.50	8.417	1.46	11.50	0.73
2.333	4.39	5.417	9.50	8.500	1.46	11.58	0.73
2.417	4.39	5.500	9.50	8.583	1.46	11.67	0.73
2.500	4.39	5.583	9.50	8.667	1.46	11.75	0.73
2.583	4.39	5.667	9.50	8.750	1.46	11.83	0.73
2.667	4.39	5.750	9.50	8.833	1.46	11.92	0.73
2.750	4.39	5.833	9.50	8.917	1.46	12.00	0.73
2.833	4.39	5.917	9.50	9.000	1.46	12.08	0.73
2.917	4.39	6.000	9.50	9.083	1.46	12.17	0.73
3.000	4.39	6.083	9.50	9.167	1.46	12.25	0.73
3.083	4.39	6.167	9.50	9.250	1.46		

Max.Eff.Inten.(mm/hr)=	33.63	16.40	
over (min)	10.00	30.00	
Storage Coeff. (min)=	7.63 (ii)	25.54 (ii)	
Unit Hyd. Tpeak (min)=	10.00	30.00	
Unit Hyd. peak (cms)=	0.13	0.04	
			TOTALS
PEAK FLOW (cms)=	0.25	0.36	0.585 (iii)
TIME TO PEAK (hrs)=	5.25	5.42	5.25
RUNOFF VOLUME (mm)=	73.00	26.99	36.19
TOTAL RAINFALL (mm)=	73.10	73.10	73.10
RUNOFF COEFFICIENT =	1.00	0.37	0.50

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0010)	Area (ha)= 9.06		
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00	Dir. Conn.(%)= 50.00	
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	8.15	0.91	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	1.00	1.00	
Length (m)=	245.76	40.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	33.63	152.86	
over (min)	5.00	15.00	
Storage Coeff. (min)=	6.78 (ii)	14.11 (ii)	
Unit Hyd. Tpeak (min)=	5.00	15.00	
Unit Hyd. peak (cms)=	0.18	0.08	
			TOTALS
PEAK FLOW (cms)=	0.42	0.37	0.789 (iii)
TIME TO PEAK (hrs)=	5.25	5.25	5.25
RUNOFF VOLUME (mm)=	73.00	55.99	64.49
TOTAL RAINFALL (mm)=	73.10	73.10	73.10
RUNOFF COEFFICIENT =	1.00	0.77	0.88

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:

```
           CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0110) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0340      0.4199
                          0.0010     0.0025   |   0.0690      0.4796
                          0.0070     0.0838   |   0.0820      0.5250
                          0.0100     0.1711   |   0.0910      0.5651
                          0.0210     0.2236   |   0.0930      0.5741
                          0.0250     0.2641   |   1.1670      0.7426
                          0.0260     0.2642   |   1.1680      0.7427
                          0.0310     0.3558   |   1.1690      0.7428
                          0.0320     0.3838   |   1.2030      0.7682

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0010)      9.060      0.789      5.25      64.49
     OUTFLOW: ID= 1 (0110)      9.060      0.069      8.25      64.42

                 PEAK   FLOW   REDUCTION [Qout/Qin](%)=  8.74
                 TIME SHIFT OF PEAK FLOW         (min)=180.00
                 MAXIMUM  STORAGE   USED       (ha.m.)=  0.4796

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63       152.86
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       5.45 (ii)   12.78 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.20         0.08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.21         0.18        0.384 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25         5.25
     RUNOFF VOLUME    (mm)=      73.00        55.99        64.49
     TOTAL RAINFALL   (mm)=      73.10        73.10        73.10
     RUNOFF COEFFICIENT   =       1.00         0.77         0.88


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0111) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0290      0.2324
                          0.0030     0.0104   |   0.0360      0.2562
                          0.0070     0.0755   |   0.0420      0.2800
                          0.0090     0.1297   |   0.0430      0.2801
                          0.0180     0.1702   |   0.5520      0.3715
                          0.0210     0.1985   |   0.9030      0.4069

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0002)      4.390      0.384      5.25      64.49
     OUTFLOW: ID= 1 (0111)      4.390      0.029      8.33      64.29

                 PEAK   FLOW   REDUCTION [Qout/Qin](%)=  7.56
                 TIME SHIFT OF PEAK FLOW         (min)=185.00
                 MAXIMUM  STORAGE   USED       (ha.m.)=  0.2324
```

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--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0110):     9.06   0.069     8.25    64.42
       + ID2= 2 (0111):     4.39   0.029     8.33    64.29
         ================================================
         ID = 3 (0005):    13.45   0.098     8.25    64.38

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0006) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63       152.86
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       5.45 (ii)   12.78 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.20         0.08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.21         0.18         0.384 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25          5.25
     RUNOFF VOLUME    (mm)=      73.00        55.99         64.49
     TOTAL RAINFALL   (mm)=      73.10        73.10         73.10
     RUNOFF COEFFICIENT   =       1.00         0.77          0.88


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0008) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.15         0.91
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     245.76        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      33.63       152.86
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       6.78 (ii)   14.11 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.18         0.08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.42         0.37         0.789 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25          5.25
     RUNOFF VOLUME    (mm)=      73.00        55.99         64.49
     TOTAL RAINFALL   (mm)=      73.10        73.10         73.10
     RUNOFF COEFFICIENT   =       1.00         0.77          0.88


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0011) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0006):     4.39   0.384     5.25    64.49
```

```
       + ID2= 2 (0008):     9.06   0.789     5.25    64.49
         ================================================
         ID = 3 (0011):    13.45   1.173     5.25    64.49

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ****************************
  ** SIMULATION NUMBER:   5 **
  ****************************


--------------------
|    READ STORM    |    Filename: C:\Users\p004967b\AppD
|                  |              ata\Local\Temp\
|                  |              c2142e63-c4e1-4cb3-9aae-d2566f8a26c9\0b5bd3f2
| Ptotal= 80.82 mm |    Comments: 50yr/12hr
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.25    0.00 |  3.50   13.74 |  6.75    5.66 | 10.00    0.81
                0.50    0.81 |  3.75   13.74 |  7.00    5.66 | 10.25    0.81
                0.75    0.81 |  4.00   13.74 |  7.25    5.66 | 10.50    0.81
                1.00    0.81 |  4.25   13.74 |  7.50    3.23 | 10.75    0.81
                1.25    0.81 |  4.50   37.17 |  7.75    3.23 | 11.00    0.81
                1.50    0.81 |  4.75   37.17 |  8.00    3.23 | 11.25    0.81
                1.75    0.81 |  5.00   37.17 |  8.25    3.23 | 11.50    0.81
                2.00    0.81 |  5.25   37.17 |  8.50    1.62 | 11.75    0.81
                2.25    0.81 |  5.50   10.50 |  8.75    1.62 | 12.00    0.81
                2.50    4.85 |  5.75   10.50 |  9.00    1.62 | 12.25    0.81
                2.75    4.85 |  6.00   10.50 |  9.25    1.62 |
                3.00    4.85 |  6.25   10.50 |  9.50    0.81 |
                3.25    4.85 |  6.50    5.66 |  9.75    0.81 |

--------------------------------------------------------------------------------

--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=  13.45
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       2.69         10.76
    Dep. Storage     (mm)=       0.10          5.00
    Average Slope     (%)=       1.00          1.00
    Length            (m)=     299.44         40.00
    Mannings n           =      0.013         0.250

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                        ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
               0.083    0.00 | 3.167    4.85 | 6.250   10.50 |  9.33    0.81
               0.167    0.00 | 3.250    4.85 | 6.333    5.66 |  9.42    0.81
               0.250    0.00 | 3.333   13.74 | 6.417    5.66 |  9.50    0.81
               0.333    0.81 | 3.417   13.74 | 6.500    5.66 |  9.58    0.81
               0.417    0.81 | 3.500   13.74 | 6.583    5.66 |  9.67    0.81
               0.500    0.81 | 3.583   13.74 | 6.667    5.66 |  9.75    0.81
               0.583    0.81 | 3.667   13.74 | 6.750    5.66 |  9.83    0.81
               0.667    0.81 | 3.750   13.74 | 6.833    5.66 |  9.92    0.81
               0.750    0.81 | 3.833   13.74 | 6.917    5.66 | 10.00    0.81
               0.833    0.81 | 3.917   13.74 | 7.000    5.66 | 10.08    0.81
               0.917    0.81 | 4.000   13.74 | 7.083    5.66 | 10.17    0.81
               1.000    0.81 | 4.083   13.74 | 7.167    5.66 | 10.25    0.81
               1.083    0.81 | 4.167   13.74 | 7.250    5.66 | 10.33    0.81
               1.167    0.81 | 4.250   13.74 | 7.333    3.23 | 10.42    0.81
               1.250    0.81 | 4.333   37.17 | 7.417    3.23 | 10.50    0.81
               1.333    0.81 | 4.417   37.17 | 7.500    3.23 | 10.58    0.81
               1.417    0.81 | 4.500   37.17 | 7.583    3.23 | 10.67    0.81
               1.500    0.81 | 4.583   37.17 | 7.667    3.23 | 10.75    0.81
               1.583    0.81 | 4.667   37.17 | 7.750    3.23 | 10.83    0.81
               1.667    0.81 | 4.750   37.17 | 7.833    3.23 | 10.92    0.81
               1.750    0.81 | 4.833   37.17 | 7.917    3.23 | 11.00    0.81
               1.833    0.81 | 4.917   37.17 | 8.000    3.23 | 11.08    0.81
               1.917    0.81 | 5.000   37.17 | 8.083    3.23 | 11.17    0.81
               2.000    0.81 | 5.083   37.17 | 8.167    3.23 | 11.25    0.81
               2.083    0.81 | 5.167   37.17 | 8.250    3.23 | 11.33    0.81
               2.167    0.81 | 5.250   37.17 | 8.333    1.62 | 11.42    0.81
               2.250    0.81 | 5.333   10.50 | 8.417    1.62 | 11.50    0.81
               2.333    4.85 | 5.417   10.50 | 8.500    1.62 | 11.58    0.81
               2.417    4.85 | 5.500   10.50 | 8.583    1.62 | 11.67    0.81
               2.500    4.85 | 5.583   10.50 | 8.667    1.62 | 11.75    0.81
```

2.583	4.85	5.667	10.50	8.750	1.62	11.83	0.81
2.667	4.85	5.750	10.50	8.833	1.62	11.92	0.81
2.750	4.85	5.833	10.50	8.917	1.62	12.00	0.81
2.833	4.85	5.917	10.50	9.000	1.62	12.08	0.81
2.917	4.85	6.000	10.50	9.083	1.62	12.17	0.81
3.000	4.85	6.083	10.50	9.167	1.62	12.25	0.81
3.083	4.85	6.167	10.50	9.250	1.62		

Max.Eff.Inten.(mm/hr)=	37.17	19.34	
over (min)	5.00	25.00	
Storage Coeff. (min)=	7.33 (ii)	24.09 (ii)	
Unit Hyd. Tpeak (min)=	5.00	25.00	
Unit Hyd. peak (cms)=	0.17	0.05	
			TOTALS
PEAK FLOW (cms)=	0.28	0.45	0.704 (iii)
TIME TO PEAK (hrs)=	5.25	5.42	5.25
RUNOFF VOLUME (mm)=	80.72	32.01	41.75
TOTAL RAINFALL (mm)=	80.82	80.82	80.82
RUNOFF COEFFICIENT =	1.00	0.40	0.52

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB	
STANDHYD (0010)	Area (ha)= 9.06
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	8.15	0.91
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.00	1.00
Length	(m)=	245.76	40.00
Mannings n	=	0.013	0.250

Max.Eff.Inten.(mm/hr)=	37.17	171.22	
over (min)	5.00	15.00	
Storage Coeff. (min)=	6.51 (ii)	13.52 (ii)	
Unit Hyd. Tpeak (min)=	5.00	15.00	
Unit Hyd. peak (cms)=	0.18	0.08	
			TOTALS
PEAK FLOW (cms)=	0.47	0.41	0.881 (iii)
TIME TO PEAK (hrs)=	5.25	5.25	5.25
RUNOFF VOLUME (mm)=	80.72	63.35	72.03
TOTAL RAINFALL (mm)=	80.82	80.82	80.82
RUNOFF COEFFICIENT =	1.00	0.78	0.89

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR (0110)
IN= 2---> OUT= 1
DT= 5.0 min

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0340	0.4199
0.0010	0.0025	0.0690	0.4796
0.0070	0.0838	0.0820	0.5250
0.0100	0.1711	0.0910	0.5651
0.0210	0.2236	0.0930	0.5741
0.0250	0.2641	1.1670	0.7426
0.0260	0.2642	1.1680	0.7427
0.0310	0.3558	1.1690	0.7428
0.0320	0.3838	1.2030	0.7682

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0010)	9.060	0.881	5.25	72.03
OUTFLOW: ID= 1 (0110)	9.060	0.082	7.92	71.97

PEAK FLOW REDUCTION [Qout/Qin](%)= 9.31
TIME SHIFT OF PEAK FLOW (min)=160.00

```
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.5250

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17       171.22
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       5.24 (ii)   12.25 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.21         0.09
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.23         0.20          0.428 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25           5.25
     RUNOFF VOLUME    (mm)=      80.72        63.35          72.03
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.78           0.89


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0111) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000    |   0.0290      0.2324
                         0.0030     0.0104    |   0.0360      0.2562
                         0.0070     0.0755    |   0.0420      0.2800
                         0.0090     0.1297    |   0.0430      0.2801
                         0.0180     0.1702    |   0.5520      0.3715
                         0.0210     0.1985    |   0.9030      0.4069

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0002)      4.390      0.428      5.25      72.03
     OUTFLOW: ID= 1 (0111)      4.390      0.036      8.25      71.83

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  8.40
                  TIME SHIFT OF PEAK FLOW         (min)=180.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.2562

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--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0110):     9.06   0.082     7.92    71.97
       + ID2= 2 (0111):     4.39   0.036     8.25    71.83
         ================================================
         ID = 3 (0005):    13.45   0.118     8.25    71.92

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0006) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17       171.22
               over (min)        5.00        15.00
```

```
     Storage Coeff.  (min)=       5.24 (ii)   12.25 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.21         0.09
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.23         0.20          0.428 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25           5.25
     RUNOFF VOLUME    (mm)=      80.72        63.35          72.03
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.78           0.89


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0008) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.15         0.91
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     245.76        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      37.17       171.22
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       6.51 (ii)   13.52 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.18         0.08
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.47         0.41          0.881 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25           5.25
     RUNOFF VOLUME    (mm)=      80.72        63.35          72.03
     TOTAL RAINFALL   (mm)=      80.82        80.82          80.82
     RUNOFF COEFFICIENT   =       1.00         0.78           0.89


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0011) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
--------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0006):     4.39   0.428     5.25    72.03
       + ID2= 2 (0008):     9.06   0.881     5.25    72.03
         ================================================
         ID = 3 (0011):    13.45   1.309     5.25    72.03

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ***************************
  ** SIMULATION NUMBER:   6 **
  ***************************



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|    READ STORM    |    Filename: C:\Users\p004967b\AppD
|                  |              ata\Local\Temp\
|                  |              c2142e63-c4e1-4cb3-9aae-d2566f8a26c9\f1cdf7f0
| Ptotal= 88.54 mm |    Comments: 100yr/12hr
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.25    0.00 |  3.50   15.05 |  6.75    6.20 | 10.00    0.89
                0.50    0.89 |  3.75   15.05 |  7.00    6.20 | 10.25    0.89
                0.75    0.89 |  4.00   15.05 |  7.25    6.20 | 10.50    0.89
                1.00    0.89 |  4.25   15.05 |  7.50    3.54 | 10.75    0.89
                1.25    0.89 |  4.50   40.71 |  7.75    3.54 | 11.00    0.89
                1.50    0.89 |  4.75   40.71 |  8.00    3.54 | 11.25    0.89
                1.75    0.89 |  5.00   40.71 |  8.25    3.54 | 11.50    0.89
                2.00    0.89 |  5.25   40.71 |  8.50    1.77 | 11.75    0.89
```

2.25	0.89	5.50	11.51	8.75	1.77	12.00	0.89
2.50	5.31	5.75	11.51	9.00	1.77	12.25	0.89
2.75	5.31	6.00	11.51	9.25	1.77		
3.00	5.31	6.25	11.51	9.50	0.89		
3.25	5.31	6.50	6.20	9.75	0.89		

CALIB	
STANDHYD (0001)	Area (ha)= 13.45
ID= 1 DT= 5.0 min	Total Imp(%)= 20.00 Dir. Conn.(%)= 20.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	2.69	10.76
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.00	1.00
Length	(m)=	299.44	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	0.00	3.167	5.31	6.250	11.51	9.33	0.89
0.167	0.00	3.250	5.31	6.333	6.20	9.42	0.89
0.250	0.00	3.333	15.05	6.417	6.20	9.50	0.89
0.333	0.89	3.417	15.05	6.500	6.20	9.58	0.89
0.417	0.89	3.500	15.05	6.583	6.20	9.67	0.89
0.500	0.89	3.583	15.05	6.667	6.20	9.75	0.89
0.583	0.89	3.667	15.05	6.750	6.20	9.83	0.89
0.667	0.89	3.750	15.05	6.833	6.20	9.92	0.89
0.750	0.89	3.833	15.05	6.917	6.20	10.00	0.89
0.833	0.89	3.917	15.05	7.000	6.20	10.08	0.89
0.917	0.89	4.000	15.05	7.083	6.20	10.17	0.89
1.000	0.89	4.083	15.05	7.167	6.20	10.25	0.89
1.083	0.89	4.167	15.05	7.250	6.20	10.33	0.89
1.167	0.89	4.250	15.05	7.333	3.54	10.42	0.89
1.250	0.89	4.333	40.71	7.417	3.54	10.50	0.89
1.333	0.89	4.417	40.71	7.500	3.54	10.58	0.89
1.417	0.89	4.500	40.71	7.583	3.54	10.67	0.89
1.500	0.89	4.583	40.71	7.667	3.54	10.75	0.89
1.583	0.89	4.667	40.71	7.750	3.54	10.83	0.89
1.667	0.89	4.750	40.71	7.833	3.54	10.92	0.89
1.750	0.89	4.833	40.71	7.917	3.54	11.00	0.89
1.833	0.89	4.917	40.71	8.000	3.54	11.08	0.89
1.917	0.89	5.000	40.71	8.083	3.54	11.17	0.89
2.000	0.89	5.083	40.71	8.167	3.54	11.25	0.89
2.083	0.89	5.167	40.71	8.250	3.54	11.33	0.89
2.167	0.89	5.250	40.71	8.333	1.77	11.42	0.89
2.250	0.89	5.333	11.51	8.417	1.77	11.50	0.89
2.333	5.31	5.417	11.51	8.500	1.77	11.58	0.89
2.417	5.31	5.500	11.51	8.583	1.77	11.67	0.89
2.500	5.31	5.583	11.51	8.667	1.77	11.75	0.89
2.583	5.31	5.667	11.51	8.750	1.77	11.83	0.89
2.667	5.31	5.750	11.51	8.833	1.77	11.92	0.89
2.750	5.31	5.833	11.51	8.917	1.77	12.00	0.89
2.833	5.31	5.917	11.51	9.000	1.77	12.08	0.89
2.917	5.31	6.000	11.51	9.083	1.77	12.17	0.89
3.000	5.31	6.083	11.51	9.167	1.77	12.25	0.89
3.083	5.31	6.167	11.51	9.250	1.77		

				TOTALS
Max.Eff.Inten.(mm/hr)=		40.71	22.39	
	over (min)	5.00	25.00	
Storage Coeff.	(min)=	7.07 (ii)	22.88 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	25.00	
Unit Hyd. peak	(cms)=	0.17	0.05	
PEAK FLOW	(cms)=	0.30	0.53	0.811 (iii)
TIME TO PEAK	(hrs)=	5.25	5.42	5.25
RUNOFF VOLUME	(mm)=	88.44	37.26	47.50
TOTAL RAINFALL	(mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT	=	1.00	0.42	0.54

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0010) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.15         0.91
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     245.76        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71       189.56
               over (min)        5.00         15.00
     Storage Coeff.  (min)=       6.28 (ii)   13.01 (ii)
     Unit Hyd. Tpeak (min)=       5.00         15.00
     Unit Hyd. peak  (cms)=       0.19         0.08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.51         0.46         0.972 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25          5.25
     RUNOFF VOLUME    (mm)=      88.44        70.77         79.60
     TOTAL RAINFALL   (mm)=      88.54        88.54         88.54
     RUNOFF COEFFICIENT   =       1.00         0.80          0.90


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0110) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000    |   0.0340      0.4199
                         0.0010     0.0025    |   0.0690      0.4796
                         0.0070     0.0838    |   0.0820      0.5250
                         0.0100     0.1711    |   0.0910      0.5651
                         0.0210     0.2236    |   0.0930      0.5741
                         0.0250     0.2641    |   1.1670      0.7426
                         0.0260     0.2642    |   1.1680      0.7427
                         0.0310     0.3558    |   1.1690      0.7428
                         0.0320     0.3838    |   1.2030      0.7682

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0010)     9.060      0.972      5.25      79.60
     OUTFLOW: ID= 1 (0110)     9.060      0.093      7.75      79.53

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  9.57
                  TIME SHIFT OF PEAK FLOW         (min)=150.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.5741

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      40.71       189.56
               over (min)        5.00         15.00
     Storage Coeff.  (min)=       5.05 (ii)   11.78 (ii)
     Unit Hyd. Tpeak (min)=       5.00         15.00
     Unit Hyd. peak  (cms)=       0.21         0.09
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.25         0.22         0.473 (iii)
     TIME TO PEAK    (hrs)=       5.25         5.25          5.25
     RUNOFF VOLUME    (mm)=      88.44        70.77         79.60
     TOTAL RAINFALL   (mm)=      88.54        88.54         88.54
     RUNOFF COEFFICIENT   =       1.00         0.80          0.90
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```
      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  71.0    Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0111) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0290      0.2324
                          0.0030     0.0104   |   0.0360      0.2562
                          0.0070     0.0755   |   0.0420      0.2800
                          0.0090     0.1297   |   0.0430      0.2801
                          0.0180     0.1702   |   0.5520      0.3715
                          0.0210     0.1985   |   0.9030      0.4069

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
    INFLOW : ID= 2 (0002)      4.390      0.473      5.25      79.60
    OUTFLOW: ID= 1 (0111)      4.390      0.042      8.25      79.40

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  8.98
                  TIME SHIFT OF PEAK FLOW         (min)=180.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.2800

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0110):     9.06   0.093     7.75    79.53
       + ID2= 2 (0111):     4.39   0.042     8.25    79.40
         ================================================
         ID = 3 (0005):    13.45   0.135     8.17    79.49

    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0006) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       3.95         0.44
    Dep. Storage     (mm)=       0.10         5.00
    Average Slope     (%)=       1.00         1.00
    Length            (m)=     171.08        40.00
    Mannings n           =      0.013        0.250

    Max.Eff.Inten.(mm/hr)=      40.71       189.56
              over (min)         5.00        15.00
    Storage Coeff.  (min)=       5.05 (ii)   11.78 (ii)
    Unit Hyd. Tpeak (min)=       5.00        15.00
    Unit Hyd. peak  (cms)=       0.21         0.09
                                                        *TOTALS*
    PEAK FLOW       (cms)=       0.25         0.22          0.473 (iii)
    TIME TO PEAK    (hrs)=       5.25         5.25           5.25
    RUNOFF VOLUME    (mm)=      88.44        70.77          79.60
    TOTAL RAINFALL   (mm)=      88.54        88.54          88.54
    RUNOFF COEFFICIENT   =       1.00         0.80           0.90


      (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  71.0    Ia = Dep. Storage  (Above)
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0008) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
    Surface Area     (ha)=       8.15         0.91
    Dep. Storage     (mm)=       0.10         5.00
    Average Slope     (%)=       1.00         1.00
    Length            (m)=     245.76        40.00
```

Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)	=	40.71	189.56
over (min)		5.00	15.00
Storage Coeff. (min)	=	6.28 (ii)	13.01 (ii)
Unit Hyd. Tpeak (min)	=	5.00	15.00
Unit Hyd. peak (cms)	=	0.19	0.08

				TOTALS
PEAK FLOW	(cms)=	0.51	0.46	0.972 (iii)
TIME TO PEAK	(hrs)=	5.25	5.25	5.25
RUNOFF VOLUME	(mm)=	88.44	70.77	79.60
TOTAL RAINFALL	(mm)=	88.54	88.54	88.54
RUNOFF COEFFICIENT	=	1.00	0.80	0.90

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0011)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0006):	4.39	0.473	5.25	79.60
+ ID2= 2 (0008):	9.06	0.972	5.25	79.60
ID = 3 (0011):	13.45	1.445	5.25	79.60

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

****
** SIMULATION NUMBER: 7 **
****

READ STORM | Filename: C:\Users\p004967b\AppData\Local\Temp\c2142e63-c4e1-4cb3-9aae-d2566f8a26c9\0ad2fd4a
Ptotal=212.00 mm | Comments: HURRICANE HAZEL - FINAL 12 HOURS

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
1.00	6.00	4.00	13.00	7.00	23.00	10.00	53.00
2.00	4.00	5.00	17.00	8.00	13.00	11.00	38.00
3.00	6.00	6.00	13.00	9.00	13.00	12.00	13.00

CALIB
STANDHYD (0001) | Area (ha)= 13.45
ID= 1 DT= 5.0 min | Total Imp(%)= 20.00 Dir. Conn.(%)= 20.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	2.69	10.76
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.00	1.00
Length	(m)=	299.44	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	6.00	3.083	13.00	6.083	23.00	9.08	53.00
0.167	6.00	3.167	13.00	6.167	23.00	9.17	53.00
0.250	6.00	3.250	13.00	6.250	23.00	9.25	53.00
0.333	6.00	3.333	13.00	6.333	23.00	9.33	53.00
0.417	6.00	3.417	13.00	6.417	23.00	9.42	53.00
0.500	6.00	3.500	13.00	6.500	23.00	9.50	53.00
0.583	6.00	3.583	13.00	6.583	23.00	9.58	53.00
0.667	6.00	3.667	13.00	6.667	23.00	9.67	53.00
0.750	6.00	3.750	13.00	6.750	23.00	9.75	53.00
0.833	6.00	3.833	13.00	6.833	23.00	9.83	53.00
0.917	6.00	3.917	13.00	6.917	23.00	9.92	53.00
1.000	6.00	4.000	13.00	7.000	23.00	10.00	53.00

1.083	4.00	4.083	17.00	7.083	13.00	10.08	38.00
1.167	4.00	4.167	17.00	7.167	13.00	10.17	38.00
1.250	4.00	4.250	17.00	7.250	13.00	10.25	38.00
1.333	4.00	4.333	17.00	7.333	13.00	10.33	38.00
1.417	4.00	4.417	17.00	7.417	13.00	10.42	38.00
1.500	4.00	4.500	17.00	7.500	13.00	10.50	38.00
1.583	4.00	4.583	17.00	7.583	13.00	10.58	38.00
1.667	4.00	4.667	17.00	7.667	13.00	10.67	38.00
1.750	4.00	4.750	17.00	7.750	13.00	10.75	38.00
1.833	4.00	4.833	17.00	7.833	13.00	10.83	38.00
1.917	4.00	4.917	17.00	7.917	13.00	10.92	38.00
2.000	4.00	5.000	17.00	8.000	13.00	11.00	38.00
2.083	6.00	5.083	13.00	8.083	13.00	11.08	13.00
2.167	6.00	5.167	13.00	8.167	13.00	11.17	13.00
2.250	6.00	5.250	13.00	8.250	13.00	11.25	13.00
2.333	6.00	5.333	13.00	8.333	13.00	11.33	13.00
2.417	6.00	5.417	13.00	8.417	13.00	11.42	13.00
2.500	6.00	5.500	13.00	8.500	13.00	11.50	13.00
2.583	6.00	5.583	13.00	8.583	13.00	11.58	13.00
2.667	6.00	5.667	13.00	8.667	13.00	11.67	13.00
2.750	6.00	5.750	13.00	8.750	13.00	11.75	13.00
2.833	6.00	5.833	13.00	8.833	13.00	11.83	13.00
2.917	6.00	5.917	13.00	8.917	13.00	11.92	13.00
3.000	6.00	6.000	13.00	9.000	13.00	12.00	13.00

Max.Eff.Inten.(mm/hr)=	53.00	44.09	
over (min)	5.00	20.00	
Storage Coeff. (min)=	6.36 (ii)	18.42 (ii)	
Unit Hyd. Tpeak (min)=	5.00	20.00	
Unit Hyd. peak (cms)=	0.19	0.06	
			TOTALS
PEAK FLOW (cms)=	0.40	1.23	1.615 (iii)
TIME TO PEAK (hrs)=	10.00	10.08	10.00
RUNOFF VOLUME (mm)=	211.90	137.89	152.69
TOTAL RAINFALL (mm)=	212.00	212.00	212.00
RUNOFF COEFFICIENT =	1.00	0.65	0.72

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0010)	Area (ha)= 9.06		
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00	Dir. Conn.(%)= 50.00	
	IMPERVIOUS	PERVIOUS (i)	
Surface Area (ha)=	8.15	0.91	
Dep. Storage (mm)=	0.10	5.00	
Average Slope (%)=	1.00	1.00	
Length (m)=	245.76	40.00	
Mannings n =	0.013	0.250	
Max.Eff.Inten.(mm/hr)=	53.00	261.33	
over (min)	5.00	15.00	
Storage Coeff. (min)=	5.65 (ii)	11.57 (ii)	
Unit Hyd. Tpeak (min)=	5.00	15.00	
Unit Hyd. peak (cms)=	0.20	0.09	
			TOTALS
PEAK FLOW (cms)=	0.67	0.65	1.318 (iii)
TIME TO PEAK (hrs)=	10.00	10.00	10.00
RUNOFF VOLUME (mm)=	211.90	192.11	202.00
TOTAL RAINFALL (mm)=	212.00	212.00	212.00
RUNOFF COEFFICIENT =	1.00	0.91	0.95

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR (0110)				
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)

```
=============================================================================================================

       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO    TM
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M   M  O   O
        OOO     T      T    H   H    Y    M   M   OOO
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                  *****  D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\VH Suite 3.0\VO2\voin.dat
  Output  filename: C:\Users\p004967b\AppData\Local\Temp\3b068a81-224f-405b-b61c-b324b8bd3ece\Scenario.out
  Summary filename: C:\Users\p004967b\AppData\Local\Temp\3b068a81-224f-405b-b61c-b324b8bd3ece\Scenario.sum


DATE: 10/07/2016                          TIME: 11:26:32

USER:


COMMENTS: _____________________________________________________________


-------------------------------------------------------------------------------------------------------------
  ****************************
  ** SIMULATION NUMBER:   1 **
  ****************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 424.160
| Ptotal= 32.11 mm |                          B=   1.500
--------------------                          C=   0.723
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  4.00 hrs
                       Storm time step    =  5.00 min
                       Time to peak ratio =  0.33

                     The CORRELATION coefficient is = 0.9996

                      TIME       INPUT INT.          TAB. INT.
                     (min)        (mm/hr)             (mm/hr)
                        5.         118.10              109.60
                       10.          72.80               72.55
                       15.          54.80               55.88
                       30.          33.80               35.01
                       60.          20.80               21.59
                      120.          12.80               13.19
                      360.           5.90                6.00
                      720.           3.70                3.64
                     1440.           2.30                2.21


                  TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                   hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                  0.08    2.39 |  1.08    8.35 |  2.08    5.74 |  3.08    3.07
                  0.17    2.51 |  1.17   11.90 |  2.17    5.31 |  3.17    2.96
                  0.25    2.66 |  1.25   24.99 |  2.25    4.94 |  3.25    2.87
                  0.33    2.82 |  1.33  109.60 |  2.33    4.63 |  3.33    2.78
                  0.42    3.01 |  1.42   31.83 |  2.42    4.37 |  3.42    2.70
                  0.50    3.24 |  1.50   18.18 |  2.50    4.13 |  3.50    2.62
                  0.58    3.50 |  1.58   13.23 |  2.58    3.93 |  3.58    2.55
                  0.67    3.83 |  1.67   10.60 |  2.67    3.75 |  3.67    2.48
                  0.75    4.25 |  1.75    8.94 |  2.75    3.58 |  3.75    2.42
                  0.83    4.78 |  1.83    7.78 |  2.83    3.43 |  3.83    2.36
                  0.92    5.52 |  1.92    6.93 |  2.92    3.30 |  3.92    2.31
                  1.00    6.59 |  2.00    6.27 |  3.00    3.18 |  4.00    2.25


-----------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=  13.45
```

```
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
-------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.69         10.76
     Dep. Storage     (mm)=       0.10          5.00
     Average Slope     (%)=       1.00          1.00
     Length            (m)=     299.44         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     109.60          5.51
               over (min)         5.00         35.00
     Storage Coeff.  (min)=       4.76 (ii)    32.45 (ii)
     Unit Hyd. Tpeak (min)=       5.00         35.00
     Unit Hyd. peak  (cms)=       0.22          0.03
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.58          0.09          0.591 (iii)
     TIME TO PEAK    (hrs)=       1.33          2.00           1.33
     RUNOFF VOLUME    (mm)=      32.01          5.62          10.90
     TOTAL RAINFALL   (mm)=      32.11         32.11          32.11
     RUNOFF COEFFICIENT   =       1.00          0.17           0.34

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-------------------
| CALIB             |
| STANDHYD  (0008) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
-------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.15          0.91
     Dep. Storage     (mm)=       0.10          5.00
     Average Slope     (%)=       1.00          1.00
     Length            (m)=     245.76         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     109.60        210.72
               over (min)         5.00         10.00
     Storage Coeff.  (min)=       4.22 (ii)     8.62 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.24          0.12
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.04          0.36          1.233 (iii)
     TIME TO PEAK    (hrs)=       1.33          1.42           1.33
     RUNOFF VOLUME    (mm)=      32.01         18.67          25.34
     TOTAL RAINFALL   (mm)=      32.11         32.11          32.11
     RUNOFF COEFFICIENT   =       1.00          0.58           0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-------------------
| CALIB             |
| STANDHYD  (0006) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
-------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95          0.44
     Dep. Storage     (mm)=       0.10          5.00
     Average Slope     (%)=       1.00          1.00
     Length            (m)=     171.08         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     109.60        210.72
               over (min)         5.00         10.00
     Storage Coeff.  (min)=       3.40 (ii)     7.80 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.26          0.13
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.55          0.19          0.646 (iii)
```

```
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      32.01        18.67         25.34
     TOTAL RAINFALL   (mm)=      32.11        32.11         32.11
     RUNOFF COEFFICIENT   =       1.00         0.58          0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0011) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0006):     4.39   0.646     1.33    25.34
        + ID2= 2 (0008):     9.06   1.233     1.33    25.34
          ================================================
          ID = 3 (0011):    13.45   1.879     1.33    25.34

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0010) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.15         0.91
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     245.76        40.00
     Mannings n             =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     109.60       210.72
               over (min)          5.00        10.00
     Storage Coeff.  (min)=       4.22 (ii)    8.62 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.24         0.12
                                                        *TOTALS*
     PEAK FLOW       (cms)=       1.04         0.36        1.233 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42         1.33
     RUNOFF VOLUME    (mm)=      32.01        18.67         25.34
     TOTAL RAINFALL   (mm)=      32.11        32.11         32.11
     RUNOFF COEFFICIENT   =       1.00         0.58          0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0110) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0340      0.4199
                          0.0010     0.0025   |   0.0690      0.4796
                          0.0070     0.0838   |   0.0820      0.5250
                          0.0100     0.1711   |   0.0910      0.5651
                          0.0210     0.2236   |   0.0930      0.5741
                          0.0250     0.2641   |   1.1670      0.7426
                          0.0260     0.2642   |   1.1680      0.7427
                          0.0310     0.3558   |   1.1690      0.7428
                          0.0320     0.3838   |   1.2030      0.7682

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0010)     9.060      1.233      1.33      25.34
     OUTFLOW: ID= 1 (0110)     9.060      0.019      4.17      25.27

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=  1.55
                    TIME SHIFT OF PEAK FLOW         (min)=170.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.2144
```

```
--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     109.60       210.72
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       3.40 (ii)    7.80 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.26         0.13
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.55         0.19          0.646 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42           1.33
     RUNOFF VOLUME    (mm)=      32.01        18.67          25.34
     TOTAL RAINFALL   (mm)=      32.11        32.11          32.11
     RUNOFF COEFFICIENT   =       1.00         0.58           0.79

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0111) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0290      0.2324
                          0.0030     0.0104   |   0.0360      0.2562
                          0.0070     0.0755   |   0.0420      0.2800
                          0.0090     0.1297   |   0.0430      0.2801
                          0.0180     0.1702   |   0.5520      0.3715
                          0.0210     0.1985   |   0.9030      0.4069

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0002)      4.390      0.646      1.33      25.34
     OUTFLOW: ID= 1 (0111)      4.390      0.008      4.17      25.14

                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=  1.24
                    TIME SHIFT OF PEAK FLOW         (min)=170.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=  0.1029

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--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0110):     9.06   0.019     4.17    25.27
        + ID2= 2 (0111):     4.39   0.008     4.17    25.14
          ================================================
          ID = 3 (0005):    13.45   0.027     4.17    25.23

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ****************************
  ** SIMULATION NUMBER:   2 **
  ****************************


--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 578.969
| Ptotal= 42.88 mm |                          B=   1.508
--------------------                          C=   0.727
                         used in:   INTENSITY =  A / (t + B)^C

                         Duration of storm  =  4.00 hrs
                         Storm time step    =  5.00 min
                         Time to peak ratio =  0.33

                     The CORRELATION coefficient is = 0.9997
```

TIME (min)	INPUT INT. (mm/hr)	TAB. INT. (mm/hr)
5.	159.00	148.35
10.	98.00	98.02
15.	73.80	75.40
30.	45.50	47.13
60.	28.00	28.98
120.	17.20	17.67
360.	8.00	8.00
720.	4.90	4.84
1440.	3.00	2.93

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.08	3.15	1.08	11.09	2.08	7.60	3.08	4.04
0.17	3.31	1.17	15.85	2.17	7.02	3.17	3.91
0.25	3.50	1.25	33.48	2.25	6.54	3.25	3.78
0.33	3.72	1.33	148.35	2.33	6.13	3.33	3.66
0.42	3.97	1.42	42.72	2.42	5.77	3.42	3.56
0.50	4.27	1.50	24.29	2.50	5.46	3.50	3.46
0.58	4.63	1.58	17.63	2.58	5.19	3.58	3.36
0.67	5.06	1.67	14.10	2.67	4.95	3.67	3.27
0.75	5.61	1.75	11.87	2.75	4.73	3.75	3.19
0.83	6.33	1.83	10.33	2.83	4.53	3.83	3.11
0.92	7.30	1.92	9.19	2.92	4.36	3.92	3.04
1.00	8.74	2.00	8.31	3.00	4.19	4.00	2.97

CALIB			
STANDHYD (0001)	Area (ha)= 13.45		
ID= 1 DT= 5.0 min	Total Imp(%)= 20.00	Dir. Conn.(%)= 20.00	

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	2.69	10.76	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	299.44	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.	(mm/hr)=	148.35	13.26	
	over (min)	5.00	25.00	
Storage Coeff.	(min)=	4.21 (ii)	23.71 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	25.00	
Unit Hyd. peak	(cms)=	0.24	0.05	
				TOTALS
PEAK FLOW	(cms)=	0.83	0.20	0.860 (iii)
TIME TO PEAK	(hrs)=	1.33	1.75	1.33
RUNOFF VOLUME	(mm)=	42.78	10.13	16.66
TOTAL RAINFALL	(mm)=	42.88	42.88	42.88
RUNOFF COEFFICIENT	=	1.00	0.24	0.39

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB			
STANDHYD (0008)	Area (ha)= 9.06		
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00	Dir. Conn.(%)= 50.00	

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	8.15	0.91	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	245.76	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.	(mm/hr)=	148.35	326.31	
	over (min)	5.00	10.00	
Storage Coeff.	(min)=	3.74 (ii)	7.64 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	10.00	
Unit Hyd. peak	(cms)=	0.25	0.13	
				TOTALS

```
     PEAK FLOW       (cms)=       1.47         0.61          1.805 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42           1.33
     RUNOFF VOLUME    (mm)=      42.78        28.01          35.39
     TOTAL RAINFALL   (mm)=      42.88        42.88          42.88
     RUNOFF COEFFICIENT   =       1.00         0.65           0.83

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0006) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=     148.35       326.31
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       3.01 (ii)    6.91 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.28         0.14
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.77         0.31          0.938 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42           1.33
     RUNOFF VOLUME    (mm)=      42.78        28.01          35.39
     TOTAL RAINFALL   (mm)=      42.88        42.88          42.88
     RUNOFF COEFFICIENT   =       1.00         0.65           0.83

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0011) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0006):     4.39   0.938     1.33    35.39
        + ID2= 2 (0008):     9.06   1.805     1.33    35.39
          ================================================
          ID = 3 (0011):    13.45   2.743     1.33    35.39

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0010) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.15         0.91
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     245.76        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=     148.35       326.31
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       3.74 (ii)    7.64 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.25         0.13
                                                      *TOTALS*
     PEAK FLOW       (cms)=       1.47         0.61          1.805 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42           1.33
     RUNOFF VOLUME    (mm)=      42.78        28.01          35.39
     TOTAL RAINFALL   (mm)=      42.88        42.88          42.88
     RUNOFF COEFFICIENT   =       1.00         0.65           0.83
```

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR (0110)
IN= 2---> OUT= 1
DT= 5.0 min

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0340	0.4199
0.0010	0.0025	0.0690	0.4796
0.0070	0.0838	0.0820	0.5250
0.0100	0.1711	0.0910	0.5651
0.0210	0.2236	0.0930	0.5741
0.0250	0.2641	1.1670	0.7426
0.0260	0.2642	1.1680	0.7427
0.0310	0.3558	1.1690	0.7428
0.0320	0.3838	1.2030	0.7682

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0010)	9.060	1.805	1.33	35.39
OUTFLOW: ID= 1 (0110)	9.060	0.028	4.08	35.33

PEAK FLOW REDUCTION [Qout/Qin](%)= 1.53
TIME SHIFT OF PEAK FLOW (min)=165.00
MAXIMUM STORAGE USED (ha.m.)= 0.2956

CALIB
STANDHYD (0002)
ID= 1 DT= 5.0 min

Area (ha)= 4.39
Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	3.95	0.44
Dep. Storage (mm)=	0.10	5.00
Average Slope (%)=	1.00	1.00
Length (m)=	171.08	40.00
Mannings n =	0.013	0.250
Max.Eff.Inten.(mm/hr)=	148.35	326.31
over (min)	5.00	10.00
Storage Coeff. (min)=	3.01 (ii)	6.91 (ii)
Unit Hyd. Tpeak (min)=	5.00	10.00
Unit Hyd. peak (cms)=	0.28	0.14

			TOTALS
PEAK FLOW (cms)=	0.77	0.31	0.938 (iii)
TIME TO PEAK (hrs)=	1.33	1.42	1.33
RUNOFF VOLUME (mm)=	42.78	28.01	35.39
TOTAL RAINFALL (mm)=	42.88	42.88	42.88
RUNOFF COEFFICIENT =	1.00	0.65	0.83

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR (0111)
IN= 2---> OUT= 1
DT= 5.0 min

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0290	0.2324
0.0030	0.0104	0.0360	0.2562
0.0070	0.0755	0.0420	0.2800
0.0090	0.1297	0.0430	0.2801
0.0180	0.1702	0.5520	0.3715
0.0210	0.1985	0.9030	0.4069

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0002)	4.390	0.938	1.33	35.39
OUTFLOW: ID= 1 (0111)	4.390	0.012	4.08	35.20

```
                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  1.31
                  TIME SHIFT OF PEAK FLOW        (min)=165.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.1447

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--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0110):     9.06   0.028     4.08    35.33
        + ID2= 2 (0111):     4.39   0.012     4.08    35.20
          ================================================
          ID = 3 (0005):    13.45   0.040     4.08    35.28

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ****************************
  ** SIMULATION NUMBER:   3 **
  ****************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 665.492
| Ptotal= 50.39 mm |                          B=   1.500
--------------------                          C=   0.723
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  4.00 hrs
                       Storm time step    =  5.00 min
                       Time to peak ratio =  0.33

                     The CORRELATION coefficient is = 0.9996

                      TIME       INPUT INT.           TAB. INT.
                     (min)        (mm/hr)              (mm/hr)
                        5.         185.30               171.95
                       10.         114.20               113.83
                       15.          86.10                87.68
                       30.          53.00                54.94
                       60.          32.70                33.87
                      120.          20.20                20.70
                      360.           9.40                 9.41
                      720.           5.80                 5.71
                     1440.           3.60                 3.46


                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
                0.08    3.75 |  1.08   13.10 |  2.08    9.01 |  3.08    4.81
                0.17    3.94 |  1.17   18.68 |  2.17    8.32 |  3.17    4.65
                0.25    4.17 |  1.25   39.21 |  2.25    7.75 |  3.25    4.50
                0.33    4.43 |  1.33  171.95 |  2.33    7.27 |  3.33    4.36
                0.42    4.73 |  1.42   49.94 |  2.42    6.85 |  3.42    4.23
                0.50    5.08 |  1.50   28.53 |  2.50    6.49 |  3.50    4.11
                0.58    5.50 |  1.58   20.76 |  2.58    6.16 |  3.58    4.00
                0.67    6.01 |  1.67   16.63 |  2.67    5.88 |  3.67    3.90
                0.75    6.66 |  1.75   14.02 |  2.75    5.62 |  3.75    3.80
                0.83    7.50 |  1.83   12.21 |  2.83    5.39 |  3.83    3.70
                0.92    8.66 |  1.92   10.87 |  2.92    5.18 |  3.92    3.62
                1.00   10.34 |  2.00    9.83 |  3.00    4.99 |  4.00    3.53


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--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=  13.45
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=         2.69          10.76
     Dep. Storage     (mm)=         0.10           5.00
     Average Slope     (%)=         1.00           1.00
     Length            (m)=       299.44          40.00
     Mannings n             =       0.013          0.250

     Max.Eff.Inten.(mm/hr)=       171.95          18.23
               over (min)           5.00          25.00
     Storage Coeff.  (min)=         3.97 (ii)     21.14 (ii)
     Unit Hyd. Tpeak (min)=         5.00          25.00
     Unit Hyd. peak  (cms)=         0.24           0.05
                                                          *TOTALS*
     PEAK FLOW       (cms)=         0.99           0.29           1.034 (iii)
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     TIME TO PEAK    (hrs)=       1.33         1.75          1.33
     RUNOFF VOLUME    (mm)=      50.29        13.81         21.11
     TOTAL RAINFALL   (mm)=      50.39        50.39         50.39
     RUNOFF COEFFICIENT   =       1.00         0.27          0.42

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0008) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.15         0.91
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     245.76        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     171.95       403.55
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       3.53 (ii)    7.20 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.26         0.14
                                                      *TOTALS*
     PEAK FLOW       (cms)=       1.74         0.78          2.179 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42           1.33
     RUNOFF VOLUME    (mm)=      50.29        34.78          42.53
     TOTAL RAINFALL   (mm)=      50.39        50.39          50.39
     RUNOFF COEFFICIENT   =       1.00         0.69           0.84

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0006) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     171.95       403.55
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       2.84 (ii)    6.51 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.28         0.14
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.91         0.39          1.127 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42           1.33
     RUNOFF VOLUME    (mm)=      50.29        34.78          42.53
     TOTAL RAINFALL   (mm)=      50.39        50.39          50.39
     RUNOFF COEFFICIENT   =       1.00         0.69           0.84

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| ADD HYD   (0011) |
|   1 +  2 =  3    |          AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0006):     4.39   1.127     1.33    42.53
       + ID2= 2 (0008):     9.06   2.179     1.33    42.53
         ================================================
         ID = 3 (0011):    13.45   3.306     1.33    42.53

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0010) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.15         0.91
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     245.76        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     171.95       403.55
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       3.53 (ii)    7.20 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.26         0.14
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.74         0.78          2.179 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42           1.33
     RUNOFF VOLUME    (mm)=      50.29        34.78          42.53
     TOTAL RAINFALL   (mm)=      50.39        50.39          50.39
     RUNOFF COEFFICIENT   =       1.00         0.69           0.84

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR (0110) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0340      0.4199
                         0.0010     0.0025   |   0.0690      0.4796
                         0.0070     0.0838   |   0.0820      0.5250
                         0.0100     0.1711   |   0.0910      0.5651
                         0.0210     0.2236   |   0.0930      0.5741
                         0.0250     0.2641   |   1.1670      0.7426
                         0.0260     0.2642   |   1.1680      0.7427
                         0.0310     0.3558   |   1.1690      0.7428
                         0.0320     0.3838   |   1.2030      0.7682

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0010)     9.060     2.179      1.33      42.53
     OUTFLOW: ID= 1 (0110)     9.060     0.031      4.17      42.46

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  1.42
                   TIME SHIFT OF PEAK FLOW         (min)=170.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.3561

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     171.95       403.55
               over (min)         5.00        10.00
     Storage Coeff.  (min)=       2.84 (ii)    6.51 (ii)
```

```
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.28         0.14
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.91         0.39         1.127 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      50.29        34.78         42.53
     TOTAL RAINFALL   (mm)=      50.39        50.39         50.39
     RUNOFF COEFFICIENT   =       1.00         0.69          0.84

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0111) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                          0.0000     0.0000   |   0.0290      0.2324
                          0.0030     0.0104   |   0.0360      0.2562
                          0.0070     0.0755   |   0.0420      0.2800
                          0.0090     0.1297   |   0.0430      0.2801
                          0.0180     0.1702   |   0.5520      0.3715
                          0.0210     0.1985   |   0.9030      0.4069

                                 AREA     QPEAK     TPEAK       R.V.
                                 (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0002)      4.390     1.127      1.33       42.53
     OUTFLOW: ID= 1 (0111)      4.390     0.018      4.08       42.33

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  1.61
                  TIME SHIFT OF PEAK FLOW         (min)=165.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.1717

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--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0110):     9.06   0.031     4.17    42.46
        + ID2= 2 (0111):     4.39   0.018     4.08    42.33
          ================================================
          ID = 3 (0005):    13.45   0.049     4.08    42.42

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ****************************
  ** SIMULATION NUMBER:   4 **
  ****************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 792.607
| Ptotal= 59.36 mm |                          B=   1.500
--------------------                          C=   0.725
                         used in:   INTENSITY =  A / (t + B)^C

                         Duration of storm  =  4.00 hrs
                         Storm time step    =  5.00 min
                         Time to peak ratio =  0.33

                      The CORRELATION coefficient is = 0.9997

                       TIME       INPUT INT.           TAB. INT.
                      (min)        (mm/hr)              (mm/hr)
                         5.         219.20               204.03
                        10.         135.10               134.91
                        15.         101.70               103.84
                        30.          62.70                64.98
                        60.          38.60                40.01
                       120.          23.80                24.42
                       360.          11.00                11.08
                       720.           6.80                 6.71
                      1440.           4.20                 4.06


                  TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                   hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
```

0.08	4.38	1.08	15.39	2.08	10.56	3.08	5.63
0.17	4.62	1.17	21.96	2.17	9.76	3.17	5.44
0.25	4.88	1.25	46.25	2.25	9.09	3.25	5.27
0.33	5.18	1.33	204.03	2.33	8.52	3.33	5.11
0.42	5.53	1.42	58.96	2.42	8.03	3.42	4.95
0.50	5.94	1.50	33.61	2.50	7.60	3.50	4.81
0.58	6.44	1.58	24.43	2.58	7.22	3.58	4.68
0.67	7.05	1.67	19.55	2.67	6.88	3.67	4.56
0.75	7.81	1.75	16.47	2.75	6.58	3.75	4.44
0.83	8.80	1.83	14.34	2.83	6.31	3.83	4.33
0.92	10.15	1.92	12.76	2.92	6.06	3.92	4.23
1.00	12.14	2.00	11.54	3.00	5.84	4.00	4.13

CALIB				
STANDHYD (0001)	Area (ha)= 13.45			
ID= 1 DT= 5.0 min	Total Imp(%)= 20.00	Dir. Conn.(%)= 20.00		
	IMPERVIOUS	PERVIOUS (i)		
Surface Area (ha)=	2.69	10.76		
Dep. Storage (mm)=	0.10	5.00		
Average Slope (%)=	1.00	1.00		
Length (m)=	299.44	40.00		
Mannings n =	0.013	0.250		
Max.Eff.Inten.(mm/hr)=	204.03	30.07		
over (min)	5.00	20.00		
Storage Coeff. (min)=	3.71 (ii)	17.76 (ii)		
Unit Hyd. Tpeak (min)=	5.00	20.00		
Unit Hyd. peak (cms)=	0.25	0.06		
			TOTALS	
PEAK FLOW (cms)=	1.21	0.46	1.304 (iii)	
TIME TO PEAK (hrs)=	1.33	1.58	1.33	
RUNOFF VOLUME (mm)=	59.26	18.69	26.80	
TOTAL RAINFALL (mm)=	59.36	59.36	59.36	
RUNOFF COEFFICIENT =	1.00	0.31	0.45	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB				
STANDHYD (0008)	Area (ha)= 9.06			
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00	Dir. Conn.(%)= 50.00		
	IMPERVIOUS	PERVIOUS (i)		
Surface Area (ha)=	8.15	0.91		
Dep. Storage (mm)=	0.10	5.00		
Average Slope (%)=	1.00	1.00		
Length (m)=	245.76	40.00		
Mannings n =	0.013	0.250		
Max.Eff.Inten.(mm/hr)=	204.03	505.91		
over (min)	5.00	10.00		
Storage Coeff. (min)=	3.29 (ii)	6.73 (ii)		
Unit Hyd. Tpeak (min)=	5.00	10.00		
Unit Hyd. peak (cms)=	0.27	0.14		
			TOTALS	
PEAK FLOW (cms)=	2.12	1.01	2.691 (iii)	
TIME TO PEAK (hrs)=	1.33	1.42	1.33	
RUNOFF VOLUME (mm)=	59.26	43.05	51.15	
TOTAL RAINFALL (mm)=	59.36	59.36	59.36	
RUNOFF COEFFICIENT =	1.00	0.73	0.86	

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
| CALIB             |
| STANDHYD  (0006) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     204.03       505.91
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.65 (ii)    6.08 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.29         0.15
                                                        *TOTALS*
     PEAK FLOW       (cms)=       1.09         0.51         1.386 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      59.26        43.05         51.15
     TOTAL RAINFALL   (mm)=      59.36        59.36         59.36
     RUNOFF COEFFICIENT   =       1.00         0.73          0.86

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| ADD HYD   (0011) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0006):     4.39   1.386     1.33    51.15
        + ID2= 2 (0008):     9.06   2.691     1.33    51.15
          ================================================
          ID = 3 (0011):    13.45   4.077     1.33    51.15

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB             |
| STANDHYD  (0010) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.15         0.91
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     245.76        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     204.03       505.91
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       3.29 (ii)    6.73 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.27         0.14
                                                        *TOTALS*
     PEAK FLOW       (cms)=       2.12         1.01         2.691 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      59.26        43.05         51.15
     TOTAL RAINFALL   (mm)=      59.36        59.36         59.36
     RUNOFF COEFFICIENT   =       1.00         0.73          0.86

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| RESERVOIR (0110) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000    |   0.0340      0.4199
```

0.0010	0.0025	0.0690	0.4796
0.0070	0.0838	0.0820	0.5250
0.0100	0.1711	0.0910	0.5651
0.0210	0.2236	0.0930	0.5741
0.0250	0.2641	1.1670	0.7426
0.0260	0.2642	1.1680	0.7427
0.0310	0.3558	1.1690	0.7428
0.0320	0.3838	1.2030	0.7682

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0010)	9.060	2.691	1.33	51.15
OUTFLOW: ID= 1 (0110)	9.060	0.040	4.08	51.08

PEAK FLOW REDUCTION [Qout/Qin](%)= 1.48
TIME SHIFT OF PEAK FLOW (min)=165.00
MAXIMUM STORAGE USED (ha.m.)= 0.4299

CALIB	
STANDHYD (0002)	Area (ha)= 4.39
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	3.95	0.44	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	171.08	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)=		204.03	505.91	
over (min)		5.00	10.00	
Storage Coeff.	(min)=	2.65 (ii)	6.08 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	10.00	
Unit Hyd. peak	(cms)=	0.29	0.15	
				TOTALS
PEAK FLOW	(cms)=	1.09	0.51	1.386 (iii)
TIME TO PEAK	(hrs)=	1.33	1.42	1.33
RUNOFF VOLUME	(mm)=	59.26	43.05	51.15
TOTAL RAINFALL	(mm)=	59.36	59.36	59.36
RUNOFF COEFFICIENT	=	1.00	0.73	0.86

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR (0111)				
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0290	0.2324
	0.0030	0.0104	0.0360	0.2562
	0.0070	0.0755	0.0420	0.2800
	0.0090	0.1297	0.0430	0.2801
	0.0180	0.1702	0.5520	0.3715
	0.0210	0.1985	0.9030	0.4069

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0002)	4.390	1.386	1.33	51.15
OUTFLOW: ID= 1 (0111)	4.390	0.023	4.08	50.95

PEAK FLOW REDUCTION [Qout/Qin](%)= 1.63
TIME SHIFT OF PEAK FLOW (min)=165.00
MAXIMUM STORAGE USED (ha.m.)= 0.2050

ADD HYD (0005)				
1 + 2 = 3	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0110):	9.06	0.040	4.08	51.08
+ ID2= 2 (0111):	4.39	0.023	4.08	50.95
ID = 3 (0005):	13.45	0.062	4.08	51.04

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

****
** SIMULATION NUMBER: 5 **
****

CHICAGO STORM	Ptotal= 66.15 mm

IDF curve parameters: A= 878.493
B= 1.500
C= 0.724
used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step = 5.00 min
Time to peak ratio = 0.33

The CORRELATION coefficient is = 0.9997

TIME (min)	INPUT INT. (mm/hr)	TAB. INT. (mm/hr)
5.	243.60	226.56
10.	150.20	149.90
15.	113.20	115.42
30.	69.80	72.27
60.	43.00	44.52
120.	26.50	27.20
360.	12.30	12.35
720.	7.60	7.49
1440.	4.70	4.54

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.08	4.90	1.08	17.18	2.08	11.80	3.08	6.30
0.17	5.16	1.17	24.50	2.17	10.90	3.17	6.09
0.25	5.46	1.25	51.51	2.25	10.16	3.25	5.89
0.33	5.79	1.33	226.56	2.33	9.52	3.33	5.71
0.42	6.18	1.42	65.63	2.42	8.97	3.42	5.54
0.50	6.65	1.50	37.45	2.50	8.49	3.50	5.38
0.58	7.20	1.58	27.24	2.58	8.07	3.58	5.24
0.67	7.87	1.67	21.81	2.67	7.69	3.67	5.10
0.75	8.72	1.75	18.38	2.75	7.36	3.75	4.97
0.83	9.83	1.83	16.01	2.83	7.05	3.83	4.85
0.92	11.34	1.92	14.25	2.92	6.78	3.92	4.73
1.00	13.55	2.00	12.89	3.00	6.53	4.00	4.62

CALIB STANDHYD (0001) ID= 1 DT= 5.0 min	Area (ha)= 13.45 Total Imp(%)= 20.00 Dir. Conn.(%)= 20.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	2.69	10.76	
Dep. Storage	(mm)=	0.10	5.00	
Average Slope	(%)=	1.00	1.00	
Length	(m)=	299.44	40.00	
Mannings n	=	0.013	0.250	
Max.Eff.Inten.(mm/hr)	=	226.56	36.82	
over (min)		5.00	20.00	
Storage Coeff.	(min)=	3.56 (ii)	16.51 (ii)	
Unit Hyd. Tpeak	(min)=	5.00	20.00	
Unit Hyd. peak	(cms)=	0.26	0.06	
				TOTALS
PEAK FLOW	(cms)=	1.36	0.59	1.491 (iii)
TIME TO PEAK	(hrs)=	1.33	1.58	1.33
RUNOFF VOLUME	(mm)=	66.05	22.68	31.35
TOTAL RAINFALL	(mm)=	66.15	66.15	66.15
RUNOFF COEFFICIENT	=	1.00	0.34	0.47

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0008) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.15         0.91
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     245.76        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     226.56       580.70
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       3.16 (ii)    6.45 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.27         0.14
                                                      *TOTALS*
     PEAK FLOW       (cms)=       2.38         1.19         3.063 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      66.05        49.41         57.73
     TOTAL RAINFALL   (mm)=      66.15        66.15         66.15
     RUNOFF COEFFICIENT   =       1.00         0.75          0.87

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0006) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=     226.56       580.70
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.54 (ii)    5.83 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.29         0.15
                                                      *TOTALS*
     PEAK FLOW       (cms)=       1.23         0.60         1.573 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      66.05        49.41         57.73
     TOTAL RAINFALL   (mm)=      66.15        66.15         66.15
     RUNOFF COEFFICIENT   =       1.00         0.75          0.87

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0011) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0006):     4.39   1.573     1.33    57.73
        + ID2= 2 (0008):     9.06   3.063     1.33    57.73
          ================================================
          ID = 3 (0011):    13.45   4.636     1.33    57.73

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0010) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
```

```
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.15          0.91
     Dep. Storage     (mm)=       0.10          5.00
     Average Slope     (%)=       1.00          1.00
     Length            (m)=     245.76         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     226.56        580.70
               over (min)         5.00         10.00
     Storage Coeff.  (min)=       3.16 (ii)     6.45 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.27          0.14
                                                        *TOTALS*
     PEAK FLOW       (cms)=       2.38          1.19          3.063 (iii)
     TIME TO PEAK    (hrs)=       1.33          1.42           1.33
     RUNOFF VOLUME    (mm)=      66.05         49.41          57.73
     TOTAL RAINFALL   (mm)=      66.15         66.15          66.15
     RUNOFF COEFFICIENT   =       1.00          0.75           0.87

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0110) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000    |   0.0340      0.4199
                         0.0010     0.0025    |   0.0690      0.4796
                         0.0070     0.0838    |   0.0820      0.5250
                         0.0100     0.1711    |   0.0910      0.5651
                         0.0210     0.2236    |   0.0930      0.5741
                         0.0250     0.2641    |   1.1670      0.7426
                         0.0260     0.2642    |   1.1680      0.7427
                         0.0310     0.3558    |   1.1690      0.7428
                         0.0320     0.3838    |   1.2030      0.7682

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0010)      9.060      3.063      1.33       57.73
     OUTFLOW: ID= 1 (0110)      9.060      0.067      4.08       57.66

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  2.19
                   TIME SHIFT OF PEAK FLOW         (min)=165.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.4763

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95          0.44
     Dep. Storage     (mm)=       0.10          5.00
     Average Slope     (%)=       1.00          1.00
     Length            (m)=     171.08         40.00
     Mannings n           =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     226.56        580.70
               over (min)         5.00         10.00
     Storage Coeff.  (min)=       2.54 (ii)     5.83 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.29          0.15
                                                        *TOTALS*
     PEAK FLOW       (cms)=       1.23          0.60          1.573 (iii)
     TIME TO PEAK    (hrs)=       1.33          1.42           1.33
     RUNOFF VOLUME    (mm)=      66.05         49.41          57.73
     TOTAL RAINFALL   (mm)=      66.15         66.15          66.15
     RUNOFF COEFFICIENT   =       1.00          0.75           0.87

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

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--------------------
| RESERVOIR (0111) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |
--------------------
```

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0290	0.2324
0.0030	0.0104	0.0360	0.2562
0.0070	0.0755	0.0420	0.2800
0.0090	0.1297	0.0430	0.2801
0.0180	0.1702	0.5520	0.3715
0.0210	0.1985	0.9030	0.4069

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0002)	4.390	1.573	1.33	57.73
OUTFLOW: ID= 1 (0111)	4.390	0.028	4.08	57.53

```
                PEAK   FLOW   REDUCTION [Qout/Qin](%)=  1.80
                TIME SHIFT OF PEAK FLOW        (min)=165.00
                MAXIMUM  STORAGE   USED       (ha.m.)=  0.2297

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--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |
--------------------
```

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0110):	9.06	0.067	4.08	57.66
+ ID2= 2 (0111):	4.39	0.028	4.08	57.53
ID = 3 (0005):	13.45	0.095	4.08	57.62

```
    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ***************************
  ** SIMULATION NUMBER:   6 **
  ***************************


--------------------
| CHICAGO STORM    |
| Ptotal= 73.18 mm |
--------------------
```

IDF curve parameters: A= 966.620
B= 1.507
C= 0.723

used in: INTENSITY = A / (t + B)^C

Duration of storm = 4.00 hrs
Storm time step = 5.00 min
Time to peak ratio = 0.33

The CORRELATION coefficient is = 0.9996

TIME (min)	INPUT INT. (mm/hr)	TAB. INT. (mm/hr)
5.	268.60	249.56
10.	165.50	165.26
15.	124.70	127.32
30.	76.90	79.78
60.	47.40	49.19
120.	29.20	30.07
360.	13.60	13.67
720.	8.40	8.29
1440.	5.20	5.03

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.08	5.44	1.08	19.04	2.08	13.08	3.08	6.99
0.17	5.73	1.17	27.14	2.17	12.09	3.17	6.75
0.25	6.06	1.25	56.99	2.25	11.27	3.25	6.54
0.33	6.43	1.33	249.56	2.33	10.56	3.33	6.34
0.42	6.86	1.42	72.58	2.42	9.95	3.42	6.15
0.50	7.37	1.50	41.46	2.50	9.42	3.50	5.98
0.58	7.99	1.58	30.17	2.58	8.95	3.58	5.81
0.67	8.74	1.67	24.16	2.67	8.54	3.67	5.66
0.75	9.68	1.75	20.37	2.75	8.16	3.75	5.52
0.83	10.90	1.83	17.74	2.83	7.83	3.83	5.38
0.92	12.57	1.92	15.79	2.92	7.52	3.92	5.25
1.00	15.03	2.00	14.29	3.00	7.24	4.00	5.13

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```
| CALIB           |
| STANDHYD  (0001) |   Area    (ha)=  13.45
|ID= 1 DT= 5.0 min |   Total Imp(%)=  20.00   Dir. Conn.(%)=  20.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       2.69         10.76
     Dep. Storage     (mm)=       0.10          5.00
     Average Slope     (%)=       1.00          1.00
     Length            (m)=     299.44         40.00
     Mannings n            =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     249.56         44.23
               over (min)        5.00         20.00
     Storage Coeff.  (min)=       3.42 (ii)    15.46 (ii)
     Unit Hyd. Tpeak (min)=       5.00         20.00
     Unit Hyd. peak  (cms)=       0.26          0.07
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.52          0.74          1.689 (iii)
     TIME TO PEAK    (hrs)=       1.33          1.58           1.33
     RUNOFF VOLUME    (mm)=      73.08         27.04          36.25
     TOTAL RAINFALL   (mm)=      73.18         73.18          73.18
     RUNOFF COEFFICIENT   =       1.00          0.37           0.50

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
              YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB           |
| STANDHYD  (0008) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.15          0.91
     Dep. Storage     (mm)=       0.10          5.00
     Average Slope     (%)=       1.00          1.00
     Length            (m)=     245.76         40.00
     Mannings n            =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     249.56        658.03
               over (min)        5.00         10.00
     Storage Coeff.  (min)=       3.04 (ii)     6.21 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.27          0.15
                                                          *TOTALS*
     PEAK FLOW       (cms)=       2.66          1.37          3.450 (iii)
     TIME TO PEAK    (hrs)=       1.33          1.42           1.33
     RUNOFF VOLUME    (mm)=      73.08         56.07          64.58
     TOTAL RAINFALL   (mm)=      73.18         73.18          73.18
     RUNOFF COEFFICIENT   =       1.00          0.77           0.88

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB           |
| STANDHYD  (0006) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95          0.44
     Dep. Storage     (mm)=       0.10          5.00
     Average Slope     (%)=       1.00          1.00
     Length            (m)=     171.08         40.00
     Mannings n            =      0.013         0.250

     Max.Eff.Inten.(mm/hr)=     249.56        658.03
               over (min)        5.00         10.00
     Storage Coeff.  (min)=       2.45 (ii)     5.61 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=       0.30          0.15
```

				TOTALS
PEAK FLOW	(cms)=	1.37	0.69	1.767 (iii)
TIME TO PEAK	(hrs)=	1.33	1.42	1.33
RUNOFF VOLUME	(mm)=	73.08	56.07	64.58
TOTAL RAINFALL	(mm)=	73.18	73.18	73.18
RUNOFF COEFFICIENT	=	1.00	0.77	0.88

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0011)
1 + 2 = 3

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0006):	4.39	1.767	1.33	64.58
+ ID2= 2 (0008):	9.06	3.450	1.33	64.58
ID = 3 (0011):	13.45	5.218	1.33	64.58

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB
STANDHYD (0010)
ID= 1 DT= 5.0 min

Area (ha)= 9.06
Total Imp(%)= 90.00 Dir. Conn.(%)= 50.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	8.15	0.91
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.00	1.00
Length	(m)=	245.76	40.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		249.56	658.03
over (min)		5.00	10.00
Storage Coeff.	(min)=	3.04 (ii)	6.21 (ii)
Unit Hyd. Tpeak	(min)=	5.00	10.00
Unit Hyd. peak	(cms)=	0.27	0.15

				TOTALS
PEAK FLOW	(cms)=	2.66	1.37	3.450 (iii)
TIME TO PEAK	(hrs)=	1.33	1.42	1.33
RUNOFF VOLUME	(mm)=	73.08	56.07	64.58
TOTAL RAINFALL	(mm)=	73.18	73.18	73.18
RUNOFF COEFFICIENT	=	1.00	0.77	0.88

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR (0110)
IN= 2---> OUT= 1
DT= 5.0 min

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0340	0.4199
0.0010	0.0025	0.0690	0.4796
0.0070	0.0838	0.0820	0.5250
0.0100	0.1711	0.0910	0.5651
0.0210	0.2236	0.0930	0.5741
0.0250	0.2641	1.1670	0.7426
0.0260	0.2642	1.1680	0.7427
0.0310	0.3558	1.1690	0.7428
0.0320	0.3838	1.2030	0.7682

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0010)	9.060	3.450	1.33	64.58
OUTFLOW: ID= 1 (0110)	9.060	0.081	4.08	64.51

PEAK FLOW REDUCTION [Qout/Qin](%)= 2.35
TIME SHIFT OF PEAK FLOW (min)=165.00

```
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.5226

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=     249.56       658.03
               over (min)        5.00        10.00
     Storage Coeff.  (min)=       2.45 (ii)    5.61 (ii)
     Unit Hyd. Tpeak (min)=       5.00        10.00
     Unit Hyd. peak  (cms)=       0.30         0.15
                                                        *TOTALS*
     PEAK FLOW       (cms)=       1.37         0.69         1.767 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=      73.08        56.07         64.58
     TOTAL RAINFALL   (mm)=      73.18        73.18         73.18
     RUNOFF COEFFICIENT   =       1.00         0.77          0.88

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0111) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0290      0.2324
                         0.0030     0.0104   |   0.0360      0.2562
                         0.0070     0.0755   |   0.0420      0.2800
                         0.0090     0.1297   |   0.0430      0.2801
                         0.0180     0.1702   |   0.5520      0.3715
                         0.0210     0.1985   |   0.9030      0.4069

                               AREA     QPEAK     TPEAK       R.V.
                               (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0002)     4.390      1.767      1.33      64.58
     OUTFLOW: ID= 1 (0111)     4.390      0.035      4.08      64.38

                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=  2.01
                  TIME SHIFT OF PEAK FLOW        (min)=165.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=  0.2545

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--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0110):     9.06   0.081     4.08    64.51
        + ID2= 2 (0111):     4.39   0.035     4.08    64.38
          ================================================
          ID = 3 (0005):    13.45   0.117     4.08    64.46

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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  ***************************
  ** SIMULATION NUMBER:   7 **
  ***************************



--------------------
|    READ STORM    |    Filename: C:\Users\p004967b\AppD
|                  |              ata\Local\Temp\
|                  |              3b068a81-224f-405b-b61c-b324b8bd3ece\1cda33d7
| Ptotal=212.00 mm |    Comments: HURRICANE HAZEL - FINAL 12 HOURS
--------------------
                TIME    RAIN |  TIME    RAIN |'  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |'   hrs   mm/hr |   hrs   mm/hr
```

1.00	6.00	4.00	13.00	7.00	23.00	10.00	53.00
2.00	4.00	5.00	17.00	8.00	13.00	11.00	38.00
3.00	6.00	6.00	13.00	9.00	13.00	12.00	13.00

CALIB	
STANDHYD (0001)	Area (ha)= 13.45
ID= 1 DT= 5.0 min	Total Imp(%)= 20.00 Dir. Conn.(%)= 20.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	2.69	10.76
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.00	1.00
Length	(m)=	299.44	40.00
Mannings n	=	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	6.00	3.083	13.00	6.083	23.00	9.08	53.00
0.167	6.00	3.167	13.00	6.167	23.00	9.17	53.00
0.250	6.00	3.250	13.00	6.250	23.00	9.25	53.00
0.333	6.00	3.333	13.00	6.333	23.00	9.33	53.00
0.417	6.00	3.417	13.00	6.417	23.00	9.42	53.00
0.500	6.00	3.500	13.00	6.500	23.00	9.50	53.00
0.583	6.00	3.583	13.00	6.583	23.00	9.58	53.00
0.667	6.00	3.667	13.00	6.667	23.00	9.67	53.00
0.750	6.00	3.750	13.00	6.750	23.00	9.75	53.00
0.833	6.00	3.833	13.00	6.833	23.00	9.83	53.00
0.917	6.00	3.917	13.00	6.917	23.00	9.92	53.00
1.000	6.00	4.000	13.00	7.000	23.00	10.00	53.00
1.083	4.00	4.083	17.00	7.083	13.00	10.08	38.00
1.167	4.00	4.167	17.00	7.167	13.00	10.17	38.00
1.250	4.00	4.250	17.00	7.250	13.00	10.25	38.00
1.333	4.00	4.333	17.00	7.333	13.00	10.33	38.00
1.417	4.00	4.417	17.00	7.417	13.00	10.42	38.00
1.500	4.00	4.500	17.00	7.500	13.00	10.50	38.00
1.583	4.00	4.583	17.00	7.583	13.00	10.58	38.00
1.667	4.00	4.667	17.00	7.667	13.00	10.67	38.00
1.750	4.00	4.750	17.00	7.750	13.00	10.75	38.00
1.833	4.00	4.833	17.00	7.833	13.00	10.83	38.00
1.917	4.00	4.917	17.00	7.917	13.00	10.92	38.00
2.000	4.00	5.000	17.00	8.000	13.00	11.00	38.00
2.083	6.00	5.083	13.00	8.083	13.00	11.08	13.00
2.167	6.00	5.167	13.00	8.167	13.00	11.17	13.00
2.250	6.00	5.250	13.00	8.250	13.00	11.25	13.00
2.333	6.00	5.333	13.00	8.333	13.00	11.33	13.00
2.417	6.00	5.417	13.00	8.417	13.00	11.42	13.00
2.500	6.00	5.500	13.00	8.500	13.00	11.50	13.00
2.583	6.00	5.583	13.00	8.583	13.00	11.58	13.00
2.667	6.00	5.667	13.00	8.667	13.00	11.67	13.00
2.750	6.00	5.750	13.00	8.750	13.00	11.75	13.00
2.833	6.00	5.833	13.00	8.833	13.00	11.83	13.00
2.917	6.00	5.917	13.00	8.917	13.00	11.92	13.00
3.000	6.00	6.000	13.00	9.000	13.00	12.00	13.00

Max.Eff.Inten.(mm/hr)=	53.00	44.09		
over (min)	5.00	20.00		
Storage Coeff. (min)=	6.36 (ii)	18.42 (ii)		
Unit Hyd. Tpeak (min)=	5.00	20.00		
Unit Hyd. peak (cms)=	0.19	0.06		
			TOTALS	
PEAK FLOW (cms)=	0.40	1.23	1.615 (iii)	
TIME TO PEAK (hrs)=	10.00	10.08	10.00	
RUNOFF VOLUME (mm)=	211.90	137.89	152.69	
TOTAL RAINFALL (mm)=	212.00	212.00	212.00	
RUNOFF COEFFICIENT =	1.00	0.65	0.72	

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
YOU SHOULD CONSIDER SPLITTING THE AREA.

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

```
| CALIB             |
| STANDHYD  (0008) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.15         0.91
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     245.76        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      53.00       261.33
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       5.65 (ii)   11.57 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.20         0.09
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.67         0.65         1.318 (iii)
     TIME TO PEAK    (hrs)=      10.00        10.00         10.00
     RUNOFF VOLUME    (mm)=     211.90       192.11        202.00
     TOTAL RAINFALL   (mm)=     212.00       212.00        212.00
     RUNOFF COEFFICIENT   =       1.00         0.91          0.95


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB             |
| STANDHYD  (0006) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      53.00       261.33
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       4.55 (ii)   10.46 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.23         0.09
                                                      *TOTALS*
     PEAK FLOW       (cms)=       0.32         0.32         0.640 (iii)
     TIME TO PEAK    (hrs)=      10.00        10.00         10.00
     RUNOFF VOLUME    (mm)=     211.90       192.11        202.00
     TOTAL RAINFALL   (mm)=     212.00       212.00        212.00
     RUNOFF COEFFICIENT   =       1.00         0.91          0.95

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| ADD HYD   (0011) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0006):     4.39   0.640    10.00   202.00
       + ID2= 2 (0008):     9.06   1.318    10.00   202.00
         ================================================
         ID = 3 (0011):    13.45   1.958    10.00   202.00

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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--------------------
| CALIB             |
| STANDHYD  (0010) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.15         0.91
```

```
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     245.76        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      53.00       261.33
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       5.65 (ii)   11.57 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.20         0.09
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.67         0.65         1.318 (iii)
     TIME TO PEAK    (hrs)=      10.00        10.00         10.00
     RUNOFF VOLUME    (mm)=     211.90       192.11        202.00
     TOTAL RAINFALL   (mm)=     212.00       212.00        212.00
     RUNOFF COEFFICIENT   =       1.00         0.91          0.95


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| RESERVOIR (0110) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0340      0.4199
                         0.0010     0.0025   |   0.0690      0.4796
                         0.0070     0.0838   |   0.0820      0.5250
                         0.0100     0.1711   |   0.0910      0.5651
                         0.0210     0.2236   |   0.0930      0.5741
                         0.0250     0.2641   |   1.1670      0.7426
                         0.0260     0.2642   |   1.1680      0.7427
                         0.0310     0.3558   |   1.1690      0.7428
                         0.0320     0.3838   |   1.2030      0.7682

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0010)      9.060      1.318     10.00     202.00
     OUTFLOW: ID= 1 (0110)      9.060      1.165     10.08     201.93

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 88.36
                   TIME SHIFT OF PEAK FLOW         (min)=  5.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.7427

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--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                               IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n           =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      53.00       261.33
               over (min)        5.00        15.00
     Storage Coeff.  (min)=       4.55 (ii)   10.46 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.23         0.09
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.32         0.32         0.640 (iii)
     TIME TO PEAK    (hrs)=      10.00        10.00         10.00
     RUNOFF VOLUME    (mm)=     211.90       192.11        202.00
     TOTAL RAINFALL   (mm)=     212.00       212.00        212.00
     RUNOFF COEFFICIENT   =       1.00         0.91          0.95

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| RESERVOIR (0111) |
| IN= 2---> OUT= 1 |
| DT= 5.0 min |

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
0.0000	0.0000	0.0290	0.2324
0.0030	0.0104	0.0360	0.2562
0.0070	0.0755	0.0420	0.2800
0.0090	0.1297	0.0430	0.2801
0.0180	0.1702	0.5520	0.3715
0.0210	0.1985	0.9030	0.4069

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0002)	4.390	0.640	10.00	202.00
OUTFLOW: ID= 1 (0111)	4.390	0.551	10.17	201.80

PEAK FLOW REDUCTION [Qout/Qin](%)= 86.07
TIME SHIFT OF PEAK FLOW (min)= 10.00
MAXIMUM STORAGE USED (ha.m.)= 0.3715

| ADD HYD (0005) |
| 1 + 2 = 3 |

	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
ID1= 1 (0110):	9.06	1.165	10.08	201.93
+ ID2= 2 (0111):	4.39	0.551	10.17	201.80
ID = 3 (0005):	13.45	1.715	10.08	201.89

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

****
** SIMULATION NUMBER: 8 **
****

| READ STORM |
| Ptotal= 25.00 mm |

Filename: C:\Users\p004967b\AppData\Local\Temp\3b068a81-224f-405b-b61c-b324b8bd3ece\d810821e
Comments: 25 mm, 4 hr. chicago dist'n. - water qua

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.17	2.40	1.17	33.60	2.17	3.45	3.17	1.65
0.33	1.95	1.33	38.10	2.33	3.00	3.33	1.80
0.50	2.40	1.50	13.80	2.50	2.70	3.50	1.50
0.67	2.85	1.67	7.35	2.67	2.25	3.67	1.50
0.83	4.65	1.83	5.55	2.83	2.25	3.83	0.75
1.00	9.60	2.00	4.35	3.00	1.95	4.00	0.60

| CALIB |
| STANDHYD (0001) |
|ID= 1 DT= 5.0 min |

Area (ha)= 13.45
Total Imp(%)= 20.00 Dir. Conn.(%)= 20.00

	IMPERVIOUS	PERVIOUS (i)
Surface Area (ha)=	2.69	10.76
Dep. Storage (mm)=	0.10	5.00
Average Slope (%)=	1.00	1.00
Length (m)=	299.44	40.00
Mannings n =	0.013	0.250

NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.

---- TRANSFORMED HYETOGRAPH ----

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
0.083	2.40	1.083	33.60	2.083	3.45	3.08	1.65
0.167	2.40	1.167	33.60	2.167	3.45	3.17	1.65
0.250	1.95	1.250	38.10	2.250	3.00	3.25	1.80
0.333	1.95	1.333	38.10	2.333	3.00	3.33	1.80
0.417	2.40	1.417	13.80	2.417	2.70	3.42	1.50
0.500	2.40	1.500	13.80	2.500	2.70	3.50	1.50
0.583	2.85	1.583	7.35	2.583	2.25	3.58	1.50
0.667	2.85	1.667	7.35	2.667	2.25	3.67	1.50
0.750	4.65	1.750	5.55	2.750	2.25	3.75	0.75
0.833	4.65	1.833	5.55	2.833	2.25	3.83	0.75

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              0.917    9.60 | 1.917    4.35 | 2.917    1.95 |  3.92    0.60
              1.000    9.60 | 2.000    4.35 | 3.000    1.95 |  4.00    0.60

     Max.Eff.Inten.(mm/hr)=      38.10         2.77
               over (min)         5.00        45.00
     Storage Coeff.  (min)=       7.26 (ii)   43.75 (ii)
     Unit Hyd. Tpeak (min)=       5.00        45.00
     Unit Hyd. peak  (cms)=       0.17         0.03
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.26         0.04          0.270 (iii)
     TIME TO PEAK    (hrs)=       1.33         2.17           1.33
     RUNOFF VOLUME    (mm)=      24.90         3.23           7.56
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       1.00         0.13           0.30

***** WARNING:FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20%
             YOU SHOULD CONSIDER SPLITTING THE AREA.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0008) |   Area    (ha)=   9.06
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.15         0.91
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     245.76        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10       112.10
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       6.45 (ii)   14.75 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.18         0.08
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.45         0.17          0.583 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50           1.33
     RUNOFF VOLUME    (mm)=      24.90        12.87          18.88
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       1.00         0.51           0.76


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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--------------------
| CALIB            |
| STANDHYD  (0006) |   Area    (ha)=   4.39
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  50.00
--------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.95         0.44
     Dep. Storage     (mm)=       0.10         5.00
     Average Slope     (%)=       1.00         1.00
     Length            (m)=     171.08        40.00
     Mannings n             =     0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10       112.10
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       5.19 (ii)   13.49 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.21         0.08
                                                          *TOTALS*
     PEAK FLOW       (cms)=       0.23         0.09          0.291 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50           1.33
     RUNOFF VOLUME    (mm)=      24.90        12.87          18.88
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       1.00         0.51           0.76


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
```

(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

ADD HYD (0011)		AREA	QPEAK	TPEAK	R.V.
1 + 2 = 3		(ha)	(cms)	(hrs)	(mm)
	ID1= 1 (0006):	4.39	0.291	1.33	18.88
	+ ID2= 2 (0008):	9.06	0.583	1.33	18.88
	ID = 3 (0011):	13.45	0.874	1.33	18.88

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

CALIB STANDHYD (0010)	Area (ha)= 9.06		
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00	Dir. Conn.(%)= 50.00	
		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	8.15	0.91
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.00	1.00
Length	(m)=	245.76	40.00
Mannings n	=	0.013	0.250
Max.Eff.Inten.(mm/hr)=		38.10	112.10
over (min)		5.00	15.00
Storage Coeff.	(min)=	6.45 (ii)	14.75 (ii)
Unit Hyd. Tpeak	(min)=	5.00	15.00
Unit Hyd. peak	(cms)=	0.18	0.08

				TOTALS
PEAK FLOW	(cms)=	0.45	0.17	0.583 (iii)
TIME TO PEAK	(hrs)=	1.33	1.50	1.33
RUNOFF VOLUME	(mm)=	24.90	12.87	18.88
TOTAL RAINFALL	(mm)=	25.00	25.00	25.00
RUNOFF COEFFICIENT	=	1.00	0.51	0.76

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 71.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

RESERVOIR (0110)				
IN= 2---> OUT= 1				
DT= 5.0 min	OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
	0.0000	0.0000	0.0340	0.4199
	0.0010	0.0025	0.0690	0.4796
	0.0070	0.0838	0.0820	0.5250
	0.0100	0.1711	0.0910	0.5651
	0.0210	0.2236	0.0930	0.5741
	0.0250	0.2641	1.1670	0.7426
	0.0260	0.2642	1.1680	0.7427
	0.0310	0.3558	1.1690	0.7428
	0.0320	0.3838	1.2030	0.7682

		AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW : ID= 2 (0010)		9.060	0.583	1.33	18.88
OUTFLOW: ID= 1 (0110)		9.060	0.010	4.17	18.82

PEAK FLOW REDUCTION [Qout/Qin](%)= 1.65
TIME SHIFT OF PEAK FLOW (min)=170.00
MAXIMUM STORAGE USED (ha.m.)= 0.1607

CALIB STANDHYD (0002)	Area (ha)= 4.39		
ID= 1 DT= 5.0 min	Total Imp(%)= 90.00	Dir. Conn.(%)= 50.00	
		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	3.95	0.44
Dep. Storage	(mm)=	0.10	5.00
Average Slope	(%)=	1.00	1.00

```
     Length           (m)=     171.08        40.00
     Mannings n          =      0.013        0.250

     Max.Eff.Inten.(mm/hr)=      38.10       112.10
               over (min)         5.00        15.00
     Storage Coeff.  (min)=       5.19 (ii)   13.49 (ii)
     Unit Hyd. Tpeak (min)=       5.00        15.00
     Unit Hyd. peak  (cms)=       0.21         0.08
                                                        *TOTALS*
     PEAK FLOW       (cms)=       0.23         0.09          0.291 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.50           1.33
     RUNOFF VOLUME    (mm)=      24.90        12.87          18.88
     TOTAL RAINFALL   (mm)=      25.00        25.00          25.00
     RUNOFF COEFFICIENT   =       1.00         0.51           0.76


       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  71.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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| RESERVOIR (0111) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                         0.0000     0.0000   |   0.0290      0.2324
                         0.0030     0.0104   |   0.0360      0.2562
                         0.0070     0.0755   |   0.0420      0.2800
                         0.0090     0.1297   |   0.0430      0.2801
                         0.0180     0.1702   |   0.5520      0.3715
                         0.0210     0.1985   |   0.9030      0.4069

                                AREA     QPEAK     TPEAK       R.V.
                                (ha)     (cms)     (hrs)       (mm)
     INFLOW : ID= 2 (0002)      4.390      0.291      1.33      18.88
     OUTFLOW: ID= 1 (0111)      4.390      0.007      4.08      18.68

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=  2.40
                   TIME SHIFT OF PEAK FLOW         (min)=165.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=  0.0756

--------------------------------------------------------------------------------

--------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
--------------------         (ha)    (cms)    (hrs)     (mm)
          ID1= 1 (0110):     9.06   0.010     4.17    18.82
        + ID2= 2 (0111):     4.39   0.007     4.08    18.68
          ================================================
          ID = 3 (0005):    13.45   0.017     4.08    18.77

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

 FINISH
================================================================================================================
```

APPENDIX F

HYDRAULIC ANALYSIS (HEC-RAS MODELLING)

APPENDIX F: Hydraulic Analysis (HEC-RAS modelling)

Existing Floodplain Mapping (TRCA)

HEC-RAS Cross-Sections Rouge River and Model Output Files

HEC-RAS Cross-Sections Petticoat Creek and Model Output Files

HEC-RAS Cross-Sections Duffins Creek and Model Output Files

ROUGE RIVER

HEC-RAS ANALYSIS WC#3

EXISTING 407 ETR

PROPOSED 407 TWY

Ex Culvert (2000mm)

ST 5 | 175.95 | 175.95 | 176.08 | 176.08

ST 10 | 177.68 | 177.68 | 177.76 | 177.75

ST 100 | 178.61 | 179.68 | 178.78 | 179.81

ST 200 | 179.29 | 180.71 | 179.53 | 180.80

ST 300 | 181.53 | 181.45 | 181.68 | 181.60

PROP CULV WC#3
SPAN x RISE= (3 x 1.25)m
L=33m, S=0.8%
U/S INV=178.50m
D/S INV=178.25m

0+700 0+800 0+900 1+000 1+100 1+200 1+300 1+400 1+500

LEGEND

- EXISTING 407 ETR
- PROPOSED 407 TWY
- CREEK FLOW DIRECTION
- EXISTING CULVERT
- PROPOSED CULVERT
- PROPOSED REGIONAL FLOODLINE
- EXISTING HIGHWAY SIGN
- EXISTING HYDRO TOWER

EX REG / EX 100 | PR REG / PR 100 | HEC ST — CROSS SECTION NUMBER — PARSONS HEC-RAS SECTION
PROPOSED WL ELEVATION (m)
EXISTING UPDATED WL ELEVATION (m)

SCALE HORIZONTAL
1:1000

5m 0m 10m 20m 30m

DATE: SEPTEMBER 2016

SCALE: 1:1000

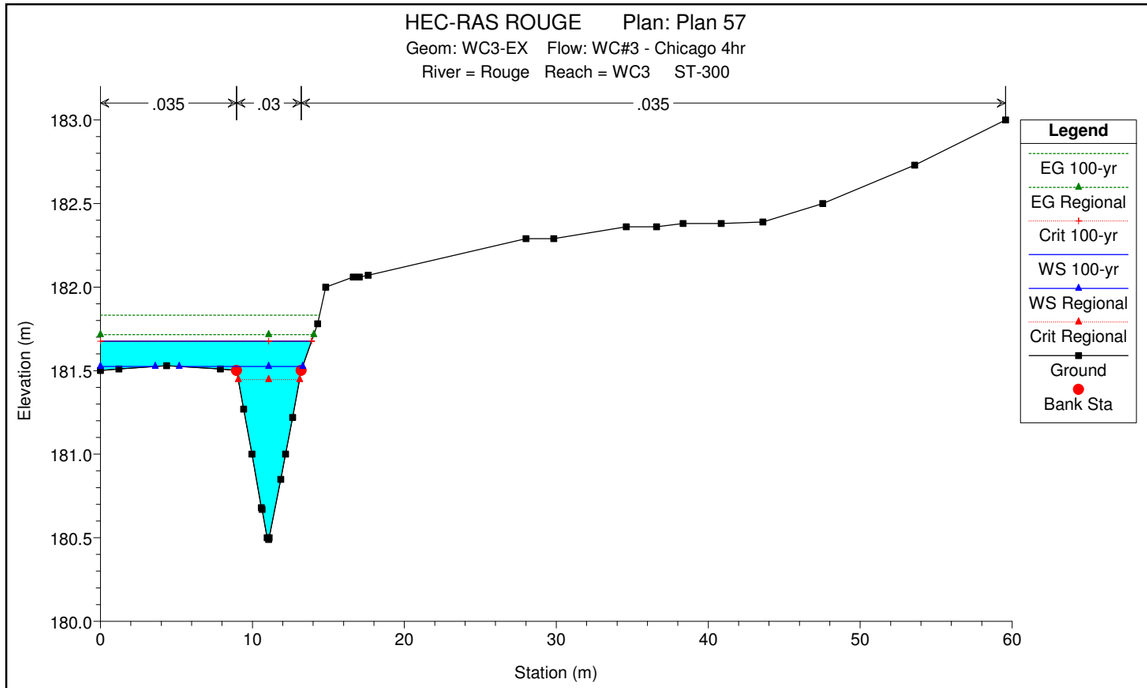
Ontario

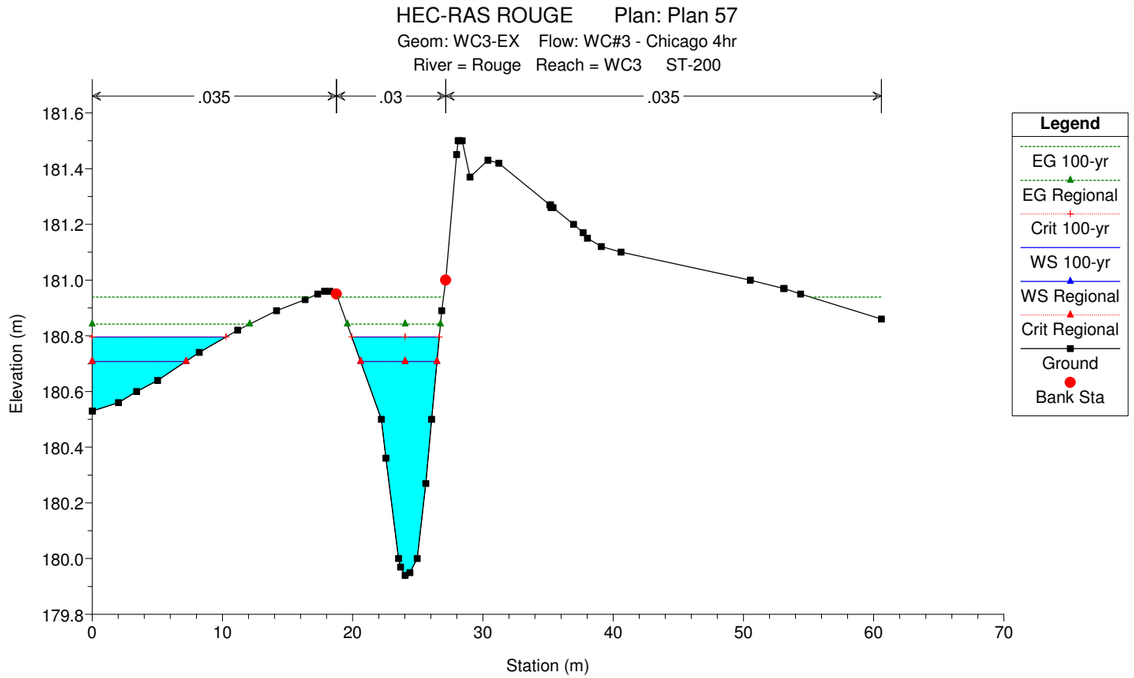
PARSONS

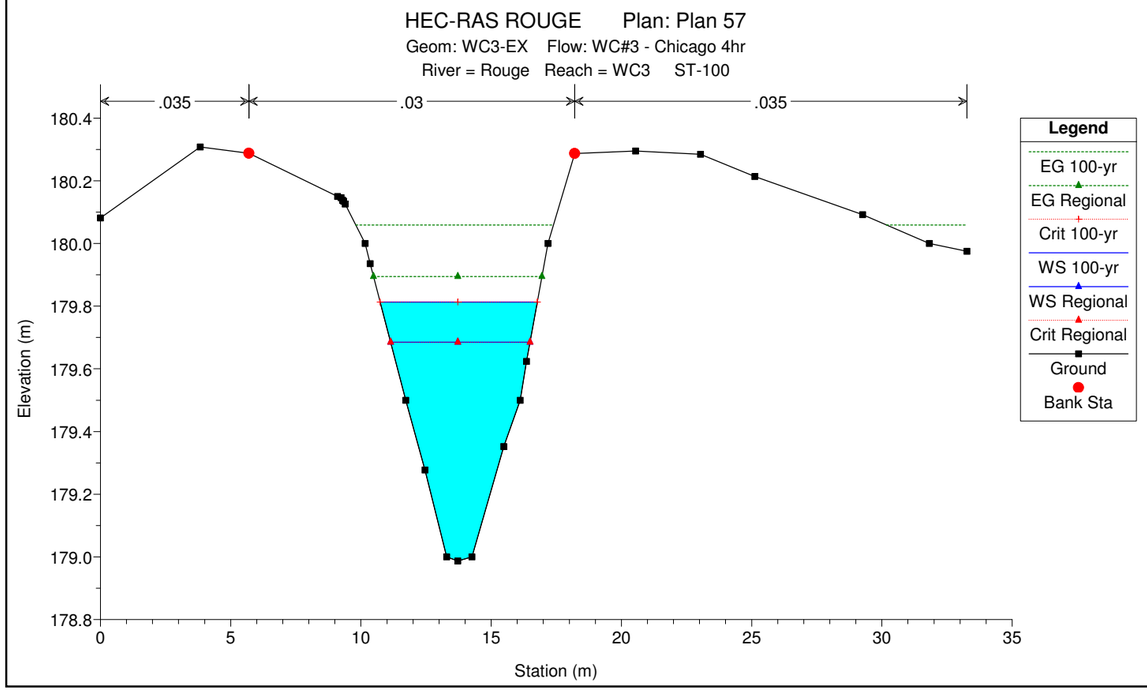
625 COCHRANE DRIVE, SUITE 500
MARKHAM, ONTARIO L3R 9R9
TEL: 905-943-0500
FAX: 905-943-0400

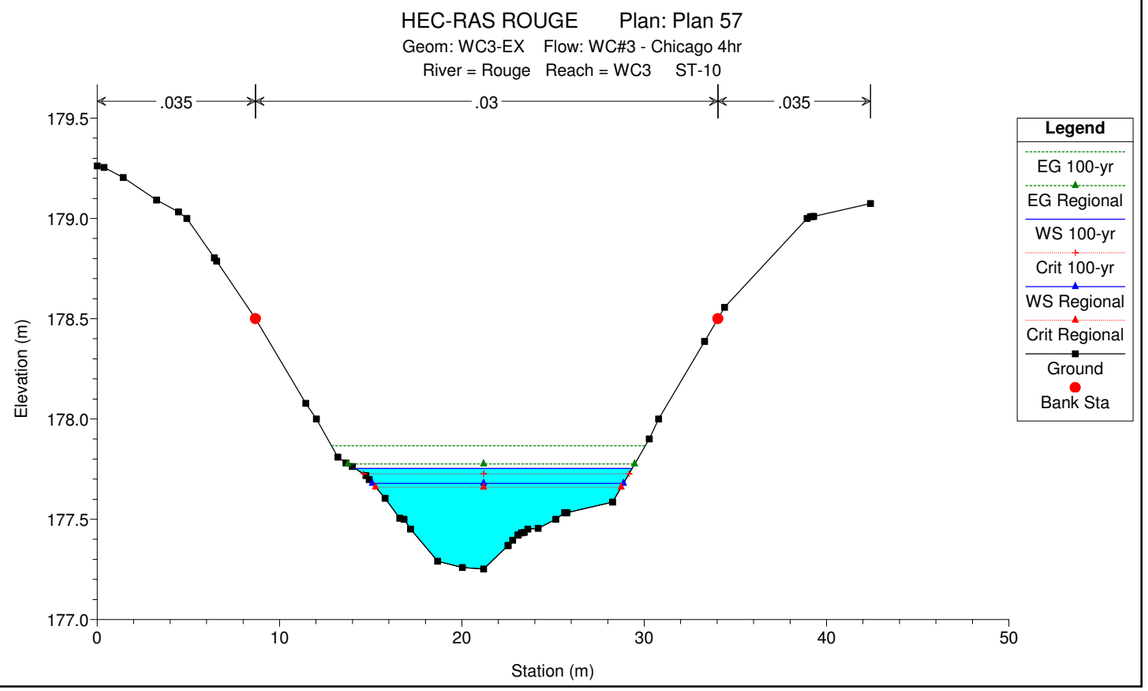
407 TRANSITWAY FROM KENNEDY RD TO BROCK RD

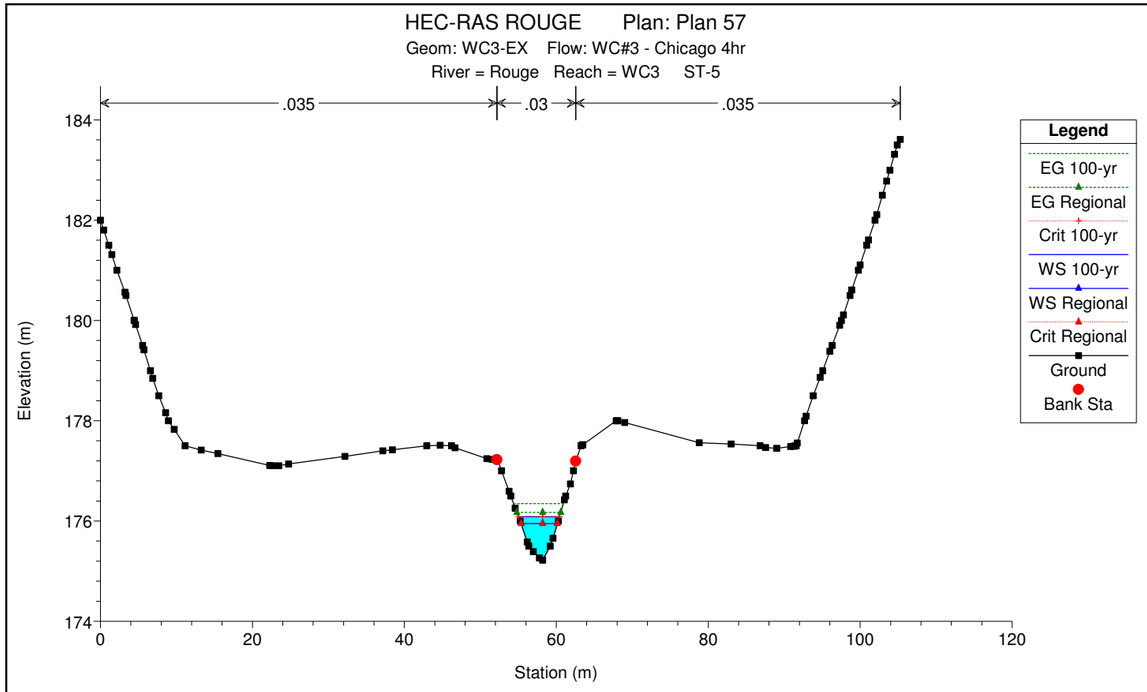
FIGURE 6.1 - HEC-RAS ANALYSIS - ROUGE RIVER (WC#3)


HEC-RAS ROUGE Plan: Plan 57
Geom: WC3-EX Flow: WC#3 - Chicago 4hr
River = Rouge Reach = WC3 ST-300
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG 100-yr
EG Regional
Crit 100-yr
WS 100-yr
WS Regional
Crit Regional
Ground
Bank Sta


HEC-RAS ROUGE Plan: Plan 57
Geom: WC3-EX Flow: WC#3 - Chicago 4hr
River = Rouge Reach = WC3 ST-200
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG 100-yr
EG Regional
Crit 100-yr
WS 100-yr
WS Regional
Crit Regional
Ground
Bank Sta


HEC-RAS ROUGE Plan: Plan 57
Geom: WC3-EX Flow: WC#3 - Chicago 4hr
River = Rouge Reach = WC3 ST-100
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG 100-yr
EG Regional
Crit 100-yr
WS 100-yr
WS Regional
Crit Regional
Ground
Bank Sta


HEC-RAS ROUGE Plan: Plan 57
Geom: WC3-EX Flow: WC#3 - Chicago 4hr
River = Rouge Reach = WC3 ST-10
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG 100-yr
EG Regional
WS 100-yr
Crit 100-yr
WS Regional
Crit Regional
Ground
Bank Sta


HEC-RAS ROUGE Plan: Plan 57
Geom: WC3-EX Flow: WC#3 - Chicago 4hr
River = Rouge Reach = WC3 ST-5
.035
.03
.035
Elevation (m)
184
182
180
178
176
174
0
20
40
60
80
100
120
Station (m)
Legend
EG 100-yr
EG Regional
Crit 100-yr
WS 100-yr
WS Regional
Crit Regional
Ground
Bank Sta

HEC-RAS Plan: WC3-EX-4hr CH River: Rouge Reach: WC3

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC3	300	2-yr	2.00	180.49	181.32	181.18	181.41	0.005450	1.31	1.53	3.55	0.64
WC3	300	5-yr	3.44	180.49	181.46		181.60	0.007384	1.68	2.04	4.10	0.76
WC3	300	10-yr	4.13	180.49	181.51	181.42	181.68	0.008231	1.84	2.25	6.01	0.81
WC3	300	25-yr	5.07	180.49	181.59	181.59	181.75	0.006628	1.83	3.32	13.58	0.75
WC3	300	50-yr	5.76	180.49	181.63	181.63	181.79	0.006321	1.86	3.87	13.74	0.74
WC3	300	100-yr	6.47	180.49	181.68	181.68	181.83	0.005845	1.87	4.46	13.90	0.72
WC3	300	Check Flow	8.42	180.49	181.73	181.73	181.92	0.006870	2.13	5.20	14.10	0.78
WC3	300	Regional	4.49	180.49	181.53	181.45	181.71	0.008665	1.93	2.41	11.73	0.84
WC3	200	2-yr	2.00	179.94	180.43	180.43	180.59	0.014008	1.78	1.12	3.54	1.01
WC3	200	5-yr	3.44	179.94	180.63	180.63	180.77	0.009727	1.69	2.23	9.69	0.87
WC3	200	10-yr	4.13	179.94	180.69	180.69	180.82	0.009071	1.68	2.85	12.13	0.85
WC3	200	25-yr	5.07	179.94	180.74	180.74	180.87	0.009088	1.73	3.53	14.28	0.85
WC3	200	50-yr	5.76	179.94	180.77	180.77	180.91	0.009033	1.76	4.02	15.79	0.85
WC3	200	100-yr	6.47	179.94	180.80	180.80	180.94	0.009326	1.81	4.44	16.97	0.87
WC3	200	Check Flow	8.42	179.94	180.87	180.87	181.01	0.008887	1.85	5.86	21.49	0.86
WC3	200	Regional	4.49	179.94	180.71	180.71	180.84	0.008975	1.69	3.13	13.07	0.84
WC3	100	2-yr	2.00	178.99	179.47	179.47	179.61	0.013885	1.67	1.20	4.17	1.00
WC3	100	5-yr	3.44	178.99	179.60	179.60	179.79	0.013229	1.91	1.80	4.92	1.01
WC3	100	10-yr	4.13	178.99	179.66	179.66	179.86	0.012823	1.99	2.07	5.20	1.01
WC3	100	25-yr	5.07	178.99	179.73	179.73	179.95	0.012416	2.08	2.43	5.56	1.01
WC3	100	50-yr	5.76	178.99	179.77	179.77	180.00	0.012190	2.14	2.69	5.80	1.01
WC3	100	100-yr	6.47	178.99	179.81	179.81	180.06	0.011976	2.20	2.94	6.03	1.00
WC3	100	Check Flow	8.42	178.99	179.92	179.92	180.20	0.011550	2.33	3.62	6.60	1.00
WC3	100	Regional	4.49	178.99	179.68	179.68	179.89	0.012645	2.03	2.21	5.35	1.01
WC3	10	2-yr	2.00	177.25	177.57	177.55	177.63	0.012060	1.09	1.84	11.34	0.86
WC3	10	5-yr	3.44	177.25	177.64	177.62	177.72	0.011674	1.26	2.73	13.15	0.88
WC3	10	10-yr	4.13	177.25	177.67	177.65	177.76	0.011634	1.34	3.09	13.57	0.90
WC3	10	25-yr	5.07	177.25	177.70	177.68	177.80	0.010962	1.40	3.62	14.16	0.89
WC3	10	50-yr	5.76	177.25	177.73	177.70	177.84	0.010843	1.45	3.97	14.61	0.89
WC3	10	100-yr	6.47	177.25	177.75	177.73	177.87	0.010640	1.49	4.35	15.20	0.89
WC3	10	Check Flow	8.42	177.25	177.82	177.79	177.94	0.009881	1.56	5.39	16.61	0.88
WC3	10	Regional	4.49	177.25	177.68	177.66	177.78	0.011610	1.37	3.27	13.77	0.90
WC3	5	2-yr	2.00	175.22	175.72	175.72	175.87	0.014177	1.74	1.15	3.82	1.01
WC3	5	5-yr	3.44	175.22	175.86	175.86	176.06	0.013127	1.98	1.73	4.41	1.01
WC3	5	10-yr	4.13	175.22	175.92	175.92	176.13	0.012611	2.06	2.00	4.66	1.00
WC3	5	25-yr	5.07	175.22	175.99	175.99	176.23	0.012464	2.18	2.33	4.94	1.01

HEC-RAS Plan: WC3-EX-4hr CH River: Rouge Reach: WC3 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC3	5	50-yr	5.76	175.22	176.03	176.03	176.29	0.012240	2.24	2.58	5.16	1.01
WC3	5	100-yr	6.47	175.22	176.08	176.08	176.35	0.011943	2.29	2.83	5.38	1.01
WC3	5	Check Flow	8.42	175.22	176.20	176.20	176.50	0.011642	2.43	3.47	5.90	1.01
WC3	5	Regional	4.49	175.22	175.95	175.95	176.17	0.012350	2.10	2.14	4.78	1.00

HEC-RAS HEC-RAS 5.0.1 April 2016
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: HEC-RAS ROUGE
Project File : HEC.prj
Run Date and Time: 9/7/2016 12:16:59 PM

Project in SI units

Project Description:
HEC-RAS model for creek crossings along the proposed 407 TWY Ph 2 started
from scratch

PLAN DATA

Plan Title: Plan 57
Plan File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.p57

Geometry Title: WC3-EX
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g09

Flow Title : WC#3 - Chicago 4hr
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f02

Plan Summary Information:
Number of: Cross Sections = 5 Multiple Openings = 0
Culverts = 0 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: WC#3 - Chicago 4hr
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f02

Flow Data (m3/s)

River	Reach	RS	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Check Flow	Regional
Rouge	WC3	300	2	3.44	4.13	5.07	5.76	6.47	8.42	4.49

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Rouge	WC3	2-yr		Critical
Rouge	WC3	5-yr		Critical
Rouge	WC3	10-yr		Critical
Rouge	WC3	25-yr		Critical
Rouge	WC3	50-yr		Critical
Rouge	WC3	100-yr		Critical
Rouge	WC3	Check Flow		Critical
Rouge	WC3	Regional		Critical

GEOMETRY DATA

Geometry Title: WC3-EX
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g09

CROSS SECTION

RIVER: Rouge
REACH: WC3 RS: 300

INPUT
Description: ST-300
Station Elevation Data num= 31

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	181.5	1.21	181.51	4.35	181.53	7.89	181.51	8.96	181.5
9.42	181.27	9.98	181	10.59	180.68	10.63	180.67	10.97	180.5
11.07	180.49	11.1	180.5	11.87	180.85	12.18	181	12.65	181.22
13.22	181.5	14.3	181.78	14.83	182	16.64	182.06	17.03	182.06
17.61	182.07	28.01	182.29	29.84	182.29	34.61	182.36	36.6	182.36
38.34	182.38	40.86	182.38	43.59	182.39	47.53	182.5	53.59	182.73
59.57	183								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	8.96	.03	13.22	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
8.96 13.22 98 98 98 .1 .3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	181.41	Element	Left OB	Channel	Right OB
Vel Head (m)	0.09	Wt. n-Val.		0.030	
W.S. Elev (m)	181.32	Reach Len. (m)	98.00	98.00	98.00
Crit W.S. (m)	181.18	Flow Area (m2)		1.53	
E.G. Slope (m/m)	0.005450	Area (m2)		1.53	
Q Total (m3/s)	2.00	Flow (m3/s)		2.00	
Top Width (m)	3.55	Top Width (m)		3.55	
Vel Total (m/s)	1.31	Avg. Vel. (m/s)		1.31	
Max Chl Dpth (m)	0.83	Hydr. Depth (m)		0.43	
Conv. Total (m3/s)	27.1	Conv. (m3/s)		27.1	
Length Wtd. (m)	98.00	Wetted Per. (m)		3.93	
Min Ch El (m)	180.49	Shear (N/m2)		20.75	
Alpha	1.00	Stream Power (N/m s)		27.17	
Frctn Loss (m)	0.81	Cum Volume (1000 m3)		0.45	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.87	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate

the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	181.60	Element	Left OB	Channel	Right OB
Vel Head (m)	0.14	Wt. n-Val.		0.030	
W.S. Elev (m)	181.46	Reach Len. (m)	98.00	98.00	98.00
Crit W.S. (m)		Flow Area (m2)		2.04	
E.G. Slope (m/m)	0.007384	Area (m2)		2.04	
Q Total (m3/s)	3.44	Flow (m3/s)		3.44	
Top Width (m)	4.10	Top Width (m)		4.10	
Vel Total (m/s)	1.68	Avg. Vel. (m/s)		1.68	
Max Chl Dpth (m)	0.97	Hydr. Depth (m)		0.50	
Conv. Total (m3/s)	40.0	Conv. (m3/s)		40.0	
Length Wtd. (m)	98.00	Wetted Per. (m)		4.54	
Min Ch El (m)	180.49	Shear (N/m2)		32.59	
Alpha	1.00	Stream Power (N/m s)		54.82	
Frctn Loss (m)	0.83	Cum Volume (1000 m3)	0.02	0.68	
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.32	2.24	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	181.68	Element	Left OB	Channel	Right OB
Vel Head (m)	0.17	Wt. n-Val.	0.035	0.030	0.000
W.S. Elev (m)	181.51	Reach Len. (m)	98.00	98.00	98.00
Crit W.S. (m)	181.42	Flow Area (m2)	0.01	2.24	0.00
E.G. Slope (m/m)	0.008231	Area (m2)	0.01	2.24	0.00
Q Total (m3/s)	4.13	Flow (m3/s)	0.00	4.13	0.00
Top Width (m)	6.01	Top Width (m)	1.72	4.26	0.03
Vel Total (m/s)	1.84	Avg. Vel. (m/s)	0.06	1.84	0.06
Max Chl Dpth (m)	1.02	Hydr. Depth (m)	0.00	0.53	0.00
Conv. Total (m3/s)	45.5	Conv. (m3/s)	0.0	45.5	0.0
Length Wtd. (m)	98.00	Wetted Per. (m)	1.73	4.72	0.03
Min Ch El (m)	180.49	Shear (N/m2)	0.31	38.34	
Alpha	1.01	Stream Power (N/m s)	0.02	70.59	
Frctn Loss (m)	0.85	Cum Volume (1000 m3)	0.04	0.77	0.00
C & E Loss (m)	0.01	Cum SA (1000 m2)	0.54	2.36	0.00

Warning: Divided flow computed for this cross-section.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	181.75	Element	Left OB	Channel	Right OB
Vel Head (m)	0.16	Wt. n-Val.	0.035	0.030	0.035
W.S. Elev (m)	181.59	Reach Len. (m)	98.00	98.00	98.00
Crit W.S. (m)	181.59	Flow Area (m2)	0.70	2.61	0.02
E.G. Slope (m/m)	0.006628	Area (m2)	0.70	2.61	0.02
Q Total (m3/s)	5.07	Flow (m3/s)	0.29	4.77	0.01
Top Width (m)	13.58	Top Width (m)	8.96	4.26	0.36
Vel Total (m/s)	1.53	Avg. Vel. (m/s)	0.42	1.83	0.30
Max Chl Dpth (m)	1.10	Hydr. Depth (m)	0.08	0.61	0.05
Conv. Total (m3/s)	62.3	Conv. (m3/s)	3.6	58.6	0.1
Length Wtd. (m)	98.00	Wetted Per. (m)	9.05	4.72	0.37
Min Ch El (m)	180.49	Shear (N/m2)	4.99	35.93	2.95
Alpha	1.36	Stream Power (N/m s)	2.10	65.68	0.88
Frctn Loss (m)	0.76	Cum Volume (1000 m3)	0.10	0.89	0.00
C & E Loss (m)	0.01	Cum SA (1000 m2)	1.01	2.48	0.02

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	181.79	Element	Left OB	Channel	Right OB
Vel Head (m)	0.16	Wt. n-Val.	0.035	0.030	0.035
W.S. Elev (m)	181.63	Reach Len. (m)	98.00	98.00	98.00
Crit W.S. (m)	181.63	Flow Area (m2)	1.05	2.78	0.03
E.G. Slope (m/m)	0.006321	Area (m2)	1.05	2.78	0.03
Q Total (m3/s)	5.76	Flow (m3/s)	0.57	5.18	0.01
Top Width (m)	13.74	Top Width (m)	8.96	4.26	0.52
Vel Total (m/s)	1.49	Avg. Vel. (m/s)	0.54	1.86	0.37
Max Chl Dpth (m)	1.14	Hydr. Depth (m)	0.12	0.65	0.07
Conv. Total (m3/s)	72.5	Conv. (m3/s)	7.2	65.1	0.2
Length Wtd. (m)	98.00	Wetted Per. (m)	9.09	4.72	0.53
Min Ch El (m)	180.49	Shear (N/m2)	7.18	36.50	4.02
Alpha	1.42	Stream Power (N/m s)	3.88	67.97	1.47
Frctn Loss (m)	0.73	Cum Volume (1000 m3)	0.14	0.98	0.00
C & E Loss (m)	0.01	Cum SA (1000 m2)	1.10	2.57	0.03

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	181.83	Element	Left OB	Channel	Right OB
Vel Head (m)	0.15	Wt. n-Val.	0.035	0.030	0.035
W.S. Elev (m)	181.68	Reach Len. (m)	98.00	98.00	98.00
Crit W.S. (m)	181.68	Flow Area (m2)	1.44	2.96	0.06
E.G. Slope (m/m)	0.005845	Area (m2)	1.44	2.96	0.06
Q Total (m3/s)	6.47	Flow (m3/s)	0.91	5.53	0.03
Top Width (m)	13.90	Top Width (m)	8.96	4.26	0.68
Vel Total (m/s)	1.45	Avg. Vel. (m/s)	0.64	1.87	0.42
Max Chl Dpth (m)	1.19	Hydr. Depth (m)	0.16	0.70	0.09
Conv. Total (m3/s)	84.6	Conv. (m3/s)	11.9	72.4	0.3
Length Wtd. (m)	98.00	Wetted Per. (m)	9.14	4.72	0.70
Min Ch El (m)	180.49	Shear (N/m2)	9.00	35.95	4.89
Alpha	1.44	Stream Power (N/m s)	5.72	67.14	2.07
Frctn Loss (m)	0.71	Cum Volume (1000 m3)	0.18	1.06	0.00
C & E Loss (m)	0.00	Cum SA (1000 m2)	1.16	2.66	0.03

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	181.92	Element	Left OB	Channel	Right OB
Vel Head (m)	0.19	Wt. n-Val.	0.035	0.030	0.035
W.S. Elev (m)	181.73	Reach Len. (m)	98.00	98.00	98.00
Crit W.S. (m)	181.73	Flow Area (m2)	1.91	3.19	0.10
E.G. Slope (m/m)	0.006870	Area (m2)	1.91	3.19	0.10
Q Total (m3/s)	8.42	Flow (m3/s)	1.59	6.78	0.06
Top Width (m)	14.10	Top Width (m)	8.96	4.26	0.88
Vel Total (m/s)	1.62	Avg. Vel. (m/s)	0.83	2.13	0.55
Max Chl Dpth (m)	1.24	Hydr. Depth (m)	0.21	0.75	0.11
Conv. Total (m3/s)	101.6	Conv. (m3/s)	19.1	81.8	0.7

Length Wtd. (m)	98.00	Wetted Per. (m)	9.19	4.72	0.91
Min Ch El (m)	180.49	Shear (N/m2)	14.00	45.48	7.48
Alpha	1.44	Stream Power (N/m s)	11.63	96.70	4.09
Frctn Loss (m)	0.76	Cum Volume (1000 m3)	0.26	1.27	0.01
C & E Loss (m)	0.02	Cum SA (1000 m2)	1.38	2.90	0.10

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	181.71	Element	Left OB	Channel	Right OB
Vel Head (m)	0.19	Wt. n-Val.	0.035	0.030	0.035
W.S. Elev (m)	181.53	Reach Len. (m)	98.00	98.00	98.00
Crit W.S. (m)	181.45	Flow Area (m2)	0.09	2.32	0.00
E.G. Slope (m/m)	0.008665	Area (m2)	0.09	2.32	0.00
Q Total (m3/s)	4.49	Flow (m3/s)	0.01	4.48	0.00
Top Width (m)	11.73	Top Width (m)	7.37	4.26	0.10
Vel Total (m/s)	1.87	Avg. Vel. (m/s)	0.14	1.93	0.14
Max Chl Dpth (m)	1.04	Hydr. Depth (m)	0.01	0.54	0.01
Conv. Total (m3/s)	48.2	Conv. (m3/s)	0.1	48.1	0.0
Length Wtd. (m)	98.00	Wetted Per. (m)	7.40	4.72	0.10
Min Ch El (m)	180.49	Shear (N/m2)	0.98	41.72	1.04
Alpha	1.07	Stream Power (N/m s)	0.13	80.58	0.15
Frctn Loss (m)	0.86	Cum Volume (1000 m3)	0.06	0.81	0.00
C & E Loss (m)	0.02	Cum SA (1000 m2)	0.87	2.40	0.00

Warning: Divided flow computed for this cross-section.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Rouge
REACH: WC3 RS: 200

INPUT
Description: ST-200
Station Elevation Data num= 45

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	180.53	.01	180.53	2.01	180.56	3.42	180.6	5.02	180.64
8.23	180.74	11.16	180.82	14.15	180.89	16.35	180.93	17.31	180.95
17.84	180.96	18.25	180.96	18.76	180.95	22.2	180.5	22.55	180.36
23.53	180	23.67	179.97	24.02	179.94	24.4	179.95	24.95	180
25.61	180.27	26.07	180.5	26.83	180.89	27.14	181	27.99	181.45
28.09	181.5	28.15	181.5	28.41	181.5	29	181.37	30.39	181.43
31.21	181.42	35.13	181.27	35.19	181.27	35.23	181.26	35.38	181.26
36.95	181.2	37.69	181.17	38.03	181.15	39.09	181.12	40.6	181.1
50.54	181	53.09	180.97	53.13	180.97	54.39	180.95	60.59	180.86

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	18.76	.03	27.14	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
18.76	27.14	43	43	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	180.59	Element	Left OB	Channel	Right OB
Vel Head (m)	0.16	Wt. n-Val.		0.030	
W.S. Elev (m)	180.43	Reach Len. (m)	43.00	43.00	43.00
Crit W.S. (m)	180.43	Flow Area (m2)		1.12	
E.G. Slope (m/m)	0.014008	Area (m2)		1.12	
Q Total (m3/s)	2.00	Flow (m3/s)		2.00	
Top Width (m)	3.54	Top Width (m)		3.54	
Vel Total (m/s)	1.78	Avg. Vel. (m/s)		1.78	
Max Chl Dpth (m)	0.49	Hydr. Depth (m)		0.32	
Conv. Total (m3/s)	16.9	Conv. (m3/s)		16.9	
Length Wtd. (m)	43.00	Wetted Per. (m)		3.72	
Min Ch El (m)	179.94	Shear (N/m2)		41.57	
Alpha	1.00	Stream Power (N/m s)		73.93	
Frctn Loss (m)	0.60	Cum Volume (1000 m3)		0.32	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.52	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	180.77	Element	Left OB	Channel	Right OB
Vel Head (m)	0.14	Wt. n-Val.	0.035	0.030	
W.S. Elev (m)	180.63	Reach Len. (m)	43.00	43.00	43.00
Crit W.S. (m)	180.63	Flow Area (m2)	0.26	1.97	
E.G. Slope (m/m)	0.009727	Area (m2)	0.26	1.97	
Q Total (m3/s)	3.44	Flow (m3/s)	0.10	3.34	
Top Width (m)	9.69	Top Width (m)	4.58	5.11	
Vel Total (m/s)	1.54	Avg. Vel. (m/s)	0.41	1.69	
Max Chl Dpth (m)	0.69	Hydr. Depth (m)	0.06	0.39	
Conv. Total (m3/s)	34.9	Conv. (m3/s)	1.0	33.8	
Length Wtd. (m)	43.00	Wetted Per. (m)	4.68	5.35	
Min Ch El (m)	179.94	Shear (N/m2)	5.20	35.18	
Alpha	1.17	Stream Power (N/m s)	2.11	59.47	
Frctn Loss (m)	0.48	Cum Volume (1000 m3)	0.01	0.48	
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.10	1.79	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	180.82	Element	Left OB	Channel	Right OB
Vel Head (m)	0.13	Wt. n-Val.	0.035	0.030	
W.S. Elev (m)	180.69	Reach Len. (m)	43.00	43.00	43.00
Crit W.S. (m)	180.69	Flow Area (m2)	0.57	2.28	
E.G. Slope (m/m)	0.009071	Area (m2)	0.57	2.28	
Q Total (m3/s)	4.13	Flow (m3/s)	0.30	3.83	
Top Width (m)	12.13	Top Width (m)	6.48	5.65	
Vel Total (m/s)	1.45	Avg. Vel. (m/s)	0.53	1.68	
Max Chl Dpth (m)	0.75	Hydr. Depth (m)	0.09	0.40	
Conv. Total (m3/s)	43.4	Conv. (m3/s)	3.2	40.2	
Length Wtd. (m)	43.00	Wetted Per. (m)	6.64	5.91	
Min Ch El (m)	179.94	Shear (N/m2)	7.63	34.27	
Alpha	1.25	Stream Power (N/m s)	4.04	57.60	
Frctn Loss (m)	0.46	Cum Volume (1000 m3)	0.01	0.55	
C & E Loss (m)	0.01	Cum SA (1000 m2)	0.14	1.87	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Warning: Divided flow computed for this cross-section.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	180.87	Element	Left OB	Channel	Right OB
Vel Head (m)	0.14	Wt. n-Val.	0.035	0.030	
W.S. Elev (m)	180.74	Reach Len. (m)	43.00	43.00	43.00
Crit W.S. (m)	180.74	Flow Area (m2)	0.95	2.58	
E.G. Slope (m/m)	0.009088	Area (m2)	0.95	2.58	
Q Total (m3/s)	5.07	Flow (m3/s)	0.60	4.47	
Top Width (m)	14.28	Top Width (m)	8.13	6.14	
Vel Total (m/s)	1.44	Avg. Vel. (m/s)	0.64	1.73	
Max Chl Dpth (m)	0.80	Hydr. Depth (m)	0.12	0.42	
Conv. Total (m3/s)	53.2	Conv. (m3/s)	6.3	46.9	
Length Wtd. (m)	43.00	Wetted Per. (m)	8.34	6.42	
Min Ch El (m)	179.94	Shear (N/m2)	10.10	35.82	
Alpha	1.30	Stream Power (N/m s)	6.44	62.00	
Frctn Loss (m)	0.45	Cum Volume (1000 m3)	0.02	0.64	
C & E Loss (m)	0.01	Cum SA (1000 m2)	0.17	1.97	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	180.91	Element	Left OB	Channel	Right OB
Vel Head (m)	0.14	Wt. n-Val.	0.035	0.030	
W.S. Elev (m)	180.77	Reach Len. (m)	43.00	43.00	43.00
Crit W.S. (m)	180.77	Flow Area (m2)	1.23	2.79	
E.G. Slope (m/m)	0.009033	Area (m2)	1.23	2.79	
Q Total (m3/s)	5.76	Flow (m3/s)	0.86	4.90	
Top Width (m)	15.79	Top Width (m)	9.33	6.46	
Vel Total (m/s)	1.43	Avg. Vel. (m/s)	0.69	1.76	
Max Chl Dpth (m)	0.83	Hydr. Depth (m)	0.13	0.43	
Conv. Total (m3/s)	60.6	Conv. (m3/s)	9.0	51.6	
Length Wtd. (m)	43.00	Wetted Per. (m)	9.57	6.75	
Min Ch El (m)	179.94	Shear (N/m2)	11.42	36.62	
Alpha	1.32	Stream Power (N/m s)	7.92	64.37	
Frctn Loss (m)	0.45	Cum Volume (1000 m3)	0.03	0.70	
C & E Loss (m)	0.01	Cum SA (1000 m2)	0.20	2.04	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	180.94	Element	Left OB	Channel	Right OB
Vel Head (m)	0.14	Wt. n-Val.	0.035	0.030	
W.S. Elev (m)	180.80	Reach Len. (m)	43.00	43.00	43.00
Crit W.S. (m)	180.80	Flow Area (m2)	1.48	2.96	
E.G. Slope (m/m)	0.009326	Area (m2)	1.48	2.96	
Q Total (m3/s)	6.47	Flow (m3/s)	1.11	5.36	
Top Width (m)	16.97	Top Width (m)	10.26	6.71	
Vel Total (m/s)	1.46	Avg. Vel. (m/s)	0.75	1.81	
Max Chl Dpth (m)	0.86	Hydr. Depth (m)	0.14	0.44	
Conv. Total (m3/s)	67.0	Conv. (m3/s)	11.5	55.5	
Length Wtd. (m)	43.00	Wetted Per. (m)	10.53	7.00	
Min Ch El (m)	179.94	Shear (N/m2)	12.89	38.63	
Alpha	1.33	Stream Power (N/m s)	9.64	70.02	
Frctn Loss (m)	0.45	Cum Volume (1000 m3)	0.03	0.77	
C & E Loss (m)	0.01	Cum SA (1000 m2)	0.22	2.12	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	181.01	Element	Left OB	Channel	Right OB
Vel Head (m)	0.14	Wt. n-Val.	0.035	0.030	0.035
W.S. Elev (m)	180.87	Reach Len. (m)	43.00	43.00	43.00
Crit W.S. (m)	180.87	Flow Area (m2)	2.37	3.49	0.00
E.G. Slope (m/m)	0.008887	Area (m2)	2.37	3.49	0.00
Q Total (m3/s)	8.42	Flow (m3/s)	1.98	6.44	0.00
Top Width (m)	21.49	Top Width (m)	13.33	7.43	0.73
Vel Total (m/s)	1.44	Avg. Vel. (m/s)	0.84	1.85	0.08
Max Chl Dpth (m)	0.93	Hydr. Depth (m)	0.18	0.47	0.01
Conv. Total (m3/s)	89.3	Conv. (m3/s)	21.0	68.3	0.0
Length Wtd. (m)	43.00	Wetted Per. (m)	13.67	7.75	0.74
Min Ch El (m)	179.94	Shear (N/m2)	15.09	39.25	0.46
Alpha	1.34	Stream Power (N/m s)	12.62	72.47	0.04
Frctn Loss (m)	0.43	Cum Volume (1000 m3)	0.05	0.95	0.00
C & E Loss (m)	0.01	Cum SA (1000 m2)	0.29	2.32	0.02

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	180.84	Element	Left OB	Channel	Right OB
Vel Head (m)	0.13	Wt. n-Val.	0.035	0.030	
W.S. Elev (m)	180.71	Reach Len. (m)	43.00	43.00	43.00
Crit W.S. (m)	180.71	Flow Area (m2)	0.72	2.41	
E.G. Slope (m/m)	0.008975	Area (m2)	0.72	2.41	
Q Total (m3/s)	4.49	Flow (m3/s)	0.42	4.07	
Top Width (m)	13.07	Top Width (m)	7.20	5.86	
Vel Total (m/s)	1.43	Avg. Vel. (m/s)	0.58	1.69	
Max Chl Dpth (m)	0.77	Hydr. Depth (m)	0.10	0.41	
Conv. Total (m3/s)	47.4	Conv. (m3/s)	4.4	43.0	
Length Wtd. (m)	43.00	Wetted Per. (m)	7.38	6.13	
Min Ch El (m)	179.94	Shear (N/m2)	8.62	34.53	
Alpha	1.28	Stream Power (N/m s)	4.96	58.45	
Frctn Loss (m)	0.45	Cum Volume (1000 m3)	0.02	0.58	
C & E Loss (m)	0.01	Cum SA (1000 m2)	0.15	1.91	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical

depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The cross-section end points had to be extended vertically for the computed water surface.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Rouge
REACH: WC3 RS: 100

INPUT
Description: ST-100
Station Elevation Data num= 26

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	180.082	3.831	180.308	5.699	180.288	9.108	180.15	9.242	180.146
9.297	180.138	9.332	180.135	9.393	180.126	10.161	180	10.35	179.936
11.726	179.5	12.461	179.277	13.289	179	13.721	178.987	14.261	179
15.481	179.352	16.109	179.5	16.356	179.624	17.18	180	18.21	180.287
20.549	180.295	23.034	180.285	25.124	180.214	29.265	180.092	31.821	180
33.265	179.975								

Manning's n values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	5.699	.03	18.21	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
5.699	18.21	44.6	44.6	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	179.61	Element	Left OB	Channel	Right OB
Vel Head (m)	0.14	Wt. n-Val.		0.030	
W.S. Elev (m)	179.47	Reach Len. (m)	44.60	44.60	44.60
Crit W.S. (m)	179.47	Flow Area (m2)		1.20	
E.G. Slope (m/m)	0.013885	Area (m2)		1.20	
Q Total (m3/s)	2.00	Flow (m3/s)		2.00	
Top Width (m)	4.17	Top Width (m)		4.17	
Vel Total (m/s)	1.67	Avg. Vel. (m/s)		1.67	
Max Chl Dpth (m)	0.49	Hydr. Depth (m)		0.29	
Conv. Total (m3/s)	17.0	Conv. (m3/s)		17.0	
Length Wtd. (m)	44.60	Wetted Per. (m)		4.31	
Min Ch El (m)	178.99	Shear (N/m2)		37.79	
Alpha	1.00	Stream Power (N/m s)		63.17	
Frctn Loss (m)	0.58	Cum Volume (1000 m3)		0.27	
C & E Loss (m)	0.02	Cum SA (1000 m2)		1.36	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	179.79	Element	Left OB	Channel	Right OB
Vel Head (m)	0.19	Wt. n-Val.		0.030	
W.S. Elev (m)	179.60	Reach Len. (m)	44.60	44.60	44.60
Crit W.S. (m)	179.60	Flow Area (m2)		1.80	
E.G. Slope (m/m)	0.013229	Area (m2)		1.80	
Q Total (m3/s)	3.44	Flow (m3/s)		3.44	
Top Width (m)	4.92	Top Width (m)		4.92	
Vel Total (m/s)	1.91	Avg. Vel. (m/s)		1.91	
Max Chl Dpth (m)	0.62	Hydr. Depth (m)		0.37	
Conv. Total (m3/s)	29.9	Conv. (m3/s)		29.9	
Length Wtd. (m)	44.60	Wetted Per. (m)		5.10	
Min Ch El (m)	178.99	Shear (N/m2)		45.72	
Alpha	1.00	Stream Power (N/m s)		87.45	
Frctn Loss (m)	0.55	Cum Volume (1000 m3)		0.40	
C & E Loss (m)	0.03	Cum SA (1000 m2)		1.58	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	179.86	Element	Left OB	Channel	Right OB
Vel Head (m)	0.20	Wt. n-Val.		0.030	
W.S. Elev (m)	179.66	Reach Len. (m)	44.60	44.60	44.60
Crit W.S. (m)	179.66	Flow Area (m2)		2.07	
E.G. Slope (m/m)	0.012823	Area (m2)		2.07	
Q Total (m3/s)	4.13	Flow (m3/s)		4.13	
Top Width (m)	5.20	Top Width (m)		5.20	
Vel Total (m/s)	1.99	Avg. Vel. (m/s)		1.99	
Max Chl Dpth (m)	0.67	Hydr. Depth (m)		0.40	
Conv. Total (m3/s)	36.5	Conv. (m3/s)		36.5	
Length Wtd. (m)	44.60	Wetted Per. (m)		5.41	
Min Ch El (m)	178.99	Shear (N/m2)		48.19	
Alpha	1.00	Stream Power (N/m s)		95.98	
Frctn Loss (m)	0.54	Cum Volume (1000 m3)		0.46	
C & E Loss (m)	0.03	Cum SA (1000 m2)		1.64	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	179.95	Element	Left OB	Channel	Right OB
Vel Head (m)	0.22	Wt. n-Val.		0.030	
W.S. Elev (m)	179.73	Reach Len. (m)	44.60	44.60	44.60
Crit W.S. (m)	179.73	Flow Area (m2)		2.43	
E.G. Slope (m/m)	0.012416	Area (m2)		2.43	
Q Total (m3/s)	5.07	Flow (m3/s)		5.07	
Top Width (m)	5.56	Top Width (m)		5.56	
Vel Total (m/s)	2.08	Avg. Vel. (m/s)		2.08	
Max Chl Dpth (m)	0.74	Hydr. Depth (m)		0.44	
Conv. Total (m3/s)	45.5	Conv. (m3/s)		45.5	
Length Wtd. (m)	44.60	Wetted Per. (m)		5.79	
Min Ch El (m)	178.99	Shear (N/m2)		51.15	
Alpha	1.00	Stream Power (N/m s)		106.55	
Frctn Loss (m)	0.52	Cum Volume (1000 m3)		0.53	
C & E Loss (m)	0.04	Cum SA (1000 m2)		1.72	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	180.00	Element	Left OB	Channel	Right OB

Vel Head (m)	0.23	Wt. n-Val.		0.030	
W.S. Elev (m)	179.77	Reach Len. (m)	44.60	44.60	44.60
Crit W.S. (m)	179.77	Flow Area (m2)		2.69	
E.G. Slope (m/m)	0.012190	Area (m2)		2.69	
Q Total (m3/s)	5.76	Flow (m3/s)		5.76	
Top Width (m)	5.80	Top Width (m)		5.80	
Vel Total (m/s)	2.14	Avg. Vel. (m/s)		2.14	
Max Chl Dpth (m)	0.78	Hydr. Depth (m)		0.46	
Conv. Total (m3/s)	52.2	Conv. (m3/s)		52.2	
Length Wtd. (m)	44.60	Wetted Per. (m)		6.05	
Min Ch El (m)	178.99	Shear (N/m2)		53.11	
Alpha	1.00	Stream Power (N/m s)		113.81	
Frctn Loss (m)	0.51	Cum Volume (1000 m3)		0.59	
C & E Loss (m)	0.04	Cum SA (1000 m2)		1.78	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	180.06	Element	Left OB	Channel	Right OB
Vel Head (m)	0.25	Wt. n-Val.		0.030	
W.S. Elev (m)	179.81	Reach Len. (m)	44.60	44.60	44.60
Crit W.S. (m)	179.81	Flow Area (m2)		2.94	
E.G. Slope (m/m)	0.011976	Area (m2)		2.94	
Q Total (m3/s)	6.47	Flow (m3/s)		6.47	
Top Width (m)	6.03	Top Width (m)		6.03	
Vel Total (m/s)	2.20	Avg. Vel. (m/s)		2.20	
Max Chl Dpth (m)	0.83	Hydr. Depth (m)		0.49	
Conv. Total (m3/s)	59.1	Conv. (m3/s)		59.1	
Length Wtd. (m)	44.60	Wetted Per. (m)		6.30	
Min Ch El (m)	178.99	Shear (N/m2)		54.91	
Alpha	1.00	Stream Power (N/m s)		120.66	
Frctn Loss (m)	0.50	Cum Volume (1000 m3)		0.64	
C & E Loss (m)	0.04	Cum SA (1000 m2)		1.85	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	180.20	Element	Left OB	Channel	Right OB
Vel Head (m)	0.28	Wt. n-Val.		0.030	
W.S. Elev (m)	179.92	Reach Len. (m)	44.60	44.60	44.60
Crit W.S. (m)	179.92	Flow Area (m2)		3.62	
E.G. Slope (m/m)	0.011550	Area (m2)		3.62	
Q Total (m3/s)	8.42	Flow (m3/s)		8.42	
Top Width (m)	6.60	Top Width (m)		6.60	
Vel Total (m/s)	2.33	Avg. Vel. (m/s)		2.33	
Max Chl Dpth (m)	0.93	Hydr. Depth (m)		0.55	
Conv. Total (m3/s)	78.3	Conv. (m3/s)		78.3	
Length Wtd. (m)	44.60	Wetted Per. (m)		6.91	
Min Ch El (m)	178.99	Shear (N/m2)		59.32	
Alpha	1.00	Stream Power (N/m s)		138.07	
Frctn Loss (m)	0.48	Cum Volume (1000 m3)		0.79	
C & E Loss (m)	0.05	Cum SA (1000 m2)		2.02	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	179.89	Element	Left OB	Channel	Right OB
Vel Head (m)	0.21	Wt. n-Val.		0.030	
W.S. Elev (m)	179.68	Reach Len. (m)	44.60	44.60	44.60
Crit W.S. (m)	179.68	Flow Area (m2)		2.21	
E.G. Slope (m/m)	0.012645	Area (m2)		2.21	
Q Total (m3/s)	4.49	Flow (m3/s)		4.49	
Top Width (m)	5.35	Top Width (m)		5.35	
Vel Total (m/s)	2.03	Avg. Vel. (m/s)		2.03	
Max Chl Dpth (m)	0.70	Hydr. Depth (m)		0.41	
Conv. Total (m3/s)	39.9	Conv. (m3/s)		39.9	
Length Wtd. (m)	44.60	Wetted Per. (m)		5.56	
Min Ch El (m)	178.99	Shear (N/m2)		49.35	
Alpha	1.00	Stream Power (N/m s)		100.08	
Frctn Loss (m)	0.54	Cum Volume (1000 m3)		0.48	
C & E Loss (m)	0.03	Cum SA (1000 m2)		1.67	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Rouge
REACH: WC3 RS: 10

INPUT
Description: ST-10
Station Elevation Data num= 47

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	179.262	.373	179.254	1.42	179.204	3.25	179.092	4.457	179.033
4.917	179	6.425	178.804	6.554	178.787	8.68	178.5	11.444	178.078
12.018	178	13.205	177.81	13.636	177.781	13.987	177.763	14.742	177.718
14.913	177.698	15.787	177.604	16.588	177.505	16.828	177.5	17.189	177.451
18.675	177.291	20.025	177.259	21.192	177.252	22.534	177.369	22.535	177.369
22.784	177.395	23.069	177.421	23.082	177.422	23.268	177.432	23.422	177.435
23.61	177.451	24.187	177.455	25.159	177.5	25.641	177.533	25.691	177.532
25.763	177.533	28.273	177.586	30.276	177.901	30.793	178	33.31	178.387
34.041	178.5	34.408	178.557	38.934	179	39.13	179.009	39.255	179.01
39.298	179.01	42.41	179.074						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	8.68	.03	34.041	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
8.68	34.041	133.7	133.7	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	177.63	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.030	
W.S. Elev (m)	177.57	Reach Len. (m)	133.70	133.70	133.70
Crit W.S. (m)	177.55	Flow Area (m2)		1.84	
E.G. Slope (m/m)	0.012060	Area (m2)		1.84	
Q Total (m3/s)	2.00	Flow (m3/s)		2.00	
Top Width (m)	11.34	Top Width (m)		11.34	
Vel Total (m/s)	1.09	Avg. Vel. (m/s)		1.09	
Max Chl Dpth (m)	0.32	Hydr. Depth (m)		0.16	

Conv. Total (m3/s)	18.2	Conv. (m3/s)	18.2
Length Wtd. (m)	133.70	Wetted Per. (m)	11.36
Min Ch El (m)	177.25	Shear (N/m2)	19.14
Alpha	1.00	Stream Power (N/m s)	20.81
Frctn Loss (m)	1.75	Cum Volume (1000 m3)	0.20
C & E Loss (m)	0.01	Cum SA (1000 m2)	1.01

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	177.72	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.		0.030	
W.S. Elev (m)	177.64	Reach Len. (m)	133.70	133.70	133.70
Crit W.S. (m)	177.62	Flow Area (m2)		2.73	
E.G. Slope (m/m)	0.011674	Area (m2)		2.73	
Q Total (m3/s)	3.44	Flow (m3/s)		3.44	
Top Width (m)	13.15	Top Width (m)		13.15	
Vel Total (m/s)	1.26	Avg. Vel. (m/s)		1.26	
Max Chl Dpth (m)	0.39	Hydr. Depth (m)		0.21	
Conv. Total (m3/s)	31.8	Conv. (m3/s)		31.8	
Length Wtd. (m)	133.70	Wetted Per. (m)		13.18	
Min Ch El (m)	177.25	Shear (N/m2)		23.70	
Alpha	1.00	Stream Power (N/m s)		29.87	
Frctn Loss (m)	1.65	Cum Volume (1000 m3)		0.30	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.17	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	177.76	Element	Left OB	Channel	Right OB
Vel Head (m)	0.09	Wt. n-Val.		0.030	
W.S. Elev (m)	177.67	Reach Len. (m)	133.70	133.70	133.70
Crit W.S. (m)	177.65	Flow Area (m2)		3.09	
E.G. Slope (m/m)	0.011634	Area (m2)		3.09	
Q Total (m3/s)	4.13	Flow (m3/s)		4.13	
Top Width (m)	13.57	Top Width (m)		13.57	
Vel Total (m/s)	1.34	Avg. Vel. (m/s)		1.34	
Max Chl Dpth (m)	0.41	Hydr. Depth (m)		0.23	
Conv. Total (m3/s)	38.3	Conv. (m3/s)		38.3	
Length Wtd. (m)	133.70	Wetted Per. (m)		13.61	
Min Ch El (m)	177.25	Shear (N/m2)		25.89	
Alpha	1.00	Stream Power (N/m s)		34.63	
Frctn Loss (m)	1.62	Cum Volume (1000 m3)		0.34	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.22	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	177.80	Element	Left OB	Channel	Right OB
Vel Head (m)	0.10	Wt. n-Val.		0.030	
W.S. Elev (m)	177.70	Reach Len. (m)	133.70	133.70	133.70
Crit W.S. (m)	177.68	Flow Area (m2)		3.62	
E.G. Slope (m/m)	0.010962	Area (m2)		3.62	
Q Total (m3/s)	5.07	Flow (m3/s)		5.07	
Top Width (m)	14.16	Top Width (m)		14.16	
Vel Total (m/s)	1.40	Avg. Vel. (m/s)		1.40	
Max Chl Dpth (m)	0.45	Hydr. Depth (m)		0.26	
Conv. Total (m3/s)	48.4	Conv. (m3/s)		48.4	
Length Wtd. (m)	133.70	Wetted Per. (m)		14.20	
Min Ch El (m)	177.25	Shear (N/m2)		27.37	
Alpha	1.00	Stream Power (N/m s)		38.37	
Frctn Loss (m)	1.56	Cum Volume (1000 m3)		0.40	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.28	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	177.84	Element	Left OB	Channel	Right OB
Vel Head (m)	0.11	Wt. n-Val.		0.030	
W.S. Elev (m)	177.73	Reach Len. (m)	133.70	133.70	133.70
Crit W.S. (m)	177.70	Flow Area (m2)		3.97	
E.G. Slope (m/m)	0.010843	Area (m2)		3.97	
Q Total (m3/s)	5.76	Flow (m3/s)		5.76	
Top Width (m)	14.61	Top Width (m)		14.61	
Vel Total (m/s)	1.45	Avg. Vel. (m/s)		1.45	
Max Chl Dpth (m)	0.48	Hydr. Depth (m)		0.27	
Conv. Total (m3/s)	55.3	Conv. (m3/s)		55.3	
Length Wtd. (m)	133.70	Wetted Per. (m)		14.66	
Min Ch El (m)	177.25	Shear (N/m2)		28.78	
Alpha	1.00	Stream Power (N/m s)		41.79	
Frctn Loss (m)	1.54	Cum Volume (1000 m3)		0.44	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.32	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	177.87	Element	Left OB	Channel	Right OB
Vel Head (m)	0.11	Wt. n-Val.		0.030	
W.S. Elev (m)	177.75	Reach Len. (m)	133.70	133.70	133.70
Crit W.S. (m)	177.73	Flow Area (m2)		4.35	
E.G. Slope (m/m)	0.010640	Area (m2)		4.35	
Q Total (m3/s)	6.47	Flow (m3/s)		6.47	
Top Width (m)	15.20	Top Width (m)		15.20	
Vel Total (m/s)	1.49	Avg. Vel. (m/s)		1.49	
Max Chl Dpth (m)	0.50	Hydr. Depth (m)		0.29	
Conv. Total (m3/s)	62.7	Conv. (m3/s)		62.7	
Length Wtd. (m)	133.70	Wetted Per. (m)		15.25	
Min Ch El (m)	177.25	Shear (N/m2)		29.74	
Alpha	1.00	Stream Power (N/m s)		44.28	
Frctn Loss (m)	1.51	Cum Volume (1000 m3)		0.48	
C & E Loss (m)	0.02	Cum SA (1000 m2)		1.38	

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	177.94	Element	Left OB	Channel	Right OB
Vel Head (m)	0.12	Wt. n-Val.		0.030	
W.S. Elev (m)	177.82	Reach Len. (m)	133.70	133.70	133.70
Crit W.S. (m)	177.79	Flow Area (m2)		5.39	
E.G. Slope (m/m)	0.009881	Area (m2)		5.39	
Q Total (m3/s)	8.42	Flow (m3/s)		8.42	
Top Width (m)	16.61	Top Width (m)		16.61	
Vel Total (m/s)	1.56	Avg. Vel. (m/s)		1.56	
Max Chl Dpth (m)	0.57	Hydr. Depth (m)		0.32	
Conv. Total (m3/s)	84.7	Conv. (m3/s)		84.7	
Length Wtd. (m)	133.70	Wetted Per. (m)		16.67	
Min Ch El (m)	177.25	Shear (N/m2)		31.35	
Alpha	1.00	Stream Power (N/m s)		48.95	
Frctn Loss (m)	1.43	Cum Volume (1000 m3)		0.59	
C & E Loss (m)	0.02	Cum SA (1000 m2)		1.50	

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	177.78	Element	Left OB	Channel	Right OB
Vel Head (m)	0.10	Wt. n-Val.		0.030	
W.S. Elev (m)	177.68	Reach Len. (m)	133.70	133.70	133.70
Crit W.S. (m)	177.66	Flow Area (m2)		3.27	
E.G. Slope (m/m)	0.011610	Area (m2)		3.27	
Q Total (m3/s)	4.49	Flow (m3/s)		4.49	
Top Width (m)	13.77	Top Width (m)		13.77	
Vel Total (m/s)	1.37	Avg. Vel. (m/s)		1.37	
Max Chl Dpth (m)	0.43	Hydr. Depth (m)		0.24	
Conv. Total (m3/s)	41.7	Conv. (m3/s)		41.7	
Length Wtd. (m)	133.70	Wetted Per. (m)		13.82	
Min Ch El (m)	177.25	Shear (N/m2)		26.93	
Alpha	1.00	Stream Power (N/m s)		37.00	
Frctn Loss (m)	1.60	Cum Volume (1000 m3)		0.36	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.24	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Rouge
REACH: WC3 RS: 5

INPUT
Description: ST-5
Station Elevation Data num= 95

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	182	.421	181.803	1.081	181.5	1.481	181.313	2.164	181
3.215	180.562	3.363	180.5	4.433	180.007	4.448	180	4.637	179.917
5.541	179.5	5.707	179.414	6.589	179	6.887	178.845	7.671	178.5
8.578	178.161	8.943	178	9.714	177.831	11.123	177.5	13.269	177.415
15.464	177.346	22.28	177.107	22.609	177.101	23.48	177.101	24.757	177.14
32.165	177.292	37.147	177.4	38.42	177.419	42.935	177.5	44.701	177.512
46.197	177.5	46.657	177.462	50.868	177.242	51.555	177.227	52.191	177.225
52.272	177.223	52.778	177	53.782	176.595	54.009	176.5	54.578	176.256
55.253	176	56.173	175.582	56.381	175.5	56.961	175.388	57.763	175.266
58.218	175.22	59.207	175.5	59.578	175.658	60.252	176	61.078	176.421
61.236	176.5	61.854	176.742	62.253	177	62.571	177.194	63.26	177.5
63.445	177.521	63.494	177.523	67.875	178	67.977	178.002	68.118	178
69.002	177.965	78.829	177.563	82.999	177.538	86.824	177.5	87.543	177.467
89.013	177.45	90.846	177.485	91.239	177.492	91.406	177.494	91.566	177.5
91.696	177.556	92.692	178	92.889	178.089	93.821	178.5	94.735	178.868
95.057	179	96.016	179.386	96.304	179.5	97.286	179.902	97.535	180
97.798	180.112	98.648	180.5	98.897	180.611	99.75	181	99.995	181.109
100.852	181.5	101.092	181.607	101.953	182	102.194	182.112	102.929	182.5
103.478	182.783	103.9	183	104.511	183.315	104.87	183.5	105.258	183.611

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	52.191	.03	62.571	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
52.191	62.571	0	0	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	175.87	Element	Left OB	Channel	Right OB
Vel Head (m)	0.15	Wt. n-Val.		0.030	
W.S. Elev (m)	175.72	Reach Len. (m)			
Crit W.S. (m)	175.72	Flow Area (m2)		1.15	
E.G. Slope (m/m)	0.014177	Area (m2)		1.15	
Q Total (m3/s)	2.00	Flow (m3/s)		2.00	
Top Width (m)	3.82	Top Width (m)		3.82	
Vel Total (m/s)	1.74	Avg. Vel. (m/s)		1.74	
Max Chl Dpth (m)	0.50	Hydr. Depth (m)		0.30	
Conv. Total (m3/s)	16.8	Conv. (m3/s)		16.8	
Length Wtd. (m)		Wetted Per. (m)		3.97	
Min Ch El (m)	175.22	Shear (N/m2)		40.29	
Alpha	1.00	Stream Power (N/m s)		70.04	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	176.06	Element	Left OB	Channel	Right OB
Vel Head (m)	0.20	Wt. n-Val.		0.030	
W.S. Elev (m)	175.86	Reach Len. (m)			
Crit W.S. (m)	175.86	Flow Area (m2)		1.73	
E.G. Slope (m/m)	0.013127	Area (m2)		1.73	
Q Total (m3/s)	3.44	Flow (m3/s)		3.44	
Top Width (m)	4.41	Top Width (m)		4.41	
Vel Total (m/s)	1.98	Avg. Vel. (m/s)		1.98	
Max Chl Dpth (m)	0.64	Hydr. Depth (m)		0.39	
Conv. Total (m3/s)	30.0	Conv. (m3/s)		30.0	
Length Wtd. (m)		Wetted Per. (m)		4.63	
Min Ch El (m)	175.22	Shear (N/m2)		48.23	
Alpha	1.00	Stream Power (N/m s)		95.74	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	176.13	Element	Left OB	Channel	Right OB
Vel Head (m)	0.22	Wt. n-Val.		0.030	
W.S. Elev (m)	175.92	Reach Len. (m)			
Crit W.S. (m)	175.92	Flow Area (m2)		2.00	
E.G. Slope (m/m)	0.012611	Area (m2)		2.00	
Q Total (m3/s)	4.13	Flow (m3/s)		4.13	
Top Width (m)	4.66	Top Width (m)		4.66	
Vel Total (m/s)	2.06	Avg. Vel. (m/s)		2.06	
Max Chl Dpth (m)	0.70	Hydr. Depth (m)		0.43	
Conv. Total (m3/s)	36.8	Conv. (m3/s)		36.8	
Length Wtd. (m)		Wetted Per. (m)		4.90	
Min Ch El (m)	175.22	Shear (N/m2)		50.55	
Alpha	1.00	Stream Power (N/m s)		104.21	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	176.23	Element	Left OB	Channel	Right OB
Vel Head (m)	0.24	Wt. n-Val.		0.030	
W.S. Elev (m)	175.99	Reach Len. (m)			
Crit W.S. (m)	175.99	Flow Area (m2)		2.33	
E.G. Slope (m/m)	0.012464	Area (m2)		2.33	
Q Total (m3/s)	5.07	Flow (m3/s)		5.07	
Top Width (m)	4.94	Top Width (m)		4.94	
Vel Total (m/s)	2.18	Avg. Vel. (m/s)		2.18	
Max Chl Dpth (m)	0.77	Hydr. Depth (m)		0.47	
Conv. Total (m3/s)	45.4	Conv. (m3/s)		45.4	
Length Wtd. (m)		Wetted Per. (m)		5.22	
Min Ch El (m)	175.22	Shear (N/m2)		54.61	
Alpha	1.00	Stream Power (N/m s)		118.79	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	176.29	Element	Left OB	Channel	Right OB
Vel Head (m)	0.25	Wt. n-Val.		0.030	
W.S. Elev (m)	176.03	Reach Len. (m)			
Crit W.S. (m)	176.03	Flow Area (m2)		2.58	

E.G. Slope (m/m)	0.012240	Area (m2)	2.58
Q Total (m3/s)	5.76	Flow (m3/s)	5.76
Top Width (m)	5.16	Top Width (m)	5.16
Vel Total (m/s)	2.24	Avg. Vel. (m/s)	2.24
Max Chl Dpth (m)	0.81	Hydr. Depth (m)	0.50
Conv. Total (m3/s)	52.1	Conv. (m3/s)	52.1
Length Wtd. (m)		Wetted Per. (m)	5.46
Min Ch El (m)	175.22	Shear (N/m2)	56.68
Alpha	1.00	Stream Power (N/m s)	126.75
Frctn Loss (m)		Cum Volume (1000 m3)	
C & E Loss (m)		Cum SA (1000 m2)	

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	176.35	Element	Left OB	Channel	Right OB
Vel Head (m)	0.27	Wt. n-Val.		0.030	
W.S. Elev (m)	176.08	Reach Len. (m)			
Crit W.S. (m)	176.08	Flow Area (m2)		2.83	
E.G. Slope (m/m)	0.011943	Area (m2)		2.83	
Q Total (m3/s)	6.47	Flow (m3/s)		6.47	
Top Width (m)	5.38	Top Width (m)		5.38	
Vel Total (m/s)	2.29	Avg. Vel. (m/s)		2.29	
Max Chl Dpth (m)	0.86	Hydr. Depth (m)		0.53	
Conv. Total (m3/s)	59.2	Conv. (m3/s)		59.2	
Length Wtd. (m)		Wetted Per. (m)		5.70	
Min Ch El (m)	175.22	Shear (N/m2)		58.19	
Alpha	1.00	Stream Power (N/m s)		132.98	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	176.50	Element	Left OB	Channel	Right OB
Vel Head (m)	0.30	Wt. n-Val.		0.030	
W.S. Elev (m)	176.20	Reach Len. (m)			
Crit W.S. (m)	176.20	Flow Area (m2)		3.47	
E.G. Slope (m/m)	0.011642	Area (m2)		3.47	
Q Total (m3/s)	8.42	Flow (m3/s)		8.42	
Top Width (m)	5.90	Top Width (m)		5.90	
Vel Total (m/s)	2.43	Avg. Vel. (m/s)		2.43	
Max Chl Dpth (m)	0.98	Hydr. Depth (m)		0.59	
Conv. Total (m3/s)	78.0	Conv. (m3/s)		78.0	
Length Wtd. (m)		Wetted Per. (m)		6.27	
Min Ch El (m)	175.22	Shear (N/m2)		63.23	
Alpha	1.00	Stream Power (N/m s)		153.36	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	176.17	Element	Left OB	Channel	Right OB
Vel Head (m)	0.22	Wt. n-Val.		0.030	
W.S. Elev (m)	175.95	Reach Len. (m)			
Crit W.S. (m)	175.95	Flow Area (m2)		2.14	
E.G. Slope (m/m)	0.012350	Area (m2)		2.14	
Q Total (m3/s)	4.49	Flow (m3/s)		4.49	
Top Width (m)	4.78	Top Width (m)		4.78	
Vel Total (m/s)	2.10	Avg. Vel. (m/s)		2.10	
Max Chl Dpth (m)	0.73	Hydr. Depth (m)		0.45	
Conv. Total (m3/s)	40.4	Conv. (m3/s)		40.4	
Length Wtd. (m)		Wetted Per. (m)		5.04	
Min Ch El (m)	175.22	Shear (N/m2)		51.52	
Alpha	1.00	Stream Power (N/m s)		107.94	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

SUMMARY OF MANNING'S N VALUES

River:Rouge

Reach	River Sta.	n1	n2	n3
WC3	300	.035	.03	.035
WC3	200	.035	.03	.035
WC3	100	.035	.03	.035
WC3	10	.035	.03	.035
WC3	5	.035	.03	.035

SUMMARY OF REACH LENGTHS

River: Rouge

Reach	River Sta.	Left	Channel	Right
WC3	300	98	98	98
WC3	200	43	43	43
WC3	100	44.6	44.6	44.6
WC3	10	133.7	133.7	133.7
WC3	5	0	0	0

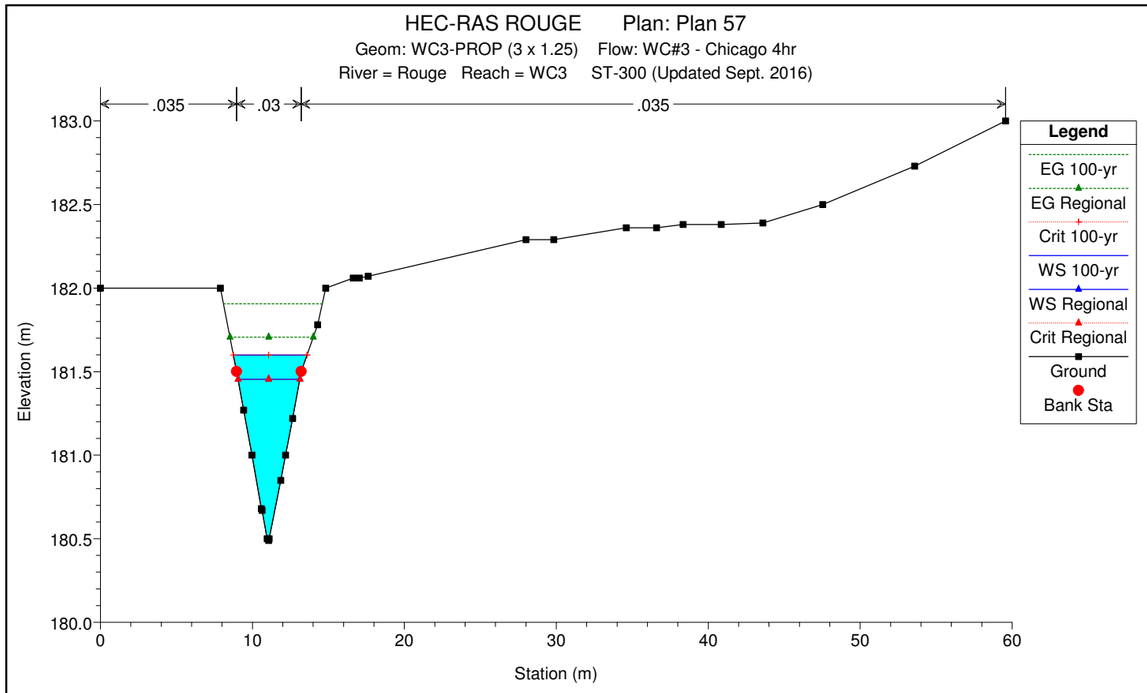
SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Rouge

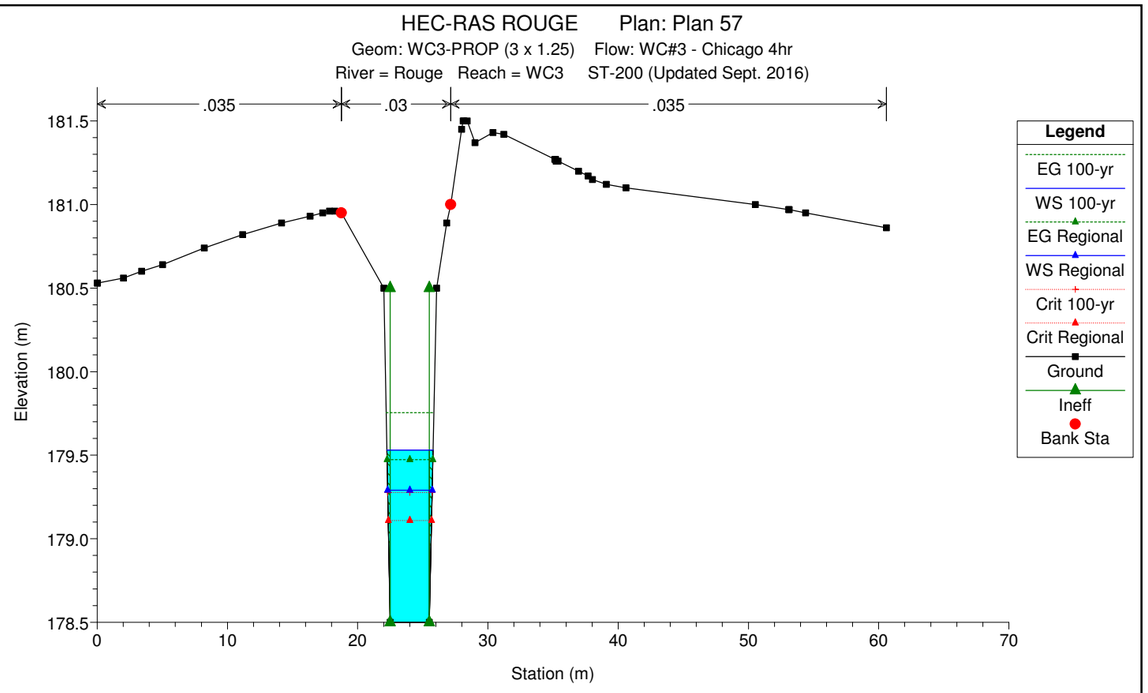
Reach	River Sta.	Contr.	Expan.
WC3	300	.1	.3
WC3	200	.1	.3
WC3	100	.1	.3
WC3	10	.1	.3
WC3	5	.1	.3

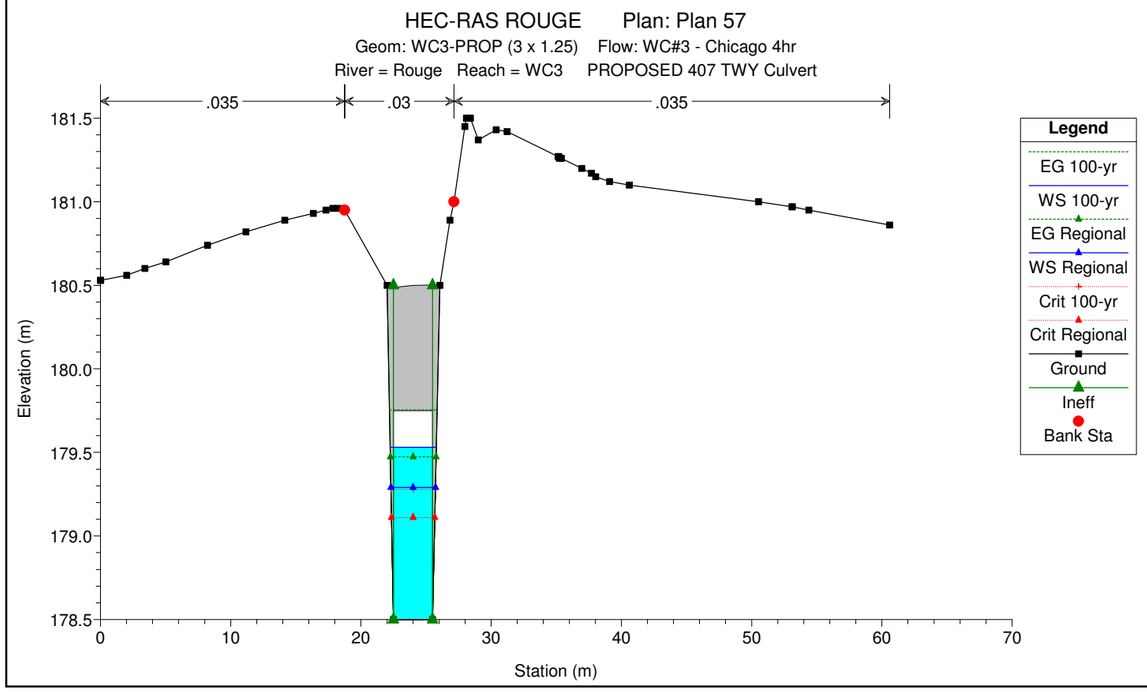
Profile Output Table - Standard Table 1

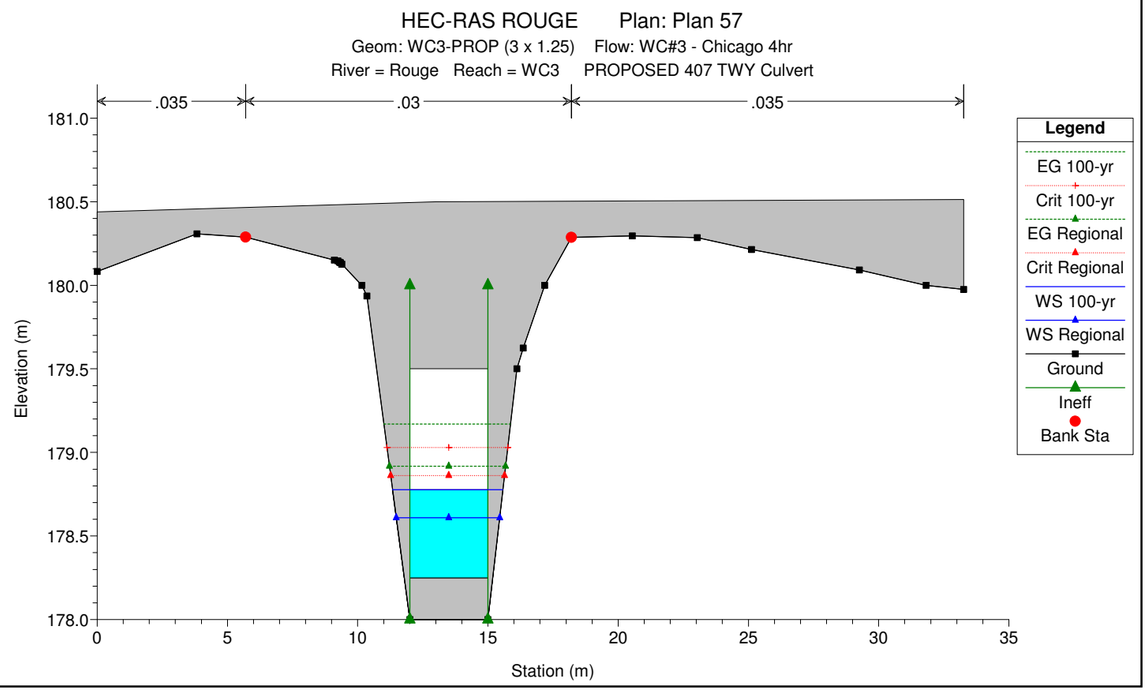
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
WC3	300	2-yr	2.00	180.49	181.32	181.18	181.41	0.005450	1.31	1.53	3.55	0.64
WC3	300	5-yr	3.44	180.49	181.46		181.60	0.007384	1.68	2.04	4.10	0.76
WC3	300	10-yr	4.13	180.49	181.51	181.42	181.68	0.008231	1.84	2.25	6.01	0.81
WC3	300	25-yr	5.07	180.49	181.59	181.59	181.75	0.006628	1.83	3.32	13.58	0.75
WC3	300	50-yr	5.76	180.49	181.63	181.63	181.79	0.006321	1.86	3.87	13.74	0.74
WC3	300	100-yr	6.47	180.49	181.68	181.68	181.83	0.005845	1.87	4.46	13.90	0.72
WC3	300	Check Flow	8.42	180.49	181.73	181.73	181.92	0.006870	2.13	5.20	14.10	0.78
WC3	300	Regional	4.49	180.49	181.53	181.45	181.71	0.008665	1.93	2.41	11.73	0.84
WC3	200	2-yr	2.00	179.94	180.43	180.43	180.59	0.014008	1.78	1.12	3.54	1.01
WC3	200	5-yr	3.44	179.94	180.63	180.63	180.77	0.009727	1.69	2.23	9.69	0.87
WC3	200	10-yr	4.13	179.94	180.69	180.69	180.82	0.009071	1.68	2.85	12.13	0.85
WC3	200	25-yr	5.07	179.94	180.74	180.74	180.87	0.009088	1.73	3.53	14.28	0.85
WC3	200	50-yr	5.76	179.94	180.77	180.77	180.91	0.009033	1.76	4.02	15.79	0.85
WC3	200	100-yr	6.47	179.94	180.80	180.80	180.94	0.009326	1.81	4.44	16.97	0.87
WC3	200	Check Flow	8.42	179.94	180.87	180.87	181.01	0.008887	1.85	5.86	21.49	0.86
WC3	200	Regional	4.49	179.94	180.71	180.71	180.84	0.008975	1.69	3.13	13.07	0.84
WC3	100	2-yr	2.00	178.99	179.47	179.47	179.61	0.013885	1.67	1.20	4.17	1.00
WC3	100	5-yr	3.44	178.99	179.60	179.60	179.79	0.013229	1.91	1.80	4.92	1.01
WC3	100	10-yr	4.13	178.99	179.66	179.66	179.86	0.012823	1.99	2.07	5.20	1.01
WC3	100	25-yr	5.07	178.99	179.73	179.73	179.95	0.012416	2.08	2.43	5.56	1.01
WC3	100	50-yr	5.76	178.99	179.77	179.77	180.00	0.012190	2.14	2.69	5.80	1.01
WC3	100	100-yr	6.47	178.99	179.81	179.81	180.06	0.011976	2.20	2.94	6.03	1.00

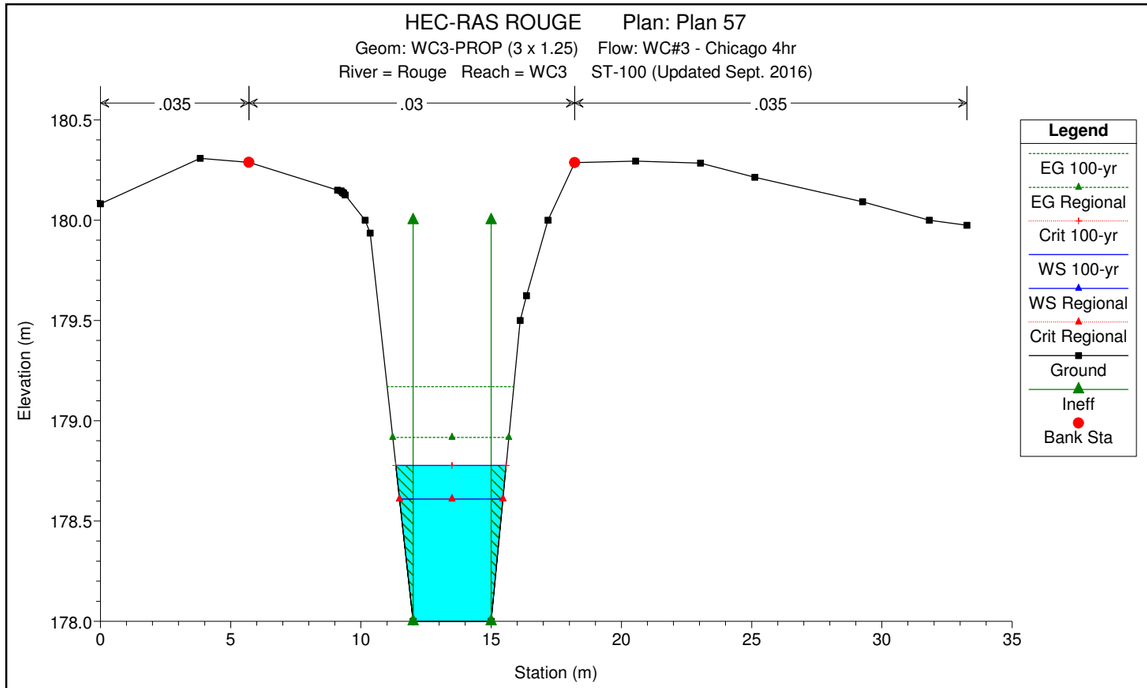
WC3	100	Check Flow	8.42	178.99	179.92	179.92	180.20	0.011550	2.33	3.62	6.60	1.00
WC3	100	Regional	4.49	178.99	179.68	179.68	179.89	0.012645	2.03	2.21	5.35	1.01
WC3	10	2-yr	2.00	177.25	177.57	177.55	177.63	0.012060	1.09	1.84	11.34	0.86
WC3	10	5-yr	3.44	177.25	177.64	177.62	177.72	0.011674	1.26	2.73	13.15	0.88
WC3	10	10-yr	4.13	177.25	177.67	177.65	177.76	0.011634	1.34	3.09	13.57	0.90
WC3	10	25-yr	5.07	177.25	177.70	177.68	177.80	0.010962	1.40	3.62	14.16	0.89
WC3	10	50-yr	5.76	177.25	177.73	177.70	177.84	0.010843	1.45	3.97	14.61	0.89
WC3	10	100-yr	6.47	177.25	177.75	177.73	177.87	0.010640	1.49	4.35	15.20	0.89
WC3	10	Check Flow	8.42	177.25	177.82	177.79	177.94	0.009881	1.56	5.39	16.61	0.88
WC3	10	Regional	4.49	177.25	177.68	177.66	177.78	0.011610	1.37	3.27	13.77	0.90
WC3	5	2-yr	2.00	175.22	175.72	175.72	175.87	0.014177	1.74	1.15	3.82	1.01
WC3	5	5-yr	3.44	175.22	175.86	175.86	176.06	0.013127	1.98	1.73	4.41	1.01
WC3	5	10-yr	4.13	175.22	175.92	175.92	176.13	0.012611	2.06	2.00	4.66	1.00
WC3	5	25-yr	5.07	175.22	175.99	175.99	176.23	0.012464	2.18	2.33	4.94	1.01
WC3	5	50-yr	5.76	175.22	176.03	176.03	176.29	0.012240	2.24	2.58	5.16	1.01
WC3	5	100-yr	6.47	175.22	176.08	176.08	176.35	0.011943	2.29	2.83	5.38	1.01
WC3	5	Check Flow	8.42	175.22	176.20	176.20	176.50	0.011642	2.43	3.47	5.90	1.01
WC3	5	Regional	4.49	175.22	175.95	175.95	176.17	0.012350	2.10	2.14	4.78	1.00

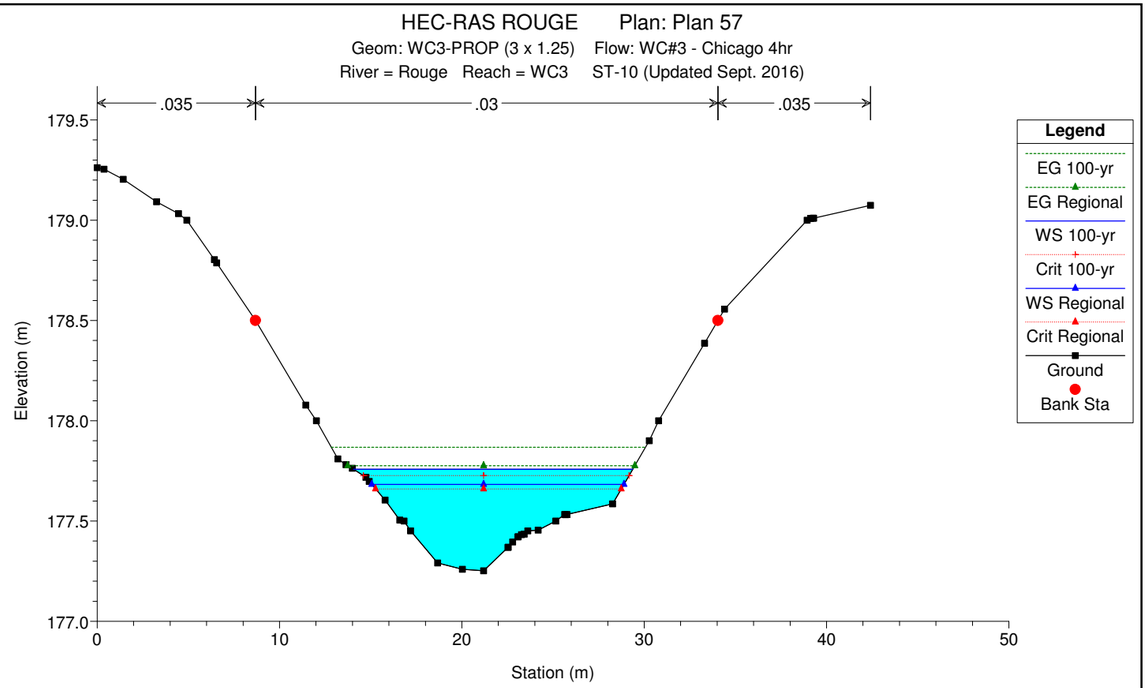

HEC-RAS ROUGE Plan: Plan 57
Geom: WC3-PROP (3 x 1.25) Flow: WC#3 - Chicago 4hr
River = Rouge Reach = WC3 ST-300 (Updated Sept. 2016)
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG 100-yr
EG Regional
Crit 100-yr
WS 100-yr
WS Regional
Crit Regional
Ground
Bank Sta

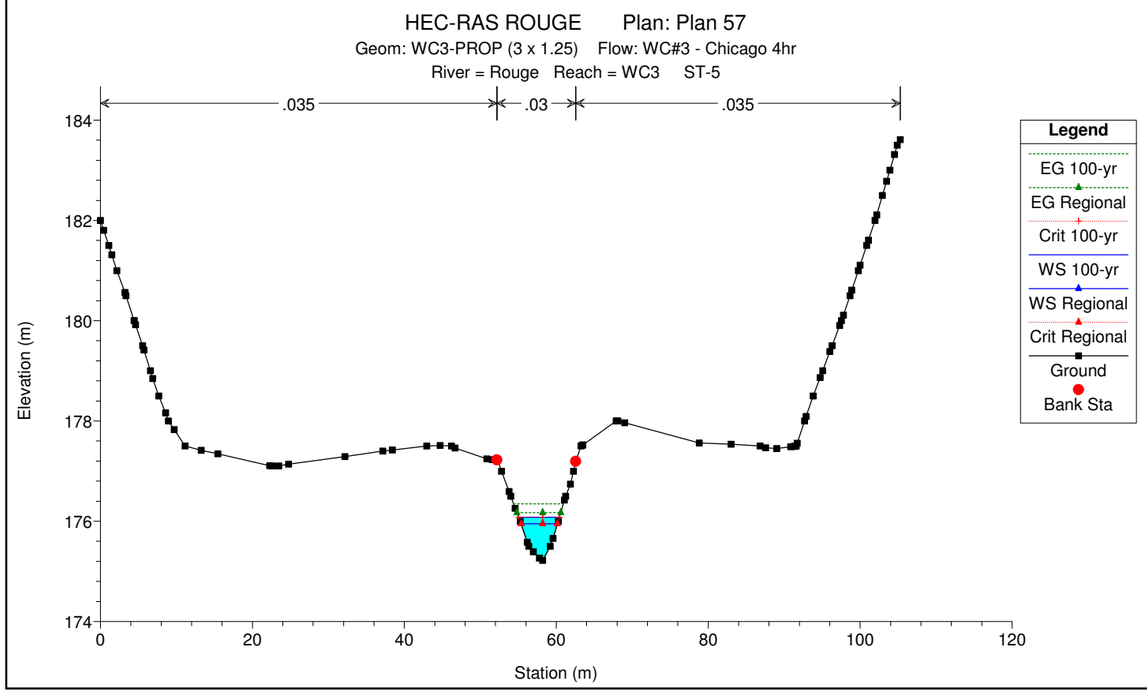

HEC-RAS ROUGE Plan: Plan 57
Geom: WC3-PROP (3 x 1.25) Flow: WC#3 - Chicago 4hr
River = Rouge Reach = WC3 ST-200 (Updated Sept. 2016)
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG 100-yr
WS 100-yr
EG Regional
WS Regional
Crit 100-yr
Crit Regional
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 57
Geom: WC3-PROP (3 x 1.25) Flow: WC#3 - Chicago 4hr
River = Rouge Reach = WC3 PROPOSED 407 TWY Culvert
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG 100-yr
WS 100-yr
EG Regional
WS Regional
Crit 100-yr
Crit Regional
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 57
Geom: WC3-PROP (3 x 1.25) Flow: WC#3 - Chicago 4hr
River = Rouge Reach = WC3 PROPOSED 407 TWY Culvert
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG 100-yr
Crit 100-yr
EG Regional
Crit Regional
WS 100-yr
WS Regional
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 57
Geom: WC3-PROP (3 x 1.25) Flow: WC#3 - Chicago 4hr
River = Rouge Reach = WC3 ST-100 (Updated Sept. 2016)
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG 100-yr
EG Regional
Crit 100-yr
WS 100-yr
WS Regional
Crit Regional
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 57
Geom: WC3-PROP (3 x 1.25) Flow: WC#3 - Chicago 4hr
River = Rouge Reach = WC3 ST-10 (Updated Sept. 2016)
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG 100-yr
EG Regional
WS 100-yr
Crit 100-yr
WS Regional
Crit Regional
Ground
Bank Sta


HEC-RAS ROUGE Plan: Plan 57
Geom: WC3-PROP (3 x 1.25) Flow: WC#3 - Chicago 4hr
River = Rouge Reach = WC3 ST-5
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG 100-yr
EG Regional
Crit 100-yr
WS 100-yr
WS Regional
Crit Regional
Ground
Bank Sta

HEC-RAS Plan: WC3-PROP-4hr CH River: Rouge Reach: WC3

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC3	300	2-yr	2.00	180.49	181.18	181.18	181.36	0.014619	1.90	1.06	2.96	1.01
WC3	300	5-yr	3.44	180.49	181.36	181.36	181.58	0.013393	2.10	1.64	3.68	1.01
WC3	300	10-yr	4.13	180.49	181.42	181.42	181.67	0.013206	2.19	1.89	3.94	1.01
WC3	300	25-yr	5.07	180.49	181.50	181.50	181.77	0.013155	2.30	2.20	4.25	1.02
WC3	300	50-yr	5.76	180.49	181.55	181.55	181.84	0.012519	2.38	2.42	4.55	1.01
WC3	300	100-yr	6.47	180.49	181.60	181.60	181.91	0.011770	2.45	2.66	4.86	1.00
WC3	300	Check Flow	8.42	180.49	181.74	181.74	182.07	0.010022	2.58	3.38	5.68	0.95
WC3	300	Regional	4.49	180.49	181.45	181.45	181.71	0.013000	2.22	2.02	4.08	1.01
WC3	200	2-yr	2.00	178.50	178.96	178.86	179.07	0.005289	1.45	1.38	3.25	0.68
WC3	200	5-yr	3.44	178.50	179.16	179.01	179.31	0.004703	1.73	1.98	3.35	0.68
WC3	200	10-yr	4.13	178.50	179.25	179.08	179.42	0.004509	1.84	2.24	3.40	0.68
WC3	200	25-yr	5.07	178.50	179.36	179.16	179.56	0.004185	1.96	2.59	3.46	0.67
WC3	200	50-yr	5.76	178.50	179.45	179.22	179.66	0.003968	2.03	2.84	3.51	0.66
WC3	200	100-yr	6.47	178.50	179.53	179.28	179.75	0.003779	2.09	3.09	3.55	0.66
WC3	200	Check Flow	8.42	178.50	179.81	179.43	180.04	0.002878	2.14	3.93	3.70	0.60
WC3	200	Regional	4.49	178.50	179.29	179.11	179.47	0.004404	1.89	2.37	3.42	0.68
WC3	150		Culvert									
WC3	100	2-yr	2.00	178.00	178.36	178.36	178.53	0.012587	1.88	1.07	3.57	1.01
WC3	100	5-yr	3.44	178.00	178.51	178.51	178.77	0.011124	2.25	1.53	3.81	1.00
WC3	100	10-yr	4.13	178.00	178.58	178.58	178.87	0.010728	2.39	1.73	3.92	1.01
WC3	100	25-yr	5.07	178.00	178.66	178.66	178.99	0.010167	2.55	1.99	4.05	1.00
WC3	100	50-yr	5.76	178.00	178.72	178.72	179.08	0.009967	2.67	2.16	4.14	1.01
WC3	100	100-yr	6.47	178.00	178.78	178.78	179.17	0.009713	2.78	2.33	4.24	1.01
WC3	100	Check Flow	8.42	178.00	178.93	178.93	179.39	0.009143	3.03	2.78	4.47	1.00
WC3	100	Regional	4.49	178.00	178.61	178.61	178.92	0.010512	2.46	1.83	3.97	1.00
WC3	10	2-yr	2.00	177.25	177.57	177.55	177.63	0.011816	1.08	1.86	11.42	0.85
WC3	10	5-yr	3.44	177.25	177.64	177.62	177.72	0.011359	1.25	2.75	13.18	0.87
WC3	10	10-yr	4.13	177.25	177.67	177.65	177.76	0.010975	1.31	3.15	13.64	0.87
WC3	10	25-yr	5.07	177.25	177.71	177.68	177.80	0.010593	1.39	3.66	14.20	0.87
WC3	10	50-yr	5.76	177.25	177.73	177.70	177.84	0.010444	1.43	4.02	14.69	0.87
WC3	10	100-yr	6.47	177.25	177.76	177.73	177.87	0.010136	1.46	4.42	15.31	0.87
WC3	10	Check Flow	8.42	177.25	177.82	177.79	177.94	0.009429	1.54	5.48	16.67	0.86
WC3	10	Regional	4.49	177.25	177.68	177.66	177.78	0.011097	1.35	3.32	13.83	0.88
WC3	5	2-yr	2.00	175.22	175.72	175.72	175.87	0.014177	1.74	1.15	3.82	1.01
WC3	5	5-yr	3.44	175.22	175.86	175.86	176.06	0.013135	1.99	1.73	4.41	1.01

HEC-RAS Plan: WC3-PROP-4hr CH River: Rouge Reach: WC3 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC3	5	10-yr	4.13	175.22	175.92	175.92	176.13	0.012800	2.07	1.99	4.65	1.01
WC3	5	25-yr	5.07	175.22	175.99	175.99	176.23	0.012463	2.17	2.33	4.94	1.01
WC3	5	50-yr	5.76	175.22	176.04	176.04	176.29	0.012228	2.24	2.58	5.16	1.01
WC3	5	100-yr	6.47	175.22	176.08	176.08	176.35	0.012039	2.29	2.82	5.37	1.01
WC3	5	Check Flow	8.42	175.22	176.20	176.20	176.50	0.011630	2.42	3.47	5.90	1.01
WC3	5	Regional	4.49	175.22	175.95	175.95	176.17	0.012356	2.10	2.14	4.78	1.00

HEC-RAS HEC-RAS 5.0.1 April 2016
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
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PROJECT DATA
Project Title: HEC-RAS ROUGE
Project File : HEC.prj
Run Date and Time: 9/7/2016 1:09:05 PM

Project in SI units

Project Description:
HEC-RAS model for creek crossings along the proposed 407 TWY Ph 2 started
from scratch

PLAN DATA

Plan Title: Plan 57
Plan File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.p57

Geometry Title: WC3-PROP (3 x 1.25)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g05

Flow Title : WC#3 - Chicago 4hr
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f02

Plan Summary Information:
Number of: Cross Sections = 5 Multiple Openings = 0
Culverts = 1 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: WC#3 - Chicago 4hr
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f02

Flow Data (m3/s)

River	Reach	RS	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Check Flow	Regional
Rouge	WC3	300	2	3.44	4.13	5.07	5.76	6.47	8.42	4.49

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Rouge	WC3	2-yr		Critical
Rouge	WC3	5-yr		Critical
Rouge	WC3	10-yr		Critical
Rouge	WC3	25-yr		Critical
Rouge	WC3	50-yr		Critical
Rouge	WC3	100-yr		Critical
Rouge	WC3	Check Flow		Critical
Rouge	WC3	Regional		Critical

GEOMETRY DATA

Geometry Title: WC3-PROP (3 x 1.25)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g05

CROSS SECTION

RIVER: Rouge
REACH: WC3 RS: 300

INPUT
Description: ST-300 (Updated Sept. 2016)
Station Elevation Data num= 29

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	182	7.89	182	8.96	181.5	9.42	181.27	9.98	181
10.59	180.68	10.63	180.67	10.97	180.5	11.07	180.49	11.1	180.5
11.87	180.85	12.18	181	12.65	181.22	13.22	181.5	14.3	181.78
14.83	182	16.64	182.06	17.03	182.06	17.61	182.07	28.01	182.29
29.84	182.29	34.61	182.36	36.6	182.36	38.34	182.38	40.86	182.38
43.59	182.39	47.53	182.5	53.59	182.73	59.57	183		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	8.96	.03	13.22	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
8.96 13.22 98 98 98 .3 .5

CROSS SECTION OUTPUT Profile #2-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	181.36	Element			
Vel Head (m)	0.18	Wt. n-Val.		0.030	
W.S. Elev (m)	181.18	Reach Len. (m)	98.00	98.00	98.00
Crit W.S. (m)	181.18	Flow Area (m2)		1.06	
E.G. Slope (m/m)	0.014619	Area (m2)		1.06	
Q Total (m3/s)	2.00	Flow (m3/s)		2.00	
Top Width (m)	2.96	Top Width (m)		2.96	
Vel Total (m/s)	1.90	Avg. Vel. (m/s)		1.90	
Max Chl Dpth (m)	0.69	Hydr. Depth (m)		0.36	
Conv. Total (m3/s)	16.5	Conv. (m3/s)		16.5	
Length Wtd. (m)	98.00	Wetted Per. (m)		3.27	
Min Ch El (m)	180.49	Shear (N/m2)		46.24	
Alpha	1.00	Stream Power (N/m s)		87.64	
Frctn Loss (m)	0.81	Cum Volume (1000 m3)		0.43	
C & E Loss (m)	0.04	Cum SA (1000 m2)		1.80	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	181.58	Element	Left OB	Channel	Right OB
Vel Head (m)	0.23	Wt. n-Val.		0.030	
W.S. Elev (m)	181.36	Reach Len. (m)	98.00	98.00	98.00
Crit W.S. (m)	181.36	Flow Area (m2)		1.64	
E.G. Slope (m/m)	0.013393	Area (m2)		1.64	
Q Total (m3/s)	3.44	Flow (m3/s)		3.44	
Top Width (m)	3.68	Top Width (m)		3.68	
Vel Total (m/s)	2.10	Avg. Vel. (m/s)		2.10	
Max Chl Dpth (m)	0.87	Hydr. Depth (m)		0.45	
Conv. Total (m3/s)	29.7	Conv. (m3/s)		29.7	
Length Wtd. (m)	98.00	Wetted Per. (m)		4.07	
Min Ch El (m)	180.49	Shear (N/m2)		52.81	
Alpha	1.00	Stream Power (N/m s)		110.99	
Frctn Loss (m)	0.73	Cum Volume (1000 m3)		0.64	
C & E Loss (m)	0.04	Cum SA (1000 m2)		2.05	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	181.67	Element	Left OB	Channel	Right OB
Vel Head (m)	0.24	Wt. n-Val.		0.030	
W.S. Elev (m)	181.42	Reach Len. (m)	98.00	98.00	98.00
Crit W.S. (m)	181.42	Flow Area (m2)		1.89	
E.G. Slope (m/m)	0.013206	Area (m2)		1.89	
Q Total (m3/s)	4.13	Flow (m3/s)		4.13	
Top Width (m)	3.94	Top Width (m)		3.94	
Vel Total (m/s)	2.19	Avg. Vel. (m/s)		2.19	
Max Chl Dpth (m)	0.93	Hydr. Depth (m)		0.48	
Conv. Total (m3/s)	35.9	Conv. (m3/s)		35.9	
Length Wtd. (m)	98.00	Wetted Per. (m)		4.37	
Min Ch El (m)	180.49	Shear (N/m2)		55.96	
Alpha	1.00	Stream Power (N/m s)		122.50	
Frctn Loss (m)	0.70	Cum Volume (1000 m3)		0.74	
C & E Loss (m)	0.04	Cum SA (1000 m2)		2.13	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	181.77	Element	Left OB	Channel	Right OB
Vel Head (m)	0.27	Wt. n-Val.		0.030	
W.S. Elev (m)	181.50	Reach Len. (m)	98.00	98.00	98.00
Crit W.S. (m)	181.50	Flow Area (m2)		2.20	
E.G. Slope (m/m)	0.013155	Area (m2)		2.20	
Q Total (m3/s)	5.07	Flow (m3/s)		5.07	
Top Width (m)	4.25	Top Width (m)		4.25	
Vel Total (m/s)	2.30	Avg. Vel. (m/s)		2.30	
Max Chl Dpth (m)	1.01	Hydr. Depth (m)		0.52	
Conv. Total (m3/s)	44.2	Conv. (m3/s)		44.2	
Length Wtd. (m)	98.00	Wetted Per. (m)		4.71	
Min Ch El (m)	180.49	Shear (N/m2)		60.27	
Alpha	1.00	Stream Power (N/m s)		138.75	
Frctn Loss (m)	0.67	Cum Volume (1000 m3)		0.86	
C & E Loss (m)	0.04	Cum SA (1000 m2)		2.23	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	181.84	Element	Left OB	Channel	Right OB
Vel Head (m)	0.29	Wt. n-Val.	0.035	0.030	0.035
W.S. Elev (m)	181.55	Reach Len. (m)	98.00	98.00	98.00
Crit W.S. (m)	181.55	Flow Area (m2)	0.00	2.41	0.00
E.G. Slope (m/m)	0.012519	Area (m2)	0.00	2.41	0.00
Q Total (m3/s)	5.76	Flow (m3/s)	0.00	5.76	0.00
Top Width (m)	4.55	Top Width (m)	0.10	4.26	0.18
Vel Total (m/s)	2.38	Avg. Vel. (m/s)	0.25	2.38	0.26
Max Chl Dpth (m)	1.06	Hydr. Depth (m)	0.02	0.57	0.02
Conv. Total (m3/s)	51.5	Conv. (m3/s)	0.0	51.5	0.0
Length Wtd. (m)	98.00	Wetted Per. (m)	0.11	4.72	0.19
Min Ch El (m)	180.49	Shear (N/m2)	2.66	62.77	2.84
Alpha	1.00	Stream Power (N/m s)	0.66	149.70	0.74
Frctn Loss (m)	0.64	Cum Volume (1000 m3)	0.00	0.94	0.00
C & E Loss (m)	0.04	Cum SA (1000 m2)	0.01	2.29	0.01

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	181.91	Element	Left OB	Channel	Right OB
Vel Head (m)	0.31	Wt. n-Val.	0.035	0.030	0.035
W.S. Elev (m)	181.60	Reach Len. (m)	98.00	98.00	98.00
Crit W.S. (m)	181.60	Flow Area (m2)	0.01	2.63	0.02
E.G. Slope (m/m)	0.011770	Area (m2)	0.01	2.63	0.02
Q Total (m3/s)	6.47	Flow (m3/s)	0.00	6.46	0.01
Top Width (m)	4.86	Top Width (m)	0.21	4.26	0.38
Vel Total (m/s)	2.43	Avg. Vel. (m/s)	0.39	2.45	0.41
Max Chl Dpth (m)	1.11	Hydr. Depth (m)	0.05	0.62	0.05
Conv. Total (m3/s)	59.6	Conv. (m3/s)	0.0	59.5	0.1
Length Wtd. (m)	98.00	Wetted Per. (m)	0.24	4.72	0.40
Min Ch El (m)	180.49	Shear (N/m2)	5.21	64.40	5.56
Alpha	1.02	Stream Power (N/m s)	2.04	157.84	2.28
Frctn Loss (m)	0.60	Cum Volume (1000 m3)	0.00	1.03	0.00
C & E Loss (m)	0.04	Cum SA (1000 m2)	0.01	2.37	0.02

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than

1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	182.07	Element	Left OB	Channel	Right OB
Vel Head (m)	0.34	Wt. n-Val.	0.035	0.030	0.035
W.S. Elev (m)	181.74	Reach Len. (m)	98.00	98.00	98.00
Crit W.S. (m)	181.74	Flow Area (m2)	0.06	3.22	0.11
E.G. Slope (m/m)	0.010022	Area (m2)	0.06	3.22	0.11
Q Total (m3/s)	8.42	Flow (m3/s)	0.04	8.31	0.07
Top Width (m)	5.68	Top Width (m)	0.51	4.26	0.91
Vel Total (m/s)	2.49	Avg. Vel. (m/s)	0.64	2.58	0.67
Max Chl Dpth (m)	1.25	Hydr. Depth (m)	0.12	0.76	0.12
Conv. Total (m3/s)	84.1	Conv. (m3/s)	0.4	83.0	0.7
Length Wtd. (m)	98.00	Wetted Per. (m)	0.56	4.72	0.94
Min Ch El (m)	180.49	Shear (N/m2)	10.51	66.94	11.23
Alpha	1.06	Stream Power (N/m s)	6.77	172.92	7.56
Frctn Loss (m)	0.48	Cum Volume (1000 m3)	0.00	1.28	0.01
C & E Loss (m)	0.05	Cum SA (1000 m2)	0.02	2.55	0.04

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	181.71	Element	Left OB	Channel	Right OB
Vel Head (m)	0.25	Wt. n-Val.		0.030	
W.S. Elev (m)	181.45	Reach Len. (m)	98.00	98.00	98.00
Crit W.S. (m)	181.45	Flow Area (m2)		2.02	
E.G. Slope (m/m)	0.013000	Area (m2)		2.02	
Q Total (m3/s)	4.49	Flow (m3/s)		4.49	
Top Width (m)	4.08	Top Width (m)		4.08	
Vel Total (m/s)	2.22	Avg. Vel. (m/s)		2.22	
Max Chl Dpth (m)	0.96	Hydr. Depth (m)		0.50	
Conv. Total (m3/s)	39.4	Conv. (m3/s)		39.4	
Length Wtd. (m)	98.00	Wetted Per. (m)		4.52	
Min Ch El (m)	180.49	Shear (N/m2)		57.02	
Alpha	1.00	Stream Power (N/m s)		126.74	
Frctn Loss (m)	0.69	Cum Volume (1000 m3)		0.78	
C & E Loss (m)	0.03	Cum SA (1000 m2)		2.17	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Rouge
REACH: WC3 RS: 200

INPUT
Description: ST-200 (Updated Sept. 2016)
Station Elevation Data num= 40

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	180.53	.01	180.53	2.01	180.56	3.42	180.6	5.02	180.64
8.23	180.74	11.16	180.82	14.15	180.89	16.35	180.93	17.31	180.95
17.84	180.96	18.25	180.96	18.76	180.95	22	180.5	22.5	178.5
25.5	178.5	26.07	180.5	26.83	180.89	27.14	181	27.99	181.45
28.09	181.5	28.15	181.5	28.41	181.5	29	181.37	30.39	181.43
31.21	181.42	35.13	181.27	35.19	181.27	35.23	181.26	35.38	181.26
36.95	181.2	37.69	181.17	38.03	181.15	39.09	181.12	40.6	181.1
50.54	181	53.09	180.97	53.13	180.97	54.39	180.95	60.59	180.86

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	18.76	.03	27.14	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
18.76 27.14 43 43 43 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	22.5	180.5	T
25.5	60.59	180.5	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	179.07	Element	Left OB	Channel	Right OB
Vel Head (m)	0.11	Wt. n-Val.		0.030	
W.S. Elev (m)	178.96	Reach Len. (m)	43.00	43.00	43.00
Crit W.S. (m)	178.86	Flow Area (m2)		1.38	
E.G. Slope (m/m)	0.005289	Area (m2)		1.44	
Q Total (m3/s)	2.00	Flow (m3/s)		2.00	
Top Width (m)	3.25	Top Width (m)		3.25	
Vel Total (m/s)	1.45	Avg. Vel. (m/s)		1.45	
Max Chl Dpth (m)	0.46	Hydr. Depth (m)		0.46	
Conv. Total (m3/s)	27.5	Conv. (m3/s)		27.5	
Length Wtd. (m)	43.00	Wetted Per. (m)		3.00	
Min Ch El (m)	178.50	Shear (N/m2)		23.91	
Alpha	1.00	Stream Power (N/m s)		34.58	
Frctn Loss (m)		Cum Volume (1000 m3)		0.31	
C & E Loss (m)		Cum SA (1000 m2)		1.50	

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	179.31	Element	Left OB	Channel	Right OB
Vel Head (m)	0.15	Wt. n-Val.		0.030	
W.S. Elev (m)	179.16	Reach Len. (m)	43.00	43.00	43.00
Crit W.S. (m)	179.01	Flow Area (m2)		1.98	
E.G. Slope (m/m)	0.004703	Area (m2)		2.10	
Q Total (m3/s)	3.44	Flow (m3/s)		3.44	
Top Width (m)	3.35	Top Width (m)		3.35	
Vel Total (m/s)	1.73	Avg. Vel. (m/s)		1.73	
Max Chl Dpth (m)	0.66	Hydr. Depth (m)		0.66	
Conv. Total (m3/s)	50.2	Conv. (m3/s)		50.2	
Length Wtd. (m)	43.00	Wetted Per. (m)		3.00	
Min Ch El (m)	178.50	Shear (N/m2)		30.49	
Alpha	1.00	Stream Power (N/m s)		52.89	
Frctn Loss (m)		Cum Volume (1000 m3)		0.46	
C & E Loss (m)		Cum SA (1000 m2)		1.71	

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	179.42	Element	Left OB	Channel	Right OB
Vel Head (m)	0.17	Wt. n-Val.		0.030	
W.S. Elev (m)	179.25	Reach Len. (m)	43.00	43.00	43.00
Crit W.S. (m)	179.08	Flow Area (m2)		2.24	
E.G. Slope (m/m)	0.004509	Area (m2)		2.39	
Q Total (m3/s)	4.13	Flow (m3/s)		4.13	
Top Width (m)	3.40	Top Width (m)		3.40	
Vel Total (m/s)	1.84	Avg. Vel. (m/s)		1.84	
Max Chl Dpth (m)	0.75	Hydr. Depth (m)		0.75	

Conv. Total (m3/s)	61.5	Conv. (m3/s)	61.5
Length Wtd. (m)	43.00	Wetted Per. (m)	3.00
Min Ch El (m)	178.50	Shear (N/m2)	33.03
Alpha	1.00	Stream Power (N/m s)	60.87
Frctn Loss (m)		Cum Volume (1000 m3)	0.53
C & E Loss (m)		Cum SA (1000 m2)	1.77

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	179.56	Element	Left OB	Channel	Right OB
Vel Head (m)	0.20	Wt. n-Val.		0.030	
W.S. Elev (m)	179.36	Reach Len. (m)	43.00	43.00	43.00
Crit W.S. (m)	179.16	Flow Area (m2)		2.59	
E.G. Slope (m/m)	0.004185	Area (m2)		2.79	
Q Total (m3/s)	5.07	Flow (m3/s)		5.07	
Top Width (m)	3.46	Top Width (m)		3.46	
Vel Total (m/s)	1.96	Avg. Vel. (m/s)		1.96	
Max Chl Dpth (m)	0.86	Hydr. Depth (m)		0.86	
Conv. Total (m3/s)	78.4	Conv. (m3/s)		78.4	
Length Wtd. (m)	43.00	Wetted Per. (m)		3.00	
Min Ch El (m)	178.50	Shear (N/m2)		35.46	
Alpha	1.00	Stream Power (N/m s)		69.37	
Frctn Loss (m)		Cum Volume (1000 m3)		0.61	
C & E Loss (m)		Cum SA (1000 m2)		1.85	

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	179.66	Element	Left OB	Channel	Right OB
Vel Head (m)	0.21	Wt. n-Val.		0.030	
W.S. Elev (m)	179.45	Reach Len. (m)	43.00	43.00	43.00
Crit W.S. (m)	179.22	Flow Area (m2)		2.84	
E.G. Slope (m/m)	0.003968	Area (m2)		3.08	
Q Total (m3/s)	5.76	Flow (m3/s)		5.76	
Top Width (m)	3.51	Top Width (m)		3.51	
Vel Total (m/s)	2.03	Avg. Vel. (m/s)		2.03	
Max Chl Dpth (m)	0.95	Hydr. Depth (m)		0.95	
Conv. Total (m3/s)	91.4	Conv. (m3/s)		91.4	
Length Wtd. (m)	43.00	Wetted Per. (m)		3.00	
Min Ch El (m)	178.50	Shear (N/m2)		36.88	
Alpha	1.00	Stream Power (N/m s)		74.71	
Frctn Loss (m)		Cum Volume (1000 m3)		0.67	
C & E Loss (m)		Cum SA (1000 m2)		1.91	

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	179.75	Element	Left OB	Channel	Right OB
Vel Head (m)	0.22	Wt. n-Val.		0.030	
W.S. Elev (m)	179.53	Reach Len. (m)	43.00	43.00	43.00
Crit W.S. (m)	179.28	Flow Area (m2)		3.09	
E.G. Slope (m/m)	0.003779	Area (m2)		3.38	
Q Total (m3/s)	6.47	Flow (m3/s)		6.47	
Top Width (m)	3.55	Top Width (m)		3.55	
Vel Total (m/s)	2.09	Avg. Vel. (m/s)		2.09	
Max Chl Dpth (m)	1.03	Hydr. Depth (m)		1.03	
Conv. Total (m3/s)	105.2	Conv. (m3/s)		105.2	
Length Wtd. (m)	43.00	Wetted Per. (m)		3.00	
Min Ch El (m)	178.50	Shear (N/m2)		38.22	
Alpha	1.00	Stream Power (N/m s)		79.93	
Frctn Loss (m)		Cum Volume (1000 m3)		0.74	
C & E Loss (m)		Cum SA (1000 m2)		1.99	

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	180.04	Element	Left OB	Channel	Right OB
Vel Head (m)	0.23	Wt. n-Val.		0.030	
W.S. Elev (m)	179.81	Reach Len. (m)	43.00	43.00	43.00
Crit W.S. (m)	179.43	Flow Area (m2)		3.93	
E.G. Slope (m/m)	0.002878	Area (m2)		4.39	
Q Total (m3/s)	8.42	Flow (m3/s)		8.42	
Top Width (m)	3.70	Top Width (m)		3.70	
Vel Total (m/s)	2.14	Avg. Vel. (m/s)		2.14	
Max Chl Dpth (m)	1.31	Hydr. Depth (m)		1.31	
Conv. Total (m3/s)	156.9	Conv. (m3/s)		156.9	
Length Wtd. (m)	43.00	Wetted Per. (m)		3.00	
Min Ch El (m)	178.50	Shear (N/m2)		36.99	
Alpha	1.00	Stream Power (N/m s)		79.23	
Frctn Loss (m)		Cum Volume (1000 m3)		0.91	
C & E Loss (m)		Cum SA (1000 m2)		2.16	

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	179.47	Element	Left OB	Channel	Right OB
Vel Head (m)	0.18	Wt. n-Val.		0.030	
W.S. Elev (m)	179.29	Reach Len. (m)	43.00	43.00	43.00
Crit W.S. (m)	179.11	Flow Area (m2)		2.37	
E.G. Slope (m/m)	0.004404	Area (m2)		2.54	
Q Total (m3/s)	4.49	Flow (m3/s)		4.49	
Top Width (m)	3.42	Top Width (m)		3.42	
Vel Total (m/s)	1.89	Avg. Vel. (m/s)		1.89	
Max Chl Dpth (m)	0.79	Hydr. Depth (m)		0.79	
Conv. Total (m3/s)	67.7	Conv. (m3/s)		67.7	
Length Wtd. (m)	43.00	Wetted Per. (m)		3.00	
Min Ch El (m)	178.50	Shear (N/m2)		34.16	
Alpha	1.00	Stream Power (N/m s)		64.64	
Frctn Loss (m)		Cum Volume (1000 m3)		0.56	
C & E Loss (m)		Cum SA (1000 m2)		1.80	

CULVERT

RIVER: Rouge
REACH: WC3 RS: 150

INPUT
Description: PROPOSED 407 TWY Culvert
Distance from Upstream XS = 13
Deck/Roadway Width = 13
Weir Coefficient = 1.4
Upstream Deck/Roadway Coordinates
num= 3

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0	180.3	24	180.5	91	180.6

Upstream Bridge Cross Section Data
Station Elevation Data num= 40

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	180.53	.01	180.53	2.01	180.56	3.42	180.6	5.02	180.64
8.23	180.74	11.16	180.82	14.15	180.89	16.35	180.93	17.31	180.95
17.84	180.96	18.25	180.96	18.76	180.95	22	180.5	22.5	178.5
25.5	178.5	26.07	180.5	26.83	180.89	27.14	181	27.99	181.45
28.09	181.5	28.15	181.5	28.41	181.5	29	181.37	30.39	181.43
31.21	181.42	35.13	181.27	35.19	181.27	35.23	181.26	35.38	181.26
36.95	181.2	37.69	181.17	38.03	181.15	39.09	181.12	40.6	181.1
50.54	181	53.09	180.97	53.13	180.97	54.39	180.95	60.59	180.86

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	18.76	.03	27.14	.035

Bank Sta: Left Right Coeff Contr. Expan.
18.76 27.14 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	22.5	180.5	T
25.5	60.59	180.5	T

Downstream Deck/Roadway Coordinates
num= 3

```
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0  180.44              13   180.5              44  180.52

Downstream Bridge Cross Section Data
Station Elevation Data     num=       22
     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev
       0 180.082   3.831 180.308   5.699 180.288   9.108  180.15   9.242 180.146
   9.297 180.138   9.332 180.135   9.393 180.126  10.161     180   10.35 179.936
      12     178      15     178  16.109   179.5  16.356 179.624   17.18     180
   18.21 180.287  20.549 180.295  23.034 180.285  25.124 180.214  29.265 180.092
  31.821     180  33.265 179.975

Manning's n Values         num=        3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .035   5.699     .03   18.21    .035

Bank Sta: Left   Right    Coeff Contr.    Expan.
          5.699   18.21          .3         .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0      12     180       T
      15  33.265     180       T

Upstream Embankment side slope              =       2 horiz. to 1.0 vertical
Downstream Embankment side slope            =       2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1         Box      1.25       3
FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                  2      33     .013     .025        0                  .2               1
Upstream   Elevation =  178.5
           Centerline Station =  24
Downstream Elevation =  178.25
           Centerline Station =  13.5

CULVERT OUTPUT  Profile #2-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       2.00    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         1.73
  Q Barrel (m3/s)           2.00    Culv Vel DS (m/s)         1.87
  E.G. US. (m)            179.07    Culv Inv El Up (m)      178.50
  W.S. US. (m)            178.96    Culv Inv El Dn (m)      178.25
  E.G. DS (m)             178.53    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             178.36    Culv Exit Loss (m)        0.25
  Delta EG (m)              0.53    Culv Entr Loss (m)        0.03
  Delta WS (m)              0.61    Q Weir (m3/s)
  E.G. IC (m)             179.06    Weir Sta Lft (m)
  E.G. OC (m)             179.07    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       178.89    Weir Max Depth (m)
  Culv WS Outlet (m)      178.61    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.39    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.36    Min El Weir Flow (m)    180.49


Note:    During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT  Profile #5-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       3.44    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         2.13
  Q Barrel (m3/s)           3.44    Culv Vel DS (m/s)         2.24
  E.G. US. (m)            179.32    Culv Inv El Up (m)      178.50
  W.S. US. (m)            179.16    Culv Inv El Dn (m)      178.25
  E.G. DS (m)             178.77    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             178.51    Culv Exit Loss (m)        0.25
  Delta EG (m)              0.55    Culv Entr Loss (m)        0.05
  Delta WS (m)              0.65    Q Weir (m3/s)
  E.G. IC (m)             179.31    Weir Sta Lft (m)
  E.G. OC (m)             179.32    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       179.04    Weir Max Depth (m)
  Culv WS Outlet (m)      178.76    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.54    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.51    Min El Weir Flow (m)    180.49


Note:    During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT  Profile #10-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       4.13    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         2.27
  Q Barrel (m3/s)           4.13    Culv Vel DS (m/s)         2.38
  E.G. US. (m)            179.42    Culv Inv El Up (m)      178.50
  W.S. US. (m)            179.25    Culv Inv El Dn (m)      178.25
  E.G. DS (m)             178.87    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             178.58    Culv Exit Loss (m)        0.25
  Delta EG (m)              0.55    Culv Entr Loss (m)        0.05
  Delta WS (m)              0.67    Q Weir (m3/s)
  E.G. IC (m)             179.42    Weir Sta Lft (m)
  E.G. OC (m)             179.42    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       179.11    Weir Max Depth (m)
  Culv WS Outlet (m)      178.83    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.61    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.58    Min El Weir Flow (m)    180.49


Note:    During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT  Profile #25-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       5.07    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         2.45
  Q Barrel (m3/s)           5.07    Culv Vel DS (m/s)         2.55
  E.G. US. (m)            179.56    Culv Inv El Up (m)      178.50
  W.S. US. (m)            179.36    Culv Inv El Dn (m)      178.25
  E.G. DS (m)             178.99    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             178.66    Culv Exit Loss (m)        0.25
  Delta EG (m)              0.57    Culv Entr Loss (m)        0.06
  Delta WS (m)              0.70    Q Weir (m3/s)
  E.G. IC (m)             179.56    Weir Sta Lft (m)
  E.G. OC (m)             179.56    Weir Sta Rgt (m)
  Culvert Control          Inlet    Weir Submerg
  Culv WS Inlet (m)       179.19    Weir Max Depth (m)
  Culv WS Outlet (m)      178.91    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.69    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.66    Min El Weir Flow (m)    180.49


Note:    During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT  Profile #50-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       5.76    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         2.56
  Q Barrel (m3/s)           5.76    Culv Vel DS (m/s)         2.66
  E.G. US. (m)            179.66    Culv Inv El Up (m)      178.50
  W.S. US. (m)            179.45    Culv Inv El Dn (m)      178.25
  E.G. DS (m)             179.08    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             178.72    Culv Exit Loss (m)        0.25
  Delta EG (m)              0.58    Culv Entr Loss (m)        0.07
  Delta WS (m)              0.73    Q Weir (m3/s)
```

E.G. IC (m)	179.66	Weir Sta Lft (m)	
E.G. OC (m)	179.65	Weir Sta Rgt (m)	
Culvert Control	Inlet	Weir Submerg	
Culv WS Inlet (m)	179.25	Weir Max Depth (m)	
Culv WS Outlet (m)	178.97	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.75	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.72	Min El Weir Flow (m)	180.49

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #100-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	6.47	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	2.67
Q Barrel (m3/s)	6.47	Culv Vel DS (m/s)	2.77
E.G. US. (m)	179.76	Culv Inv El Up (m)	178.50
W.S. US. (m)	179.53	Culv Inv El Dn (m)	178.25
E.G. DS (m)	179.17	Culv Frctn Ls (m)	0.00
W.S. DS (m)	178.78	Culv Exit Loss (m)	0.25
Delta EG (m)	0.59	Culv Entr Loss (m)	0.08
Delta WS (m)	0.75	Q Weir (m3/s)	
E.G. IC (m)	179.76	Weir Sta Lft (m)	
E.G. OC (m)	179.74	Weir Sta Rgt (m)	
Culvert Control	Inlet	Weir Submerg	
Culv WS Inlet (m)	179.31	Weir Max Depth (m)	
Culv WS Outlet (m)	179.03	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.81	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.78	Min El Weir Flow (m)	180.49

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #Check Flow Culv Group: Culvert #1

Q Culv Group (m3/s)	8.42	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	2.93
Q Barrel (m3/s)	8.42	Culv Vel DS (m/s)	3.02
E.G. US. (m)	180.05	Culv Inv El Up (m)	178.50
W.S. US. (m)	179.81	Culv Inv El Dn (m)	178.25
E.G. DS (m)	179.39	Culv Frctn Ls (m)	0.00
W.S. DS (m)	178.93	Culv Exit Loss (m)	0.25
Delta EG (m)	0.65	Culv Entr Loss (m)	0.15
Delta WS (m)	0.88	Q Weir (m3/s)	
E.G. IC (m)	180.05	Weir Sta Lft (m)	
E.G. OC (m)	179.98	Weir Sta Rgt (m)	
Culvert Control	Inlet	Weir Submerg	
Culv WS Inlet (m)	179.46	Weir Max Depth (m)	
Culv WS Outlet (m)	179.18	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.96	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.93	Min El Weir Flow (m)	180.49

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #Regional Culv Group: Culvert #1

Q Culv Group (m3/s)	4.49	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	2.34
Q Barrel (m3/s)	4.49	Culv Vel DS (m/s)	2.45
E.G. US. (m)	179.48	Culv Inv El Up (m)	178.50
W.S. US. (m)	179.29	Culv Inv El Dn (m)	178.25
E.G. DS (m)	178.92	Culv Frctn Ls (m)	0.00
W.S. DS (m)	178.61	Culv Exit Loss (m)	0.25
Delta EG (m)	0.56	Culv Entr Loss (m)	0.06
Delta WS (m)	0.68	Q Weir (m3/s)	
E.G. IC (m)	179.48	Weir Sta Lft (m)	
E.G. OC (m)	179.47	Weir Sta Rgt (m)	
Culvert Control	Inlet	Weir Submerg	
Culv WS Inlet (m)	179.14	Weir Max Depth (m)	
Culv WS Outlet (m)	178.86	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.64	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.61	Min El Weir Flow (m)	180.49

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CROSS SECTION

RIVER: Rouge
REACH: WC3 RS: 100

INPUT
Description: ST-100 (Updated Sept. 2016)
Station Elevation Data num= 22

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	180.082	3.831	180.308	5.699	180.288	9.108	180.15	9.242	180.146
9.297	180.138	9.332	180.135	9.393	180.126	10.161	180	10.35	179.936
12	178	15	178	16.109	179.5	16.356	179.624	17.18	180
18.21	180.287	20.549	180.295	23.034	180.285	25.124	180.214	29.265	180.092
31.821	180	33.265	179.975						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	5.699	.03	18.21	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

5.699	18.21	44.6	44.6	44.6	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	12	180	T
15	33.265	180	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	178.53	Element	Left OB	Channel	Right OB
Vel Head (m)	0.18	Wt. n-Val.		0.030	
W.S. Elev (m)	178.36	Reach Len. (m)	44.60	44.60	44.60
Crit W.S. (m)	178.36	Flow Area (m2)		1.07	
E.G. Slope (m/m)	0.012587	Area (m2)		1.17	
Q Total (m3/s)	2.00	Flow (m3/s)		2.00	
Top Width (m)	3.57	Top Width (m)		3.57	
Vel Total (m/s)	1.88	Avg. Vel. (m/s)		1.88	
Max Chl Dpth (m)	0.36	Hydr. Depth (m)		0.36	
Conv. Total (m3/s)	17.8	Conv. (m3/s)		17.8	
Length Wtd. (m)	44.60	Wetted Per. (m)		3.00	
Min Ch El (m)	178.00	Shear (N/m2)		43.86	
Alpha	1.00	Stream Power (N/m s)		82.29	
Frctn Loss (m)	0.54	Cum Volume (1000 m3)		0.27	
C & E Loss (m)	0.06	Cum SA (1000 m2)		1.35	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	178.77	Element	Left OB	Channel	Right OB
Vel Head (m)	0.26	Wt. n-Val.		0.030	
W.S. Elev (m)	178.51	Reach Len. (m)	44.60	44.60	44.60
Crit W.S. (m)	178.51	Flow Area (m2)		1.53	
E.G. Slope (m/m)	0.011124	Area (m2)		1.74	
Q Total (m3/s)	3.44	Flow (m3/s)		3.44	
Top Width (m)	3.81	Top Width (m)		3.81	
Vel Total (m/s)	2.25	Avg. Vel. (m/s)		2.25	
Max Chl Dpth (m)	0.51	Hydr. Depth (m)		0.51	
Conv. Total (m3/s)	32.6	Conv. (m3/s)		32.6	
Length Wtd. (m)	44.60	Wetted Per. (m)		3.00	

Min Ch El (m)	178.00	Shear (N/m2)	55.70
Alpha	1.00	Stream Power (N/m s)	125.08
Frctn Loss (m)	0.50	Cum Volume (1000 m3)	0.40
C & E Loss (m)	0.09	Cum SA (1000 m2)	1.55

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	178.87	Element	Left OB	Channel	Right OB
Vel Head (m)	0.29	Wt. n-Val.		0.030	
W.S. Elev (m)	178.58	Reach Len. (m)	44.60	44.60	44.60
Crit W.S. (m)	178.58	Flow Area (m2)		1.73	
E.G. Slope (m/m)	0.010728	Area (m2)		1.99	
Q Total (m3/s)	4.13	Flow (m3/s)		4.13	
Top Width (m)	3.92	Top Width (m)		3.92	
Vel Total (m/s)	2.39	Avg. Vel. (m/s)		2.39	
Max Chl Dpth (m)	0.58	Hydr. Depth (m)		0.58	
Conv. Total (m3/s)	39.9	Conv. (m3/s)		39.9	
Length Wtd. (m)	44.60	Wetted Per. (m)		3.00	
Min Ch El (m)	178.00	Shear (N/m2)		60.60	
Alpha	1.00	Stream Power (N/m s)		144.83	
Frctn Loss (m)	0.48	Cum Volume (1000 m3)		0.46	
C & E Loss (m)	0.10	Cum SA (1000 m2)		1.61	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	178.99	Element	Left OB	Channel	Right OB
Vel Head (m)	0.33	Wt. n-Val.		0.030	
W.S. Elev (m)	178.66	Reach Len. (m)	44.60	44.60	44.60
Crit W.S. (m)	178.66	Flow Area (m2)		1.99	
E.G. Slope (m/m)	0.010167	Area (m2)		2.33	
Q Total (m3/s)	5.07	Flow (m3/s)		5.07	
Top Width (m)	4.05	Top Width (m)		4.05	
Vel Total (m/s)	2.55	Avg. Vel. (m/s)		2.55	
Max Chl Dpth (m)	0.66	Hydr. Depth (m)		0.66	
Conv. Total (m3/s)	50.3	Conv. (m3/s)		50.3	
Length Wtd. (m)	44.60	Wetted Per. (m)		3.00	
Min Ch El (m)	178.00	Shear (N/m2)		66.00	
Alpha	1.00	Stream Power (N/m s)		168.48	
Frctn Loss (m)	0.46	Cum Volume (1000 m3)		0.53	
C & E Loss (m)	0.12	Cum SA (1000 m2)		1.69	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	179.08	Element	Left OB	Channel	Right OB
Vel Head (m)	0.36	Wt. n-Val.		0.030	
W.S. Elev (m)	178.72	Reach Len. (m)	44.60	44.60	44.60
Crit W.S. (m)	178.72	Flow Area (m2)		2.16	
E.G. Slope (m/m)	0.009967	Area (m2)		2.57	
Q Total (m3/s)	5.76	Flow (m3/s)		5.76	
Top Width (m)	4.14	Top Width (m)		4.14	
Vel Total (m/s)	2.67	Avg. Vel. (m/s)		2.67	
Max Chl Dpth (m)	0.72	Hydr. Depth (m)		0.72	
Conv. Total (m3/s)	57.7	Conv. (m3/s)		57.7	
Length Wtd. (m)	44.60	Wetted Per. (m)		3.00	
Min Ch El (m)	178.00	Shear (N/m2)		70.26	
Alpha	1.00	Stream Power (N/m s)		187.65	
Frctn Loss (m)	0.45	Cum Volume (1000 m3)		0.59	
C & E Loss (m)	0.13	Cum SA (1000 m2)		1.75	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	179.17	Element	Left OB	Channel	Right OB
Vel Head (m)	0.39	Wt. n-Val.		0.030	
W.S. Elev (m)	178.78	Reach Len. (m)	44.60	44.60	44.60
Crit W.S. (m)	178.78	Flow Area (m2)		2.33	
E.G. Slope (m/m)	0.009713	Area (m2)		2.81	
Q Total (m3/s)	6.47	Flow (m3/s)		6.47	
Top Width (m)	4.24	Top Width (m)		4.24	
Vel Total (m/s)	2.78	Avg. Vel. (m/s)		2.78	
Max Chl Dpth (m)	0.78	Hydr. Depth (m)		0.78	
Conv. Total (m3/s)	65.6	Conv. (m3/s)		65.6	
Length Wtd. (m)	44.60	Wetted Per. (m)		3.00	
Min Ch El (m)	178.00	Shear (N/m2)		73.99	
Alpha	1.00	Stream Power (N/m s)		205.41	
Frctn Loss (m)	0.44	Cum Volume (1000 m3)		0.65	
C & E Loss (m)	0.14	Cum SA (1000 m2)		1.82	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	179.39	Element	Left OB	Channel	Right OB
Vel Head (m)	0.47	Wt. n-Val.		0.030	
W.S. Elev (m)	178.93	Reach Len. (m)	44.60	44.60	44.60
Crit W.S. (m)	178.93	Flow Area (m2)		2.78	
E.G. Slope (m/m)	0.009143	Area (m2)		3.46	
Q Total (m3/s)	8.42	Flow (m3/s)		8.42	
Top Width (m)	4.47	Top Width (m)		4.47	
Vel Total (m/s)	3.03	Avg. Vel. (m/s)		3.03	
Max Chl Dpth (m)	0.93	Hydr. Depth (m)		0.93	
Conv. Total (m3/s)	88.1	Conv. (m3/s)		88.1	

Length Wtd. (m)	44.60	Wetted Per. (m)	3.00
Min Ch El (m)	178.00	Shear (N/m2)	83.07
Alpha	1.00	Stream Power (N/m s)	251.65
Frctn Loss (m)	0.41	Cum Volume (1000 m3)	0.80
C & E Loss (m)	0.17	Cum SA (1000 m2)	1.98

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	178.92	Element	Left OB	Channel	Right OB
Vel Head (m)	0.31	Wt. n-Val.		0.030	
W.S. Elev (m)	178.61	Reach Len. (m)	44.60	44.60	44.60
Crit W.S. (m)	178.61	Flow Area (m2)		1.83	
E.G. Slope (m/m)	0.010512	Area (m2)		2.12	
Q Total (m3/s)	4.49	Flow (m3/s)		4.49	
Top Width (m)	3.97	Top Width (m)		3.97	
Vel Total (m/s)	2.46	Avg. Vel. (m/s)		2.46	
Max Chl Dpth (m)	0.61	Hydr. Depth (m)		0.61	
Conv. Total (m3/s)	43.8	Conv. (m3/s)		43.8	
Length Wtd. (m)	44.60	Wetted Per. (m)		3.00	
Min Ch El (m)	178.00	Shear (N/m2)		62.81	
Alpha	1.00	Stream Power (N/m s)		154.27	
Frctn Loss (m)	0.48	Cum Volume (1000 m3)		0.49	
C & E Loss (m)	0.11	Cum SA (1000 m2)		1.64	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Rouge
REACH: WC3 RS: 10

INPUT
Description: ST-10 (Updated Sept. 2016)
Station Elevation Data num= 47

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	179.262	.373	179.254	1.42	179.204	3.25	179.092	4.457	179.033
4.917	179	6.425	178.804	6.554	178.787	8.68	178.5	11.444	178.078
12.018	178	13.205	177.81	13.636	177.781	13.987	177.763	14.742	177.718
14.913	177.698	15.787	177.604	16.588	177.505	16.828	177.5	17.189	177.451
18.675	177.291	20.025	177.259	21.192	177.252	22.534	177.369	22.535	177.369
22.784	177.395	23.069	177.421	23.082	177.422	23.268	177.432	23.422	177.435
23.61	177.451	24.187	177.455	25.159	177.5	25.641	177.533	25.691	177.532
25.763	177.533	28.273	177.586	30.276	177.901	30.793	178	33.31	178.387
34.041	178.5	34.408	178.557	38.934	179	39.13	179.009	39.255	179.01
39.298	179.01	42.41	179.074						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	8.68	.03	34.041	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
8.68	34.041	133.7	133.7	.3	.5

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	177.63	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.030	
W.S. Elev (m)	177.57	Reach Len. (m)	133.70	133.70	133.70
Crit W.S. (m)	177.55	Flow Area (m2)		1.86	
E.G. Slope (m/m)	0.011816	Area (m2)		1.86	
Q Total (m3/s)	2.00	Flow (m3/s)		2.00	
Top Width (m)	11.42	Top Width (m)		11.42	
Vel Total (m/s)	1.08	Avg. Vel. (m/s)		1.08	
Max Chl Dpth (m)	0.32	Hydr. Depth (m)		0.16	
Conv. Total (m3/s)	18.4	Conv. (m3/s)		18.4	
Length Wtd. (m)	133.70	Wetted Per. (m)		11.44	
Min Ch El (m)	177.25	Shear (N/m2)		18.79	
Alpha	1.00	Stream Power (N/m s)		20.25	
Frctn Loss (m)	1.73	Cum Volume (1000 m3)		0.20	
C & E Loss (m)	0.03	Cum SA (1000 m2)		1.02	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	177.72	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.		0.030	
W.S. Elev (m)	177.64	Reach Len. (m)	133.70	133.70	133.70
Crit W.S. (m)	177.62	Flow Area (m2)		2.75	
E.G. Slope (m/m)	0.011359	Area (m2)		2.75	
Q Total (m3/s)	3.44	Flow (m3/s)		3.44	
Top Width (m)	13.18	Top Width (m)		13.18	
Vel Total (m/s)	1.25	Avg. Vel. (m/s)		1.25	
Max Chl Dpth (m)	0.39	Hydr. Depth (m)		0.21	
Conv. Total (m3/s)	32.3	Conv. (m3/s)		32.3	
Length Wtd. (m)	133.70	Wetted Per. (m)		13.21	
Min Ch El (m)	177.25	Shear (N/m2)		23.22	
Alpha	1.00	Stream Power (N/m s)		29.00	
Frctn Loss (m)	1.63	Cum Volume (1000 m3)		0.30	
C & E Loss (m)	0.04	Cum SA (1000 m2)		1.18	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	177.76	Element	Left OB	Channel	Right OB
Vel Head (m)	0.09	Wt. n-Val.		0.030	
W.S. Elev (m)	177.67	Reach Len. (m)	133.70	133.70	133.70
Crit W.S. (m)	177.65	Flow Area (m2)		3.15	
E.G. Slope (m/m)	0.010975	Area (m2)		3.15	
Q Total (m3/s)	4.13	Flow (m3/s)		4.13	
Top Width (m)	13.64	Top Width (m)		13.64	
Vel Total (m/s)	1.31	Avg. Vel. (m/s)		1.31	
Max Chl Dpth (m)	0.42	Hydr. Depth (m)		0.23	
Conv. Total (m3/s)	39.4	Conv. (m3/s)		39.4	
Length Wtd. (m)	133.70	Wetted Per. (m)		13.68	
Min Ch El (m)	177.25	Shear (N/m2)		24.78	
Alpha	1.00	Stream Power (N/m s)		32.50	
Frctn Loss (m)	1.58	Cum Volume (1000 m3)		0.34	
C & E Loss (m)	0.04	Cum SA (1000 m2)		1.22	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	177.80	Element	Left OB	Channel	Right OB
Vel Head (m)	0.10	Wt. n-Val.		0.030	

W.S. Elev (m)	177.71	Reach Len. (m)	133.70	133.70	133.70
Crit W.S. (m)	177.68	Flow Area (m2)		3.66	
E.G. Slope (m/m)	0.010593	Area (m2)		3.66	
Q Total (m3/s)	5.07	Flow (m3/s)		5.07	
Top Width (m)	14.20	Top Width (m)		14.20	
Vel Total (m/s)	1.39	Avg. Vel. (m/s)		1.39	
Max Chl Dpth (m)	0.46	Hydr. Depth (m)		0.26	
Conv. Total (m3/s)	49.3	Conv. (m3/s)		49.3	
Length Wtd. (m)	133.70	Wetted Per. (m)		14.25	
Min Ch El (m)	177.25	Shear (N/m2)		26.67	
Alpha	1.00	Stream Power (N/m s)		36.96	
Frctn Loss (m)	1.53	Cum Volume (1000 m3)		0.40	
C & E Loss (m)	0.04	Cum SA (1000 m2)		1.28	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	177.84	Element	Left OB	Channel	Right OB
Vel Head (m)	0.10	Wt. n-Val.		0.030	
W.S. Elev (m)	177.73	Reach Len. (m)	133.70	133.70	133.70
Crit W.S. (m)	177.70	Flow Area (m2)		4.02	
E.G. Slope (m/m)	0.010444	Area (m2)		4.02	
Q Total (m3/s)	5.76	Flow (m3/s)		5.76	
Top Width (m)	14.69	Top Width (m)		14.69	
Vel Total (m/s)	1.43	Avg. Vel. (m/s)		1.43	
Max Chl Dpth (m)	0.48	Hydr. Depth (m)		0.27	
Conv. Total (m3/s)	56.4	Conv. (m3/s)		56.4	
Length Wtd. (m)	133.70	Wetted Per. (m)		14.74	
Min Ch El (m)	177.25	Shear (N/m2)		27.93	
Alpha	1.00	Stream Power (N/m s)		40.01	
Frctn Loss (m)	1.51	Cum Volume (1000 m3)		0.44	
C & E Loss (m)	0.05	Cum SA (1000 m2)		1.33	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	177.87	Element	Left OB	Channel	Right OB
Vel Head (m)	0.11	Wt. n-Val.		0.030	
W.S. Elev (m)	177.76	Reach Len. (m)	133.70	133.70	133.70
Crit W.S. (m)	177.73	Flow Area (m2)		4.42	
E.G. Slope (m/m)	0.010136	Area (m2)		4.42	
Q Total (m3/s)	6.47	Flow (m3/s)		6.47	
Top Width (m)	15.31	Top Width (m)		15.31	
Vel Total (m/s)	1.46	Avg. Vel. (m/s)		1.46	
Max Chl Dpth (m)	0.51	Hydr. Depth (m)		0.29	
Conv. Total (m3/s)	64.3	Conv. (m3/s)		64.3	
Length Wtd. (m)	133.70	Wetted Per. (m)		15.36	
Min Ch El (m)	177.25	Shear (N/m2)		28.61	
Alpha	1.00	Stream Power (N/m s)		41.86	
Frctn Loss (m)	1.47	Cum Volume (1000 m3)		0.48	
C & E Loss (m)	0.05	Cum SA (1000 m2)		1.38	

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	177.94	Element	Left OB	Channel	Right OB
Vel Head (m)	0.12	Wt. n-Val.		0.030	
W.S. Elev (m)	177.82	Reach Len. (m)	133.70	133.70	133.70
Crit W.S. (m)	177.79	Flow Area (m2)		5.48	
E.G. Slope (m/m)	0.009429	Area (m2)		5.48	
Q Total (m3/s)	8.42	Flow (m3/s)		8.42	
Top Width (m)	16.67	Top Width (m)		16.67	
Vel Total (m/s)	1.54	Avg. Vel. (m/s)		1.54	
Max Chl Dpth (m)	0.57	Hydr. Depth (m)		0.33	
Conv. Total (m3/s)	86.7	Conv. (m3/s)		86.7	
Length Wtd. (m)	133.70	Wetted Per. (m)		16.73	
Min Ch El (m)	177.25	Shear (N/m2)		30.27	
Alpha	1.00	Stream Power (N/m s)		46.53	
Frctn Loss (m)	1.40	Cum Volume (1000 m3)		0.60	
C & E Loss (m)	0.05	Cum SA (1000 m2)		1.51	

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	177.78	Element	Left OB	Channel	Right OB
Vel Head (m)	0.09	Wt. n-Val.		0.030	
W.S. Elev (m)	177.68	Reach Len. (m)	133.70	133.70	133.70
Crit W.S. (m)	177.66	Flow Area (m2)		3.32	
E.G. Slope (m/m)	0.011097	Area (m2)		3.32	
Q Total (m3/s)	4.49	Flow (m3/s)		4.49	
Top Width (m)	13.83	Top Width (m)		13.83	
Vel Total (m/s)	1.35	Avg. Vel. (m/s)		1.35	
Max Chl Dpth (m)	0.43	Hydr. Depth (m)		0.24	
Conv. Total (m3/s)	42.6	Conv. (m3/s)		42.6	
Length Wtd. (m)	133.70	Wetted Per. (m)		13.87	
Min Ch El (m)	177.25	Shear (N/m2)		26.03	
Alpha	1.00	Stream Power (N/m s)		35.22	
Frctn Loss (m)	1.56	Cum Volume (1000 m3)		0.37	
C & E Loss (m)	0.04	Cum SA (1000 m2)		1.24	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Rouge
REACH: WC3 RS: 5

INPUT
Description: ST-5
Station Elevation Data num= 95

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	182	.421	181.803	1.081	181.5	1.481	181.313	2.164	181
3.215	180.562	3.363	180.5	4.433	180.007	4.448	180	4.637	179.917
5.541	179.5	5.707	179.414	6.589	179	6.887	178.845	7.671	178.5
8.578	178.161	8.943	178	9.714	177.831	11.123	177.5	13.269	177.415
15.464	177.346	22.28	177.107	22.609	177.101	23.48	177.101	24.757	177.14
32.165	177.292	37.147	177.4	38.42	177.419	42.935	177.5	44.701	177.512
46.197	177.5	46.657	177.462	50.868	177.242	51.555	177.227	52.191	177.225
52.272	177.223	52.778	177	53.782	176.595	54.009	176.5	54.578	176.256
55.253	176	56.173	175.582	56.381	175.5	56.961	175.388	57.763	175.266
58.218	175.22	59.207	175.5	59.578	175.658	60.252	176	61.078	176.421
61.236	176.5	61.854	176.742	62.253	177	62.571	177.194	63.26	177.5
63.445	177.521	63.494	177.523	67.875	178	67.977	178.002	68.118	178
69.002	177.965	78.829	177.563	82.999	177.538	86.824	177.5	87.543	177.467
89.013	177.45	90.846	177.485	91.239	177.492	91.406	177.494	91.566	177.5
91.696	177.556	92.692	178	92.889	178.089	93.821	178.5	94.735	178.868
95.057	179	96.016	179.386	96.304	179.5	97.286	179.902	97.535	180
97.798	180.112	98.648	180.5	98.897	180.611	99.75	181	99.995	181.109
100.852	181.5	101.092	181.607	101.953	182	102.194	182.112	102.929	182.5
103.478	182.783	103.9	183	104.511	183.315	104.87	183.5	105.258	183.611

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	52.191	.03	62.571	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
52.191	62.571	0	0	0 .1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	175.87	Element	Left OB	Channel	Right OB
Vel Head (m)	0.15	Wt. n-Val.		0.030	
W.S. Elev (m)	175.72	Reach Len. (m)			
Crit W.S. (m)	175.72	Flow Area (m2)		1.15	
E.G. Slope (m/m)	0.014177	Area (m2)		1.15	
Q Total (m3/s)	2.00	Flow (m3/s)		2.00	
Top Width (m)	3.82	Top Width (m)		3.82	
Vel Total (m/s)	1.74	Avg. Vel. (m/s)		1.74	
Max Chl Dpth (m)	0.50	Hydr. Depth (m)		0.30	
Conv. Total (m3/s)	16.8	Conv. (m3/s)		16.8	
Length Wtd. (m)		Wetted Per. (m)		3.97	
Min Ch El (m)	175.22	Shear (N/m2)		40.29	
Alpha	1.00	Stream Power (N/m s)		70.04	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	176.06	Element	Left OB	Channel	Right OB
Vel Head (m)	0.20	Wt. n-Val.		0.030	
W.S. Elev (m)	175.86	Reach Len. (m)			
Crit W.S. (m)	175.86	Flow Area (m2)		1.73	
E.G. Slope (m/m)	0.013135	Area (m2)		1.73	
Q Total (m3/s)	3.44	Flow (m3/s)		3.44	
Top Width (m)	4.41	Top Width (m)		4.41	
Vel Total (m/s)	1.99	Avg. Vel. (m/s)		1.99	
Max Chl Dpth (m)	0.64	Hydr. Depth (m)		0.39	
Conv. Total (m3/s)	30.0	Conv. (m3/s)		30.0	
Length Wtd. (m)		Wetted Per. (m)		4.62	
Min Ch El (m)	175.22	Shear (N/m2)		48.26	
Alpha	1.00	Stream Power (N/m s)		95.81	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	176.13	Element	Left OB	Channel	Right OB
Vel Head (m)	0.22	Wt. n-Val.		0.030	
W.S. Elev (m)	175.92	Reach Len. (m)			
Crit W.S. (m)	175.92	Flow Area (m2)		1.99	
E.G. Slope (m/m)	0.012800	Area (m2)		1.99	
Q Total (m3/s)	4.13	Flow (m3/s)		4.13	
Top Width (m)	4.65	Top Width (m)		4.65	
Vel Total (m/s)	2.07	Avg. Vel. (m/s)		2.07	
Max Chl Dpth (m)	0.70	Hydr. Depth (m)		0.43	
Conv. Total (m3/s)	36.5	Conv. (m3/s)		36.5	
Length Wtd. (m)		Wetted Per. (m)		4.89	
Min Ch El (m)	175.22	Shear (N/m2)		51.14	
Alpha	1.00	Stream Power (N/m s)		106.00	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	176.23	Element	Left OB	Channel	Right OB
Vel Head (m)	0.24	Wt. n-Val.		0.030	
W.S. Elev (m)	175.99	Reach Len. (m)			
Crit W.S. (m)	175.99	Flow Area (m2)		2.33	
E.G. Slope (m/m)	0.012463	Area (m2)		2.33	
Q Total (m3/s)	5.07	Flow (m3/s)		5.07	
Top Width (m)	4.94	Top Width (m)		4.94	
Vel Total (m/s)	2.17	Avg. Vel. (m/s)		2.17	
Max Chl Dpth (m)	0.77	Hydr. Depth (m)		0.47	
Conv. Total (m3/s)	45.4	Conv. (m3/s)		45.4	
Length Wtd. (m)		Wetted Per. (m)		5.22	
Min Ch El (m)	175.22	Shear (N/m2)		54.61	
Alpha	1.00	Stream Power (N/m s)		118.77	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	176.29	Element	Left OB	Channel	Right OB
Vel Head (m)	0.25	Wt. n-Val.		0.030	
W.S. Elev (m)	176.04	Reach Len. (m)			
Crit W.S. (m)	176.04	Flow Area (m2)		2.58	
E.G. Slope (m/m)	0.012228	Area (m2)		2.58	
Q Total (m3/s)	5.76	Flow (m3/s)		5.76	
Top Width (m)	5.16	Top Width (m)		5.16	
Vel Total (m/s)	2.24	Avg. Vel. (m/s)		2.24	
Max Chl Dpth (m)	0.81	Hydr. Depth (m)		0.50	
Conv. Total (m3/s)	52.1	Conv. (m3/s)		52.1	
Length Wtd. (m)		Wetted Per. (m)		5.46	
Min Ch El (m)	175.22	Shear (N/m2)		56.63	
Alpha	1.00	Stream Power (N/m s)		126.60	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	176.35	Element	Left OB	Channel	Right OB
Vel Head (m)	0.27	Wt. n-Val.		0.030	
W.S. Elev (m)	176.08	Reach Len. (m)			
Crit W.S. (m)	176.08	Flow Area (m2)		2.82	
E.G. Slope (m/m)	0.012039	Area (m2)		2.82	
Q Total (m3/s)	6.47	Flow (m3/s)		6.47	
Top Width (m)	5.37	Top Width (m)		5.37	
Vel Total (m/s)	2.29	Avg. Vel. (m/s)		2.29	
Max Chl Dpth (m)	0.86	Hydr. Depth (m)		0.53	
Conv. Total (m3/s)	59.0	Conv. (m3/s)		59.0	
Length Wtd. (m)		Wetted Per. (m)		5.69	
Min Ch El (m)	175.22	Shear (N/m2)		58.56	
Alpha	1.00	Stream Power (N/m s)		134.23	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	176.50	Element	Left OB	Channel	Right OB
Vel Head (m)	0.30	Wt. n-Val.		0.030	
W.S. Elev (m)	176.20	Reach Len. (m)			
Crit W.S. (m)	176.20	Flow Area (m2)		3.47	
E.G. Slope (m/m)	0.011630	Area (m2)		3.47	
Q Total (m3/s)	8.42	Flow (m3/s)		8.42	
Top Width (m)	5.90	Top Width (m)		5.90	
Vel Total (m/s)	2.42	Avg. Vel. (m/s)		2.42	
Max Chl Dpth (m)	0.98	Hydr. Depth (m)		0.59	
Conv. Total (m3/s)	78.1	Conv. (m3/s)		78.1	
Length Wtd. (m)		Wetted Per. (m)		6.27	
Min Ch El (m)	175.22	Shear (N/m2)		63.18	
Alpha	1.00	Stream Power (N/m s)		153.18	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	176.17	Element	Left OB	Channel	Right OB
Vel Head (m)	0.22	Wt. n-Val.		0.030	
W.S. Elev (m)	175.95	Reach Len. (m)			
Crit W.S. (m)	175.95	Flow Area (m2)		2.14	
E.G. Slope (m/m)	0.012356	Area (m2)		2.14	
Q Total (m3/s)	4.49	Flow (m3/s)		4.49	

Top Width (m)	4.78	Top Width (m)	4.78
Vel Total (m/s)	2.10	Avg. Vel. (m/s)	2.10
Max Chl Dpth (m)	0.73	Hydr. Depth (m)	0.45
Conv. Total (m3/s)	40.4	Conv. (m3/s)	40.4
Length Wtd. (m)		Wetted Per. (m)	5.04
Min Ch El (m)	175.22	Shear (N/m2)	51.54
Alpha	1.00	Stream Power (N/m s)	108.00
Frctn Loss (m)		Cum Volume (1000 m3)	
C & E Loss (m)		Cum SA (1000 m2)	

SUMMARY OF MANNING'S N VALUES

River:Rouge

Reach	River Sta.	n1	n2	n3
WC3	300	.035	.03	.035
WC3	200	.035	.03	.035
WC3	150	Culvert		
WC3	100	.035	.03	.035
WC3	10	.035	.03	.035
WC3	5	.035	.03	.035

SUMMARY OF REACH LENGTHS

River: Rouge

Reach	River Sta.	Left	Channel	Right
WC3	300	98	98	98
WC3	200	43	43	43
WC3	150	Culvert		
WC3	100	44.6	44.6	44.6
WC3	10	133.7	133.7	133.7
WC3	5	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Rouge

Reach	River Sta.	Contr.	Expan.
WC3	300	.3	.5
WC3	200	.3	.5
WC3	150	Culvert	
WC3	100	.3	.5
WC3	10	.3	.5
WC3	5	.1	.3

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
WC3	300	2-yr	2.00	180.49	181.18	181.18	181.36	0.014619	1.90	1.06	2.96	1.01
WC3	300	5-yr	3.44	180.49	181.36	181.36	181.58	0.013393	2.10	1.64	3.68	1.01
WC3	300	10-yr	4.13	180.49	181.42	181.42	181.67	0.013206	2.19	1.89	3.94	1.01
WC3	300	25-yr	5.07	180.49	181.50	181.50	181.77	0.013155	2.30	2.20	4.25	1.02
WC3	300	50-yr	5.76	180.49	181.55	181.55	181.84	0.012519	2.38	2.42	4.55	1.01
WC3	300	100-yr	6.47	180.49	181.60	181.60	181.91	0.011770	2.45	2.66	4.86	1.00
WC3	300	Check Flow	8.42	180.49	181.74	181.74	182.07	0.010022	2.58	3.38	5.68	0.95
WC3	300	Regional	4.49	180.49	181.45	181.45	181.71	0.013000	2.22	2.02	4.08	1.01
WC3	200	2-yr	2.00	178.50	178.96	178.86	179.07	0.005289	1.45	1.38	3.25	0.68
WC3	200	5-yr	3.44	178.50	179.16	179.01	179.31	0.004703	1.73	1.98	3.35	0.68
WC3	200	10-yr	4.13	178.50	179.25	179.08	179.42	0.004509	1.84	2.24	3.40	0.68
WC3	200	25-yr	5.07	178.50	179.36	179.16	179.56	0.004185	1.96	2.59	3.46	0.67
WC3	200	50-yr	5.76	178.50	179.45	179.22	179.66	0.003968	2.03	2.84	3.51	0.66
WC3	200	100-yr	6.47	178.50	179.53	179.28	179.75	0.003779	2.09	3.09	3.55	0.66
WC3	200	Check Flow	8.42	178.50	179.81	179.43	180.04	0.002878	2.14	3.93	3.70	0.60
WC3	200	Regional	4.49	178.50	179.29	179.11	179.47	0.004404	1.89	2.37	3.42	0.68
WC3	150		Culvert									
WC3	100	2-yr	2.00	178.00	178.36	178.36	178.53	0.012587	1.88	1.07	3.57	1.01
WC3	100	5-yr	3.44	178.00	178.51	178.51	178.77	0.011124	2.25	1.53	3.81	1.00
WC3	100	10-yr	4.13	178.00	178.58	178.58	178.87	0.010728	2.39	1.73	3.92	1.01
WC3	100	25-yr	5.07	178.00	178.66	178.66	178.99	0.010167	2.55	1.99	4.05	1.00
WC3	100	50-yr	5.76	178.00	178.72	178.72	179.08	0.009967	2.67	2.16	4.14	1.01
WC3	100	100-yr	6.47	178.00	178.78	178.78	179.17	0.009713	2.78	2.33	4.24	1.01
WC3	100	Check Flow	8.42	178.00	178.93	178.93	179.39	0.009143	3.03	2.78	4.47	1.00
WC3	100	Regional	4.49	178.00	178.61	178.61	178.92	0.010512	2.46	1.83	3.97	1.00
WC3	10	2-yr	2.00	177.25	177.57	177.55	177.63	0.011816	1.08	1.86	11.42	0.85
WC3	10	5-yr	3.44	177.25	177.64	177.62	177.72	0.011359	1.25	2.75	13.18	0.87
WC3	10	10-yr	4.13	177.25	177.67	177.65	177.76	0.010975	1.31	3.15	13.64	0.87
WC3	10	25-yr	5.07	177.25	177.71	177.68	177.80	0.010593	1.39	3.66	14.20	0.87
WC3	10	50-yr	5.76	177.25	177.73	177.70	177.84	0.010444	1.43	4.02	14.69	0.87
WC3	10	100-yr	6.47	177.25	177.76	177.73	177.87	0.010136	1.46	4.42	15.31	0.87
WC3	10	Check Flow	8.42	177.25	177.82	177.79	177.94	0.009429	1.54	5.48	16.67	0.86
WC3	10	Regional	4.49	177.25	177.68	177.66	177.78	0.011097	1.35	3.32	13.83	0.88
WC3	5	2-yr	2.00	175.22	175.72	175.72	175.87	0.014177	1.74	1.15	3.82	1.01
WC3	5	5-yr	3.44	175.22	175.86	175.86	176.06	0.013135	1.99	1.73	4.41	1.01
WC3	5	10-yr	4.13	175.22	175.92	175.92	176.13	0.012800	2.07	1.99	4.65	1.01
WC3	5	25-yr	5.07	175.22	175.99	175.99	176.23	0.012463	2.17	2.33	4.94	1.01
WC3	5	50-yr	5.76	175.22	176.04	176.04	176.29	0.012228	2.24	2.58	5.16	1.01
WC3	5	100-yr	6.47	175.22	176.08	176.08	176.35	0.012039	2.29	2.82	5.37	1.01
WC3	5	Check Flow	8.42	175.22	176.20	176.20	176.50	0.011630	2.42	3.47	5.90	1.01
WC3	5	Regional	4.49	175.22	175.95	175.95	176.17	0.012356	2.10	2.14	4.78	1.00

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (m)	W.S. Elev (m)	Vel Head (m)	Frctn Loss (m)	C & E Loss (m)	Q Left (m3/s)	Q Channel (m3/s)	Q Right (m3/s)	Top Width (m)
WC3	300	2-yr	181.36	181.18	0.18	0.81	0.04		2.00		2.96
WC3	300	5-yr	181.58	181.36	0.23	0.73	0.04		3.44		3.68
WC3	300	10-yr	181.67	181.42	0.24	0.70	0.04		4.13		3.94
WC3	300	25-yr	181.77	181.50	0.27	0.67	0.04		5.07		4.25
WC3	300	50-yr	181.84	181.55	0.29	0.64	0.04	0.00	5.76	0.00	4.55
WC3	300	100-yr	181.91	181.60	0.31	0.60	0.04	0.00	6.46	0.01	4.86
WC3	300	Check Flow	182.07	181.74	0.34	0.48	0.05	0.04	8.31	0.07	5.68
WC3	300	Regional	181.71	181.45	0.25	0.69	0.03		4.49		4.08
WC3	200	2-yr	179.07	178.96	0.11				2.00		3.25
WC3	200	5-yr	179.31	179.16	0.15				3.44		3.35
WC3	200	10-yr	179.42	179.25	0.17				4.13		3.40
WC3	200	25-yr	179.56	179.36	0.20				5.07		3.46
WC3	200	50-yr	179.66	179.45	0.21				5.76		3.51
WC3	200	100-yr	179.75	179.53	0.22				6.47		3.55
WC3	200	Check Flow	180.04	179.81	0.23				8.42		3.70
WC3	200	Regional	179.47	179.29	0.18				4.49		3.42
WC3	150		Culvert								
WC3	100	2-yr	178.53	178.36	0.18	0.54	0.06		2.00		3.57
WC3	100	5-yr	178.77	178.51	0.26	0.50	0.09		3.44		3.81
WC3	100	10-yr	178.87	178.58	0.29	0.48	0.10		4.13		3.92
WC3	100	25-yr	178.99	178.66	0.33	0.46	0.12		5.07		4.05
WC3	100	50-yr	179.08	178.72	0.36	0.45	0.13		5.76		4.14
WC3	100	100-yr	179.17	178.78	0.39	0.44	0.14		6.47		4.24
WC3	100	Check Flow	179.39	178.93	0.47	0.41	0.17		8.42		4.47

WC3	100	Regional	178.92	178.61	0.31	0.48	0.11	4.49	3.97
WC3	10	2-yr	177.63	177.57	0.06	1.73	0.03	2.00	11.42
WC3	10	5-yr	177.72	177.64	0.08	1.63	0.04	3.44	13.18
WC3	10	10-yr	177.76	177.67	0.09	1.58	0.04	4.13	13.64
WC3	10	25-yr	177.80	177.71	0.10	1.53	0.04	5.07	14.20
WC3	10	50-yr	177.84	177.73	0.10	1.51	0.05	5.76	14.69
WC3	10	100-yr	177.87	177.76	0.11	1.47	0.05	6.47	15.31
WC3	10	Check Flow	177.94	177.82	0.12	1.40	0.05	8.42	16.67
WC3	10	Regional	177.78	177.68	0.09	1.56	0.04	4.49	13.83
WC3	5	2-yr	175.87	175.72	0.15			2.00	3.82
WC3	5	5-yr	176.06	175.86	0.20			3.44	4.41
WC3	5	10-yr	176.13	175.92	0.22			4.13	4.65
WC3	5	25-yr	176.23	175.99	0.24			5.07	4.94
WC3	5	50-yr	176.29	176.04	0.25			5.76	5.16
WC3	5	100-yr	176.35	176.08	0.27			6.47	5.37
WC3	5	Check Flow	176.50	176.20	0.30			8.42	5.90
WC3	5	Regional	176.17	175.95	0.22			4.49	4.78

Profile Output Table - Culvert Only

Reach	River Sta		Profile	E.G. US. (m)	W.S. US. (m)	E.G. IC (m)	E.G. OC (m)	Min El Weir Flow (m)	Q Culv Group (m3/s)	Q Weir (m3/s)	Delta WS (m)	Culv Vel US (m/s)	Culv Vel DS (m/s)
WC3	150	Culvert #1	2-yr	179.07	178.96	179.06	179.07	180.49	2.00		0.61	1.73	1.87
WC3	150	Culvert #1	5-yr	179.32	179.16	179.31	179.32	180.49	3.44		0.65	2.13	2.24
WC3	150	Culvert #1	10-yr	179.42	179.25	179.42	179.42	180.49	4.13		0.67	2.27	2.38
WC3	150	Culvert #1	25-yr	179.56	179.36	179.56	179.56	180.49	5.07		0.70	2.45	2.55
WC3	150	Culvert #1	50-yr	179.66	179.45	179.66	179.65	180.49	5.76		0.73	2.56	2.66
WC3	150	Culvert #1	100-yr	179.76	179.53	179.76	179.74	180.49	6.47		0.75	2.67	2.77
WC3	150	Culvert #1	Check Flow	180.05	179.81	180.05	179.98	180.49	8.42		0.88	2.93	3.02
WC3	150	Culvert #1	Regional	179.48	179.29	179.48	179.47	180.49	4.49		0.68	2.34	2.45

ROUGE RIVER

HEC-RAS ANALYSIS WC#4

EXISTING 407 ETR

PROPOSED 407 TWY

ST 10	177.94	177.94
	178.03	178.03

179.30	179.16	ST 100
179.37	179.31	

ST 200	179.92	180.58
	180.14	180.61

ST 300	181.04	181.41
	181.15	181.43

PROP CULV WC#4
SPAN x RISE = (2 x 1.25)m
L=34m, S=0.8%
U/S INV= 179.20m
D/S INV= 178.92m

SEE FIG. 6.3

1+400 1+500 1+600

LEGEND

- EXISTING 407 ETR
- PROPOSED 407 TWY
- CREEK FLOW DIRECTION
- EXISTING CULVERT
- PROPOSED CULVERT
- PROPOSED REGIONAL FLOODLINE

EX REG / EX 100 — PR REG / PR 100 — HEC ST — PARSONS HEC-RAS SECTION

CROSS SECTION NUMBER

PROPOSED WL ELEVATION (m)

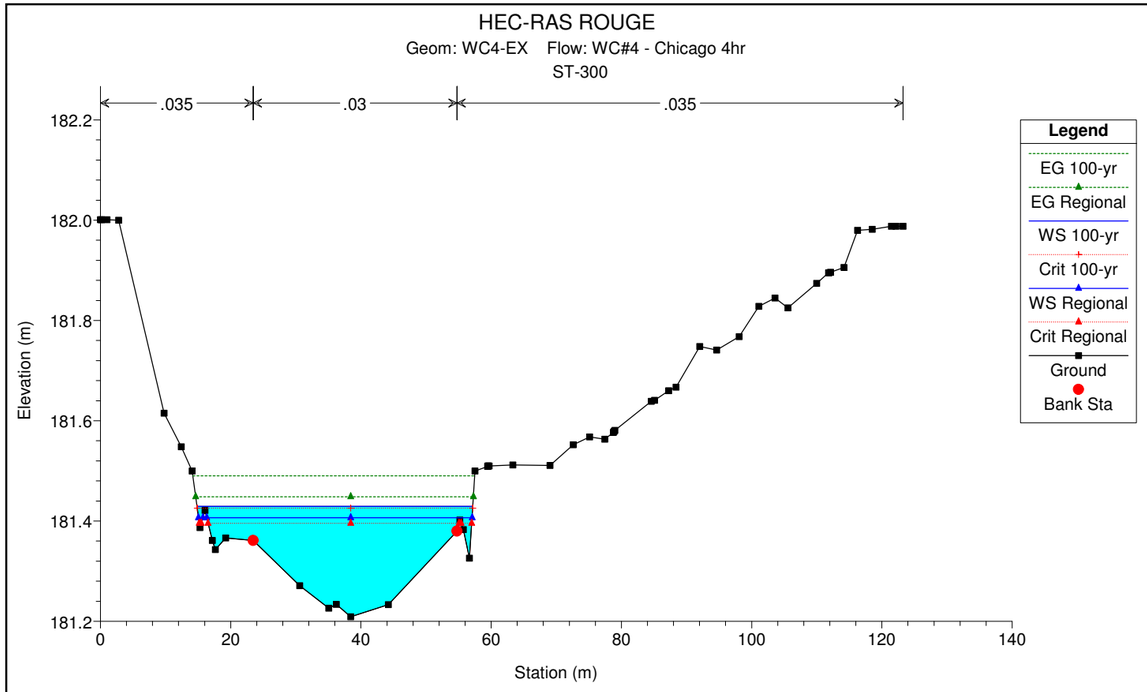
EXISTING UPDATED WL ELEVATION (m)

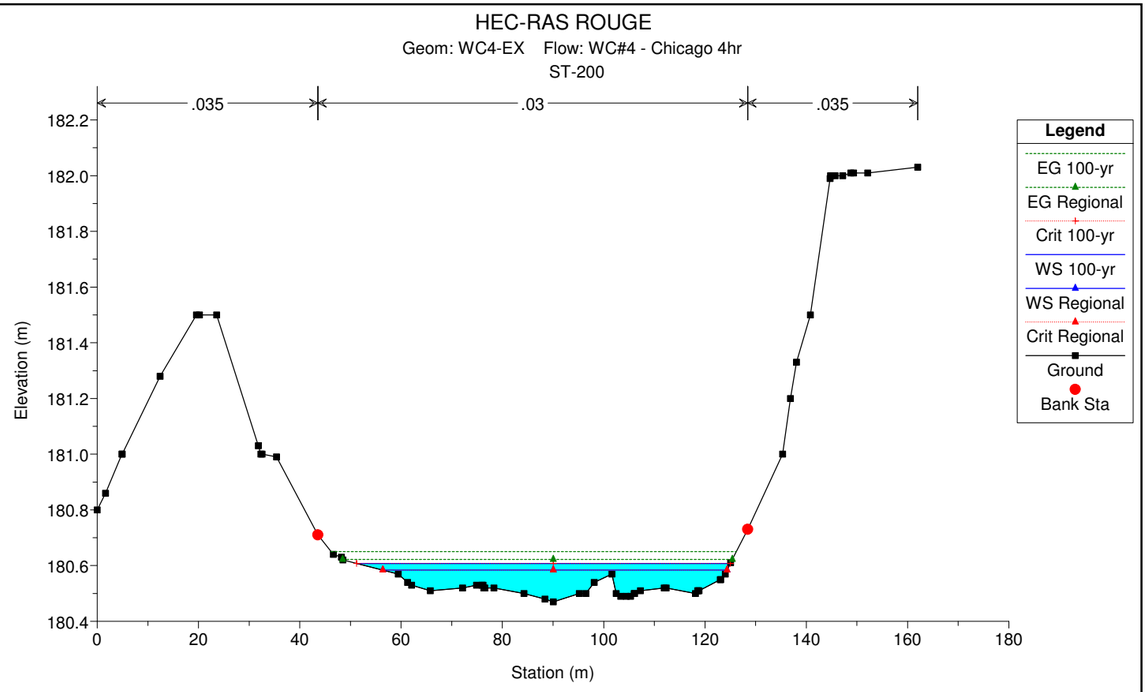
SCALE HORIZONTAL

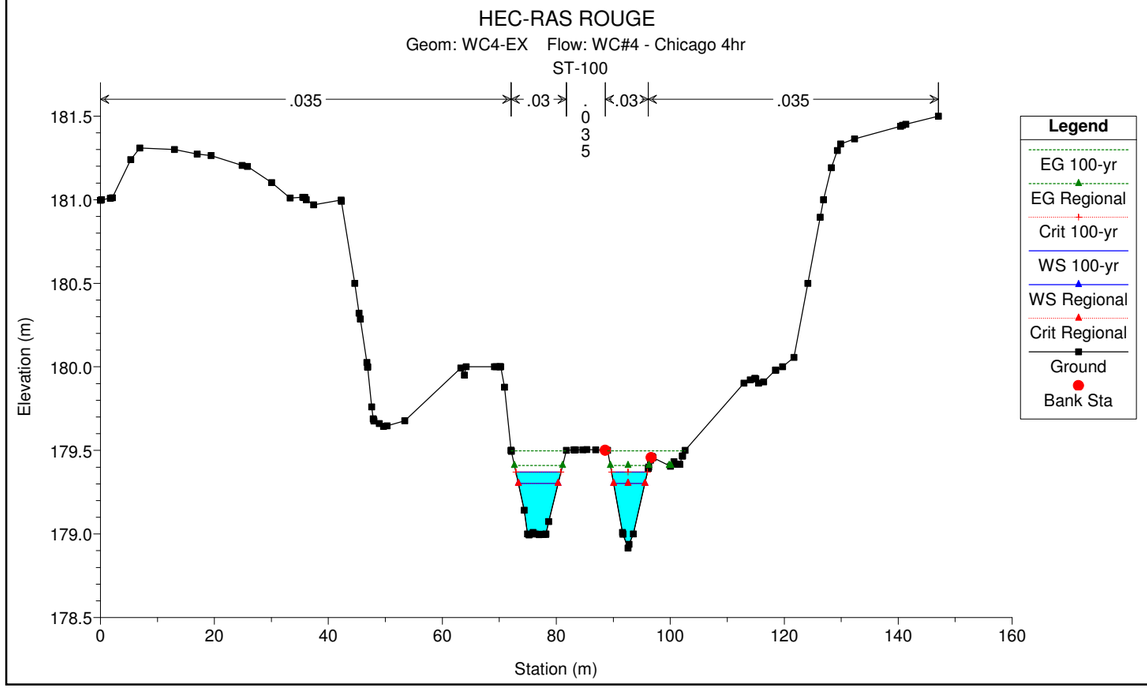
5m 0m 10m 20m 30m

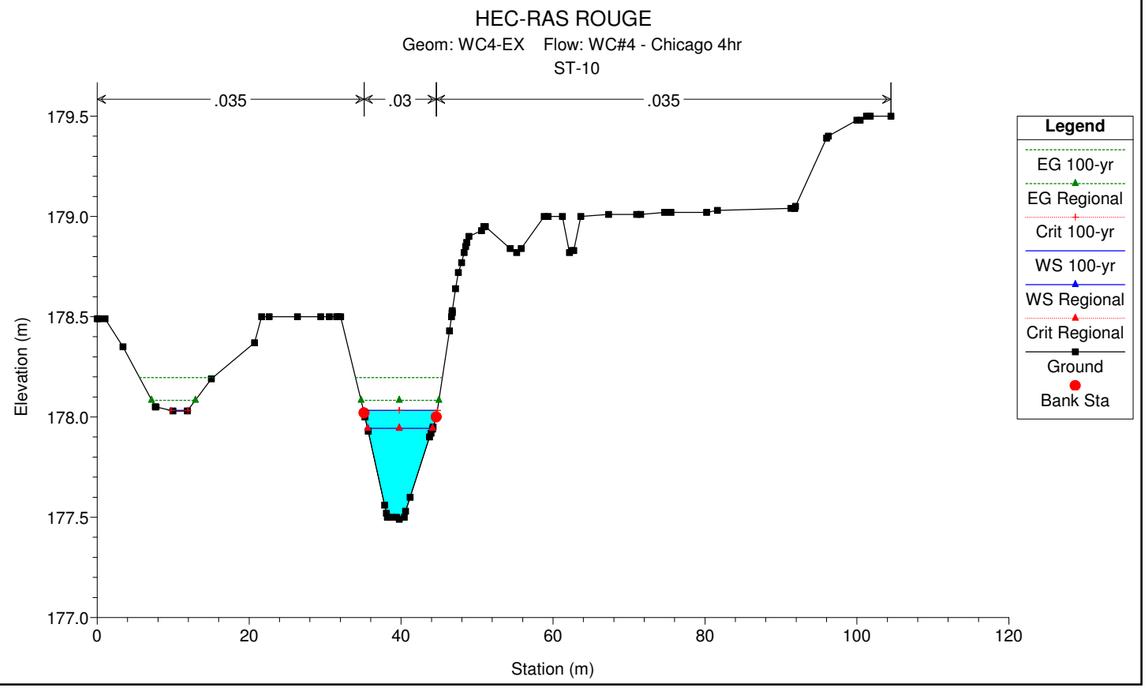
1:1000

DATE: SEPTEMBER 2016	Ontario	PARSONS 625 COCHRANE DRIVE, SUITE 500 MARKHAM, ONTARIO L3R 9R9 TEL: 905-943-0500 FAX: 905-943-0400	407 TRANSITWAY FROM KENNEDY RD TO BROCK RD
SCALE: 1:1000			FIGURE 6.2 - HEC-RAS ANALYSIS - ROUGE RIVER (WC#4)


HEC-RAS ROUGE
Geom: WC4-EX Flow: WC#4 - Chicago 4hr
ST-300
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG 100-yr
EG Regional
WS 100-yr
Crit 100-yr
WS Regional
Crit Regional
Ground
Bank Sta


HEC-RAS ROUGE
Geom: WC4-EX Flow: WC#4 - Chicago 4hr
ST-200
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG 100-yr
EG Regional
Crit 100-yr
WS 100-yr
WS Regional
Crit Regional
Ground
Bank Sta


HEC-RAS ROUGE
Geom: WC4-EX Flow: WC#4 - Chicago 4hr
ST-100
.035
.03
.035
.035
Elevation (m)
Station (m)
Legend
EG 100-yr
EG Regional
Crit 100-yr
WS 100-yr
WS Regional
Crit Regional
Ground
Bank Sta


HEC-RAS ROUGE
Geom: WC4-EX Flow: WC#4 - Chicago 4hr
ST-10
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG 100-yr
EG Regional
Crit 100-yr
WS 100-yr
WS Regional
Crit Regional
Ground
Bank Sta

HEC-RAS Plan: WC4-EX-4hr CH River: Rouge Reach: WC4

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC4	300	2-yr	1.76	181.21	181.35	181.33	181.38	0.013097	0.73	2.41	29.79	0.81
WC4	300	5-yr	3.03	181.21	181.39	181.37	181.42	0.011121	0.83	3.82	39.86	0.78
WC4	300	10-yr	3.64	181.21	181.40	181.39	181.44	0.011389	0.89	4.29	41.10	0.80
WC4	300	25-yr	4.46	181.21	181.42	181.40	181.46	0.011815	0.98	4.85	41.90	0.83
WC4	300	50-yr	5.07	181.21	181.43	181.42	181.48	0.010976	1.00	5.42	42.35	0.82
WC4	300	100-yr	5.70	181.21	181.43	181.43	181.49	0.013758	1.12	5.44	42.35	0.91
WC4	300	Check Flow	7.41	181.21	181.45	181.45	181.53	0.013943	1.24	6.43	42.71	0.94
WC4	300	Regional	3.92	181.21	181.41	181.40	181.45	0.011502	0.92	4.49	41.40	0.81
WC4	200	2-yr	1.76	180.47	180.56	180.56	180.58	0.019954	0.61	2.89	61.89	0.90
WC4	200	5-yr	3.03	180.47	180.57	180.57	180.61	0.026602	0.81	3.74	65.09	1.08
WC4	200	10-yr	3.64	180.47	180.58	180.58	180.62	0.025417	0.85	4.29	67.11	1.07
WC4	200	25-yr	4.46	180.47	180.59	180.59	180.63	0.024361	0.90	4.98	69.58	1.07
WC4	200	50-yr	5.07	180.47	180.59	180.59	180.64	0.027489	0.97	5.21	70.38	1.14
WC4	200	100-yr	5.70	180.47	180.61	180.61	180.65	0.020460	0.92	6.22	73.82	1.01
WC4	200	Check Flow	7.41	180.47	180.63	180.63	180.68	0.014362	0.89	8.29	78.30	0.88
WC4	200	Regional	3.92	180.47	180.58	180.58	180.62	0.025072	0.87	4.52	67.97	1.07
WC4	100	2-yr	1.76	178.91	179.19	179.19	179.26	0.016572	1.23	1.45	9.54	1.00
WC4	100	5-yr	3.03	178.91	179.26	179.26	179.36	0.015309	1.37	2.21	11.41	0.99
WC4	100	10-yr	3.64	178.91	179.29	179.29	179.39	0.014907	1.42	2.55	12.16	0.99
WC4	100	25-yr	4.46	178.91	179.32	179.32	179.44	0.014615	1.49	2.98	13.04	1.00
WC4	100	50-yr	5.07	178.91	179.35	179.35	179.47	0.014326	1.53	3.30	13.65	1.00
WC4	100	100-yr	5.70	178.91	179.37	179.37	179.50	0.014122	1.57	3.61	14.24	1.00
WC4	100	Check Flow	7.41	178.91	179.43	179.43	179.57	0.012911	1.65	4.53	18.85	0.99
WC4	100	Regional	3.92	178.91	179.30	179.30	179.41	0.014749	1.44	2.70	12.48	0.99
WC4	10	2-yr	1.76	177.49	177.80	177.80	177.89	0.015207	1.39	1.27	6.38	1.00
WC4	10	5-yr	3.03	177.49	177.89	177.89	178.02	0.014055	1.56	1.94	7.76	1.00
WC4	10	10-yr	3.64	177.49	177.93	177.93	178.06	0.013720	1.62	2.25	8.34	1.00
WC4	10	25-yr	4.46	177.49	177.97	177.97	178.12	0.013408	1.69	2.64	9.01	1.00
WC4	10	50-yr	5.07	177.49	178.00	178.00	178.16	0.013275	1.75	2.90	9.42	1.00
WC4	10	100-yr	5.70	177.49	178.03	178.03	178.20	0.012532	1.79	3.19	11.92	0.99
WC4	10	Check Flow	7.41	177.49	178.12	178.12	178.28	0.009256	1.79	4.52	17.58	0.88
WC4	10	Regional	3.92	177.49	177.94	177.94	178.08	0.013903	1.66	2.36	8.56	1.01

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X    X
X     X  X        X           X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X           X  X     X    X        X
X     X  X        X    X      X   X    X    X        X
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PROJECT DATA
Project Title: HEC-RAS ROUGE
Project File : HEC.prj
Run Date and Time: 1/19/2016 3:06:17 PM

Project in SI units

Project Description:
HEC-RAS model for creek crossings along the proposed 407 TWY Ph 2 started from
scratch

PLAN DATA

Plan Title: Plan 02
Plan File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.p02

Geometry Title: WC4-EX
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g10

Flow Title : WC#4 - Chicago 4hr
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f03

Plan Summary Information:
Number of: Cross Sections = 4 Multiple Openings = 0
Culverts = 0 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: WC#4 - Chicago 4hr
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f03

Flow Data (m3/s)

River	Reach	RS	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Check Flow	Regional
Rouge	WC4	300	1.76	3.03	3.64	4.46	5.07	5.7	7.41	3.92

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Rouge	WC4	2-yr		Critical
Rouge	WC4	5-yr		Critical
Rouge	WC4	10-yr		Critical
Rouge	WC4	25-yr		Critical
Rouge	WC4	50-yr		Critical
Rouge	WC4	100-yr		Critical
Rouge	WC4	Check Flow		Critical
Rouge	WC4	Regional		Critical

GEOMETRY DATA

Geometry Title: WC4-EX
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g10

CROSS SECTION

RIVER: Rouge
REACH: WC4 RS: 300

INPUT
Description: ST-300
Station Elevation Data num= 55

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	182.001	.145	182.001	.993	182.001	2.781	182	9.762	181.615
12.403	181.548	14.082	181.5	15.267	181.387	16.066	181.421	17.177	181.361
17.638	181.343	19.244	181.366	23.477	181.361	30.596	181.271	35.041	181.226
36.218	181.234	38.43	181.209	44.216	181.233	54.742	181.38	55.197	181.402
55.729	181.383	56.668	181.326	57.529	181.5	59.468	181.509	59.496	181.51
59.518	181.51	59.68	181.51	63.342	181.512	69.038	181.511	72.601	181.552
75.128	181.568	77.449	181.563	78.779	181.577	78.896	181.579	79.007	181.581
84.596	181.639	85.073	181.641	87.266	181.66	88.399	181.667	92.012	181.748
94.645	181.741	98.077	181.768	101.104	181.828	103.603	181.845	105.57	181.825
109.997	181.874	111.812	181.895	111.892	181.895	112.108	181.896	114.177	181.906
116.278	181.98	118.533	181.982	121.45	181.988	122.171	181.988	123.254	181.988

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	23.477	.03	54.742	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
23.477 54.742 50.1 50.1 50.1 .1 .3

CROSS SECTION OUTPUT Profile #2-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	181.38	Element	0.035	0.030	0.035
Vel Head (m)	0.03	Wt. n-Val.	50.10	50.10	50.10
W.S. Elev (m)	181.35	Reach Len. (m)	0.00	2.40	0.01
Crit W.S. (m)	181.33	Flow Area (m2)	0.00	2.40	0.01
E.G. Slope (m/m)	0.013097	Area (m2)	0.00	1.76	0.00
Q Total (m3/s)	1.76	Flow (m3/s)	0.00	29.79	0.54
Top Width (m)	29.79	Top Width (m)	0.80	0.73	0.18
Vel Total (m/s)	0.73	Avg. Vel. (m/s)	0.09	0.14	0.01
Max Chl Dpth (m)	0.14	Hydr. Depth (m)	0.00	15.4	0.0
Conv. Total (m3/s)	15.4	Conv. (m3/s)	0.0	50.10	0.54
Length Wtd. (m)	50.10	Wetted Per. (m)	0.80	181.21	1.61
Min Ch El (m)	181.21	Shear (N/m2)	0.54	1.01	0.00
Alpha	1.01	Stream Power (N/m s)	5901.15	0.80	0.00
Frctn Loss (m)	0.80	Cum Volume (1000 m3)	0.03	0.25	0.00

C & E Loss (m)	0.00	Cum SA (1000 m2)	0.25	3.89	0.01

Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	181.42	Element			
Vel Head (m)	0.03	Wt. n-Val.	0.035	0.030	0.035
W.S. Elev (m)	181.39	Reach Len. (m)	50.10	50.10	50.10
Crit W.S. (m)	181.37	Flow Area (m2)	0.20	3.58	0.05
E.G. Slope (m/m)	0.011121	Area (m2)	0.20	3.58	0.05
Q Total (m3/s)	3.03	Flow (m3/s)	0.05	2.96	0.01
Top Width (m)	39.86	Top Width (m)	6.94	31.27	1.66
Vel Total (m/s)	0.79	Avg. Vel. (m/s)	0.28	0.83	0.29
Max Chl Dpth (m)	0.18	Hydr. Depth (m)	0.03	0.11	0.03
Conv. Total (m3/s)	28.7	Conv. (m3/s)	0.5	28.1	0.1
Length Wtd. (m)	50.10	Wetted Per. (m)	6.94	31.27	1.67
Min Ch El (m)	181.21	Shear (N/m2)	3.07	12.47	2.95
Alpha	1.07	Stream Power (N/m s)	5901.15	0.00	0.00
Frctn Loss (m)	0.82	Cum Volume (1000 m3)	0.06	0.34	0.00
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.44	4.18	0.04

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	181.44	Element			
Vel Head (m)	0.04	Wt. n-Val.	0.035	0.030	0.035
W.S. Elev (m)	181.40	Reach Len. (m)	50.10	50.10	50.10
Crit W.S. (m)	181.39	Flow Area (m2)	0.28	3.94	0.07
E.G. Slope (m/m)	0.011389	Area (m2)	0.28	3.94	0.07
Q Total (m3/s)	3.64	Flow (m3/s)	0.10	3.52	0.02
Top Width (m)	41.10	Top Width (m)	7.55	31.27	2.28
Vel Total (m/s)	0.85	Avg. Vel. (m/s)	0.35	0.89	0.31
Max Chl Dpth (m)	0.19	Hydr. Depth (m)	0.04	0.13	0.03
Conv. Total (m3/s)	34.1	Conv. (m3/s)	0.9	33.0	0.2
Length Wtd. (m)	50.10	Wetted Per. (m)	7.55	31.27	2.29
Min Ch El (m)	181.21	Shear (N/m2)	4.13	14.07	3.31
Alpha	1.08	Stream Power (N/m s)	5901.15	0.00	0.00
Frctn Loss (m)	0.82	Cum Volume (1000 m3)	0.07	0.39	0.00
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.47	4.30	0.06

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	181.46	Element			
Vel Head (m)	0.05	Wt. n-Val.	0.035	0.030	0.035
W.S. Elev (m)	181.42	Reach Len. (m)	50.10	50.10	50.10
Crit W.S. (m)	181.40	Flow Area (m2)	0.39	4.37	0.10
E.G. Slope (m/m)	0.011815	Area (m2)	0.39	4.37	0.10
Q Total (m3/s)	4.46	Flow (m3/s)	0.16	4.26	0.04
Top Width (m)	41.90	Top Width (m)	8.27	31.27	2.37
Vel Total (m/s)	0.92	Avg. Vel. (m/s)	0.42	0.98	0.38
Max Chl Dpth (m)	0.21	Hydr. Depth (m)	0.05	0.14	0.04
Conv. Total (m3/s)	41.0	Conv. (m3/s)	1.5	39.2	0.3
Length Wtd. (m)	50.10	Wetted Per. (m)	8.28	31.27	2.38
Min Ch El (m)	181.21	Shear (N/m2)	5.43	16.18	4.86
Alpha	1.09	Stream Power (N/m s)	5901.15	0.00	0.00
Frctn Loss (m)	0.82	Cum Volume (1000 m3)	0.08	0.45	0.00
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.51	4.44	0.06

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	181.48	Element			
Vel Head (m)	0.05	Wt. n-Val.	0.035	0.030	0.035
W.S. Elev (m)	181.43	Reach Len. (m)	50.10	50.10	50.10
Crit W.S. (m)	181.42	Flow Area (m2)	0.50	4.79	0.13
E.G. Slope (m/m)	0.010976	Area (m2)	0.50	4.79	0.13
Q Total (m3/s)	5.07	Flow (m3/s)	0.23	4.79	0.06
Top Width (m)	42.35	Top Width (m)	8.65	31.27	2.43
Vel Total (m/s)	0.93	Avg. Vel. (m/s)	0.45	1.00	0.43
Max Chl Dpth (m)	0.22	Hydr. Depth (m)	0.06	0.15	0.05
Conv. Total (m3/s)	48.4	Conv. (m3/s)	2.2	45.7	0.5
Length Wtd. (m)	50.10	Wetted Per. (m)	8.65	31.27	2.45
Min Ch El (m)	181.21	Shear (N/m2)	6.25	16.49	5.82
Alpha	1.09	Stream Power (N/m s)	5901.15	0.00	0.00
Frctn Loss (m)	0.83	Cum Volume (1000 m3)	0.09	0.48	0.00
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.54	4.50	0.06

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	181.49	Element			
Vel Head (m)	0.06	Wt. n-Val.	0.035	0.030	0.035
W.S. Elev (m)	181.43	Reach Len. (m)	50.10	50.10	50.10
Crit W.S. (m)	181.43	Flow Area (m2)	0.51	4.80	0.13
E.G. Slope (m/m)	0.013758	Area (m2)	0.51	4.80	0.13
Q Total (m3/s)	5.70	Flow (m3/s)	0.26	5.38	0.06
Top Width (m)	42.35	Top Width (m)	8.65	31.27	2.44
Vel Total (m/s)	1.05	Avg. Vel. (m/s)	0.50	1.12	0.48
Max Chl Dpth (m)	0.22	Hydr. Depth (m)	0.06	0.15	0.05
Conv. Total (m3/s)	48.6	Conv. (m3/s)	2.2	45.9	0.5
Length Wtd. (m)	50.10	Wetted Per. (m)	8.66	31.27	2.45
Min Ch El (m)	181.21	Shear (N/m2)	7.88	20.71	7.33
Alpha	1.09	Stream Power (N/m s)	5901.15	0.00	0.00
Frctn Loss (m)	0.83	Cum Volume (1000 m3)	0.10	0.54	0.00
C & E Loss (m)	0.01	Cum SA (1000 m2)	0.60	4.67	0.06

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

			Left OB	Channel	Right OB
E.G. Elev (m)	181.53	Element			
Vel Head (m)	0.07	Wt. n-Val.	0.035	0.030	0.035
W.S. Elev (m)	181.45	Reach Len. (m)	50.10	50.10	50.10
Crit W.S. (m)	181.45	Flow Area (m2)	0.71	5.53	0.19
E.G. Slope (m/m)	0.013943	Area (m2)	0.71	5.53	0.19
Q Total (m3/s)	7.41	Flow (m3/s)	0.44	6.85	0.11
Top Width (m)	42.71	Top Width (m)	8.90	31.27	2.55
Vel Total (m/s)	1.15	Avg. Vel. (m/s)	0.62	1.24	0.60
Max Chl Dpth (m)	0.24	Hydr. Depth (m)	0.08	0.18	0.07
Conv. Total (m3/s)	62.8	Conv. (m3/s)	3.8	58.0	1.0
Length Wtd. (m)	50.10	Wetted Per. (m)	8.90	31.27	2.57
Min Ch El (m)	181.21	Shear (N/m2)	10.90	24.17	10.18

Alpha	1.09	Stream Power (N/m s)	5901.15	0.00	0.00	
Frctn Loss (m)	0.71	Cum Volume (1000 m3)	0.13	0.69	0.01	
C & E Loss (m)	0.01	Cum SA (1000 m2)	0.74	4.91	0.20	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	181.45	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.04	Wt. n-Val.	0.035	0.030	0.035	
W.S. Elev (m)	181.41	Reach Len. (m)	50.10	50.10	50.10	
Crit W.S. (m)	181.40	Flow Area (m2)	0.32	4.10	0.08	
E.G. Slope (m/m)	0.011502	Area (m2)	0.32	4.10	0.08	
Q Total (m3/s)	3.92	Flow (m3/s)	0.12	3.78	0.03	
Top Width (m)	41.40	Top Width (m)	7.81	31.27	2.32	
Vel Total (m/s)	0.87	Avg. Vel. (m/s)	0.37	0.92	0.32	
Max Chl Dpth (m)	0.20	Hydr. Depth (m)	0.04	0.13	0.03	
Conv. Total (m3/s)	36.6	Conv. (m3/s)	1.1	35.2	0.2	
Length Wtd. (m)	50.10	Wetted Per. (m)	7.82	31.27	2.34	
Min Ch El (m)	181.21	Shear (N/m2)	4.58	14.77	3.84	
Alpha	1.08	Stream Power (N/m s)	5901.15	0.00	0.00	
Frctn Loss (m)	0.82	Cum Volume (1000 m3)	0.07	0.41	0.00	
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.49	4.35	0.06	

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Rouge
REACH: WC4 RS: 200

INPUT
Description: ST-200
Station Elevation Data num= 65

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	180.8	1.65	180.86	4.88	181	4.94	181	12.4	181.28
19.58	181.5	20.17	181.5	23.59	181.5	31.81	181.03	32.31	181
32.56	181	35.4	180.99	43.57	180.71	46.61	180.64	48.21	180.63
48.5	180.62	59.41	180.57	61.26	180.54	62.09	180.53	65.79	180.51
72.16	180.52	74.89	180.53	75.97	180.53	76.19	180.53	76.35	180.52
76.54	180.52	78.34	180.52	84.26	180.5	88.38	180.48	90.03	180.47
95.2	180.5	96.46	180.5	98.12	180.54	101.6	180.57	102.45	180.5
103.37	180.49	104.48	180.49	105.29	180.49	106	180.5	106.09	180.5
107.25	180.51	111.93	180.52	112.33	180.52	118.11	180.5	118.58	180.51
118.59	180.51	118.82	180.51	122.99	180.55	123.1	180.55	124	180.57
125.05	180.61	128.42	180.73	135.34	181	136.88	181.2	138.08	181.33
140.79	181.5	144.69	181.99	144.8	182	144.87	182	145.69	182
147.17	182	148.79	182.01	149.34	182.01	152.15	182.01	162.02	182.03

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	43.57	.03	128.42	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
43.57	128.42	42.9	42.9	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	180.58	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.02	Wt. n-Val.		0.030		
W.S. Elev (m)	180.56	Reach Len. (m)	42.90	42.90	42.90	
Crit W.S. (m)	180.56	Flow Area (m2)		2.89		
E.G. Slope (m/m)	0.019954	Area (m2)		2.89		
Q Total (m3/s)	1.76	Flow (m3/s)		1.76		
Top Width (m)	61.89	Top Width (m)		61.89		
Vel Total (m/s)	0.61	Avg. Vel. (m/s)		0.61		
Max Chl Dpth (m)	0.09	Hydr. Depth (m)		0.05		
Conv. Total (m3/s)	12.5	Conv. (m3/s)		12.5		
Length Wtd. (m)	42.90	Wetted Per. (m)		61.90		
Min Ch El (m)	180.47	Shear (N/m2)		9.12		
Alpha	1.00	Stream Power (N/m s)	7757.18	0.00	0.00	
Frctn Loss (m)	0.78	Cum Volume (1000 m3)	0.03	0.11		
C & E Loss (m)	0.01	Cum SA (1000 m2)	0.23	1.63		

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	180.61	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.03	Wt. n-Val.		0.030		
W.S. Elev (m)	180.57	Reach Len. (m)	42.90	42.90	42.90	
Crit W.S. (m)	180.57	Flow Area (m2)		3.74		
E.G. Slope (m/m)	0.026602	Area (m2)		3.74		
Q Total (m3/s)	3.03	Flow (m3/s)		3.03		
Top Width (m)	65.09	Top Width (m)		65.09		
Vel Total (m/s)	0.81	Avg. Vel. (m/s)		0.81		
Max Chl Dpth (m)	0.10	Hydr. Depth (m)		0.06		
Conv. Total (m3/s)	18.6	Conv. (m3/s)		18.6		
Length Wtd. (m)	42.90	Wetted Per. (m)		65.10		
Min Ch El (m)	180.47	Shear (N/m2)		14.99		
Alpha	1.00	Stream Power (N/m s)	7757.18	0.00	0.00	
Frctn Loss (m)	0.85	Cum Volume (1000 m3)	0.05	0.16		
C & E Loss (m)	0.01	Cum SA (1000 m2)	0.27	1.76		

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	180.62	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.04	Wt. n-Val.		0.030		
W.S. Elev (m)	180.58	Reach Len. (m)	42.90	42.90	42.90	
Crit W.S. (m)	180.58	Flow Area (m2)		4.29		
E.G. Slope (m/m)	0.025417	Area (m2)		4.29		
Q Total (m3/s)	3.64	Flow (m3/s)		3.64		
Top Width (m)	67.11	Top Width (m)		67.11		
Vel Total (m/s)	0.85	Avg. Vel. (m/s)		0.85		
Max Chl Dpth (m)	0.11	Hydr. Depth (m)		0.06		
Conv. Total (m3/s)	22.8	Conv. (m3/s)		22.8		
Length Wtd. (m)	42.90	Wetted Per. (m)		67.12		
Min Ch El (m)	180.47	Shear (N/m2)		15.92		
Alpha	1.00	Stream Power (N/m s)	7757.18	0.00	0.00	
Frctn Loss (m)	0.82	Cum Volume (1000 m3)	0.06	0.18		
C & E Loss (m)	0.01	Cum SA (1000 m2)	0.29	1.83		

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	180.63	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.030	
W.S. Elev (m)	180.59	Reach Len. (m)	42.90	42.90	42.90
Crit W.S. (m)	180.59	Flow Area (m2)		4.98	
E.G. Slope (m/m)	0.024361	Area (m2)		4.98	
Q Total (m3/s)	4.46	Flow (m3/s)		4.46	
Top Width (m)	69.58	Top Width (m)		69.58	
Vel Total (m/s)	0.90	Avg. Vel. (m/s)		0.90	
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	28.6	Conv. (m3/s)		28.6	
Length Wtd. (m)	42.90	Wetted Per. (m)		69.58	
Min Ch El (m)	180.47	Shear (N/m2)		17.08	
Alpha	1.00	Stream Power (N/m s)	7757.18	0.00	0.00
Frctn Loss (m)	0.80	Cum Volume (1000 m3)	0.07	0.22	
C & E Loss (m)	0.01	Cum SA (1000 m2)	0.31	1.92	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	180.64	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.030	
W.S. Elev (m)	180.59	Reach Len. (m)	42.90	42.90	42.90
Crit W.S. (m)	180.59	Flow Area (m2)		5.21	
E.G. Slope (m/m)	0.027489	Area (m2)		5.21	
Q Total (m3/s)	5.07	Flow (m3/s)		5.07	
Top Width (m)	70.38	Top Width (m)		70.38	
Vel Total (m/s)	0.97	Avg. Vel. (m/s)		0.97	
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	30.6	Conv. (m3/s)		30.6	
Length Wtd. (m)	42.90	Wetted Per. (m)		70.39	
Min Ch El (m)	180.47	Shear (N/m2)		19.94	
Alpha	1.00	Stream Power (N/m s)	7757.18	0.00	0.00
Frctn Loss (m)	0.83	Cum Volume (1000 m3)	0.08	0.23	0.00
C & E Loss (m)	0.01	Cum SA (1000 m2)	0.32	1.96	0.00

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	180.65	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.030	
W.S. Elev (m)	180.61	Reach Len. (m)	42.90	42.90	42.90
Crit W.S. (m)	180.61	Flow Area (m2)		6.22	
E.G. Slope (m/m)	0.020460	Area (m2)		6.22	
Q Total (m3/s)	5.70	Flow (m3/s)		5.70	
Top Width (m)	73.82	Top Width (m)		73.82	
Vel Total (m/s)	0.92	Avg. Vel. (m/s)		0.92	
Max Chl Dpth (m)	0.14	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	39.8	Conv. (m3/s)		39.8	
Length Wtd. (m)	42.90	Wetted Per. (m)		73.83	
Min Ch El (m)	180.47	Shear (N/m2)		16.91	
Alpha	1.00	Stream Power (N/m s)	7757.18	0.00	0.00
Frctn Loss (m)	0.72	Cum Volume (1000 m3)	0.09	0.26	0.00
C & E Loss (m)	0.01	Cum SA (1000 m2)	0.38	2.04	0.00

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	180.68	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.030	
W.S. Elev (m)	180.63	Reach Len. (m)	42.90	42.90	42.90
Crit W.S. (m)	180.63	Flow Area (m2)		8.29	
E.G. Slope (m/m)	0.014362	Area (m2)		8.29	
Q Total (m3/s)	7.41	Flow (m3/s)		7.41	
Top Width (m)	78.30	Top Width (m)		78.30	
Vel Total (m/s)	0.89	Avg. Vel. (m/s)		0.89	
Max Chl Dpth (m)	0.16	Hydr. Depth (m)		0.11	
Conv. Total (m3/s)	61.8	Conv. (m3/s)		61.8	
Length Wtd. (m)	42.90	Wetted Per. (m)		78.31	
Min Ch El (m)	180.47	Shear (N/m2)		14.91	
Alpha	1.00	Stream Power (N/m s)	7757.18	0.00	0.00
Frctn Loss (m)	0.58	Cum Volume (1000 m3)	0.12	0.34	0.00
C & E Loss (m)	0.01	Cum SA (1000 m2)	0.52	2.17	0.14

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	180.62	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.030	
W.S. Elev (m)	180.58	Reach Len. (m)	42.90	42.90	42.90
Crit W.S. (m)	180.58	Flow Area (m2)		4.52	
E.G. Slope (m/m)	0.025072	Area (m2)		4.52	
Q Total (m3/s)	3.92	Flow (m3/s)		3.92	
Top Width (m)	67.97	Top Width (m)		67.97	
Vel Total (m/s)	0.87	Avg. Vel. (m/s)		0.87	
Max Chl Dpth (m)	0.11	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	24.8	Conv. (m3/s)		24.8	
Length Wtd. (m)	42.90	Wetted Per. (m)		67.97	
Min Ch El (m)	180.47	Shear (N/m2)		16.36	
Alpha	1.00	Stream Power (N/m s)	7757.18	0.00	0.00
Frctn Loss (m)	0.81	Cum Volume (1000 m3)	0.06	0.19	
C & E Loss (m)	0.01	Cum SA (1000 m2)	0.29	1.86	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

CROSS SECTION

RIVER: Rouge
REACH: WC4 RS: 100

INPUT
Description: ST-100
Station Elevation Data num= 112

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	180.997	.158	181	1.716	181.009	2.077	181.012	5.322	181.24
6.909	181.31	12.98	181.301	16.962	181.274	19.398	181.264	24.875	181.206
25.784	181.2	30.051	181.103	33.3	181.011	35.515	181.015	35.672	181.014
35.802	181.013	35.819	181.014	35.846	181.013	36.108	181	37.394	180.97
42.223	180.998	42.292	180.991	44.628	180.5	45.402	180.321	45.628	180.286
46.777	180.026	46.878	180	46.885	179.998	47.61	179.761	47.887	179.69
47.956	179.683	48.02	179.676	48.933	179.66	49.695	179.644	50.319	179.647
53.401	179.677	63.238	179.993	63.869	179.951	64.197	180	69.158	180
69.44	180	70.122	180	70.124	180	70.244	180	70.909	179.879
72.066	179.5	72.075	179.5	72.101	179.494	74.373	179.142	74.959	179
75.219	178.994	75.848	179	75.939	179.009	76.265	179	76.965	178.996
77.299	178.999	77.718	178.997	78.153	178.997	78.198	179	78.671	179.075
81.758	179.5	83.103	179.503	83.175	179.503	83.246	179.503	83.376	179.504
84.639	179.504	85.35	179.505	86.897	179.503	88.608	179.501	88.992	179.5
91.629	179.01	91.681	179	91.686	178.999	92.573	178.915	92.784	178.938
93.507	179	96.136	179.391	96.21	179.401	96.53	179.442	96.67	179.457
96.769	179.462	96.844	179.463	96.982	179.456	100.042	179.406	100.644	179.432
101.197	179.418	101.658	179.417	102.111	179.465	102.154	179.467	102.624	179.5
112.927	179.903	114.044	179.922	114.838	179.931	114.887	179.929	114.992	179.928
115.507	179.902	116.389	179.91	118.463	179.981	118.514	179.98	119.727	180
121.71	180.057	124.145	180.5	126.313	180.895	126.904	181	128.268	181.191
129.322	181.294	129.887	181.334	132.363	181.364	140.405	181.44	140.76	181.446
141.348	181.451	147.038	181.5						

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.035	72.066	.03	81.758	.035	88.608	.03	96.136	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
88.608	96.67	40.9	40.9	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	179.26	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.	0.030	0.030	
W.S. Elev (m)	179.19	Reach Len. (m)	40.90	40.90	40.90
Crit W.S. (m)	179.19	Flow Area (m2)	0.81	0.64	
E.G. Slope (m/m)	0.016572	Area (m2)	0.81	0.64	
Q Total (m3/s)	1.76	Flow (m3/s)	0.98	0.78	
Top Width (m)	9.54	Top Width (m)	5.43	4.11	
Vel Total (m/s)	1.22	Avg. Vel. (m/s)	1.20	1.23	
Max Chl Dpth (m)	0.27	Hydr. Depth (m)	0.15	0.15	
Conv. Total (m3/s)	13.7	Conv. (m3/s)	7.6	6.1	
Length Wtd. (m)	40.90	Wetted Per. (m)	5.46	4.15	
Min Ch El (m)	178.91	Shear (N/m2)	24.15	24.93	
Alpha	1.00	Stream Power (N/m s)	7039.87	0.00	0.00
Frctn Loss (m)	0.65	Cum Volume (1000 m3)	0.02	0.04	
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.11	0.21	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	179.36	Element	Left OB	Channel	Right OB
Vel Head (m)	0.10	Wt. n-Val.	0.030	0.030	
W.S. Elev (m)	179.26	Reach Len. (m)	40.90	40.90	40.90
Crit W.S. (m)	179.26	Flow Area (m2)	1.24	0.97	
E.G. Slope (m/m)	0.015309	Area (m2)	1.24	0.97	
Q Total (m3/s)	3.03	Flow (m3/s)	1.70	1.33	
Top Width (m)	11.41	Top Width (m)	6.42	4.99	
Vel Total (m/s)	1.37	Avg. Vel. (m/s)	1.37	1.37	
Max Chl Dpth (m)	0.35	Hydr. Depth (m)	0.19	0.19	
Conv. Total (m3/s)	24.5	Conv. (m3/s)	13.8	10.7	
Length Wtd. (m)	40.90	Wetted Per. (m)	6.47	5.04	
Min Ch El (m)	178.91	Shear (N/m2)	28.82	28.79	
Alpha	1.00	Stream Power (N/m s)	7039.87	0.00	0.00
Frctn Loss (m)	0.60	Cum Volume (1000 m3)	0.03	0.06	
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.13	0.26	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	179.39	Element	Left OB	Channel	Right OB
Vel Head (m)	0.10	Wt. n-Val.	0.030	0.030	
W.S. Elev (m)	179.29	Reach Len. (m)	40.90	40.90	40.90
Crit W.S. (m)	179.29	Flow Area (m2)	1.43	1.12	
E.G. Slope (m/m)	0.014907	Area (m2)	1.43	1.12	
Q Total (m3/s)	3.64	Flow (m3/s)	2.05	1.59	
Top Width (m)	12.16	Top Width (m)	6.82	5.34	
Vel Total (m/s)	1.43	Avg. Vel. (m/s)	1.43	1.42	
Max Chl Dpth (m)	0.38	Hydr. Depth (m)	0.21	0.21	
Conv. Total (m3/s)	29.8	Conv. (m3/s)	16.8	13.0	
Length Wtd. (m)	40.90	Wetted Per. (m)	6.87	5.39	
Min Ch El (m)	178.91	Shear (N/m2)	30.50	30.24	
Alpha	1.00	Stream Power (N/m s)	7039.87	0.00	0.00
Frctn Loss (m)	0.58	Cum Volume (1000 m3)	0.03	0.07	
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.14	0.28	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	179.44	Element	Left OB	Channel	Right OB
Vel Head (m)	0.11	Wt. n-Val.	0.030	0.030	
W.S. Elev (m)	179.32	Reach Len. (m)	40.90	40.90	40.90
Crit W.S. (m)	179.32	Flow Area (m2)	1.67	1.31	
E.G. Slope (m/m)	0.014615	Area (m2)	1.67	1.31	
Q Total (m3/s)	4.46	Flow (m3/s)	2.52	1.94	
Top Width (m)	13.04	Top Width (m)	7.29	5.75	
Vel Total (m/s)	1.50	Avg. Vel. (m/s)	1.50	1.49	
Max Chl Dpth (m)	0.41	Hydr. Depth (m)	0.23	0.23	
Conv. Total (m3/s)	36.9	Conv. (m3/s)	20.8	16.1	
Length Wtd. (m)	40.90	Wetted Per. (m)	7.34	5.81	
Min Ch El (m)	178.91	Shear (N/m2)	32.68	32.17	
Alpha	1.00	Stream Power (N/m s)	7039.87	0.00	0.00

Frctn Loss (m)	0.57	Cum Volume (1000 m3)	0.03	0.08	
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.15	0.30	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	179.47	Element	Left OB	Channel	Right OB
Vel Head (m)	0.12	Wt. n-Val.	0.030	0.030	
W.S. Elev (m)	179.35	Reach Len. (m)	40.90	40.90	40.90
Crit W.S. (m)	179.35	Flow Area (m2)	1.85	1.45	
E.G. Slope (m/m)	0.014326	Area (m2)	1.85	1.45	
Q Total (m3/s)	5.07	Flow (m3/s)	2.86	2.21	
Top Width (m)	13.65	Top Width (m)	7.61	6.04	
Vel Total (m/s)	1.54	Avg. Vel. (m/s)	1.55	1.53	
Max Chl Dpth (m)	0.43	Hydr. Depth (m)	0.24	0.24	
Conv. Total (m3/s)	42.4	Conv. (m3/s)	23.9	18.4	
Length Wtd. (m)	40.90	Wetted Per. (m)	7.67	6.11	
Min Ch El (m)	178.91	Shear (N/m2)	33.90	33.26	
Alpha	1.00	Stream Power (N/m s)	7039.87	0.00	0.00
Frctn Loss (m)	0.56	Cum Volume (1000 m3)	0.04	0.09	0.00
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.16	0.32	0.00

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	179.50	Element	Left OB	Channel	Right OB
Vel Head (m)	0.13	Wt. n-Val.	0.030	0.030	
W.S. Elev (m)	179.37	Reach Len. (m)	40.90	40.90	40.90
Crit W.S. (m)	179.37	Flow Area (m2)	2.03	1.59	
E.G. Slope (m/m)	0.014122	Area (m2)	2.03	1.59	
Q Total (m3/s)	5.70	Flow (m3/s)	3.22	2.48	
Top Width (m)	14.24	Top Width (m)	7.92	6.31	
Vel Total (m/s)	1.58	Avg. Vel. (m/s)	1.59	1.57	
Max Chl Dpth (m)	0.46	Hydr. Depth (m)	0.26	0.25	
Conv. Total (m3/s)	48.0	Conv. (m3/s)	27.1	20.9	
Length Wtd. (m)	40.90	Wetted Per. (m)	7.99	6.38	
Min Ch El (m)	178.91	Shear (N/m2)	35.15	34.39	
Alpha	1.00	Stream Power (N/m s)	7039.87	0.00	0.00
Frctn Loss (m)	0.54	Cum Volume (1000 m3)	0.04	0.10	0.00
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.21	0.32	0.00

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	179.57	Element	Left OB	Channel	Right OB
Vel Head (m)	0.14	Wt. n-Val.	0.030	0.030	0.035
W.S. Elev (m)	179.43	Reach Len. (m)	40.90	40.90	40.90
Crit W.S. (m)	179.43	Flow Area (m2)	2.52	1.98	0.03
E.G. Slope (m/m)	0.012911	Area (m2)	2.52	1.98	0.03
Q Total (m3/s)	7.41	Flow (m3/s)	4.14	3.26	0.01
Top Width (m)	18.85	Top Width (m)	8.73	7.07	3.06
Vel Total (m/s)	1.64	Avg. Vel. (m/s)	1.64	1.65	0.16
Max Chl Dpth (m)	0.51	Hydr. Depth (m)	0.29	0.28	0.01
Conv. Total (m3/s)	65.2	Conv. (m3/s)	36.4	28.7	0.0
Length Wtd. (m)	40.90	Wetted Per. (m)	8.80	7.14	3.06
Min Ch El (m)	178.91	Shear (N/m2)	36.22	35.08	1.38
Alpha	1.01	Stream Power (N/m s)	7039.87	0.00	0.00
Frctn Loss (m)	0.44	Cum Volume (1000 m3)	0.06	0.12	0.00
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.33	0.34	0.07

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	179.41	Element	Left OB	Channel	Right OB
Vel Head (m)	0.11	Wt. n-Val.	0.030	0.030	
W.S. Elev (m)	179.30	Reach Len. (m)	40.90	40.90	40.90
Crit W.S. (m)	179.30	Flow Area (m2)	1.52	1.18	
E.G. Slope (m/m)	0.014749	Area (m2)	1.52	1.18	
Q Total (m3/s)	3.92	Flow (m3/s)	2.21	1.71	
Top Width (m)	12.48	Top Width (m)	6.99	5.49	
Vel Total (m/s)	1.45	Avg. Vel. (m/s)	1.46	1.44	
Max Chl Dpth (m)	0.39	Hydr. Depth (m)	0.22	0.22	
Conv. Total (m3/s)	32.3	Conv. (m3/s)	18.2	14.1	
Length Wtd. (m)	40.90	Wetted Per. (m)	7.04	5.55	
Min Ch El (m)	178.91	Shear (N/m2)	31.20	30.84	
Alpha	1.00	Stream Power (N/m s)	7039.87	0.00	0.00
Frctn Loss (m)	0.59	Cum Volume (1000 m3)	0.03	0.07	
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.14	0.29	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Rouge
REACH: WC4 RS: 10

INPUT
Description: ST-10
Station Elevation Data num= 80

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	178.49	.19	178.49	1.03	178.49	3.38	178.35	7.63	178.05
7.73	178.05	9.97	178.03	11.87	178.03	15.04	178.19	20.71	178.37
21.65	178.5	22.64	178.5	26.37	178.5	29.42	178.5	30.56	178.5
31.52	178.5	31.71	178.5	32.05	178.5	35.14	178.02	35.24	178
35.68	177.93	37.84	177.56	38.06	177.52	38.19	177.5	38.23	177.5
38.72	177.5	39.38	177.5	39.74	177.49	40.41	177.5	40.58	177.53
41.17	177.6	43.74	177.9	43.93	177.92	44.13	177.94	44.22	177.95

44.63	178	46.37	178.43	46.64	178.5	46.72	178.52	46.74	178.52
46.75	178.53	47.18	178.64	47.55	178.72	47.97	178.77	48.31	178.82
48.5	178.85	48.64	178.87	48.92	178.9	50.59	178.93	50.9	178.95
51.09	178.95	54.34	178.84	55.2	178.82	55.81	178.84	58.83	179
59.35	179	61.23	179	62.15	178.82	62.43	178.83	62.74	178.83
63.64	179	67.3	179.01	71.01	179.01	71.54	179.01	74.68	179.02
75.53	179.02	80.2	179.02	81.65	179.03	91.3	179.04	91.77	179.04
91.81	179.04	91.91	179.05	96.01	179.39	96.22	179.4	99.99	179.48
100.43	179.48	101.24	179.5	101.51	179.5	101.74	179.5	104.46	179.5

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	35.14	.03	44.63	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
35.14	44.63	0	0	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	177.89	Element	Left OB	Channel	Right OB
Vel Head (m)	0.10	Wt. n-Val.		0.030	
W.S. Elev (m)	177.80	Reach Len. (m)			
Crit W.S. (m)	177.80	Flow Area (m2)		1.27	
E.G. Slope (m/m)	0.015207	Area (m2)		1.27	
Q Total (m3/s)	1.76	Flow (m3/s)		1.76	
Top Width (m)	6.38	Top Width (m)		6.38	
Vel Total (m/s)	1.39	Avg. Vel. (m/s)		1.39	
Max Chl Dpth (m)	0.31	Hydr. Depth (m)		0.20	
Conv. Total (m3/s)	14.3	Conv. (m3/s)		14.3	
Length Wtd. (m)		Wetted Per. (m)		6.43	
Min Ch El (m)	177.49	Shear (N/m2)		29.36	
Alpha	1.00	Stream Power (N/m s)	5001.33	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	178.02	Element	Left OB	Channel	Right OB
Vel Head (m)	0.12	Wt. n-Val.		0.030	
W.S. Elev (m)	177.89	Reach Len. (m)			
Crit W.S. (m)	177.89	Flow Area (m2)		1.94	
E.G. Slope (m/m)	0.014055	Area (m2)		1.94	
Q Total (m3/s)	3.03	Flow (m3/s)		3.03	
Top Width (m)	7.76	Top Width (m)		7.76	
Vel Total (m/s)	1.56	Avg. Vel. (m/s)		1.56	
Max Chl Dpth (m)	0.40	Hydr. Depth (m)		0.25	
Conv. Total (m3/s)	25.6	Conv. (m3/s)		25.6	
Length Wtd. (m)		Wetted Per. (m)		7.82	
Min Ch El (m)	177.49	Shear (N/m2)		34.22	
Alpha	1.00	Stream Power (N/m s)	5001.33	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	178.06	Element	Left OB	Channel	Right OB
Vel Head (m)	0.13	Wt. n-Val.		0.030	
W.S. Elev (m)	177.93	Reach Len. (m)			
Crit W.S. (m)	177.93	Flow Area (m2)		2.25	
E.G. Slope (m/m)	0.013720	Area (m2)		2.25	
Q Total (m3/s)	3.64	Flow (m3/s)		3.64	
Top Width (m)	8.34	Top Width (m)		8.34	
Vel Total (m/s)	1.62	Avg. Vel. (m/s)		1.62	
Max Chl Dpth (m)	0.44	Hydr. Depth (m)		0.27	
Conv. Total (m3/s)	31.1	Conv. (m3/s)		31.1	
Length Wtd. (m)		Wetted Per. (m)		8.40	
Min Ch El (m)	177.49	Shear (N/m2)		35.98	
Alpha	1.00	Stream Power (N/m s)	5001.33	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	178.12	Element	Left OB	Channel	Right OB
Vel Head (m)	0.15	Wt. n-Val.		0.030	
W.S. Elev (m)	177.97	Reach Len. (m)			
Crit W.S. (m)	177.97	Flow Area (m2)		2.64	
E.G. Slope (m/m)	0.013408	Area (m2)		2.64	
Q Total (m3/s)	4.46	Flow (m3/s)		4.46	
Top Width (m)	9.01	Top Width (m)		9.01	
Vel Total (m/s)	1.69	Avg. Vel. (m/s)		1.69	
Max Chl Dpth (m)	0.48	Hydr. Depth (m)		0.29	
Conv. Total (m3/s)	38.5	Conv. (m3/s)		38.5	
Length Wtd. (m)		Wetted Per. (m)		9.08	
Min Ch El (m)	177.49	Shear (N/m2)		38.16	
Alpha	1.00	Stream Power (N/m s)	5001.33	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	178.16	Element	Left OB	Channel	Right OB
Vel Head (m)	0.16	Wt. n-Val.		0.030	0.000
W.S. Elev (m)	178.00	Reach Len. (m)			
Crit W.S. (m)	178.00	Flow Area (m2)		2.90	0.00
E.G. Slope (m/m)	0.013275	Area (m2)		2.90	0.00
Q Total (m3/s)	5.07	Flow (m3/s)		5.07	0.00
Top Width (m)	9.42	Top Width (m)		9.41	0.01
Vel Total (m/s)	1.75	Avg. Vel. (m/s)		1.75	0.04
Max Chl Dpth (m)	0.51	Hydr. Depth (m)		0.31	0.00
Conv. Total (m3/s)	44.0	Conv. (m3/s)		44.0	0.0
Length Wtd. (m)		Wetted Per. (m)		9.48	0.01
Min Ch El (m)	177.49	Shear (N/m2)		39.89	
Alpha	1.00	Stream Power (N/m s)	5001.33	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	178.20	Element	Left OB	Channel	Right OB
Vel Head (m)	0.16	Wt. n-Val.	0.035	0.030	0.035
W.S. Elev (m)	178.03	Reach Len. (m)			
Crit W.S. (m)	178.03	Flow Area (m2)	0.01	3.18	0.00
E.G. Slope (m/m)	0.012532	Area (m2)	0.01	3.18	0.00
Q Total (m3/s)	5.70	Flow (m3/s)	0.00	5.70	0.00
Top Width (m)	11.92	Top Width (m)	2.30	9.49	0.13
Vel Total (m/s)	1.79	Avg. Vel. (m/s)	0.06	1.79	0.20
Max Chl Dpth (m)	0.54	Hydr. Depth (m)	0.00	0.34	0.02
Conv. Total (m3/s)	50.9	Conv. (m3/s)	0.0	50.9	0.0
Length Wtd. (m)		Wetted Per. (m)	2.30	9.56	0.13
Min Ch El (m)	177.49	Shear (N/m2)	0.29	40.88	1.93
Alpha	1.00	Stream Power (N/m s)	5001.33	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	178.28	Element	Left OB	Channel	Right OB
Vel Head (m)	0.16	Wt. n-Val.	0.035	0.030	0.035
W.S. Elev (m)	178.12	Reach Len. (m)			
Crit W.S. (m)	178.12	Flow Area (m2)	0.50	4.00	0.03
E.G. Slope (m/m)	0.009256	Area (m2)	0.50	4.00	0.03
Q Total (m3/s)	7.41	Flow (m3/s)	0.22	7.18	0.01
Top Width (m)	17.58	Top Width (m)	7.61	9.49	0.48

Vel Total (m/s)	1.64	Avg. Vel. (m/s)	0.45	1.79	0.41
Max Chl Dpth (m)	0.63	Hydr. Depth (m)	0.07	0.42	0.06
Conv. Total (m3/s)	77.0	Conv. (m3/s)	2.3	74.6	0.1
Length Wtd. (m)		Wetted Per. (m)	7.62	9.56	0.50
Min Ch El (m)	177.49	Shear (N/m2)	5.90	37.97	5.23
Alpha	1.16	Stream Power (N/m s)	5001.33	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	178.08	Element	Left OB	Channel	Right OB
Vel Head (m)	0.14	Wt. n-Val.		0.030	
W.S. Elev (m)	177.94	Reach Len. (m)			
Crit W.S. (m)	177.94	Flow Area (m2)		2.36	
E.G. Slope (m/m)	0.013903	Area (m2)		2.36	
Q Total (m3/s)	3.92	Flow (m3/s)		3.92	
Top Width (m)	8.56	Top Width (m)		8.56	
Vel Total (m/s)	1.66	Avg. Vel. (m/s)		1.66	
Max Chl Dpth (m)	0.45	Hydr. Depth (m)		0.28	
Conv. Total (m3/s)	33.2	Conv. (m3/s)		33.2	
Length Wtd. (m)		Wetted Per. (m)		8.62	
Min Ch El (m)	177.49	Shear (N/m2)		37.37	
Alpha	1.00	Stream Power (N/m s)	5001.33	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

SUMMARY OF MANNING'S N VALUES

River:Rouge

Reach	River Sta.	n1	n2	n3	n4	n5
WC4	300	.035	.03	.035		
WC4	200	.035	.03	.035		
WC4	100	.035	.03	.035	.03	.035
WC4	10	.035	.03	.035		

SUMMARY OF REACH LENGTHS

River: Rouge

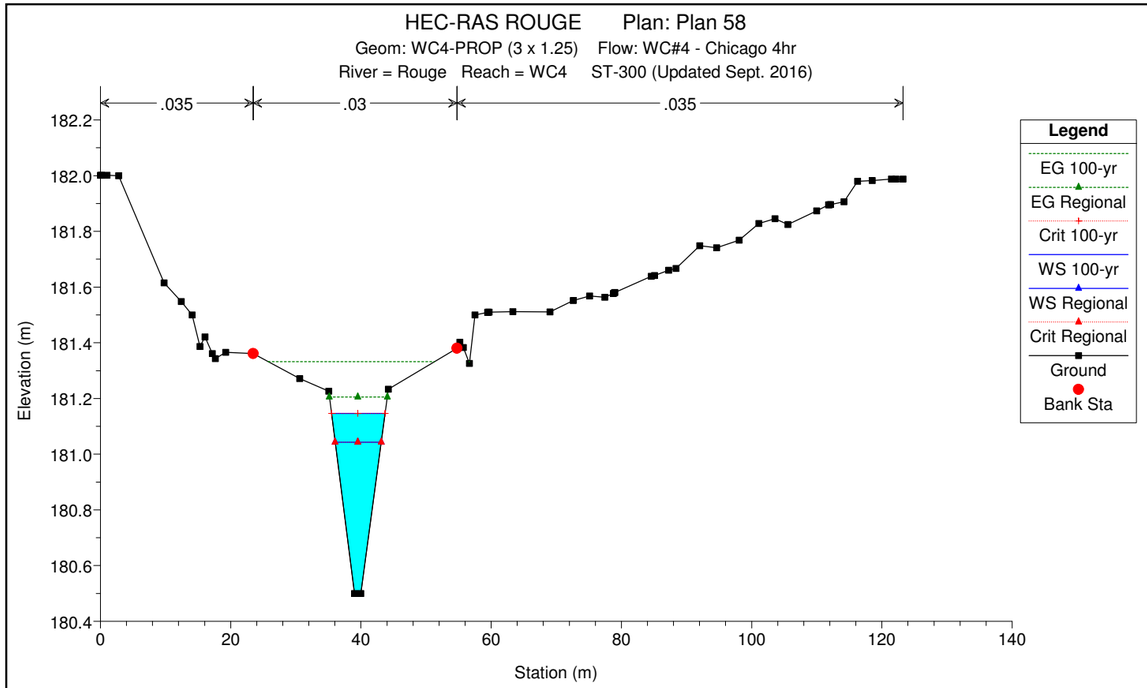
Reach	River Sta.	Left	Channel	Right
WC4	300	50.1	50.1	50.1
WC4	200	42.9	42.9	42.9
WC4	100	40.9	40.9	40.9
WC4	10	0	0	0

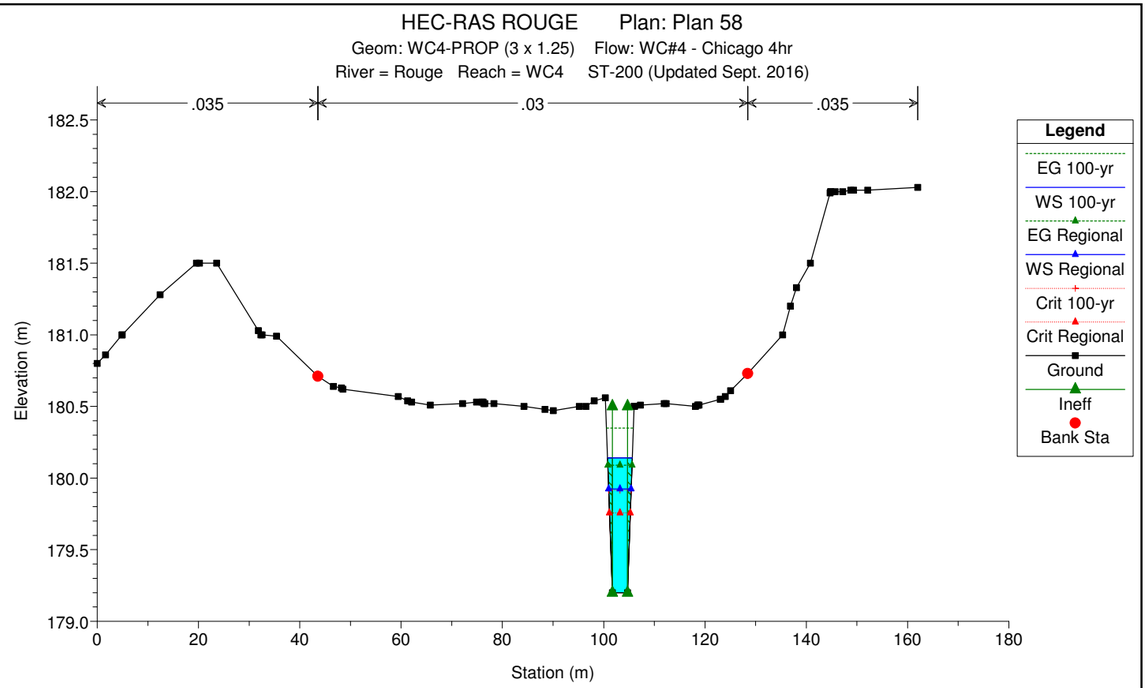
SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Rouge

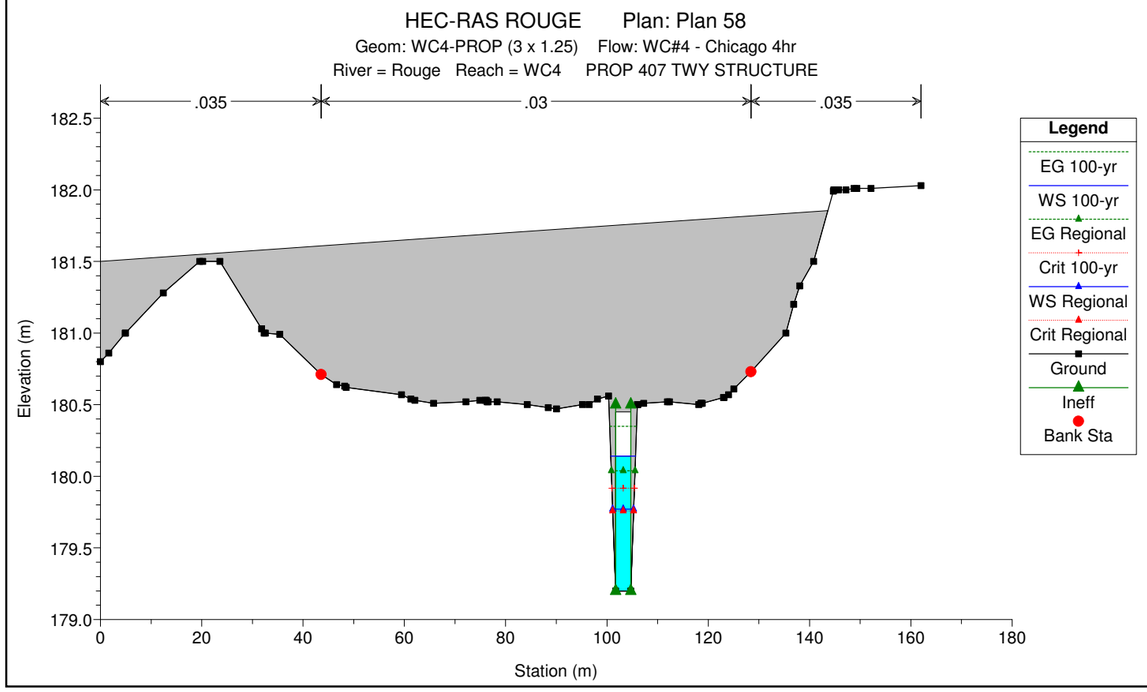
Reach	River Sta.	Contr.	Expan.
WC4	300	.1	.3
WC4	200	.1	.3
WC4	100	.1	.3
WC4	10	.1	.3

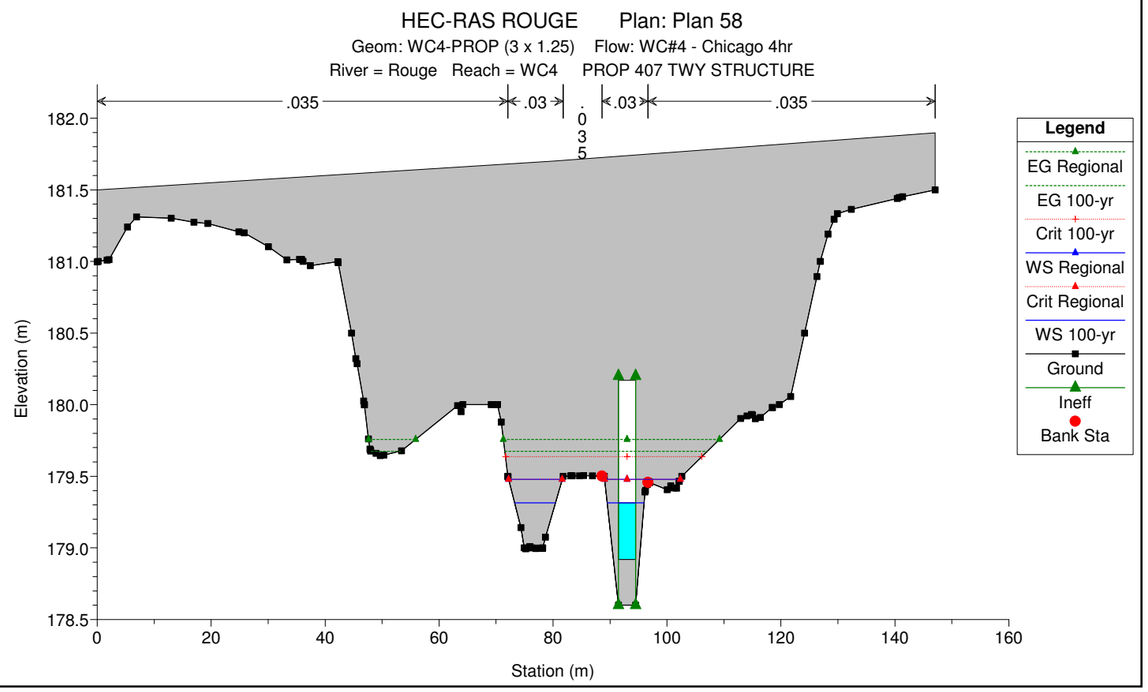
Profile Output Table - Standard Table 1

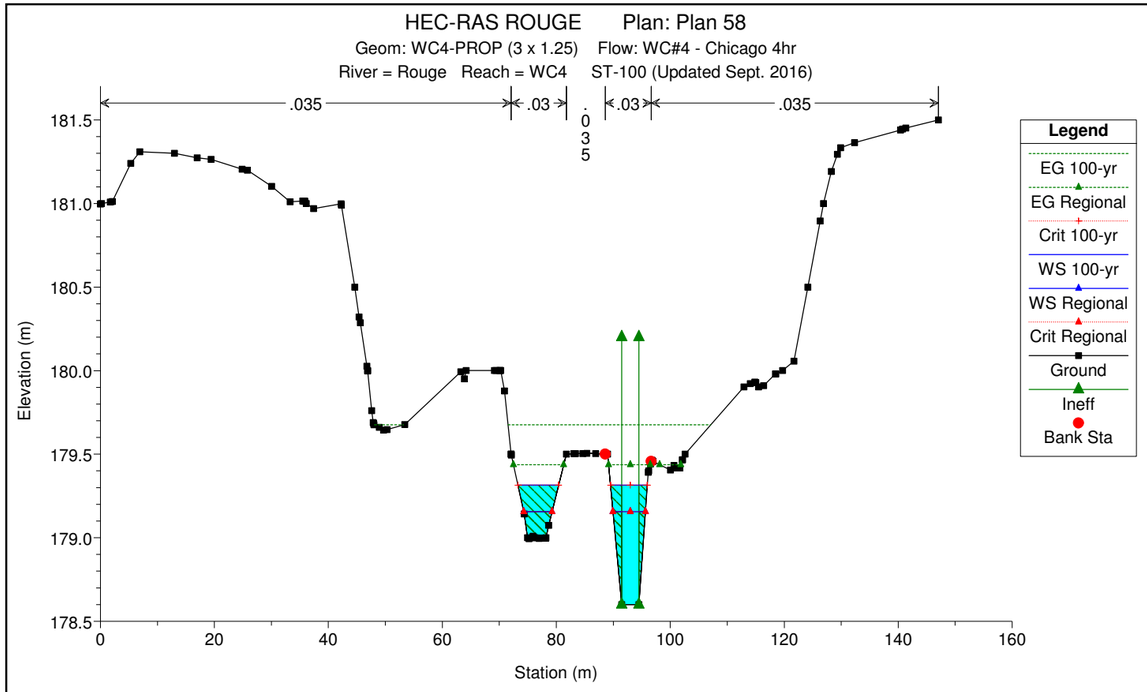
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
WC4	300	2-yr	1.76	181.21	181.35	181.33	181.38	0.013097	0.73	2.41	29.79	0.81
WC4	300	5-yr	3.03	181.21	181.39	181.37	181.42	0.011121	0.83	3.82	39.86	0.78
WC4	300	10-yr	3.64	181.21	181.40	181.39	181.44	0.011389	0.89	4.29	41.10	0.80
WC4	300	25-yr	4.46	181.21	181.42	181.40	181.46	0.011815	0.98	4.85	41.90	0.83
WC4	300	50-yr	5.07	181.21	181.43	181.42	181.48	0.010976	1.00	5.42	42.35	0.82
WC4	300	100-yr	5.70	181.21	181.43	181.43	181.49	0.013758	1.12	5.44	42.35	0.91
WC4	300	Check Flow	7.41	181.21	181.45	181.45	181.53	0.013943	1.24	6.43	42.71	0.94
WC4	300	Regional	3.92	181.21	181.41	181.40	181.45	0.011502	0.92	4.49	41.40	0.81
WC4	200	2-yr	1.76	180.47	180.56	180.56	180.58	0.019954	0.61	2.89	61.89	0.90
WC4	200	5-yr	3.03	180.47	180.57	180.57	180.61	0.026602	0.81	3.74	65.09	1.08
WC4	200	10-yr	3.64	180.47	180.58	180.58	180.62	0.025417	0.85	4.29	67.11	1.07
WC4	200	25-yr	4.46	180.47	180.59	180.59	180.63	0.024361	0.90	4.98	69.58	1.07
WC4	200	50-yr	5.07	180.47	180.59	180.59	180.64	0.027489	0.97	5.21	70.38	1.14
WC4	200	100-yr	5.70	180.47	180.61	180.61	180.65	0.020460	0.92	6.22	73.82	1.01
WC4	200	Check Flow	7.41	180.47	180.63	180.63	180.68	0.014362	0.89	8.29	78.30	0.88
WC4	200	Regional	3.92	180.47	180.58	180.58	180.62	0.025072	0.87	4.52	67.97	1.07
WC4	100	2-yr	1.76	178.91	179.19	179.19	179.26	0.016572	1.23	1.45	9.54	1.00
WC4	100	5-yr	3.03	178.91	179.26	179.26	179.36	0.015309	1.37	2.21	11.41	0.99
WC4	100	10-yr	3.64	178.91	179.29	179.29	179.39	0.014907	1.42	2.55	12.16	0.99
WC4	100	25-yr	4.46	178.91	179.32	179.32	179.44	0.014615	1.49	2.98	13.04	1.00
WC4	100	50-yr	5.07	178.91	179.35	179.35	179.47	0.014326	1.53	3.30	13.65	1.00
WC4	100	100-yr	5.70	178.91	179.37	179.37	179.50	0.014122	1.57	3.61	14.24	1.00
WC4	100	Check Flow	7.41	178.91	179.43	179.43	179.57	0.012911	1.65	4.53	18.85	0.99
WC4	100	Regional	3.92	178.91	179.30	179.30	179.41	0.014749	1.44	2.70	12.48	0.99
WC4	10	2-yr	1.76	177.49	177.80	177.80	177.89	0.015207	1.39	1.27	6.38	1.00
WC4	10	5-yr	3.03	177.49	177.89	177.89	178.02	0.014055	1.56	1.94	7.76	1.00
WC4	10	10-yr	3.64	177.49	177.93	177.93	178.06	0.013720	1.62	2.25	8.34	1.00
WC4	10	25-yr	4.46	177.49	177.97	177.97	178.12	0.013408	1.69	2.64	9.01	1.00
WC4	10	50-yr	5.07	177.49	178.00	178.00	178.16	0.013275	1.75	2.90	9.42	1.00
WC4	10	100-yr	5.70	177.49	178.03	178.03	178.20	0.012532	1.79	3.19	11.92	0.99
WC4	10	Check Flow	7.41	177.49	178.12	178.12	178.28	0.009256	1.79	4.52	17.58	0.88
WC4	10	Regional	3.92	177.49	177.94	177.94	178.08	0.013903	1.66	2.36	8.56	1.01

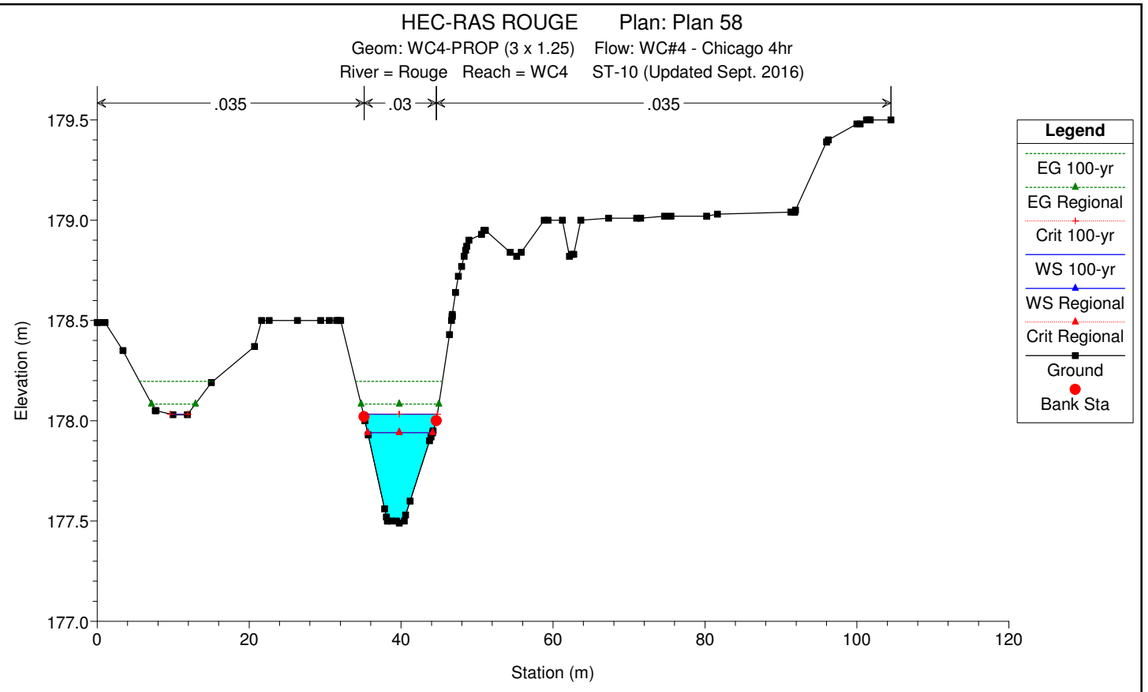

HEC-RAS ROUGE Plan: Plan 58
Geom: WC4-PROP (3 x 1.25) Flow: WC#4 - Chicago 4hr
River = Rouge Reach = WC4 ST-300 (Updated Sept. 2016)
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG 100-yr
EG Regional
Crit 100-yr
WS 100-yr
WS Regional
Crit Regional
Ground
Bank Sta


HEC-RAS ROUGE Plan: Plan 58
Geom: WC4-PROP (3 x 1.25) Flow: WC#4 - Chicago 4hr
River = Rouge Reach = WC4 ST-200 (Updated Sept. 2016)
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG 100-yr
WS 100-yr
EG Regional
WS Regional
Crit 100-yr
Crit Regional
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 58
Geom: WC4-PROP (3 x 1.25) Flow: WC#4 - Chicago 4hr
River = Rouge Reach = WC4 PROP 407 TWY STRUCTURE
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG 100-yr
WS 100-yr
EG Regional
Crit 100-yr
WS Regional
Crit Regional
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 58
Geom: WC4-PROP (3 x 1.25) Flow: WC#4 - Chicago 4hr
River = Rouge Reach = WC4 PROP 407 TWY STRUCTURE
.035
.03
.03
.035
Elevation (m)
Station (m)
Legend
EG Regional
EG 100-yr
Crit 100-yr
WS Regional
Crit Regional
WS 100-yr
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 58
Geom: WC4-PROP (3 x 1.25) Flow: WC#4 - Chicago 4hr
River = Rouge Reach = WC4 ST-100 (Updated Sept. 2016)
.035
.03
.035
.035
Elevation (m)
Station (m)
Legend
EG 100-yr
EG Regional
Crit 100-yr
WS 100-yr
WS Regional
Crit Regional
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 58
Geom: WC4-PROP (3 x 1.25) Flow: WC#4 - Chicago 4hr
River = Rouge Reach = WC4 ST-10 (Updated Sept. 2016)
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG 100-yr
EG Regional
Crit 100-yr
WS 100-yr
WS Regional
Crit Regional
Ground
Bank Sta

HEC-RAS Plan: WC3-PROP-4hr CH River: Rouge Reach: WC4

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC4	300	2-yr	1.76	180.50	180.88	180.88	180.99	0.014789	1.49	1.18	5.24	1.00
WC4	300	5-yr	3.03	180.50	180.99	180.99	181.13	0.013598	1.66	1.83	6.48	1.00
WC4	300	10-yr	3.64	180.50	181.03	181.03	181.18	0.013696	1.74	2.09	6.92	1.01
WC4	300	25-yr	4.46	180.50	181.08	181.08	181.25	0.012966	1.80	2.48	7.53	1.00
WC4	300	50-yr	5.07	180.50	181.11	181.11	181.29	0.013102	1.86	2.72	7.88	1.01
WC4	300	100-yr	5.70	180.50	181.15	181.15	181.33	0.012899	1.91	2.99	8.25	1.01
WC4	300	Check Flow	7.41	180.50	181.31	181.31	181.42	0.014802	1.50	4.94	21.86	1.01
WC4	300	Regional	3.92	180.50	181.04	181.04	181.21	0.013963	1.79	2.19	7.08	1.03
WC4	200	2-yr	1.76	179.20	179.62	179.53	179.72	0.005458	1.39	1.27	3.85	0.68
WC4	200	5-yr	3.03	179.20	179.81	179.67	179.95	0.004807	1.66	1.83	4.22	0.68
WC4	200	10-yr	3.64	179.20	179.89	179.73	180.05	0.004594	1.76	2.07	4.38	0.68
WC4	200	25-yr	4.46	179.20	179.99	179.81	180.17	0.004375	1.88	2.37	4.58	0.68
WC4	200	50-yr	5.07	179.20	180.06	179.86	180.26	0.004196	1.96	2.59	4.73	0.67
WC4	200	100-yr	5.70	179.20	180.14	179.91	180.35	0.003994	2.02	2.82	4.88	0.67
WC4	200	Check Flow	7.41	179.20	180.34	180.05	180.58	0.003550	2.17	3.42	5.28	0.65
WC4	200	Regional	3.92	179.20	179.92	179.76	180.09	0.004514	1.81	2.17	4.45	0.68
WC4	150		Culvert									
WC4	100	2-yr	1.76	178.60	178.93	178.93	179.09	0.012752	1.79	0.98	4.59	1.00
WC4	100	5-yr	3.03	178.60	179.07	179.07	179.31	0.011370	2.15	1.41	9.25	1.00
WC4	100	10-yr	3.64	178.60	179.13	179.13	179.40	0.010866	2.28	1.60	10.25	1.00
WC4	100	25-yr	4.46	178.60	179.21	179.21	179.51	0.010552	2.45	1.82	11.61	1.01
WC4	100	50-yr	5.07	178.60	179.26	179.26	179.59	0.010239	2.56	1.98	12.62	1.01
WC4	100	100-yr	5.70	178.60	179.31	179.31	179.68	0.009975	2.66	2.14	13.62	1.01
WC4	100	Check Flow	7.41	178.60	179.45	179.45	179.88	0.009394	2.90	2.55	21.23	1.00
WC4	100	Regional	3.92	178.60	179.16	179.16	179.44	0.010847	2.35	1.67	10.68	1.01
WC4	10	2-yr	1.76	177.49	177.80	177.80	177.89	0.015191	1.39	1.27	6.38	1.00
WC4	10	5-yr	3.03	177.49	177.89	177.89	178.02	0.014041	1.56	1.94	7.76	1.00
WC4	10	10-yr	3.64	177.49	177.93	177.93	178.06	0.013761	1.62	2.24	8.33	1.00
WC4	10	25-yr	4.46	177.49	177.97	177.97	178.12	0.013661	1.70	2.62	8.99	1.01
WC4	10	50-yr	5.07	177.49	178.00	178.00	178.16	0.013730	1.76	2.87	9.39	1.02
WC4	10	100-yr	5.70	177.49	178.03	178.03	178.20	0.012446	1.79	3.20	12.02	0.98
WC4	10	Check Flow	7.41	177.49	178.12	178.12	178.28	0.009177	1.79	4.54	17.62	0.88
WC4	10	Regional	3.92	177.49	177.94	177.94	178.08	0.014286	1.68	2.34	8.52	1.02

HEC-RAS HEC-RAS 5.0.1 April 2016
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: HEC-RAS ROUGE
Project File : HEC.prj
Run Date and Time: 9/7/2016 1:27:41 PM

Project in SI units

Project Description:
HEC-RAS model for creek crossings along the proposed 407 TWY Ph 2 started
from scratch

PLAN DATA

Plan Title: Plan 58
Plan File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.p58

Geometry Title: WC4-PROP (3 x 1.25)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g29

Flow Title : WC#4 - Chicago 4hr
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f03

Plan Summary Information:
Number of: Cross Sections = 4 Multiple Openings = 0
Culverts = 1 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: WC#4 - Chicago 4hr
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f03

Flow Data (m3/s)

River	Reach	RS	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Check Flow	Regional
Rouge	WC4	300	1.76	3.03	3.64	4.46	5.07	5.7	7.41	3.92

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Rouge	WC4	2-yr		Critical
Rouge	WC4	5-yr		Critical
Rouge	WC4	10-yr		Critical
Rouge	WC4	25-yr		Critical
Rouge	WC4	50-yr		Critical
Rouge	WC4	100-yr		Critical
Rouge	WC4	Check Flow		Critical
Rouge	WC4	Regional		Critical

GEOMETRY DATA

Geometry Title: WC4-PROP (3 x 1.25)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g29

CROSS SECTION

RIVER: Rouge
REACH: WC4 RS: 300

INPUT
Description: ST-300
Section re-graded; creek bottom elevation changed from
181.21 to 180.5 (creek lowered by 0.7m); addedd 1m wide creek
bottom at elevation 180.5
Station Elevation Data num= 55

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	182.001	.145	182.001	.993	182.001	2.781	182	9.762	181.615
12.403	181.548	14.082	181.5	15.267	181.387	16.066	181.421	17.177	181.361
17.638	181.343	19.244	181.366	23.477	181.361	30.596	181.271	35.041	181.226
39	180.5	40	180.5	44.216	181.233	54.742	181.38	55.197	181.402
55.729	181.383	56.668	181.326	57.529	181.5	59.468	181.509	59.496	181.51
59.518	181.51	59.68	181.51	63.342	181.512	69.038	181.511	72.601	181.552
75.128	181.568	77.449	181.563	78.779	181.577	78.896	181.579	79.007	181.581
84.596	181.639	85.073	181.641	87.266	181.66	88.399	181.667	92.012	181.748
94.645	181.741	98.077	181.768	101.104	181.828	103.603	181.845	105.57	181.825
109.997	181.874	111.812	181.895	111.892	181.895	112.108	181.896	114.177	181.906
116.278	181.98	118.533	181.982	121.45	181.988	122.171	181.988	123.254	181.988

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	23.477	.03	54.742	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
23.477 54.742 50.1 50.1 50.1 .3 .5

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	180.99	Element	Left OB	Channel	Right OB
Vel Head (m)	0.11	Wt. n-Val.		0.030	
W.S. Elev (m)	180.88	Reach Len. (m)	50.10	50.10	50.10
Crit W.S. (m)	180.88	Flow Area (m2)		1.18	
E.G. Slope (m/m)	0.014789	Area (m2)		1.18	
Q Total (m3/s)	1.76	Flow (m3/s)		1.76	
Top Width (m)	5.24	Top Width (m)		5.24	
Vel Total (m/s)	1.49	Avg. Vel. (m/s)		1.49	
Max Chl Dpth (m)	0.38	Hydr. Depth (m)		0.23	
Conv. Total (m3/s)	14.5	Conv. (m3/s)		14.5	
Length Wtd. (m)	50.10	Wetted Per. (m)		5.31	
Min Ch El (m)	180.50	Shear (N/m2)		32.28	
Alpha	1.00	Stream Power (N/m s)		48.06	

Frctn Loss (m)	0.42	Cum Volume (1000 m3)	0.16
C & E Loss (m)	0.01	Cum SA (1000 m2)	0.63

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	181.13	Element	Left OB	Channel	Right OB
Vel Head (m)	0.14	Wt. n-Val.		0.030	
W.S. Elev (m)	180.99	Reach Len. (m)	50.10	50.10	50.10
Crit W.S. (m)	180.99	Flow Area (m2)		1.83	
E.G. Slope (m/m)	0.013598	Area (m2)		1.83	
Q Total (m3/s)	3.03	Flow (m3/s)		3.03	
Top Width (m)	6.48	Top Width (m)		6.48	
Vel Total (m/s)	1.66	Avg. Vel. (m/s)		1.66	
Max Chl Dpth (m)	0.49	Hydr. Depth (m)		0.28	
Conv. Total (m3/s)	26.0	Conv. (m3/s)		26.0	
Length Wtd. (m)	50.10	Wetted Per. (m)		6.57	
Min Ch El (m)	180.50	Shear (N/m2)		37.13	
Alpha	1.00	Stream Power (N/m s)		61.54	
Frctn Loss (m)	0.38	Cum Volume (1000 m3)	0.01	0.24	
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.17	0.74	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	181.18	Element	Left OB	Channel	Right OB
Vel Head (m)	0.15	Wt. n-Val.		0.030	
W.S. Elev (m)	181.03	Reach Len. (m)	50.10	50.10	50.10
Crit W.S. (m)	181.03	Flow Area (m2)		2.09	
E.G. Slope (m/m)	0.013696	Area (m2)		2.09	
Q Total (m3/s)	3.64	Flow (m3/s)		3.64	
Top Width (m)	6.92	Top Width (m)		6.92	
Vel Total (m/s)	1.74	Avg. Vel. (m/s)		1.74	
Max Chl Dpth (m)	0.53	Hydr. Depth (m)		0.30	
Conv. Total (m3/s)	31.1	Conv. (m3/s)		31.1	
Length Wtd. (m)	50.10	Wetted Per. (m)		7.01	
Min Ch El (m)	180.50	Shear (N/m2)		40.04	
Alpha	1.00	Stream Power (N/m s)		69.72	
Frctn Loss (m)	0.37	Cum Volume (1000 m3)	0.01	0.27	
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.20	0.78	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	181.25	Element	Left OB	Channel	Right OB
Vel Head (m)	0.16	Wt. n-Val.		0.030	
W.S. Elev (m)	181.08	Reach Len. (m)	50.10	50.10	50.10
Crit W.S. (m)	181.08	Flow Area (m2)		2.48	
E.G. Slope (m/m)	0.012966	Area (m2)		2.48	
Q Total (m3/s)	4.46	Flow (m3/s)		4.46	
Top Width (m)	7.53	Top Width (m)		7.53	
Vel Total (m/s)	1.80	Avg. Vel. (m/s)		1.80	
Max Chl Dpth (m)	0.58	Hydr. Depth (m)		0.33	
Conv. Total (m3/s)	39.2	Conv. (m3/s)		39.2	
Length Wtd. (m)	50.10	Wetted Per. (m)		7.63	
Min Ch El (m)	180.50	Shear (N/m2)		41.38	
Alpha	1.00	Stream Power (N/m s)		74.31	
Frctn Loss (m)	0.35	Cum Volume (1000 m3)	0.02	0.32	
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.24	0.83	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	181.29	Element	Left OB	Channel	Right OB
Vel Head (m)	0.18	Wt. n-Val.		0.030	
W.S. Elev (m)	181.11	Reach Len. (m)	50.10	50.10	50.10
Crit W.S. (m)	181.11	Flow Area (m2)		2.72	
E.G. Slope (m/m)	0.013102	Area (m2)		2.72	
Q Total (m3/s)	5.07	Flow (m3/s)		5.07	
Top Width (m)	7.88	Top Width (m)		7.88	
Vel Total (m/s)	1.86	Avg. Vel. (m/s)		1.86	
Max Chl Dpth (m)	0.61	Hydr. Depth (m)		0.35	
Conv. Total (m3/s)	44.3	Conv. (m3/s)		44.3	
Length Wtd. (m)	50.10	Wetted Per. (m)		7.98	
Min Ch El (m)	180.50	Shear (N/m2)		43.81	
Alpha	1.00	Stream Power (N/m s)		81.58	
Frctn Loss (m)	0.34	Cum Volume (1000 m3)	0.03	0.35	
C & E Loss (m)	0.01	Cum SA (1000 m2)	0.27	0.87	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	181.33	Element	Left OB	Channel	Right OB
Vel Head (m)	0.19	Wt. n-Val.		0.030	
W.S. Elev (m)	181.15	Reach Len. (m)	50.10	50.10	50.10
Crit W.S. (m)	181.15	Flow Area (m2)		2.99	
E.G. Slope (m/m)	0.012899	Area (m2)		2.99	
Q Total (m3/s)	5.70	Flow (m3/s)		5.70	
Top Width (m)	8.25	Top Width (m)		8.25	
Vel Total (m/s)	1.91	Avg. Vel. (m/s)		1.91	
Max Chl Dpth (m)	0.65	Hydr. Depth (m)		0.36	
Conv. Total (m3/s)	50.2	Conv. (m3/s)		50.2	
Length Wtd. (m)	50.10	Wetted Per. (m)		8.36	
Min Ch El (m)	180.50	Shear (N/m2)		45.22	

Alpha	1.00	Stream Power (N/m s)		86.23	
Frctn Loss (m)	0.33	Cum Volume (1000 m3)	0.03	0.39	0.00
C & E Loss (m)	0.01	Cum SA (1000 m2)	0.35	0.90	0.00

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	181.42	Element	Left OB	Channel	Right OB
Vel Head (m)	0.11	Wt. n-Val.		0.030	
W.S. Elev (m)	181.31	Reach Len. (m)	50.10	50.10	50.10
Crit W.S. (m)	181.31	Flow Area (m2)		4.94	
E.G. Slope (m/m)	0.014802	Area (m2)		4.94	
Q Total (m3/s)	7.41	Flow (m3/s)		7.41	
Top Width (m)	21.86	Top Width (m)		21.86	
Vel Total (m/s)	1.50	Avg. Vel. (m/s)		1.50	
Max Chl Dpth (m)	0.81	Hydr. Depth (m)		0.23	
Conv. Total (m3/s)	60.9	Conv. (m3/s)		60.9	
Length Wtd. (m)	50.10	Wetted Per. (m)		21.99	
Min Ch El (m)	180.50	Shear (N/m2)		32.63	
Alpha	1.00	Stream Power (N/m s)		48.92	
Frctn Loss (m)	0.32	Cum Volume (1000 m3)	0.07	0.52	0.00
C & E Loss (m)	0.04	Cum SA (1000 m2)	0.53	1.30	0.21

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	181.21	Element	Left OB	Channel	Right OB
Vel Head (m)	0.16	Wt. n-Val.		0.030	
W.S. Elev (m)	181.04	Reach Len. (m)	50.10	50.10	50.10
Crit W.S. (m)	181.04	Flow Area (m2)		2.19	
E.G. Slope (m/m)	0.013963	Area (m2)		2.19	
Q Total (m3/s)	3.92	Flow (m3/s)		3.92	
Top Width (m)	7.08	Top Width (m)		7.08	
Vel Total (m/s)	1.79	Avg. Vel. (m/s)		1.79	
Max Chl Dpth (m)	0.54	Hydr. Depth (m)		0.31	
Conv. Total (m3/s)	33.2	Conv. (m3/s)		33.2	
Length Wtd. (m)	50.10	Wetted Per. (m)		7.18	
Min Ch El (m)	180.50	Shear (N/m2)		41.84	
Alpha	1.00	Stream Power (N/m s)		74.76	
Frctn Loss (m)	0.37	Cum Volume (1000 m3)	0.01	0.29	
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.21	0.80	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Rouge
REACH: WC4 RS: 200

INPUT
Description: ST-200
Section re-graded; creek bottom elevation changed from
180.47 to 179.2 (creek lowered by 1.27m); addedd 3m wide creek
bottom at elevation 179.2 to allow for the culvert opening

Station Elevation Data num= 63

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	180.8	1.65	180.86	4.88	181	4.94	181	12.4	181.28
19.58	181.5	20.17	181.5	23.59	181.5	31.81	181.03	32.31	181
32.56	181	35.4	180.99	43.57	180.71	46.61	180.64	48.21	180.63
48.5	180.62	59.41	180.57	61.26	180.54	62.09	180.53	65.79	180.51
72.16	180.52	74.89	180.53	75.97	180.53	76.19	180.53	76.35	180.52
76.54	180.52	78.34	180.52	84.26	180.5	88.38	180.48	90.03	180.47
95.2	180.5	96.46	180.5	98.12	180.54	100.34	180.56	101.7	179.2
104.7	179.2	106	180.5	106.09	180.5	107.25	180.51	111.93	180.52
112.33	180.52	118.11	180.5	118.58	180.51	118.59	180.51	118.82	180.51
122.99	180.55	123.1	180.55	124	180.57	125.05	180.61	128.42	180.73
135.34	181	136.88	181.2	138.08	181.33	140.79	181.5	144.69	181.99
144.8	182	144.87	182	145.69	182	147.17	182	148.79	182.01
149.34	182.01	152.15	182.01	162.02	182.03				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	43.57	.03	128.42	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
43.57	128.42	42.9	42.9	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	101.7	180.5	T
104.7	162.02	180.5	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	179.72	Element	Left OB	Channel	Right OB
Vel Head (m)	0.10	Wt. n-Val.		0.030	
W.S. Elev (m)	179.62	Reach Len. (m)	42.90	42.90	42.90
Crit W.S. (m)	179.53	Flow Area (m2)		1.27	
E.G. Slope (m/m)	0.005458	Area (m2)		1.45	
Q Total (m3/s)	1.76	Flow (m3/s)		1.76	
Top Width (m)	3.85	Top Width (m)		3.85	
Vel Total (m/s)	1.39	Avg. Vel. (m/s)		1.39	
Max Chl Dpth (m)	0.42	Hydr. Depth (m)		0.42	
Conv. Total (m3/s)	23.8	Conv. (m3/s)		23.8	
Length Wtd. (m)	42.90	Wetted Per. (m)		3.00	
Min Ch El (m)	179.20	Shear (N/m2)		22.63	
Alpha	1.00	Stream Power (N/m s)		31.40	
Frctn Loss (m)		Cum Volume (1000 m3)		0.09	
C & E Loss (m)		Cum SA (1000 m2)		0.41	

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	179.95	Element	Left OB	Channel	Right OB
Vel Head (m)	0.14	Wt. n-Val.		0.030	
W.S. Elev (m)	179.81	Reach Len. (m)	42.90	42.90	42.90
Crit W.S. (m)	179.67	Flow Area (m2)		1.83	
E.G. Slope (m/m)	0.004807	Area (m2)		2.20	
Q Total (m3/s)	3.03	Flow (m3/s)		3.03	
Top Width (m)	4.22	Top Width (m)		4.22	
Vel Total (m/s)	1.66	Avg. Vel. (m/s)		1.66	
Max Chl Dpth (m)	0.61	Hydr. Depth (m)		0.61	
Conv. Total (m3/s)	43.7	Conv. (m3/s)		43.7	
Length Wtd. (m)	42.90	Wetted Per. (m)		3.00	
Min Ch El (m)	179.20	Shear (N/m2)		28.68	

Alpha	1.00	Stream Power (N/m s)		47.60
Frctn Loss (m)		Cum Volume (1000 m3)	0.01	0.14
C & E Loss (m)		Cum SA (1000 m2)	0.17	0.47

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	180.05	Element	Left OB	Channel	Right OB
Vel Head (m)	0.16	Wt. n-Val.		0.030	
W.S. Elev (m)	179.89	Reach Len. (m)	42.90	42.90	42.90
Crit W.S. (m)	179.73	Flow Area (m2)		2.07	
E.G. Slope (m/m)	0.004594	Area (m2)		2.54	
Q Total (m3/s)	3.64	Flow (m3/s)		3.64	
Top Width (m)	4.38	Top Width (m)		4.38	
Vel Total (m/s)	1.76	Avg. Vel. (m/s)		1.76	
Max Chl Dpth (m)	0.69	Hydr. Depth (m)		0.69	
Conv. Total (m3/s)	53.7	Conv. (m3/s)		53.7	
Length Wtd. (m)	42.90	Wetted Per. (m)		3.00	
Min Ch El (m)	179.20	Shear (N/m2)		31.02	
Alpha	1.00	Stream Power (N/m s)		54.66	
Frctn Loss (m)		Cum Volume (1000 m3)	0.01	0.16	
C & E Loss (m)		Cum SA (1000 m2)	0.20	0.50	

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	180.17	Element	Left OB	Channel	Right OB
Vel Head (m)	0.18	Wt. n-Val.		0.030	
W.S. Elev (m)	179.99	Reach Len. (m)	42.90	42.90	42.90
Crit W.S. (m)	179.81	Flow Area (m2)		2.37	
E.G. Slope (m/m)	0.004375	Area (m2)		2.99	
Q Total (m3/s)	4.46	Flow (m3/s)		4.46	
Top Width (m)	4.58	Top Width (m)		4.58	
Vel Total (m/s)	1.88	Avg. Vel. (m/s)		1.88	
Max Chl Dpth (m)	0.79	Hydr. Depth (m)		0.79	
Conv. Total (m3/s)	67.4	Conv. (m3/s)		67.4	
Length Wtd. (m)	42.90	Wetted Per. (m)		3.00	
Min Ch El (m)	179.20	Shear (N/m2)		33.87	
Alpha	1.00	Stream Power (N/m s)		63.78	
Frctn Loss (m)		Cum Volume (1000 m3)	0.02	0.18	
C & E Loss (m)		Cum SA (1000 m2)	0.24	0.53	

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	180.26	Element	Left OB	Channel	Right OB
Vel Head (m)	0.20	Wt. n-Val.		0.030	
W.S. Elev (m)	180.06	Reach Len. (m)	42.90	42.90	42.90
Crit W.S. (m)	179.86	Flow Area (m2)		2.59	
E.G. Slope (m/m)	0.004196	Area (m2)		3.34	
Q Total (m3/s)	5.07	Flow (m3/s)		5.07	
Top Width (m)	4.73	Top Width (m)		4.73	
Vel Total (m/s)	1.96	Avg. Vel. (m/s)		1.96	
Max Chl Dpth (m)	0.86	Hydr. Depth (m)		0.86	
Conv. Total (m3/s)	78.3	Conv. (m3/s)		78.3	
Length Wtd. (m)	42.90	Wetted Per. (m)		3.00	
Min Ch El (m)	179.20	Shear (N/m2)		35.52	
Alpha	1.00	Stream Power (N/m s)		69.53	
Frctn Loss (m)		Cum Volume (1000 m3)	0.03	0.20	
C & E Loss (m)		Cum SA (1000 m2)	0.27	0.55	

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	180.35	Element	Left OB	Channel	Right OB
Vel Head (m)	0.21	Wt. n-Val.		0.030	
W.S. Elev (m)	180.14	Reach Len. (m)	42.90	42.90	42.90
Crit W.S. (m)	179.91	Flow Area (m2)		2.82	
E.G. Slope (m/m)	0.003994	Area (m2)		3.70	
Q Total (m3/s)	5.70	Flow (m3/s)		5.70	
Top Width (m)	4.88	Top Width (m)		4.88	
Vel Total (m/s)	2.02	Avg. Vel. (m/s)		2.02	
Max Chl Dpth (m)	0.94	Hydr. Depth (m)		0.94	
Conv. Total (m3/s)	90.2	Conv. (m3/s)		90.2	
Length Wtd. (m)	42.90	Wetted Per. (m)		3.00	
Min Ch El (m)	179.20	Shear (N/m2)		36.81	
Alpha	1.00	Stream Power (N/m s)		74.41	
Frctn Loss (m)		Cum Volume (1000 m3)	0.03	0.22	0.00
C & E Loss (m)		Cum SA (1000 m2)	0.35	0.57	0.00

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	180.58	Element	Left OB	Channel	Right OB
Vel Head (m)	0.24	Wt. n-Val.		0.030	
W.S. Elev (m)	180.34	Reach Len. (m)	42.90	42.90	42.90
Crit W.S. (m)	180.05	Flow Area (m2)		3.42	
E.G. Slope (m/m)	0.003550	Area (m2)		4.72	
Q Total (m3/s)	7.41	Flow (m3/s)		7.41	
Top Width (m)	5.28	Top Width (m)		5.28	
Vel Total (m/s)	2.17	Avg. Vel. (m/s)		2.17	
Max Chl Dpth (m)	1.14	Hydr. Depth (m)		1.14	
Conv. Total (m3/s)	124.4	Conv. (m3/s)		124.4	
Length Wtd. (m)	42.90	Wetted Per. (m)		3.00	
Min Ch El (m)	179.20	Shear (N/m2)		39.68	
Alpha	1.00	Stream Power (N/m s)		85.98	
Frctn Loss (m)		Cum Volume (1000 m3)	0.07	0.27	0.00
C & E Loss (m)		Cum SA (1000 m2)	0.53	0.62	0.21

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	180.09	Element	Left OB	Channel	Right OB
Vel Head (m)	0.17	Wt. n-Val.		0.030	
W.S. Elev (m)	179.92	Reach Len. (m)	42.90	42.90	42.90
Crit W.S. (m)	179.76	Flow Area (m2)		2.17	
E.G. Slope (m/m)	0.004514	Area (m2)		2.70	
Q Total (m3/s)	3.92	Flow (m3/s)		3.92	
Top Width (m)	4.45	Top Width (m)		4.45	
Vel Total (m/s)	1.81	Avg. Vel. (m/s)		1.81	
Max Chl Dpth (m)	0.72	Hydr. Depth (m)		0.72	
Conv. Total (m3/s)	58.3	Conv. (m3/s)		58.3	
Length Wtd. (m)	42.90	Wetted Per. (m)		3.00	
Min Ch El (m)	179.20	Shear (N/m2)		32.04	
Alpha	1.00	Stream Power (N/m s)		57.84	
Frctn Loss (m)		Cum Volume (1000 m3)	0.01	0.17	
C & E Loss (m)		Cum SA (1000 m2)	0.21	0.51	

CULVERT

RIVER: Rouge
REACH: WC4 RS: 150

INPUT
Description: PROP 407 TWY STRUCTURE
Distance from Upstream XS = 12.9
Deck/Roadway Width = 12.2
Weir Coefficient = 1.4
Upstream Deck/Roadway Coordinates
num= 3

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	181.5		80	181.7		162	181.9	

Upstream Bridge Cross Section Data
Station Elevation Data num= 63

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	180.8	1.65	180.86	4.88	181	4.94	181	12.4	181.28
19.58	181.5	20.17	181.5	23.59	181.5	31.81	181.03	32.31	181
32.56	181	35.4	180.99	43.57	180.71	46.61	180.64	48.21	180.63
48.5	180.62	59.41	180.57	61.26	180.54	62.09	180.53	65.79	180.51
72.16	180.52	74.89	180.53	75.97	180.53	76.19	180.53	76.35	180.52
76.54	180.52	78.34	180.52	84.26	180.5	88.38	180.48	90.03	180.47

```
    95.2   180.5   96.46   180.5   98.12  180.54  100.34  180.56   101.7   179.2
   104.7   179.2     106   180.5  106.09   180.5  107.25  180.51  111.93  180.52
  112.33  180.52  118.11   180.5  118.58  180.51  118.59  180.51  118.82  180.51
  122.99  180.55   123.1  180.55     124  180.57  125.05  180.61  128.42  180.73
  135.34     181  136.88   181.2  138.08  181.33  140.79   181.5  144.69  181.99
   144.8     182  144.87     182  145.69     182  147.17     182  148.79  182.01
  149.34  182.01  152.15  182.01  162.02  182.03

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .035   43.57     .03  128.42    .035

Bank Sta: Left   Right    Coeff Contr.   Expan.
         43.57  128.42           .3        .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   101.7   180.5       T
   104.7  162.02   180.5       T

Downstream  Deck/Roadway Coordinates
    num=       3
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0   181.5               80   181.7              148   181.9

Downstream Bridge Cross Section Data
Station Elevation Data    num=     108
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 180.997    .158     181   1.716 181.009   2.077 181.012   5.322  181.24
   6.909  181.31   12.98 181.301  16.962 181.274  19.398 181.264  24.875 181.206
  25.784   181.2  30.051 181.103    33.3 181.011  35.515 181.015  35.672 181.014
  35.802 181.013  35.819 181.014  35.846 181.013  36.108     181  37.394  180.97
  42.223 180.998  42.292 180.991  44.628   180.5 45.402 180.321  45.628 180.286
  46.777 180.026  46.878     180  46.885 179.998  47.61 179.761  47.887  179.69
  47.956 179.683   48.02 179.676  48.933  179.66  49.695 179.644  50.319 179.647
  53.401 179.677  63.238 179.993  63.869 179.951  64.197     180  69.158     180
   69.44     180  70.122     180  70.124     180  70.244     180  70.909 179.879
  72.066   179.5  72.075   179.5  72.101 179.494  74.373 179.142  74.959     179
  75.219 178.994  75.848     179  75.939 179.009  76.265     179  76.965 178.996
  77.299 178.999  77.718 178.997  78.153 178.997  78.198     179  78.671 179.075
  81.758   179.5  83.103 179.503  83.175 179.503  83.246 179.503  83.376 179.504
  84.639 179.504   85.35 179.505  86.897 179.503  88.608 179.501  88.992   179.5
   91.5   178.6    94.5   178.6  96.136 179.391   96.21 179.401   96.53 179.442
   96.67 179.457  96.769 179.462  96.844 179.463  96.982 179.456 100.042 179.406
 100.644 179.432 101.197 179.418 101.658 179.417 102.111 179.465 102.154 179.467
 102.624   179.5 112.927 179.903 114.044 179.922 114.838 179.931 114.887 179.929
 114.992 179.928 115.507 179.902 116.389  179.91 118.463 179.981 118.514  179.98
 119.727     180  121.71 180.057 124.145   180.5 126.313 180.895 126.904     181
 128.268 181.191 129.322 181.294 129.887 181.334 132.363 181.364 140.405  181.44
  140.76 181.446 141.348 181.451 147.038   181.5

Manning's n Values         num=       5
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
       0    .035  72.066     .03  81.758    .035  88.608     .03   96.67    .035

Bank Sta: Left   Right    Coeff Contr.   Expan.
       88.608   96.67           .3        .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0    91.5   180.2       T
    94.5 147.038   180.2       T

Upstream Embankment side slope              =       2 horiz. to 1.0 vertical
Downstream Embankment side slope            =       2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1           Box    1.25       3
FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
               2.3      34     .013     .025        0                  .2               1
Upstream   Elevation =  179.2
           Centerline Station =  103.2
Downstream Elevation =  178.92
           Centerline Station =  93

CULVERT OUTPUT  Profile #2-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       1.76    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         1.69
  Q Barrel (m3/s)           1.76    Culv Vel DS (m/s)         1.79
  E.G. US. (m)            179.72    Culv Inv El Up (m)      179.20
  W.S. US. (m)            179.62    Culv Inv El Dn (m)      178.92
  E.G. DS (m)             179.09    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             178.93    Culv Exit Loss (m)        0.32
  Delta EG (m)              0.63    Culv Entr Loss (m)        0.03
  Delta WS (m)              0.70    Q Weir (m3/s)
  E.G. IC (m)             179.71    Weir Sta Lft (m)
  E.G. OC (m)             179.72    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       179.55    Weir Max Depth (m)
  Culv WS Outlet (m)      179.25    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.35    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.33    Min El Weir Flow (m)    181.50


Note:    During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT  Profile #5-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       3.03    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         2.08
  Q Barrel (m3/s)           3.03    Culv Vel DS (m/s)         2.15
  E.G. US. (m)            179.95    Culv Inv El Up (m)      179.20
  W.S. US. (m)            179.81    Culv Inv El Dn (m)      178.92
  E.G. DS (m)             179.31    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             179.07    Culv Exit Loss (m)        0.32
  Delta EG (m)              0.64    Culv Entr Loss (m)        0.04
  Delta WS (m)              0.74    Q Weir (m3/s)
  E.G. IC (m)             179.94    Weir Sta Lft (m)
  E.G. OC (m)             179.95    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       179.69    Weir Max Depth (m)
  Culv WS Outlet (m)      179.39    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.49    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.47    Min El Weir Flow (m)    181.50


Note:    During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT  Profile #10-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       3.64    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         2.23
  Q Barrel (m3/s)           3.64    Culv Vel DS (m/s)         2.28
  E.G. US. (m)            180.05    Culv Inv El Up (m)      179.20
  W.S. US. (m)            179.89    Culv Inv El Dn (m)      178.92
  E.G. DS (m)             179.40    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             179.13    Culv Exit Loss (m)        0.32
  Delta EG (m)              0.65    Culv Entr Loss (m)        0.05
  Delta WS (m)              0.76    Q Weir (m3/s)
  E.G. IC (m)             180.04    Weir Sta Lft (m)
  E.G. OC (m)             180.05    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       179.74    Weir Max Depth (m)
  Culv WS Outlet (m)      179.45    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.54    Weir Flow Area (m2)
```

Culv Crt Depth (m)	0.53	Min El Weir Flow (m)	181.50

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #25-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	4.46	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	2.40
Q Barrel (m3/s)	4.46	Culv Vel DS (m/s)	2.44
E.G. US. (m)	180.17	Culv Inv El Up (m)	179.20
W.S. US. (m)	179.99	Culv Inv El Dn (m)	178.92
E.G. DS (m)	179.51	Culv Frctn Ls (m)	0.00
W.S. DS (m)	179.21	Culv Exit Loss (m)	0.32
Delta EG (m)	0.66	Culv Entr Loss (m)	0.06
Delta WS (m)	0.78	Q Weir (m3/s)	
E.G. IC (m)	180.17	Weir Sta Lft (m)	
E.G. OC (m)	180.17	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	179.82	Weir Max Depth (m)	
Culv WS Outlet (m)	179.53	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.62	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.61	Min El Weir Flow (m)	181.50

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #50-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	5.07	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	2.51
Q Barrel (m3/s)	5.07	Culv Vel DS (m/s)	2.55
E.G. US. (m)	180.26	Culv Inv El Up (m)	179.20
W.S. US. (m)	180.06	Culv Inv El Dn (m)	178.92
E.G. DS (m)	179.59	Culv Frctn Ls (m)	0.00
W.S. DS (m)	179.26	Culv Exit Loss (m)	0.32
Delta EG (m)	0.67	Culv Entr Loss (m)	0.07
Delta WS (m)	0.80	Q Weir (m3/s)	
E.G. IC (m)	180.26	Weir Sta Lft (m)	
E.G. OC (m)	180.26	Weir Sta Rgt (m)	
Culvert Control	Inlet	Weir Submerg	
Culv WS Inlet (m)	179.87	Weir Max Depth (m)	
Culv WS Outlet (m)	179.58	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.67	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.66	Min El Weir Flow (m)	181.50

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #100-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	5.70	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	2.62
Q Barrel (m3/s)	5.70	Culv Vel DS (m/s)	2.65
E.G. US. (m)	180.35	Culv Inv El Up (m)	179.20
W.S. US. (m)	180.14	Culv Inv El Dn (m)	178.92
E.G. DS (m)	179.68	Culv Frctn Ls (m)	0.00
W.S. DS (m)	179.31	Culv Exit Loss (m)	0.32
Delta EG (m)	0.67	Culv Entr Loss (m)	0.07
Delta WS (m)	0.83	Q Weir (m3/s)	
E.G. IC (m)	180.35	Weir Sta Lft (m)	
E.G. OC (m)	180.35	Weir Sta Rgt (m)	
Culvert Control	Inlet	Weir Submerg	
Culv WS Inlet (m)	179.92	Weir Max Depth (m)	
Culv WS Outlet (m)	179.64	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.72	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.72	Min El Weir Flow (m)	181.50

Note: During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth. Therefore, the inlet will be at normal depth.

CULVERT OUTPUT Profile #Check Flow Culv Group: Culvert #1

Q Culv Group (m3/s)	7.41	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	2.88
Q Barrel (m3/s)	7.41	Culv Vel DS (m/s)	2.89
E.G. US. (m)	180.58	Culv Inv El Up (m)	179.20
W.S. US. (m)	180.34	Culv Inv El Dn (m)	178.92
E.G. DS (m)	179.88	Culv Frctn Ls (m)	0.00
W.S. DS (m)	179.45	Culv Exit Loss (m)	0.32
Delta EG (m)	0.70	Culv Entr Loss (m)	0.10
Delta WS (m)	0.89	Q Weir (m3/s)	
E.G. IC (m)	180.58	Weir Sta Lft (m)	
E.G. OC (m)	180.57	Weir Sta Rgt (m)	
Culvert Control	Inlet	Weir Submerg	
Culv WS Inlet (m)	180.06	Weir Max Depth (m)	
Culv WS Outlet (m)	179.77	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.86	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.85	Min El Weir Flow (m)	181.50

Note: During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth. Therefore, the inlet will be at normal depth.

CULVERT OUTPUT Profile #Regional Culv Group: Culvert #1

Q Culv Group (m3/s)	3.92	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	2.29
Q Barrel (m3/s)	3.92	Culv Vel DS (m/s)	2.34
E.G. US. (m)	180.09	Culv Inv El Up (m)	179.20
W.S. US. (m)	179.92	Culv Inv El Dn (m)	178.92
E.G. DS (m)	179.44	Culv Frctn Ls (m)	0.00
W.S. DS (m)	179.16	Culv Exit Loss (m)	0.32
Delta EG (m)	0.65	Culv Entr Loss (m)	0.05
Delta WS (m)	0.77	Q Weir (m3/s)	
E.G. IC (m)	180.09	Weir Sta Lft (m)	
E.G. OC (m)	180.09	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	179.77	Weir Max Depth (m)	
Culv WS Outlet (m)	179.48	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.57	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.56	Min El Weir Flow (m)	181.50

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CROSS SECTION

RIVER: Rouge
REACH: WC4 RS: 100

INPUT
Description: ST-100
Section re-graded; creek bottom elevation changed from
178.92 to 178.6 (creek lowered by 0.32m); addedd 3m wide creek
bottom at elevation 178.6 to allow for the culvert opening
Station Elevation Data num= 108

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	180.997	.158	181	1.716	181.009	2.077	181.012	5.322	181.24
6.909	181.31	12.98	181.301	16.962	181.274	19.398	181.264	24.875	181.206
25.784	181.2	30.051	181.103	33.3	181.011	35.515	181.015	35.672	181.014
35.802	181.013	35.819	181.014	35.846	181.013	36.108	181	37.394	180.97
42.223	180.998	42.292	180.991	44.628	180.5	45.402	180.321	45.628	180.286
46.777	180.026	46.878	180	46.885	179.998	47.61	179.761	47.887	179.69
47.956	179.683	48.02	179.676	48.933	179.66	49.695	179.644	50.319	179.647
53.401	179.677	63.238	179.993	63.869	179.951	64.197	180	69.158	180
69.44	180	70.122	180	70.124	180	70.244	180	70.909	179.879
72.066	179.5	72.075	179.5	72.101	179.494	74.373	179.142	74.959	179
75.219	178.994	75.848	179	75.939	179.009	76.265	179	76.965	178.996
77.299	178.999	77.718	178.997	78.153	178.997	78.198	179	78.671	179.075
81.758	179.5	83.103	179.503	83.175	179.503	83.246	179.503	83.376	179.504
84.639	179.504	85.35	179.505	86.897	179.503	88.608	179.501	88.992	179.5

```
   91.5   178.6    94.5   178.6  96.136 179.391   96.21 179.401   96.53 179.442
  96.67 179.457  96.769 179.462  96.844 179.463  96.982 179.456 100.042 179.406
 100.644 179.432 101.197 179.418 101.658 179.417 102.111 179.465 102.154 179.467
 102.624   179.5 112.927 179.903 114.044 179.922 114.838 179.931 114.887 179.929
 114.992 179.928 115.507 179.902 116.389  179.91 118.463 179.981 118.514  179.98
 119.727     180  121.71 180.057 124.145   180.5 126.313 180.895 126.904     181
 128.268 181.191 129.322 181.294 129.887 181.334 132.363 181.364 140.405  181.44
  140.76 181.446 141.348 181.451 147.038   181.5

Manning's n Values         num=       5
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
       0    .035  72.066     .03  81.758    .035  88.608     .03   96.67    .035

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.    Expan.
       88.608   96.67              40.9    40.9    40.9             .3       .5
Ineffective Flow      num=       2
   Sta L    Sta R    Elev  Permanent
       0     91.5   180.2        T
    94.5 147.038   180.2        T
```

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	179.09	Element	Left OB	Channel	Right OB
Vel Head (m)	0.16	Wt. n-Val.		0.030	
W.S. Elev (m)	178.93	Reach Len. (m)	40.90	40.90	40.90
Crit W.S. (m)	178.93	Flow Area (m2)		0.98	
E.G. Slope (m/m)	0.012752	Area (m2)		1.24	
Q Total (m3/s)	1.76	Flow (m3/s)		1.76	
Top Width (m)	4.59	Top Width (m)		4.59	
Vel Total (m/s)	1.79	Avg. Vel. (m/s)		1.79	
Max Chl Dpth (m)	0.33	Hydr. Depth (m)		0.33	
Conv. Total (m3/s)	15.6	Conv. (m3/s)		15.6	
Length Wtd. (m)	40.90	Wetted Per. (m)		3.00	
Min Ch El (m)	178.60	Shear (N/m2)		41.00	
Alpha	1.00	Stream Power (N/m s)		73.37	
Frctn Loss (m)	0.57	Cum Volume (1000 m3)		0.05	
C & E Loss (m)	0.03	Cum SA (1000 m2)		0.22	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	179.31	Element	Left OB	Channel	Right OB
Vel Head (m)	0.24	Wt. n-Val.		0.030	
W.S. Elev (m)	179.07	Reach Len. (m)	40.90	40.90	40.90
Crit W.S. (m)	179.07	Flow Area (m2)		1.41	
E.G. Slope (m/m)	0.011370	Area (m2)	0.26	1.95	
Q Total (m3/s)	3.03	Flow (m3/s)		3.03	
Top Width (m)	9.25	Top Width (m)	3.97	5.28	
Vel Total (m/s)	2.15	Avg. Vel. (m/s)		2.15	
Max Chl Dpth (m)	0.47	Hydr. Depth (m)		0.47	
Conv. Total (m3/s)	28.4	Conv. (m3/s)		28.4	
Length Wtd. (m)	40.90	Wetted Per. (m)		3.00	
Min Ch El (m)	178.60	Shear (N/m2)		52.41	
Alpha	1.00	Stream Power (N/m s)		112.62	
Frctn Loss (m)	0.52	Cum Volume (1000 m3)	0.01	0.08	
C & E Loss (m)	0.06	Cum SA (1000 m2)	0.08	0.27	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	179.40	Element	Left OB	Channel	Right OB
Vel Head (m)	0.27	Wt. n-Val.		0.030	
W.S. Elev (m)	179.13	Reach Len. (m)	40.90	40.90	40.90
Crit W.S. (m)	179.13	Flow Area (m2)		1.60	
E.G. Slope (m/m)	0.010866	Area (m2)	0.53	2.28	
Q Total (m3/s)	3.64	Flow (m3/s)		3.64	
Top Width (m)	10.25	Top Width (m)	4.67	5.58	
Vel Total (m/s)	2.28	Avg. Vel. (m/s)		2.28	
Max Chl Dpth (m)	0.53	Hydr. Depth (m)		0.53	
Conv. Total (m3/s)	34.9	Conv. (m3/s)		34.9	
Length Wtd. (m)	40.90	Wetted Per. (m)		3.00	
Min Ch El (m)	178.60	Shear (N/m2)		56.68	
Alpha	1.00	Stream Power (N/m s)		129.29	
Frctn Loss (m)	0.50	Cum Volume (1000 m3)	0.01	0.09	
C & E Loss (m)	0.07	Cum SA (1000 m2)	0.10	0.28	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	179.51	Element	Left OB	Channel	Right OB
Vel Head (m)	0.31	Wt. n-Val.		0.030	
W.S. Elev (m)	179.21	Reach Len. (m)	40.90	40.90	40.90
Crit W.S. (m)	179.21	Flow Area (m2)		1.82	
E.G. Slope (m/m)	0.010552	Area (m2)	0.91	2.71	
Q Total (m3/s)	4.46	Flow (m3/s)		4.46	
Top Width (m)	11.61	Top Width (m)	5.67	5.94	
Vel Total (m/s)	2.45	Avg. Vel. (m/s)		2.45	
Max Chl Dpth (m)	0.61	Hydr. Depth (m)		0.61	
Conv. Total (m3/s)	43.4	Conv. (m3/s)		43.4	
Length Wtd. (m)	40.90	Wetted Per. (m)		3.00	
Min Ch El (m)	178.60	Shear (N/m2)		62.73	
Alpha	1.00	Stream Power (N/m s)		153.85	
Frctn Loss (m)	0.49	Cum Volume (1000 m3)	0.02	0.11	
C & E Loss (m)	0.08	Cum SA (1000 m2)	0.12	0.31	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	179.59	Element	Left OB	Channel	Right OB
Vel Head (m)	0.33	Wt. n-Val.		0.030	
W.S. Elev (m)	179.26	Reach Len. (m)	40.90	40.90	40.90
Crit W.S. (m)	179.26	Flow Area (m2)		1.98	
E.G. Slope (m/m)	0.010239	Area (m2)	1.24	3.04	
Q Total (m3/s)	5.07	Flow (m3/s)		5.07	
Top Width (m)	12.62	Top Width (m)	6.41	6.21	
Vel Total (m/s)	2.56	Avg. Vel. (m/s)		2.56	
Max Chl Dpth (m)	0.66	Hydr. Depth (m)		0.66	

Conv. Total (m3/s)	50.1	Conv. (m3/s)		50.1	
Length Wtd. (m)	40.90	Wetted Per. (m)		3.00	
Min Ch El (m)	178.60	Shear (N/m2)		66.33	
Alpha	1.00	Stream Power (N/m s)		169.69	
Frctn Loss (m)	0.48	Cum Volume (1000 m3)	0.03	0.12	
C & E Loss (m)	0.09	Cum SA (1000 m2)	0.13	0.32	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	179.68	Element	Left OB	Channel	Right OB
Vel Head (m)	0.36	Wt. n-Val.		0.030	
W.S. Elev (m)	179.31	Reach Len. (m)	40.90	40.90	40.90
Crit W.S. (m)	179.31	Flow Area (m2)		2.14	
E.G. Slope (m/m)	0.009975	Area (m2)	1.60	3.38	
Q Total (m3/s)	5.70	Flow (m3/s)		5.70	
Top Width (m)	13.62	Top Width (m)	7.15	6.47	
Vel Total (m/s)	2.66	Avg. Vel. (m/s)		2.66	
Max Chl Dpth (m)	0.71	Hydr. Depth (m)		0.71	
Conv. Total (m3/s)	57.1	Conv. (m3/s)		57.1	
Length Wtd. (m)	40.90	Wetted Per. (m)		3.00	
Min Ch El (m)	178.60	Shear (N/m2)		69.87	
Alpha	1.00	Stream Power (N/m s)		185.86	
Frctn Loss (m)	0.45	Cum Volume (1000 m3)	0.03	0.13	0.00
C & E Loss (m)	0.10	Cum SA (1000 m2)	0.20	0.33	0.00

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	179.88	Element	Left OB	Channel	Right OB
Vel Head (m)	0.43	Wt. n-Val.		0.030	
W.S. Elev (m)	179.45	Reach Len. (m)	40.90	40.90	40.90
Crit W.S. (m)	179.45	Flow Area (m2)		2.55	
E.G. Slope (m/m)	0.009394	Area (m2)	2.71	4.32	0.12
Q Total (m3/s)	7.41	Flow (m3/s)		7.41	
Top Width (m)	21.23	Top Width (m)	9.03	7.49	4.72
Vel Total (m/s)	2.90	Avg. Vel. (m/s)		2.90	
Max Chl Dpth (m)	0.85	Hydr. Depth (m)		0.85	
Conv. Total (m3/s)	76.5	Conv. (m3/s)		76.5	
Length Wtd. (m)	40.90	Wetted Per. (m)		3.00	
Min Ch El (m)	178.60	Shear (N/m2)		78.42	
Alpha	1.00	Stream Power (N/m s)		227.55	
Frctn Loss (m)	0.38	Cum Volume (1000 m3)	0.07	0.17	0.00
C & E Loss (m)	0.14	Cum SA (1000 m2)	0.34	0.35	0.11

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	179.44	Element	Left OB	Channel	Right OB
Vel Head (m)	0.28	Wt. n-Val.		0.030	
W.S. Elev (m)	179.16	Reach Len. (m)	40.90	40.90	40.90
Crit W.S. (m)	179.16	Flow Area (m2)		1.67	
E.G. Slope (m/m)	0.010847	Area (m2)	0.64	2.42	
Q Total (m3/s)	3.92	Flow (m3/s)		3.92	
Top Width (m)	10.68	Top Width (m)	4.98	5.70	
Vel Total (m/s)	2.35	Avg. Vel. (m/s)		2.35	
Max Chl Dpth (m)	0.56	Hydr. Depth (m)		0.56	
Conv. Total (m3/s)	37.6	Conv. (m3/s)		37.6	
Length Wtd. (m)	40.90	Wetted Per. (m)		3.00	
Min Ch El (m)	178.60	Shear (N/m2)		59.18	
Alpha	1.00	Stream Power (N/m s)		138.99	
Frctn Loss (m)	0.51	Cum Volume (1000 m3)	0.01	0.10	
C & E Loss (m)	0.07	Cum SA (1000 m2)	0.10	0.29	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Rouge
REACH: WC4 RS: 10

INPUT
Description: ST-10
no re-grading; section the same as in the existing condition
Station Elevation Data num= 80

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	178.49	.19	178.49	1.03	178.49	3.38	178.35	7.63	178.05
7.73	178.05	9.97	178.03	11.87	178.03	15.04	178.19	20.71	178.37
21.65	178.5	22.64	178.5	26.37	178.5	29.42	178.5	30.56	178.5
31.52	178.5	31.71	178.5	32.05	178.5	35.14	178.02	35.24	178
35.68	177.93	37.84	177.56	38.06	177.52	38.19	177.5	38.23	177.5
38.72	177.5	39.38	177.5	39.74	177.49	40.41	177.5	40.58	177.53
41.17	177.6	43.74	177.9	43.93	177.92	44.13	177.94	44.22	177.95
44.63	178	46.37	178.43	46.64	178.5	46.72	178.52	46.74	178.52
46.75	178.53	47.18	178.64	47.55	178.72	47.97	178.77	48.31	178.82
48.5	178.85	48.64	178.87	48.92	178.9	50.59	178.93	50.9	178.95
51.09	178.95	54.34	178.84	55.2	178.82	55.81	178.84	58.83	179
59.35	179	61.23	179	62.15	178.82	62.43	178.83	62.74	178.83
63.64	179	67.3	179.01	71.01	179.01	71.54	179.01	74.68	179.02
75.53	179.02	80.2	179.02	81.65	179.03	91.3	179.04	91.77	179.04
91.81	179.04	91.91	179.05	96.01	179.39	96.22	179.4	99.99	179.48
100.43	179.48	101.24	179.5	101.51	179.5	101.74	179.5	104.46	179.5

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	35.14	.03	44.63	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
35.14	44.63	0	0	.3	.5

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	177.89	Element	Left OB	Channel	Right OB
Vel Head (m)	0.10	Wt. n-Val.		0.030	
W.S. Elev (m)	177.80	Reach Len. (m)			
Crit W.S. (m)	177.80	Flow Area (m2)		1.27	
E.G. Slope (m/m)	0.015191	Area (m2)		1.27	
Q Total (m3/s)	1.76	Flow (m3/s)		1.76	
Top Width (m)	6.38	Top Width (m)		6.38	
Vel Total (m/s)	1.39	Avg. Vel. (m/s)		1.39	
Max Chl Dpth (m)	0.31	Hydr. Depth (m)		0.20	
Conv. Total (m3/s)	14.3	Conv. (m3/s)		14.3	
Length Wtd. (m)		Wetted Per. (m)		6.43	
Min Ch El (m)	177.49	Shear (N/m2)		29.33	
Alpha	1.00	Stream Power (N/m s)		40.79	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	178.02	Element	Left OB	Channel	Right OB
Vel Head (m)	0.12	Wt. n-Val.		0.030	
W.S. Elev (m)	177.89	Reach Len. (m)			
Crit W.S. (m)	177.89	Flow Area (m2)		1.94	
E.G. Slope (m/m)	0.014041	Area (m2)		1.94	
Q Total (m3/s)	3.03	Flow (m3/s)		3.03	
Top Width (m)	7.76	Top Width (m)		7.76	
Vel Total (m/s)	1.56	Avg. Vel. (m/s)		1.56	
Max Chl Dpth (m)	0.40	Hydr. Depth (m)		0.25	
Conv. Total (m3/s)	25.6	Conv. (m3/s)		25.6	
Length Wtd. (m)		Wetted Per. (m)		7.82	
Min Ch El (m)	177.49	Shear (N/m2)		34.19	
Alpha	1.00	Stream Power (N/m s)		53.36	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	178.06	Element	Left OB	Channel	Right OB
Vel Head (m)	0.13	Wt. n-Val.		0.030	
W.S. Elev (m)	177.93	Reach Len. (m)			
Crit W.S. (m)	177.93	Flow Area (m2)		2.24	
E.G. Slope (m/m)	0.013761	Area (m2)		2.24	
Q Total (m3/s)	3.64	Flow (m3/s)		3.64	
Top Width (m)	8.33	Top Width (m)		8.33	
Vel Total (m/s)	1.62	Avg. Vel. (m/s)		1.62	
Max Chl Dpth (m)	0.44	Hydr. Depth (m)		0.27	
Conv. Total (m3/s)	31.0	Conv. (m3/s)		31.0	
Length Wtd. (m)		Wetted Per. (m)		8.39	
Min Ch El (m)	177.49	Shear (N/m2)		36.07	
Alpha	1.00	Stream Power (N/m s)		58.52	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	178.12	Element	Left OB	Channel	Right OB
Vel Head (m)	0.15	Wt. n-Val.		0.030	
W.S. Elev (m)	177.97	Reach Len. (m)			
Crit W.S. (m)	177.97	Flow Area (m2)		2.62	
E.G. Slope (m/m)	0.013661	Area (m2)		2.62	
Q Total (m3/s)	4.46	Flow (m3/s)		4.46	
Top Width (m)	8.99	Top Width (m)		8.99	
Vel Total (m/s)	1.70	Avg. Vel. (m/s)		1.70	
Max Chl Dpth (m)	0.48	Hydr. Depth (m)		0.29	
Conv. Total (m3/s)	38.2	Conv. (m3/s)		38.2	
Length Wtd. (m)		Wetted Per. (m)		9.05	
Min Ch El (m)	177.49	Shear (N/m2)		38.74	
Alpha	1.00	Stream Power (N/m s)		65.99	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	178.16	Element	Left OB	Channel	Right OB
Vel Head (m)	0.16	Wt. n-Val.		0.030	
W.S. Elev (m)	178.00	Reach Len. (m)			
Crit W.S. (m)	178.00	Flow Area (m2)		2.87	
E.G. Slope (m/m)	0.013730	Area (m2)		2.87	
Q Total (m3/s)	5.07	Flow (m3/s)		5.07	
Top Width (m)	9.39	Top Width (m)		9.39	
Vel Total (m/s)	1.76	Avg. Vel. (m/s)		1.76	
Max Chl Dpth (m)	0.51	Hydr. Depth (m)		0.31	
Conv. Total (m3/s)	43.3	Conv. (m3/s)		43.3	
Length Wtd. (m)		Wetted Per. (m)		9.46	
Min Ch El (m)	177.49	Shear (N/m2)		40.90	
Alpha	1.00	Stream Power (N/m s)		72.18	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	178.20	Element	Left OB	Channel	Right OB
Vel Head (m)	0.16	Wt. n-Val.	0.035	0.030	0.035
W.S. Elev (m)	178.03	Reach Len. (m)			
Crit W.S. (m)	178.03	Flow Area (m2)	0.01	3.19	0.00
E.G. Slope (m/m)	0.012446	Area (m2)	0.01	3.19	0.00
Q Total (m3/s)	5.70	Flow (m3/s)	0.00	5.70	0.00
Top Width (m)	12.02	Top Width (m)	2.40	9.49	0.13
Vel Total (m/s)	1.78	Avg. Vel. (m/s)	0.07	1.79	0.20
Max Chl Dpth (m)	0.54	Hydr. Depth (m)	0.00	0.34	0.02
Conv. Total (m3/s)	51.1	Conv. (m3/s)	0.0	51.1	0.0
Length Wtd. (m)		Wetted Per. (m)	2.40	9.56	0.14
Min Ch El (m)	177.49	Shear (N/m2)	0.36	40.68	1.96
Alpha	1.01	Stream Power (N/m s)	0.02	72.73	0.40
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	178.28	Element	Left OB	Channel	Right OB
Vel Head (m)	0.16	Wt. n-Val.	0.035	0.030	0.035
W.S. Elev (m)	178.12	Reach Len. (m)			
Crit W.S. (m)	178.12	Flow Area (m2)	0.50	4.01	0.03
E.G. Slope (m/m)	0.009177	Area (m2)	0.50	4.01	0.03
Q Total (m3/s)	7.41	Flow (m3/s)	0.22	7.17	0.01
Top Width (m)	17.62	Top Width (m)	7.65	9.49	0.48
Vel Total (m/s)	1.63	Avg. Vel. (m/s)	0.45	1.79	0.41
Max Chl Dpth (m)	0.63	Hydr. Depth (m)	0.07	0.42	0.06
Conv. Total (m3/s)	77.4	Conv. (m3/s)	2.3	74.9	0.1
Length Wtd. (m)		Wetted Per. (m)	7.66	9.56	0.50
Min Ch El (m)	177.49	Shear (N/m2)	5.90	37.73	5.23
Alpha	1.17	Stream Power (N/m s)	2.64	67.50	2.15
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	178.08	Element	Left OB	Channel	Right OB
Vel Head (m)	0.14	Wt. n-Val.		0.030	
W.S. Elev (m)	177.94	Reach Len. (m)			
Crit W.S. (m)	177.94	Flow Area (m2)		2.34	
E.G. Slope (m/m)	0.014286	Area (m2)		2.34	
Q Total (m3/s)	3.92	Flow (m3/s)		3.92	
Top Width (m)	8.52	Top Width (m)		8.52	

Vel Total (m/s)	1.68	Avg. Vel. (m/s)	1.68
Max Chl Dpth (m)	0.45	Hydr. Depth (m)	0.27
Conv. Total (m3/s)	32.8	Conv. (m3/s)	32.8
Length Wtd. (m)		Wetted Per. (m)	8.58
Min Ch El (m)	177.49	Shear (N/m2)	38.20
Alpha	1.00	Stream Power (N/m s)	64.00
Frctn Loss (m)		Cum Volume (1000 m3)	
C & E Loss (m)		Cum SA (1000 m2)	

SUMMARY OF MANNING'S N VALUES

River:Rouge

Reach	River Sta.	n1	n2	n3	n4	n5
WC4	300	.035	.03	.035		
WC4	200	.035	.03	.035		
WC4	150	Culvert				
WC4	100	.035	.03	.035	.03	.035
WC4	10	.035	.03	.035		

SUMMARY OF REACH LENGTHS

River: Rouge

Reach	River Sta.	Left	Channel	Right
WC4	300	50.1	50.1	50.1
WC4	200	42.9	42.9	42.9
WC4	150	Culvert		
WC4	100	40.9	40.9	40.9
WC4	10	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Rouge

Reach	River Sta.	Contr.	Expan.
WC4	300	.3	.5
WC4	200	.3	.5
WC4	150	Culvert	
WC4	100	.3	.5
WC4	10	.3	.5

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
WC4	300	2-yr	1.76	180.50	180.88	180.88	180.99	0.014789	1.49	1.18	5.24	1.00
WC4	300	5-yr	3.03	180.50	180.99	180.99	181.13	0.013598	1.66	1.83	6.48	1.00
WC4	300	10-yr	3.64	180.50	181.03	181.03	181.18	0.013696	1.74	2.09	6.92	1.01
WC4	300	25-yr	4.46	180.50	181.08	181.08	181.25	0.012966	1.80	2.48	7.53	1.00
WC4	300	50-yr	5.07	180.50	181.11	181.11	181.29	0.013102	1.86	2.72	7.88	1.01
WC4	300	100-yr	5.70	180.50	181.15	181.15	181.33	0.012899	1.91	2.99	8.25	1.01
WC4	300	Check Flow	7.41	180.50	181.31	181.31	181.42	0.014802	1.50	4.94	21.86	1.01
WC4	300	Regional	3.92	180.50	181.04	181.04	181.21	0.013963	1.79	2.19	7.08	1.03
WC4	200	2-yr	1.76	179.20	179.62	179.53	179.72	0.005458	1.39	1.27	3.85	0.68
WC4	200	5-yr	3.03	179.20	179.81	179.67	179.95	0.004807	1.66	1.83	4.22	0.68
WC4	200	10-yr	3.64	179.20	179.89	179.73	180.05	0.004594	1.76	2.07	4.38	0.68
WC4	200	25-yr	4.46	179.20	179.99	179.81	180.17	0.004375	1.88	2.37	4.58	0.68
WC4	200	50-yr	5.07	179.20	180.06	179.86	180.26	0.004196	1.96	2.59	4.73	0.67
WC4	200	100-yr	5.70	179.20	180.14	179.91	180.35	0.003994	2.02	2.82	4.88	0.67
WC4	200	Check Flow	7.41	179.20	180.34	180.05	180.58	0.003550	2.17	3.42	5.28	0.65
WC4	200	Regional	3.92	179.20	179.92	179.76	180.09	0.004514	1.81	2.17	4.45	0.68
WC4	150		Culvert									
WC4	100	2-yr	1.76	178.60	178.93	178.93	179.09	0.012752	1.79	0.98	4.59	1.00
WC4	100	5-yr	3.03	178.60	179.07	179.07	179.31	0.011370	2.15	1.41	9.25	1.00
WC4	100	10-yr	3.64	178.60	179.13	179.13	179.40	0.010866	2.28	1.60	10.25	1.00
WC4	100	25-yr	4.46	178.60	179.21	179.21	179.51	0.010552	2.45	1.82	11.61	1.01
WC4	100	50-yr	5.07	178.60	179.26	179.26	179.59	0.010239	2.56	1.98	12.62	1.01
WC4	100	100-yr	5.70	178.60	179.31	179.31	179.68	0.009975	2.66	2.14	13.62	1.01
WC4	100	Check Flow	7.41	178.60	179.45	179.45	179.88	0.009394	2.90	2.55	21.23	1.00
WC4	100	Regional	3.92	178.60	179.16	179.16	179.44	0.010847	2.35	1.67	10.68	1.01
WC4	10	2-yr	1.76	177.49	177.80	177.80	177.89	0.015191	1.39	1.27	6.38	1.00
WC4	10	5-yr	3.03	177.49	177.89	177.89	178.02	0.014041	1.56	1.94	7.76	1.00
WC4	10	10-yr	3.64	177.49	177.93	177.93	178.06	0.013761	1.62	2.24	8.33	1.00
WC4	10	25-yr	4.46	177.49	177.97	177.97	178.12	0.013661	1.70	2.62	8.99	1.01
WC4	10	50-yr	5.07	177.49	178.00	178.00	178.16	0.013730	1.76	2.87	9.39	1.02
WC4	10	100-yr	5.70	177.49	178.03	178.03	178.20	0.012446	1.79	3.20	12.02	0.98
WC4	10	Check Flow	7.41	177.49	178.12	178.12	178.28	0.009177	1.79	4.54	17.62	0.88
WC4	10	Regional	3.92	177.49	177.94	177.94	178.08	0.014286	1.68	2.34	8.52	1.02

Profile Output Table - Standard Table 2

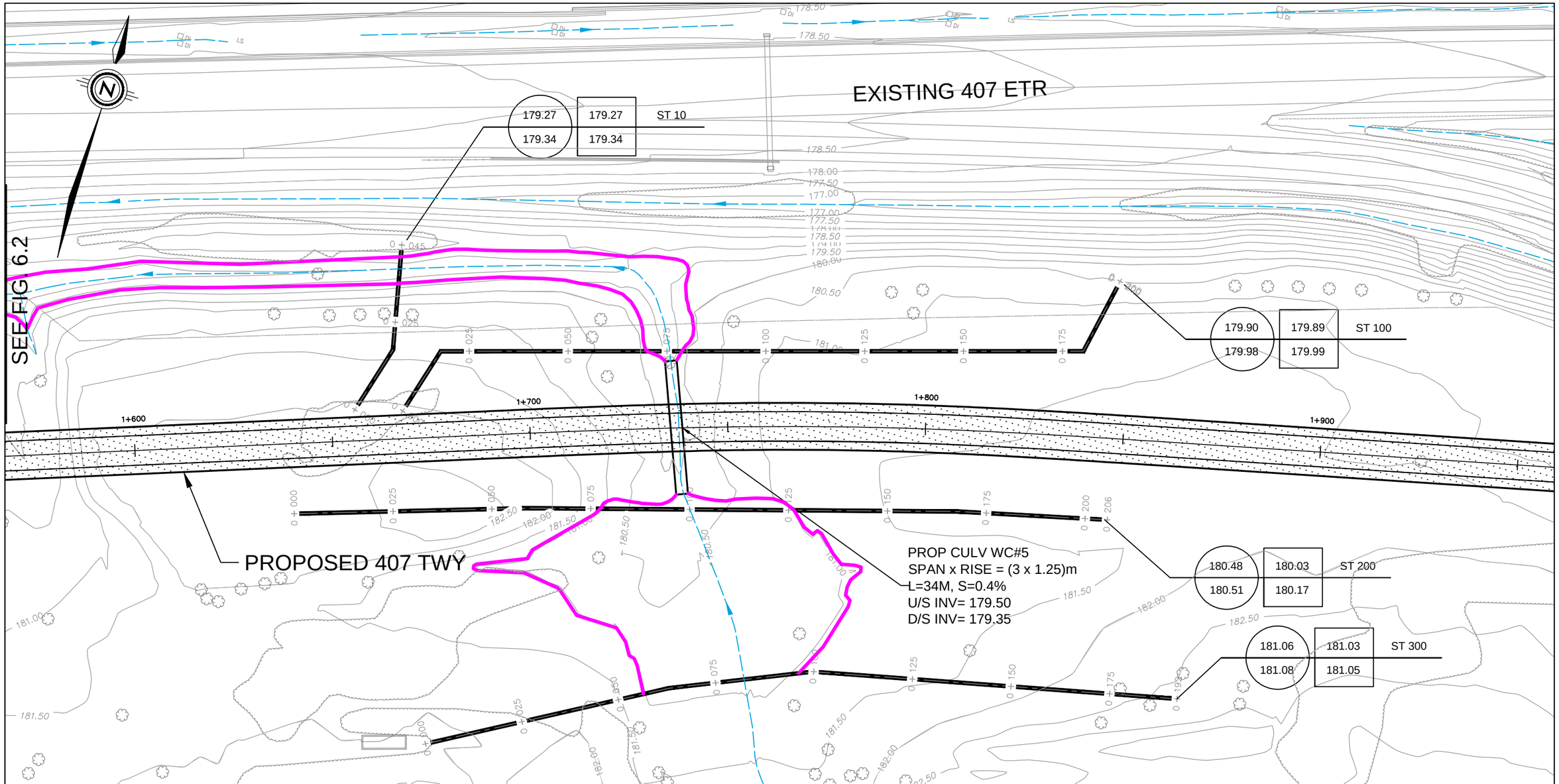
Reach	River Sta	Profile	E.G. Elev (m)	W.S. Elev (m)	Vel Head (m)	Frctn Loss (m)	C & E Loss (m)	Q Left (m3/s)	Q Channel (m3/s)	Q Right (m3/s)	Top Width (m)
WC4	300	2-yr	180.99	180.88	0.11	0.42	0.01		1.76		5.24
WC4	300	5-yr	181.13	180.99	0.14	0.38	0.00		3.03		6.48
WC4	300	10-yr	181.18	181.03	0.15	0.37	0.00		3.64		6.92
WC4	300	25-yr	181.25	181.08	0.16	0.35	0.00		4.46		7.53
WC4	300	50-yr	181.29	181.11	0.18	0.34	0.01		5.07		7.88
WC4	300	100-yr	181.33	181.15	0.19	0.33	0.01		5.70		8.25
WC4	300	Check Flow	181.42	181.31	0.11	0.32	0.04		7.41		21.86
WC4	300	Regional	181.21	181.04	0.16	0.37	0.00		3.92		7.08
WC4	200	2-yr	179.72	179.62	0.10				1.76		3.85
WC4	200	5-yr	179.95	179.81	0.14				3.03		4.22
WC4	200	10-yr	180.05	179.89	0.16				3.64		4.38
WC4	200	25-yr	180.17	179.99	0.18				4.46		4.58
WC4	200	50-yr	180.26	180.06	0.20				5.07		4.73
WC4	200	100-yr	180.35	180.14	0.21				5.70		4.88
WC4	200	Check Flow	180.58	180.34	0.24				7.41		5.28
WC4	200	Regional	180.09	179.92	0.17				3.92		4.45
WC4	150		Culvert								
WC4	100	2-yr	179.09	178.93	0.16	0.57	0.03		1.76		4.59
WC4	100	5-yr	179.31	179.07	0.24	0.52	0.06		3.03		9.25
WC4	100	10-yr	179.40	179.13	0.27	0.50	0.07		3.64		10.25
WC4	100	25-yr	179.51	179.21	0.31	0.49	0.08		4.46		11.61
WC4	100	50-yr	179.59	179.26	0.33	0.48	0.09		5.07		12.62
WC4	100	100-yr	179.68	179.31	0.36	0.45	0.10		5.70		13.62
WC4	100	Check Flow	179.88	179.45	0.43	0.38	0.14		7.41		21.23
WC4	100	Regional	179.44	179.16	0.28	0.51	0.07		3.92		10.68
WC4	10	2-yr	177.89	177.80	0.10				1.76		6.38
WC4	10	5-yr	178.02	177.89	0.12				3.03		7.76
WC4	10	10-yr	178.06	177.93	0.13				3.64		8.33
WC4	10	25-yr	178.12	177.97	0.15				4.46		8.99
WC4	10	50-yr	178.16	178.00	0.16				5.07		9.39
WC4	10	100-yr	178.20	178.03	0.16			0.00	5.70	0.00	12.02
WC4	10	Check Flow	178.28	178.12	0.16			0.22	7.17	0.01	17.62
WC4	10	Regional	178.08	177.94	0.14				3.92		8.52

Profile Output Table - Culvert Only

Reach	River Sta	Profile	E.G. US. (m)	W.S. US. (m)	E.G. IC (m)	E.G. OC (m)	Min El Weir Flow (m)	Q Culv Group (m3/s)	Q Weir (m3/s)	Delta WS (m)	Culv Vel US (m/s)	Culv Vel DS (m/s)
WC4	150 Culvert #1	2-yr	179.72	179.62	179.71	179.72	181.50	1.76		0.70	1.69	1.79
WC4	150 Culvert #1	5-yr	179.95	179.81	179.94	179.95	181.50	3.03		0.74	2.08	2.15
WC4	150 Culvert #1	10-yr	180.05	179.89	180.04	180.05	181.50	3.64		0.76	2.23	2.28
WC4	150 Culvert #1	25-yr	180.17	179.99	180.17	180.17	181.50	4.46		0.78	2.40	2.44
WC4	150 Culvert #1	50-yr	180.26	180.06	180.26	180.26	181.50	5.07		0.80	2.51	2.55
WC4	150 Culvert #1	100-yr	180.35	180.14	180.35	180.35	181.50	5.70		0.83	2.62	2.65
WC4	150 Culvert #1	Check Flow	180.58	180.34	180.58	180.57	181.50	7.41		0.89	2.88	2.89
WC4	150 Culvert #1	Regional	180.09	179.92	180.09	180.09	181.50	3.92		0.77	2.29	2.34

ROUGE RIVER

HEC-RAS ANALYSIS WC#5



LEGEND

- EXISTING 407 ETR
- PROPOSED 407 TWY
- CREEK FLOW DIRECTION
- EXISTING CULVERT
- PROPOSED CULVERT
- PROPOSED REGIONAL FLOODLINE

EX REG / EX 100 — PR REG / PR 100 — HEC ST
CROSS SECTION NUMBER
PARSONS HEC-RAS SECTION
PROPOSED WL ELEVATION (m)
EXISTING UPDATED WL ELEVATION (m)

5m 0m 10m 20m 30m

SCALE HORIZONTAL 1:1000

DATE: SEPTEMBER 2016

SCALE: 1:1000

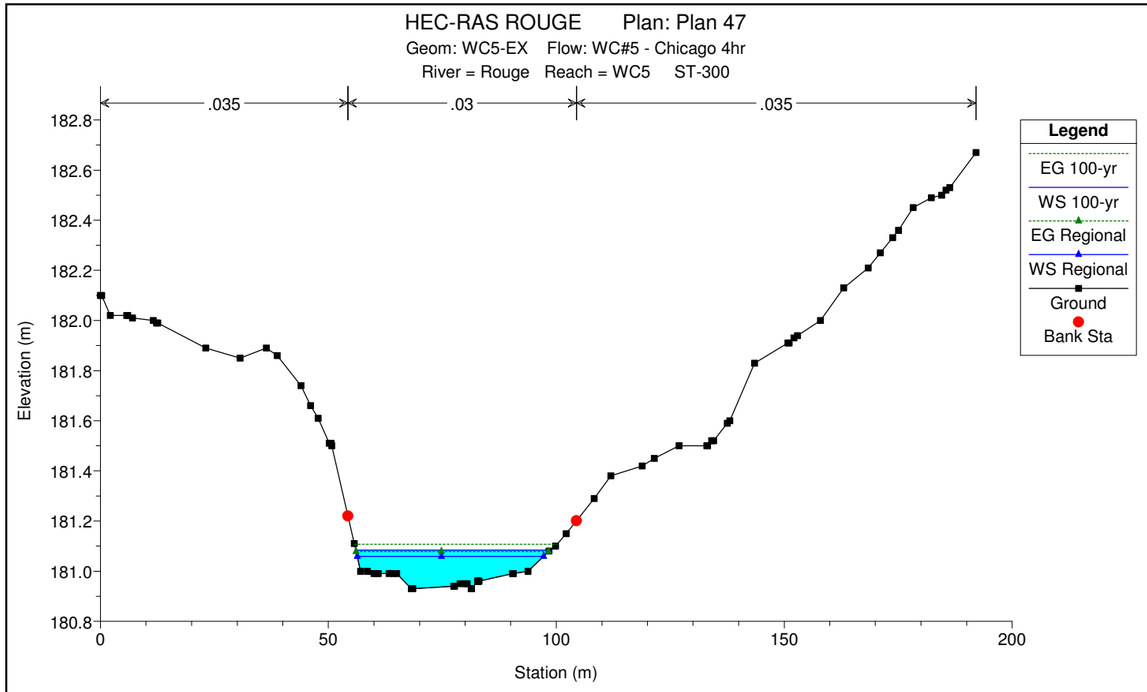
Ontario

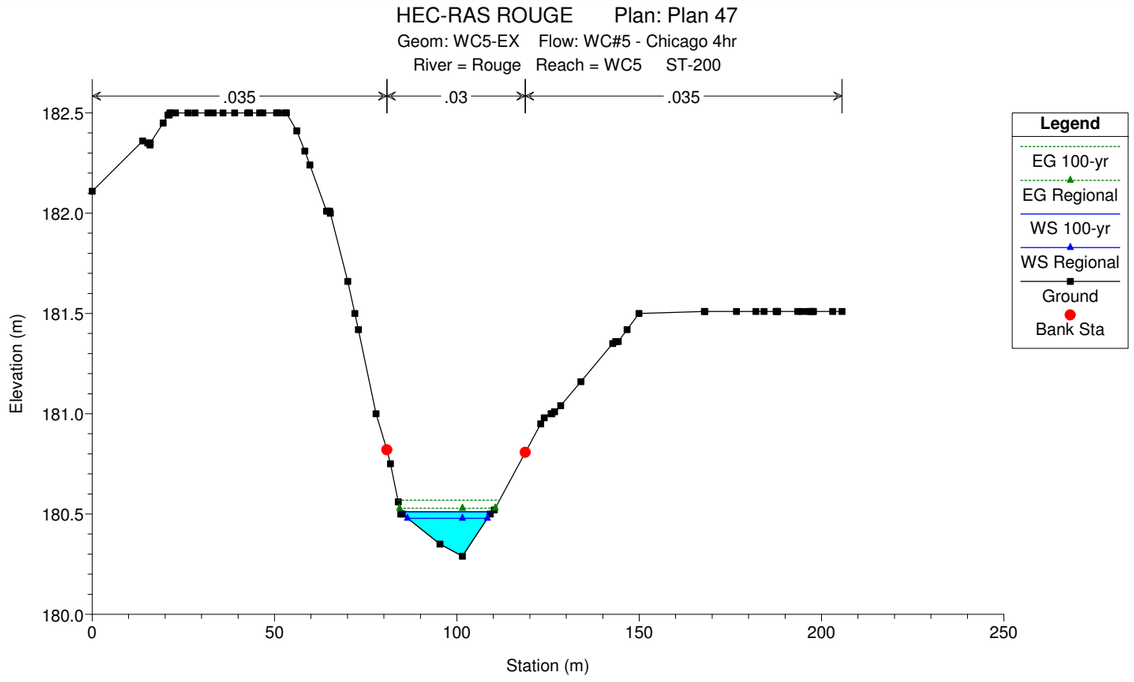
PARSONS

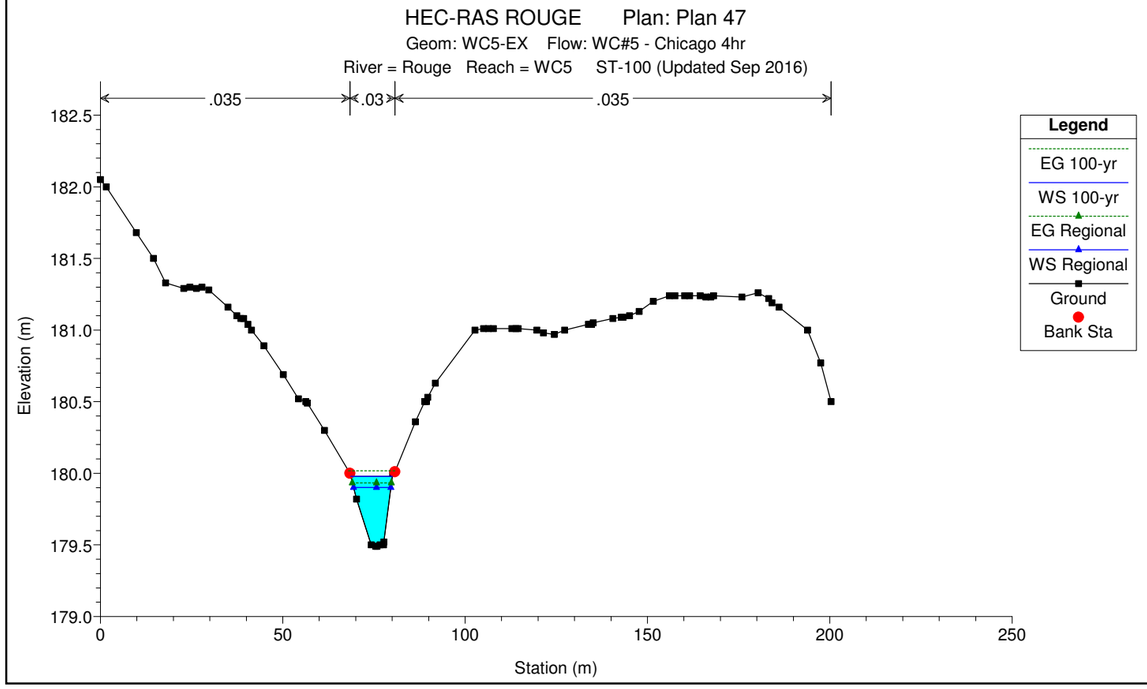
625 COCHRANE DRIVE, SUITE 500
MARKHAM, ONTARIO L3R 9R9
TEL: 905-943-0500
FAX: 905-943-0400

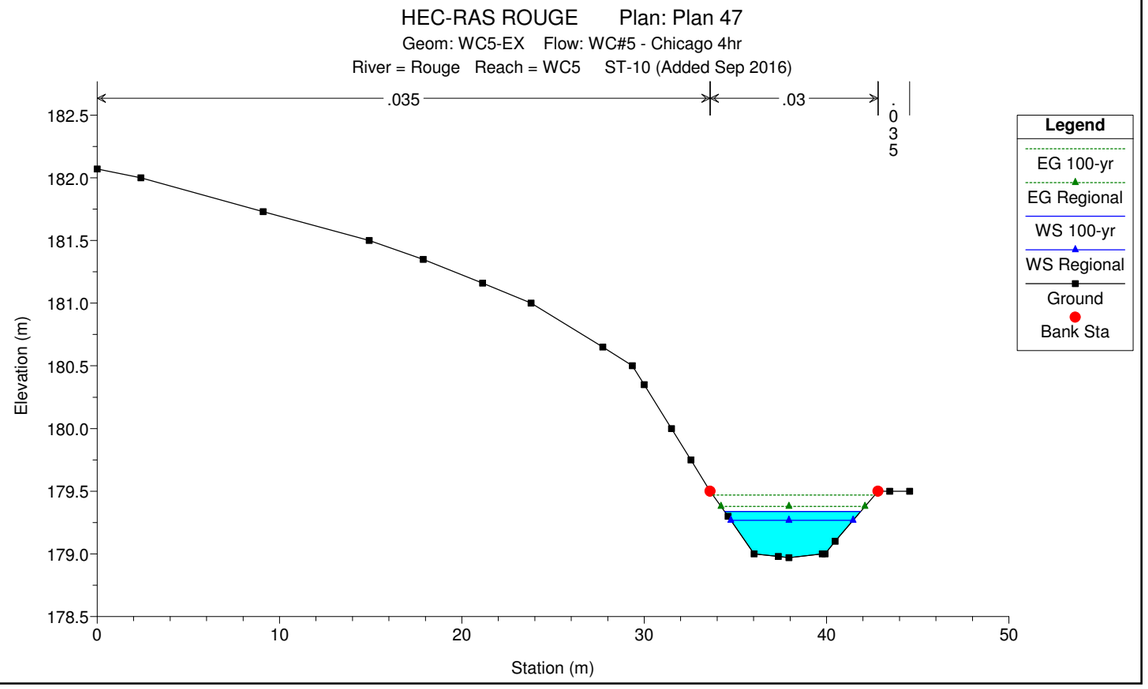
407 TRANSITWAY FROM KENNEDY RD TO BROCK RD

FIGURE 6.3 - HEC-RAS ANALYSIS - ROUGE RIVER (WC#5)


HEC-RAS ROUGE Plan: Plan 47
Geom: WC5-EX Flow: WC#5 - Chicago 4hr
River = Rouge Reach = WC5 ST-300
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG 100-yr
WS 100-yr
EG Regional
WS Regional
Ground
Bank Sta


HEC-RAS ROUGE Plan: Plan 47
Geom: WC5-EX Flow: WC#5 - Chicago 4hr
River = Rouge Reach = WC5 ST-200
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG 100-yr
EG Regional
WS 100-yr
WS Regional
Ground
Bank Sta


HEC-RAS ROUGE Plan: Plan 47
Geom: WC5-EX Flow: WC#5 - Chicago 4hr
River = Rouge Reach = WC5 ST-100 (Updated Sep 2016)
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG 100-yr
WS 100-yr
EG Regional
WS Regional
Ground
Bank Sta


HEC-RAS ROUGE Plan: Plan 47
Geom: WC5-EX Flow: WC#5 - Chicago 4hr
River = Rouge Reach = WC5 ST-10 (Added Sep 2016)
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG 100-yr
EG Regional
WS 100-yr
WS Regional
Ground
Bank Sta

HEC-RAS Plan: WC5-EX (4HR CH) River: Rouge Reach: WC5

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC5	300	2-yr	0.98	180.93	181.02		181.03	0.007866	0.44	2.22	38.48	0.59
WC5	300	5-yr	1.68	180.93	181.05	181.03	181.06	0.008544	0.55	3.04	39.94	0.64
WC5	300	10-yr	2.02	180.93	181.06	181.03	181.07	0.008408	0.59	3.43	40.63	0.65
WC5	300	25-yr	2.48	180.93	181.07	181.04	181.09	0.008465	0.64	3.91	41.45	0.66
WC5	300	50-yr	2.81	180.93	181.08	181.05	181.10	0.008366	0.66	4.25	42.02	0.66
WC5	300	100-yr	3.16	180.93	181.08	181.05	181.11	0.008181	0.68	4.62	42.68	0.66
WC5	300	Check Flow	4.11	180.93	181.10		181.13	0.008205	0.75	5.48	44.24	0.68
WC5	300	Regional	2.17	180.93	181.06	181.03	181.08	0.008507	0.61	3.58	40.89	0.65
WC5	200	2-yr	0.98	180.29	180.42	180.42	180.46	0.024175	0.88	1.11	15.83	1.06
WC5	200	5-yr	1.68	180.29	180.46	180.46	180.50	0.019504	0.94	1.79	19.86	1.00
WC5	200	10-yr	2.02	180.29	180.47	180.47	180.52	0.019420	0.98	2.06	21.23	1.01
WC5	200	25-yr	2.48	180.29	180.49	180.49	180.54	0.018469	1.01	2.44	23.06	1.00
WC5	200	50-yr	2.81	180.29	180.50	180.50	180.56	0.018416	1.04	2.70	24.54	1.00
WC5	200	100-yr	3.16	180.29	180.51	180.51	180.57	0.017922	1.07	2.96	25.25	1.00
WC5	200	Check Flow	4.11	180.29	180.53	180.53	180.60	0.017320	1.15	3.57	26.47	1.00
WC5	200	Regional	2.17	180.29	180.48	180.48	180.53	0.018814	0.99	2.20	21.91	1.00
WC5	100	2-yr	0.98	179.49	179.78	179.67	179.79	0.002959	0.61	1.61	8.23	0.44
WC5	100	5-yr	1.68	179.49	179.86		179.88	0.003102	0.72	2.33	9.56	0.47
WC5	100	10-yr	2.02	179.49	179.89		179.92	0.003188	0.77	2.63	10.02	0.48
WC5	100	25-yr	2.48	179.49	179.93		179.96	0.003146	0.81	3.06	10.65	0.48
WC5	100	50-yr	2.81	179.49	179.95		179.99	0.003202	0.85	3.32	11.02	0.49
WC5	100	100-yr	3.16	179.49	179.98		180.02	0.003214	0.87	3.61	11.41	0.50
WC5	100	Check Flow	4.11	179.49	180.04		180.09	0.003156	0.94	4.42	13.85	0.50
WC5	100	Regional	2.17	179.49	179.90		179.93	0.003148	0.78	2.78	10.25	0.48
WC5	10	2-yr	0.98	178.97	179.16	179.16	179.23	0.017753	1.22	0.80	5.54	1.02
WC5	10	5-yr	1.68	178.97	179.23	179.23	179.33	0.015600	1.38	1.21	6.28	1.01
WC5	10	10-yr	2.02	178.97	179.26	179.26	179.36	0.015022	1.45	1.40	6.59	1.00
WC5	10	25-yr	2.48	178.97	179.29	179.29	179.41	0.014369	1.51	1.64	6.96	1.00
WC5	10	50-yr	2.81	178.97	179.31	179.31	179.44	0.014353	1.57	1.79	7.19	1.01
WC5	10	100-yr	3.16	178.97	179.34	179.34	179.47	0.013859	1.61	1.97	7.46	1.00
WC5	10	Check Flow	4.11	178.97	179.39	179.39	179.54	0.013597	1.72	2.39	8.04	1.01
WC5	10	Regional	2.17	178.97	179.27	179.27	179.38	0.014963	1.48	1.47	6.70	1.01

HEC-RAS HEC-RAS 5.0.1 April 2016
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
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PROJECT DATA
Project Title: HEC-RAS ROUGE
Project File : HEC.prj
Run Date and Time: 9/23/2016 2:40:46 PM

Project in SI units

Project Description:
HEC-RAS model for creek crossings along the proposed 407 TWY Ph 2 started
from scratch

PLAN DATA

Plan Title: Plan 47
Plan File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.p47

Geometry Title: WC5-EX
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g11

Flow Title : WC#5 - Chicago 4hr
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f04

Plan Summary Information:
Number of: Cross Sections = 4 Multiple Openings = 0
Culverts = 0 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: WC#5 - Chicago 4hr
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f04

Flow Data (m3/s)

River	Reach	RS	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Check Flow	Regional
Rouge	WC5	300	.98	1.68	2.02	2.48	2.81	3.16	4.11	2.17

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Rouge	WC5	2-yr		Critical
Rouge	WC5	5-yr		Critical
Rouge	WC5	10-yr		Critical
Rouge	WC5	25-yr		Critical
Rouge	WC5	50-yr		Critical
Rouge	WC5	100-yr		Critical
Rouge	WC5	Check Flow		Critical
Rouge	WC5	Regional		Critical

GEOMETRY DATA

Geometry Title: WC5-EX
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g11

CROSS SECTION

RIVER: Rouge
REACH: WC5 RS: 300

INPUT
Description: ST-300
Station Elevation Data num= 81

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	182.1	.26	182.1	2.18	182.02	5.78	182.02	5.97	182.02
7.02	182.01	11.57	182	12.3	181.99	12.57	181.99	23.13	181.89
30.63	181.85	36.4	181.89	38.8	181.86	44	181.74	46.07	181.66
47.78	181.61	50.19	181.51	50.56	181.51	50.73	181.5	54.28	181.22
55.67	181.11	57.07	181	58.57	181	60.01	180.99	60.54	180.99
60.96	180.99	63.34	180.99	64.3	180.99	64.97	180.99	68.19	180.93
68.52	180.93	77.5	180.94	77.7	180.94	78.89	180.95	80.12	180.95
80.46	180.95	81.34	180.93	81.4	180.93	82.7	180.96	82.79	180.96
82.86	180.96	82.89	180.96	82.94	180.96	83.05	180.96	90.43	180.99
90.49	180.99	90.5	180.99	90.52	180.99	93.81	181	98.42	181.08
99.82	181.1	102.18	181.15	104.42	181.201	108.32	181.29	111.94	181.38
118.82	181.42	121.51	181.45	126.93	181.5	133.01	181.5	133.2	181.5
134.05	181.52	134.49	181.52	137.51	181.59	138.04	181.6	143.48	181.83
150.78	181.91	151.09	181.91	152.12	181.93	152.9	181.94	157.95	182
163.04	182.13	168.4	182.21	171.08	182.27	173.78	182.33	175.08	182.36
178.27	182.45	182.26	182.49	184.53	182.5	185.47	182.52	186.34	182.53
192.1	182.67								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	54.28	.03	104.42	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
54.28 104.42 45.3 45.3 45.3 .1 .3

CROSS SECTION OUTPUT Profile #2-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	181.03	Element			
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	181.02	Reach Len. (m)	45.30	45.30	45.30
Crit W.S. (m)		Flow Area (m2)		2.22	
E.G. Slope (m/m)	0.007866	Area (m2)		2.22	
Q Total (m3/s)	0.98	Flow (m3/s)		0.98	
Top Width (m)	38.48	Top Width (m)		38.48	
Vel Total (m/s)	0.44	Avg. Vel. (m/s)		0.44	
Max Chl Dpth (m)	0.09	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	11.0	Conv. (m3/s)		11.0	

Length Wtd. (m)	45.30	Wetted Per. (m)	38.48
Min Ch El (m)	180.93	Shear (N/m2)	4.45
Alpha	1.00	Stream Power (N/m s)	1.96
Frctn Loss (m)	0.58	Cum Volume (1000 m3)	0.24
C & E Loss (m)	0.00	Cum SA (1000 m2)	2.35

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	181.06	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	181.05	Reach Len. (m)	45.30	45.30	45.30
Crit W.S. (m)	181.03	Flow Area (m2)		3.04	
E.G. Slope (m/m)	0.008544	Area (m2)		3.04	
Q Total (m3/s)	1.68	Flow (m3/s)		1.68	
Top Width (m)	39.94	Top Width (m)		39.94	
Vel Total (m/s)	0.55	Avg. Vel. (m/s)		0.55	
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	18.2	Conv. (m3/s)		18.2	
Length Wtd. (m)	45.30	Wetted Per. (m)		39.95	
Min Ch El (m)	180.93	Shear (N/m2)		6.37	
Alpha	1.00	Stream Power (N/m s)		3.52	
Frctn Loss (m)	0.56	Cum Volume (1000 m3)		0.36	
C & E Loss (m)	0.00	Cum SA (1000 m2)		2.68	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	181.07	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	181.06	Reach Len. (m)	45.30	45.30	45.30
Crit W.S. (m)	181.03	Flow Area (m2)		3.43	
E.G. Slope (m/m)	0.008408	Area (m2)		3.43	
Q Total (m3/s)	2.02	Flow (m3/s)		2.02	
Top Width (m)	40.63	Top Width (m)		40.63	
Vel Total (m/s)	0.59	Avg. Vel. (m/s)		0.59	
Max Chl Dpth (m)	0.13	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	22.0	Conv. (m3/s)		22.0	
Length Wtd. (m)	45.30	Wetted Per. (m)		40.64	
Min Ch El (m)	180.93	Shear (N/m2)		6.97	
Alpha	1.00	Stream Power (N/m s)		4.10	
Frctn Loss (m)	0.55	Cum Volume (1000 m3)		0.41	
C & E Loss (m)	0.00	Cum SA (1000 m2)		2.80	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	181.09	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	181.07	Reach Len. (m)	45.30	45.30	45.30
Crit W.S. (m)	181.04	Flow Area (m2)		3.91	
E.G. Slope (m/m)	0.008465	Area (m2)		3.91	
Q Total (m3/s)	2.48	Flow (m3/s)		2.48	
Top Width (m)	41.45	Top Width (m)		41.45	
Vel Total (m/s)	0.64	Avg. Vel. (m/s)		0.64	
Max Chl Dpth (m)	0.14	Hydr. Depth (m)		0.09	
Conv. Total (m3/s)	27.0	Conv. (m3/s)		27.0	
Length Wtd. (m)	45.30	Wetted Per. (m)		41.45	
Min Ch El (m)	180.93	Shear (N/m2)		7.82	
Alpha	1.00	Stream Power (N/m s)		4.97	
Frctn Loss (m)	0.55	Cum Volume (1000 m3)		0.47	
C & E Loss (m)	0.00	Cum SA (1000 m2)		2.96	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	181.10	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	181.08	Reach Len. (m)	45.30	45.30	45.30
Crit W.S. (m)	181.05	Flow Area (m2)		4.25	
E.G. Slope (m/m)	0.008366	Area (m2)		4.25	
Q Total (m3/s)	2.81	Flow (m3/s)		2.81	
Top Width (m)	42.02	Top Width (m)		42.02	
Vel Total (m/s)	0.66	Avg. Vel. (m/s)		0.66	
Max Chl Dpth (m)	0.15	Hydr. Depth (m)		0.10	
Conv. Total (m3/s)	30.7	Conv. (m3/s)		30.7	
Length Wtd. (m)	45.30	Wetted Per. (m)		42.03	
Min Ch El (m)	180.93	Shear (N/m2)		8.29	
Alpha	1.00	Stream Power (N/m s)		5.49	
Frctn Loss (m)	0.54	Cum Volume (1000 m3)		0.52	
C & E Loss (m)	0.00	Cum SA (1000 m2)		3.07	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	181.11	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	181.08	Reach Len. (m)	45.30	45.30	45.30
Crit W.S. (m)	181.05	Flow Area (m2)		4.62	
E.G. Slope (m/m)	0.008181	Area (m2)		4.62	
Q Total (m3/s)	3.16	Flow (m3/s)		3.16	
Top Width (m)	42.68	Top Width (m)		42.68	
Vel Total (m/s)	0.68	Avg. Vel. (m/s)		0.68	
Max Chl Dpth (m)	0.15	Hydr. Depth (m)		0.11	
Conv. Total (m3/s)	34.9	Conv. (m3/s)		34.9	
Length Wtd. (m)	45.30	Wetted Per. (m)		42.69	
Min Ch El (m)	180.93	Shear (N/m2)		8.68	
Alpha	1.00	Stream Power (N/m s)		5.94	
Frctn Loss (m)	0.53	Cum Volume (1000 m3)		0.56	
C & E Loss (m)	0.00	Cum SA (1000 m2)		3.15	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	181.13	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.030	
W.S. Elev (m)	181.10	Reach Len. (m)	45.30	45.30	45.30
Crit W.S. (m)		Flow Area (m2)		5.48	
E.G. Slope (m/m)	0.008205	Area (m2)		5.48	
Q Total (m3/s)	4.11	Flow (m3/s)		4.11	
Top Width (m)	44.24	Top Width (m)		44.24	
Vel Total (m/s)	0.75	Avg. Vel. (m/s)		0.75	
Max Chl Dpth (m)	0.17	Hydr. Depth (m)		0.12	
Conv. Total (m3/s)	45.4	Conv. (m3/s)		45.4	

Length Wtd. (m)	45.30	Wetted Per. (m)		44.24		
Min Ch El (m)	180.93	Shear (N/m2)		9.96		
Alpha	1.00	Stream Power (N/m s)		7.47		
Frctn Loss (m)	0.52	Cum Volume (1000 m3)	0.00	0.68	0.00	
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.06	3.33	0.04	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	181.08	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	181.06	Reach Len. (m)	45.30	45.30	45.30
Crit W.S. (m)	181.03	Flow Area (m2)		3.58	
E.G. Slope (m/m)	0.008507	Area (m2)		3.58	
Q Total (m3/s)	2.17	Flow (m3/s)		2.17	
Top Width (m)	40.89	Top Width (m)		40.89	
Vel Total (m/s)	0.61	Avg. Vel. (m/s)		0.61	
Max Chl Dpth (m)	0.13	Hydr. Depth (m)		0.09	
Conv. Total (m3/s)	23.5	Conv. (m3/s)		23.5	
Length Wtd. (m)	45.30	Wetted Per. (m)		40.89	
Min Ch El (m)	180.93	Shear (N/m2)		7.30	
Alpha	1.00	Stream Power (N/m s)		4.43	
Frctn Loss (m)	0.55	Cum Volume (1000 m3)		0.43	
C & E Loss (m)	0.00	Cum SA (1000 m2)		2.86	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Rouge
REACH: WC5 RS: 200

INPUT
Description: ST-200
Station Elevation Data num= 74

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	182.11	13.84	182.36	15.21	182.35	15.87	182.34	15.93	182.35
19.48	182.45	20.8	182.49	21.1	182.49	21.36	182.5	21.38	182.5
22.82	182.5	26.26	182.5	28.16	182.5	31.73	182.5	33.2	182.5
35.88	182.5	39.09	182.5	42.63	182.5	43.14	182.5	45.94	182.5
46.8	182.5	50.53	182.5	50.97	182.5	52.83	182.5	53.26	182.5
56.11	182.41	58.29	182.31	59.7	182.24	64.26	182.01	64.99	182.01
65.12	182.01	65.29	182	70.09	181.66	72.05	181.5	72.97	181.42
77.83	181	80.85	180.82	81.76	180.75	83.93	180.56	84.65	180.5
85.01	180.5	95.38	180.35	101.5	180.29	109.12	180.5	110.26	180.52
118.75	180.807	123	180.95	123.94	180.98	125.86	181	126.01	181
126.78	181.01	128.44	181.04	133.99	181.16	142.76	181.35	143.55	181.36
144.28	181.36	146.66	181.42	149.95	181.5	167.9	181.51	168.02	181.51
176.64	181.51	182.01	181.51	184.21	181.51	187.51	181.51	187.76	181.51
187.92	181.51	193.5	181.51	194.67	181.51	196.5	181.51	197.04	181.51
197.59	181.51	197.78	181.51	203.05	181.51	205.64	181.51		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	80.85	.03	118.75	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
80.85	118.75	40.5	40.5	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	180.46	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.030	
W.S. Elev (m)	180.42	Reach Len. (m)	40.50	40.50	40.50
Crit W.S. (m)	180.42	Flow Area (m2)		1.11	
E.G. Slope (m/m)	0.024175	Area (m2)		1.11	
Q Total (m3/s)	0.98	Flow (m3/s)		0.98	
Top Width (m)	15.83	Top Width (m)		15.83	
Vel Total (m/s)	0.88	Avg. Vel. (m/s)		0.88	
Max Chl Dpth (m)	0.13	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	6.3	Conv. (m3/s)		6.3	
Length Wtd. (m)	40.50	Wetted Per. (m)		15.84	
Min Ch El (m)	180.29	Shear (N/m2)		16.64	
Alpha	1.00	Stream Power (N/m s)		14.67	
Frctn Loss (m)	0.26	Cum Volume (1000 m3)		0.17	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.12	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	180.50	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.030	
W.S. Elev (m)	180.46	Reach Len. (m)	40.50	40.50	40.50
Crit W.S. (m)	180.46	Flow Area (m2)		1.79	
E.G. Slope (m/m)	0.019504	Area (m2)		1.79	
Q Total (m3/s)	1.68	Flow (m3/s)		1.68	
Top Width (m)	19.86	Top Width (m)		19.86	
Vel Total (m/s)	0.94	Avg. Vel. (m/s)		0.94	
Max Chl Dpth (m)	0.17	Hydr. Depth (m)		0.09	
Conv. Total (m3/s)	12.0	Conv. (m3/s)		12.0	
Length Wtd. (m)	40.50	Wetted Per. (m)		19.86	
Min Ch El (m)	180.29	Shear (N/m2)		17.27	
Alpha	1.00	Stream Power (N/m s)		16.18	
Frctn Loss (m)	0.26	Cum Volume (1000 m3)		0.25	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.33	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	180.52	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.030	
W.S. Elev (m)	180.47	Reach Len. (m)	40.50	40.50	40.50
Crit W.S. (m)	180.47	Flow Area (m2)		2.06	
E.G. Slope (m/m)	0.019420	Area (m2)		2.06	
Q Total (m3/s)	2.02	Flow (m3/s)		2.02	
Top Width (m)	21.23	Top Width (m)		21.23	
Vel Total (m/s)	0.98	Avg. Vel. (m/s)		0.98	
Max Chl Dpth (m)	0.18	Hydr. Depth (m)		0.10	
Conv. Total (m3/s)	14.5	Conv. (m3/s)		14.5	
Length Wtd. (m)	40.50	Wetted Per. (m)		21.23	
Min Ch El (m)	180.29	Shear (N/m2)		18.47	
Alpha	1.00	Stream Power (N/m s)		18.12	
Frctn Loss (m)	0.26	Cum Volume (1000 m3)		0.28	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.40	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	180.54	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.030	
W.S. Elev (m)	180.49	Reach Len. (m)	40.50	40.50	40.50
Crit W.S. (m)	180.49	Flow Area (m2)		2.44	
E.G. Slope (m/m)	0.018469	Area (m2)		2.44	
Q Total (m3/s)	2.48	Flow (m3/s)		2.48	
Top Width (m)	23.06	Top Width (m)		23.06	
Vel Total (m/s)	1.01	Avg. Vel. (m/s)		1.01	
Max Chl Dpth (m)	0.20	Hydr. Depth (m)		0.11	
Conv. Total (m3/s)	18.2	Conv. (m3/s)		18.2	
Length Wtd. (m)	40.50	Wetted Per. (m)		23.06	
Min Ch El (m)	180.29	Shear (N/m2)		19.20	
Alpha	1.00	Stream Power (N/m s)		19.47	
Frctn Loss (m)	0.26	Cum Volume (1000 m3)		0.33	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.50	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	180.56	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.030	
W.S. Elev (m)	180.50	Reach Len. (m)	40.50	40.50	40.50
Crit W.S. (m)	180.50	Flow Area (m2)		2.70	
E.G. Slope (m/m)	0.018416	Area (m2)		2.70	
Q Total (m3/s)	2.81	Flow (m3/s)		2.81	
Top Width (m)	24.54	Top Width (m)		24.54	
Vel Total (m/s)	1.04	Avg. Vel. (m/s)		1.04	
Max Chl Dpth (m)	0.21	Hydr. Depth (m)		0.11	
Conv. Total (m3/s)	20.7	Conv. (m3/s)		20.7	
Length Wtd. (m)	40.50	Wetted Per. (m)		24.54	
Min Ch El (m)	180.29	Shear (N/m2)		19.89	
Alpha	1.00	Stream Power (N/m s)		20.68	
Frctn Loss (m)	0.26	Cum Volume (1000 m3)		0.36	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.56	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	180.57	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.030	
W.S. Elev (m)	180.51	Reach Len. (m)	40.50	40.50	40.50
Crit W.S. (m)	180.51	Flow Area (m2)		2.96	
E.G. Slope (m/m)	0.017922	Area (m2)		2.96	
Q Total (m3/s)	3.16	Flow (m3/s)		3.16	
Top Width (m)	25.25	Top Width (m)		25.25	
Vel Total (m/s)	1.07	Avg. Vel. (m/s)		1.07	
Max Chl Dpth (m)	0.22	Hydr. Depth (m)		0.12	
Conv. Total (m3/s)	23.6	Conv. (m3/s)		23.6	
Length Wtd. (m)	40.50	Wetted Per. (m)		25.26	
Min Ch El (m)	180.29	Shear (N/m2)		20.58	
Alpha	1.00	Stream Power (N/m s)		21.99	
Frctn Loss (m)	0.26	Cum Volume (1000 m3)		0.39	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.61	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	180.60	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.030	
W.S. Elev (m)	180.53	Reach Len. (m)	40.50	40.50	40.50
Crit W.S. (m)	180.53	Flow Area (m2)		3.57	
E.G. Slope (m/m)	0.017320	Area (m2)		3.57	
Q Total (m3/s)	4.11	Flow (m3/s)		4.11	
Top Width (m)	26.47	Top Width (m)		26.47	
Vel Total (m/s)	1.15	Avg. Vel. (m/s)		1.15	
Max Chl Dpth (m)	0.24	Hydr. Depth (m)		0.13	
Conv. Total (m3/s)	31.2	Conv. (m3/s)		31.2	
Length Wtd. (m)	40.50	Wetted Per. (m)		26.47	
Min Ch El (m)	180.29	Shear (N/m2)		22.88	
Alpha	1.00	Stream Power (N/m s)		26.37	
Frctn Loss (m)	0.25	Cum Volume (1000 m3)	0.00	0.47	0.00
C & E Loss (m)	0.01	Cum SA (1000 m2)	0.06	1.73	0.04

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	180.53	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.030	
W.S. Elev (m)	180.48	Reach Len. (m)	40.50	40.50	40.50
Crit W.S. (m)	180.48	Flow Area (m2)		2.20	
E.G. Slope (m/m)	0.018814	Area (m2)		2.20	
Q Total (m3/s)	2.17	Flow (m3/s)		2.17	
Top Width (m)	21.91	Top Width (m)		21.91	
Vel Total (m/s)	0.99	Avg. Vel. (m/s)		0.99	
Max Chl Dpth (m)	0.19	Hydr. Depth (m)		0.10	
Conv. Total (m3/s)	15.8	Conv. (m3/s)		15.8	
Length Wtd. (m)	40.50	Wetted Per. (m)		21.91	
Min Ch El (m)	180.29	Shear (N/m2)		18.51	
Alpha	1.00	Stream Power (N/m s)		18.27	
Frctn Loss (m)	0.26	Cum Volume (1000 m3)		0.30	

C & E Loss (m)	0.01	Cum SA (1000 m2)	1.43

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Rouge
REACH: WC5 RS: 100

INPUT
Description: ST-100 (Updated Sep 2016)
Station Elevation Data num= 75

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	182.05	1.58	182	9.83	181.68	14.51	181.5	17.88	181.33
22.83	181.29	24.5	181.3	26.32	181.29	27.81	181.3	29.69	181.28
34.96	181.16	37.38	181.1	38.49	181.08	39.26	181.08	40.46	181.04
41.39	181	44.79	180.89	50.14	180.69	54.31	180.52	56.3	180.5
56.69	180.49	61.45	180.3	68.4	180	70.2	179.82	74.24	179.5
75.48	179.49	75.86	179.49	76.68	179.5	77.6	179.5	77.7	179.52
80.13	180	80.73	180.01	86.35	180.36	88.94	180.5	89.37	180.5
89.75	180.53	91.83	180.63	102.73	181	105.08	181.01	106.36	181.01
107.77	181.01	112.84	181.01	113.94	181.01	114.56	181.01	119.7	181
121.5	180.98	124.43	180.97	127.27	181	133.82	181.04	134.24	181.04
134.27	181.04	134.66	181.04	135.14	181.05	140.54	181.08	142.82	181.09
143.29	181.09	145.11	181.1	147.69	181.13	151.6	181.2	156.04	181.24
157.58	181.24	160.19	181.24	161.58	181.24	164.44	181.24	166.03	181.23
167.4	181.23	168.13	181.24	175.91	181.23	180.35	181.26	183.26	181.22
184.13	181.19	186.06	181.16	193.9	181	197.52	180.77	200.36	180.5

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	68.4	.03	80.73	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
68.4	80.73	77	92.5	108	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	179.79	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	179.78	Reach Len. (m)	77.00	92.50	108.00
Crit W.S. (m)	179.67	Flow Area (m2)		1.61	
E.G. Slope (m/m)	0.002959	Area (m2)		1.61	
Q Total (m3/s)	0.98	Flow (m3/s)		0.98	
Top Width (m)	8.23	Top Width (m)		8.23	
Vel Total (m/s)	0.61	Avg. Vel. (m/s)		0.61	
Max Chl Dpth (m)	0.29	Hydr. Depth (m)		0.20	
Conv. Total (m3/s)	18.0	Conv. (m3/s)		18.0	
Length Wtd. (m)	92.50	Wetted Per. (m)		8.27	
Min Ch El (m)	179.49	Shear (N/m2)		5.65	
Alpha	1.00	Stream Power (N/m s)		3.44	
Frctn Loss (m)	0.55	Cum Volume (1000 m3)		0.11	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.64	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	179.88	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.030	
W.S. Elev (m)	179.86	Reach Len. (m)	77.00	92.50	108.00
Crit W.S. (m)		Flow Area (m2)		2.33	
E.G. Slope (m/m)	0.003102	Area (m2)		2.33	
Q Total (m3/s)	1.68	Flow (m3/s)		1.68	
Top Width (m)	9.56	Top Width (m)		9.56	
Vel Total (m/s)	0.72	Avg. Vel. (m/s)		0.72	
Max Chl Dpth (m)	0.37	Hydr. Depth (m)		0.24	
Conv. Total (m3/s)	30.2	Conv. (m3/s)		30.2	
Length Wtd. (m)	92.50	Wetted Per. (m)		9.61	
Min Ch El (m)	179.49	Shear (N/m2)		7.37	
Alpha	1.00	Stream Power (N/m s)		5.32	
Frctn Loss (m)	0.55	Cum Volume (1000 m3)		0.16	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.73	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	179.92	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.030	
W.S. Elev (m)	179.89	Reach Len. (m)	77.00	92.50	108.00
Crit W.S. (m)		Flow Area (m2)		2.63	
E.G. Slope (m/m)	0.003188	Area (m2)		2.63	
Q Total (m3/s)	2.02	Flow (m3/s)		2.02	
Top Width (m)	10.02	Top Width (m)		10.02	
Vel Total (m/s)	0.77	Avg. Vel. (m/s)		0.77	
Max Chl Dpth (m)	0.40	Hydr. Depth (m)		0.26	
Conv. Total (m3/s)	35.8	Conv. (m3/s)		35.8	
Length Wtd. (m)	92.50	Wetted Per. (m)		10.08	
Min Ch El (m)	179.49	Shear (N/m2)		8.16	
Alpha	1.00	Stream Power (N/m s)		6.27	
Frctn Loss (m)	0.55	Cum Volume (1000 m3)		0.19	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.77	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	179.96	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.030	
W.S. Elev (m)	179.93	Reach Len. (m)	77.00	92.50	108.00
Crit W.S. (m)		Flow Area (m2)		3.06	
E.G. Slope (m/m)	0.003146	Area (m2)		3.06	
Q Total (m3/s)	2.48	Flow (m3/s)		2.48	
Top Width (m)	10.65	Top Width (m)		10.65	
Vel Total (m/s)	0.81	Avg. Vel. (m/s)		0.81	
Max Chl Dpth (m)	0.44	Hydr. Depth (m)		0.29	
Conv. Total (m3/s)	44.2	Conv. (m3/s)		44.2	
Length Wtd. (m)	92.50	Wetted Per. (m)		10.71	
Min Ch El (m)	179.49	Shear (N/m2)		8.81	
Alpha	1.00	Stream Power (N/m s)		7.14	
Frctn Loss (m)	0.54	Cum Volume (1000 m3)		0.22	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.81	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	179.99	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.030	
W.S. Elev (m)	179.95	Reach Len. (m)	77.00	92.50	108.00
Crit W.S. (m)		Flow Area (m2)		3.32	
E.G. Slope (m/m)	0.003202	Area (m2)		3.32	
Q Total (m3/s)	2.81	Flow (m3/s)		2.81	
Top Width (m)	11.02	Top Width (m)		11.02	
Vel Total (m/s)	0.85	Avg. Vel. (m/s)		0.85	
Max Chl Dpth (m)	0.46	Hydr. Depth (m)		0.30	
Conv. Total (m3/s)	49.7	Conv. (m3/s)		49.7	
Length Wtd. (m)	92.50	Wetted Per. (m)		11.08	
Min Ch El (m)	179.49	Shear (N/m2)		9.42	
Alpha	1.00	Stream Power (N/m s)		7.96	
Frctn Loss (m)	0.55	Cum Volume (1000 m3)		0.24	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.84	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	180.02	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.030	
W.S. Elev (m)	179.98	Reach Len. (m)	77.00	92.50	108.00
Crit W.S. (m)		Flow Area (m2)		3.61	
E.G. Slope (m/m)	0.003214	Area (m2)		3.61	
Q Total (m3/s)	3.16	Flow (m3/s)		3.16	
Top Width (m)	11.41	Top Width (m)		11.41	
Vel Total (m/s)	0.87	Avg. Vel. (m/s)		0.87	
Max Chl Dpth (m)	0.49	Hydr. Depth (m)		0.32	
Conv. Total (m3/s)	55.7	Conv. (m3/s)		55.7	
Length Wtd. (m)	92.50	Wetted Per. (m)		11.47	
Min Ch El (m)	179.49	Shear (N/m2)		9.92	
Alpha	1.00	Stream Power (N/m s)		8.68	
Frctn Loss (m)	0.54	Cum Volume (1000 m3)		0.26	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.87	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	180.09	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.	0.035	0.030	0.035
W.S. Elev (m)	180.04	Reach Len. (m)	77.00	92.50	108.00
Crit W.S. (m)		Flow Area (m2)	0.02	4.39	0.01
E.G. Slope (m/m)	0.003156	Area (m2)	0.02	4.39	0.01
Q Total (m3/s)	4.11	Flow (m3/s)	0.00	4.11	0.00
Top Width (m)	13.85	Top Width (m)	0.99	12.33	0.53
Vel Total (m/s)	0.93	Avg. Vel. (m/s)	0.12	0.94	0.10
Max Chl Dpth (m)	0.55	Hydr. Depth (m)	0.02	0.36	0.02
Conv. Total (m3/s)	73.2	Conv. (m3/s)	0.0	73.1	0.0
Length Wtd. (m)	92.50	Wetted Per. (m)	0.99	12.40	0.53
Min Ch El (m)	179.49	Shear (N/m2)	0.66	10.94	0.51
Alpha	1.01	Stream Power (N/m s)	0.08	10.25	0.05
Frctn Loss (m)	0.53	Cum Volume (1000 m3)	0.00	0.31	0.00
C & E Loss (m)	0.01	Cum SA (1000 m2)	0.04	0.94	0.03

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	179.93	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.030	
W.S. Elev (m)	179.90	Reach Len. (m)	77.00	92.50	108.00
Crit W.S. (m)		Flow Area (m2)		2.78	
E.G. Slope (m/m)	0.003148	Area (m2)		2.78	
Q Total (m3/s)	2.17	Flow (m3/s)		2.17	
Top Width (m)	10.25	Top Width (m)		10.25	
Vel Total (m/s)	0.78	Avg. Vel. (m/s)		0.78	
Max Chl Dpth (m)	0.41	Hydr. Depth (m)		0.27	
Conv. Total (m3/s)	38.7	Conv. (m3/s)		38.7	
Length Wtd. (m)	92.50	Wetted Per. (m)		10.30	
Min Ch El (m)	179.49	Shear (N/m2)		8.33	
Alpha	1.00	Stream Power (N/m s)		6.50	
Frctn Loss (m)	0.55	Cum Volume (1000 m3)		0.20	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.78	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Rouge
REACH: WC5 RS: 10

INPUT
Description: ST-10 (Added Sep 2016)
Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	182.07	2.39	182	9.1	181.73	14.91	181.5	17.88	181.35
21.14	181.16	23.79	181	27.73	180.65	29.35	180.5	30	180.35
31.49	180	32.56	179.75	33.62	179.5	34.6	179.3	36.03	179
37.36	178.98	37.94	178.97	39.76	179	39.91	179	40.47	179.1
42.82	179.5	43.46	179.5	44.55	179.5				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	33.62	.03	42.82	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
33.62	42.82	0	0	0 .1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	179.23	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.		0.030	
W.S. Elev (m)	179.16	Reach Len. (m)			
Crit W.S. (m)	179.16	Flow Area (m2)		0.80	
E.G. Slope (m/m)	0.017753	Area (m2)		0.80	
Q Total (m3/s)	0.98	Flow (m3/s)		0.98	
Top Width (m)	5.54	Top Width (m)		5.54	
Vel Total (m/s)	1.22	Avg. Vel. (m/s)		1.22	
Max Chl Dpth (m)	0.19	Hydr. Depth (m)		0.14	
Conv. Total (m3/s)	7.4	Conv. (m3/s)		7.4	
Length Wtd. (m)		Wetted Per. (m)		5.57	
Min Ch El (m)	178.97	Shear (N/m2)		25.08	
Alpha	1.00	Stream Power (N/m s)		30.61	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	179.33	Element	Left OB	Channel	Right OB
Vel Head (m)	0.10	Wt. n-Val.		0.030	
W.S. Elev (m)	179.23	Reach Len. (m)			
Crit W.S. (m)	179.23	Flow Area (m2)		1.21	
E.G. Slope (m/m)	0.015600	Area (m2)		1.21	
Q Total (m3/s)	1.68	Flow (m3/s)		1.68	

Top Width (m)	6.28	Top Width (m)	6.28
Vel Total (m/s)	1.38	Avg. Vel. (m/s)	1.38
Max Chl Dpth (m)	0.26	Hydr. Depth (m)	0.19
Conv. Total (m3/s)	13.5	Conv. (m3/s)	13.5
Length Wtd. (m)		Wetted Per. (m)	6.33
Min Ch El (m)	178.97	Shear (N/m2)	29.34
Alpha	1.00	Stream Power (N/m s)	40.63
Frctn Loss (m)		Cum Volume (1000 m3)	
C & E Loss (m)		Cum SA (1000 m2)	

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	179.36	Element	Left OB	Channel	Right OB
Vel Head (m)	0.11	Wt. n-Val.		0.030	
W.S. Elev (m)	179.26	Reach Len. (m)			
Crit W.S. (m)	179.26	Flow Area (m2)		1.40	
E.G. Slope (m/m)	0.015022	Area (m2)		1.40	
Q Total (m3/s)	2.02	Flow (m3/s)		2.02	
Top Width (m)	6.59	Top Width (m)		6.59	
Vel Total (m/s)	1.45	Avg. Vel. (m/s)		1.45	
Max Chl Dpth (m)	0.29	Hydr. Depth (m)		0.21	
Conv. Total (m3/s)	16.5	Conv. (m3/s)		16.5	
Length Wtd. (m)		Wetted Per. (m)		6.63	
Min Ch El (m)	178.97	Shear (N/m2)		31.02	
Alpha	1.00	Stream Power (N/m s)		44.85	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	179.41	Element	Left OB	Channel	Right OB
Vel Head (m)	0.12	Wt. n-Val.		0.030	
W.S. Elev (m)	179.29	Reach Len. (m)			
Crit W.S. (m)	179.29	Flow Area (m2)		1.64	
E.G. Slope (m/m)	0.014369	Area (m2)		1.64	
Q Total (m3/s)	2.48	Flow (m3/s)		2.48	
Top Width (m)	6.96	Top Width (m)		6.96	
Vel Total (m/s)	1.51	Avg. Vel. (m/s)		1.51	
Max Chl Dpth (m)	0.32	Hydr. Depth (m)		0.24	
Conv. Total (m3/s)	20.7	Conv. (m3/s)		20.7	
Length Wtd. (m)		Wetted Per. (m)		7.02	
Min Ch El (m)	178.97	Shear (N/m2)		32.88	
Alpha	1.00	Stream Power (N/m s)		49.78	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	179.44	Element	Left OB	Channel	Right OB
Vel Head (m)	0.13	Wt. n-Val.		0.030	
W.S. Elev (m)	179.31	Reach Len. (m)			
Crit W.S. (m)	179.31	Flow Area (m2)		1.79	
E.G. Slope (m/m)	0.014353	Area (m2)		1.79	
Q Total (m3/s)	2.81	Flow (m3/s)		2.81	
Top Width (m)	7.19	Top Width (m)		7.19	
Vel Total (m/s)	1.57	Avg. Vel. (m/s)		1.57	
Max Chl Dpth (m)	0.34	Hydr. Depth (m)		0.25	
Conv. Total (m3/s)	23.5	Conv. (m3/s)		23.5	
Length Wtd. (m)		Wetted Per. (m)		7.25	
Min Ch El (m)	178.97	Shear (N/m2)		34.72	
Alpha	1.00	Stream Power (N/m s)		54.53	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	179.47	Element	Left OB	Channel	Right OB
Vel Head (m)	0.13	Wt. n-Val.		0.030	
W.S. Elev (m)	179.34	Reach Len. (m)			
Crit W.S. (m)	179.34	Flow Area (m2)		1.97	
E.G. Slope (m/m)	0.013859	Area (m2)		1.97	
Q Total (m3/s)	3.16	Flow (m3/s)		3.16	
Top Width (m)	7.46	Top Width (m)		7.46	
Vel Total (m/s)	1.61	Avg. Vel. (m/s)		1.61	
Max Chl Dpth (m)	0.37	Hydr. Depth (m)		0.26	
Conv. Total (m3/s)	26.8	Conv. (m3/s)		26.8	
Length Wtd. (m)		Wetted Per. (m)		7.52	
Min Ch El (m)	178.97	Shear (N/m2)		35.57	
Alpha	1.00	Stream Power (N/m s)		57.11	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	179.54	Element	Left OB	Channel	Right OB
Vel Head (m)	0.15	Wt. n-Val.		0.030	
W.S. Elev (m)	179.39	Reach Len. (m)			
Crit W.S. (m)	179.39	Flow Area (m2)		2.39	
E.G. Slope (m/m)	0.013597	Area (m2)		2.39	
Q Total (m3/s)	4.11	Flow (m3/s)		4.11	
Top Width (m)	8.04	Top Width (m)		8.04	
Vel Total (m/s)	1.72	Avg. Vel. (m/s)		1.72	
Max Chl Dpth (m)	0.42	Hydr. Depth (m)		0.30	
Conv. Total (m3/s)	35.2	Conv. (m3/s)		35.2	
Length Wtd. (m)		Wetted Per. (m)		8.12	
Min Ch El (m)	178.97	Shear (N/m2)		39.25	
Alpha	1.00	Stream Power (N/m s)		67.52	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	179.38	Element	Left OB	Channel	Right OB
Vel Head (m)	0.11	Wt. n-Val.		0.030	
W.S. Elev (m)	179.27	Reach Len. (m)			
Crit W.S. (m)	179.27	Flow Area (m2)		1.47	
E.G. Slope (m/m)	0.014963	Area (m2)		1.47	
Q Total (m3/s)	2.17	Flow (m3/s)		2.17	
Top Width (m)	6.70	Top Width (m)		6.70	
Vel Total (m/s)	1.48	Avg. Vel. (m/s)		1.48	
Max Chl Dpth (m)	0.30	Hydr. Depth (m)		0.22	
Conv. Total (m3/s)	17.7	Conv. (m3/s)		17.7	
Length Wtd. (m)		Wetted Per. (m)		6.75	
Min Ch El (m)	178.97	Shear (N/m2)		31.95	
Alpha	1.00	Stream Power (N/m s)		47.14	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

SUMMARY OF MANNING'S N VALUES

River:Rouge

Reach	River Sta.	n1	n2	n3
WC5	300	.035	.03	.035
WC5	200	.035	.03	.035
WC5	100	.035	.03	.035
WC5	10	.035	.03	.035

SUMMARY OF REACH LENGTHS

River: Rouge

Reach	River Sta.	Left	Channel	Right
WC5	300	45.3	45.3	45.3
WC5	200	40.5	40.5	40.5
WC5	100	77	92.5	108
WC5	10	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Rouge

Reach	River Sta.	Contr.	Expan.
WC5	300	.1	.3
WC5	200	.1	.3
WC5	100	.1	.3
WC5	10	.1	.3

Profile Output Table - Standard Table 1

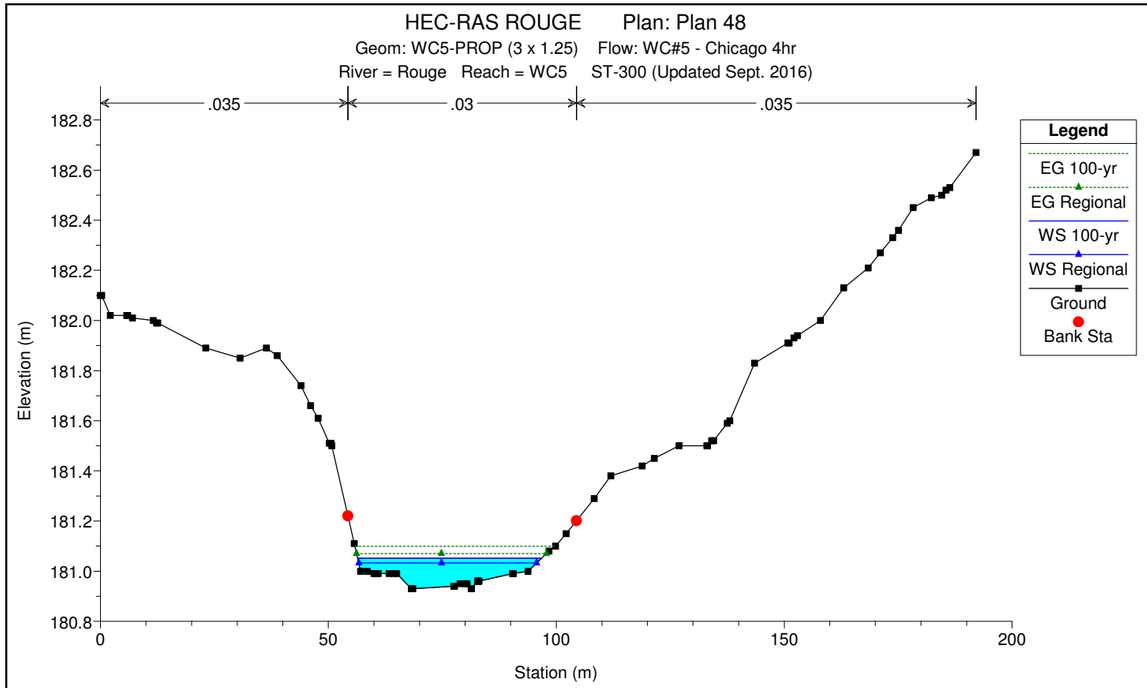
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
WC5	300	2-yr	0.98	180.93	181.02		181.03	0.007866	0.44	2.22	38.48	0.59
WC5	300	5-yr	1.68	180.93	181.05	181.03	181.06	0.008544	0.55	3.04	39.94	0.64
WC5	300	10-yr	2.02	180.93	181.06	181.03	181.07	0.008408	0.59	3.43	40.63	0.65
WC5	300	25-yr	2.48	180.93	181.07	181.04	181.09	0.008465	0.64	3.91	41.45	0.66
WC5	300	50-yr	2.81	180.93	181.08	181.05	181.10	0.008366	0.66	4.25	42.02	0.66
WC5	300	100-yr	3.16	180.93	181.08	181.05	181.11	0.008181	0.68	4.62	42.68	0.66
WC5	300	Check Flow	4.11	180.93	181.10		181.13	0.008205	0.75	5.48	44.24	0.68
WC5	300	Regional	2.17	180.93	181.06	181.03	181.08	0.008507	0.61	3.58	40.89	0.65
WC5	200	2-yr	0.98	180.29	180.42	180.42	180.46	0.024175	0.88	1.11	15.83	1.06
WC5	200	5-yr	1.68	180.29	180.46	180.46	180.50	0.019504	0.94	1.79	19.86	1.00
WC5	200	10-yr	2.02	180.29	180.47	180.47	180.52	0.019420	0.98	2.06	21.23	1.01
WC5	200	25-yr	2.48	180.29	180.49	180.49	180.54	0.018469	1.01	2.44	23.06	1.00
WC5	200	50-yr	2.81	180.29	180.50	180.50	180.56	0.018416	1.04	2.70	24.54	1.00
WC5	200	100-yr	3.16	180.29	180.51	180.51	180.57	0.017922	1.07	2.96	25.25	1.00
WC5	200	Check Flow	4.11	180.29	180.53	180.53	180.60	0.017320	1.15	3.57	26.47	1.00
WC5	200	Regional	2.17	180.29	180.48	180.48	180.53	0.018814	0.99	2.20	21.91	1.00
WC5	100	2-yr	0.98	179.49	179.78	179.67	179.79	0.002959	0.61	1.61	8.23	0.44
WC5	100	5-yr	1.68	179.49	179.86		179.88	0.003102	0.72	2.33	9.56	0.47
WC5	100	10-yr	2.02	179.49	179.89		179.92	0.003188	0.77	2.63	10.02	0.48
WC5	100	25-yr	2.48	179.49	179.93		179.96	0.003146	0.81	3.06	10.65	0.48
WC5	100	50-yr	2.81	179.49	179.95		179.99	0.003202	0.85	3.32	11.02	0.49
WC5	100	100-yr	3.16	179.49	179.98		180.02	0.003214	0.87	3.61	11.41	0.50
WC5	100	Check Flow	4.11	179.49	180.04		180.09	0.003156	0.94	4.42	13.85	0.50
WC5	100	Regional	2.17	179.49	179.90		179.93	0.003148	0.78	2.78	10.25	0.48
WC5	10	2-yr	0.98	178.97	179.16	179.16	179.23	0.017753	1.22	0.80	5.54	1.02
WC5	10	5-yr	1.68	178.97	179.23	179.23	179.33	0.015600	1.38	1.21	6.28	1.01
WC5	10	10-yr	2.02	178.97	179.26	179.26	179.36	0.015022	1.45	1.40	6.59	1.00
WC5	10	25-yr	2.48	178.97	179.29	179.29	179.41	0.014369	1.51	1.64	6.96	1.00
WC5	10	50-yr	2.81	178.97	179.31	179.31	179.44	0.014353	1.57	1.79	7.19	1.01
WC5	10	100-yr	3.16	178.97	179.34	179.34	179.47	0.013859	1.61	1.97	7.46	1.00
WC5	10	Check Flow	4.11	178.97	179.39	179.39	179.54	0.013597	1.72	2.39	8.04	1.01
WC5	10	Regional	2.17	178.97	179.27	179.27	179.38	0.014963	1.48	1.47	6.70	1.01

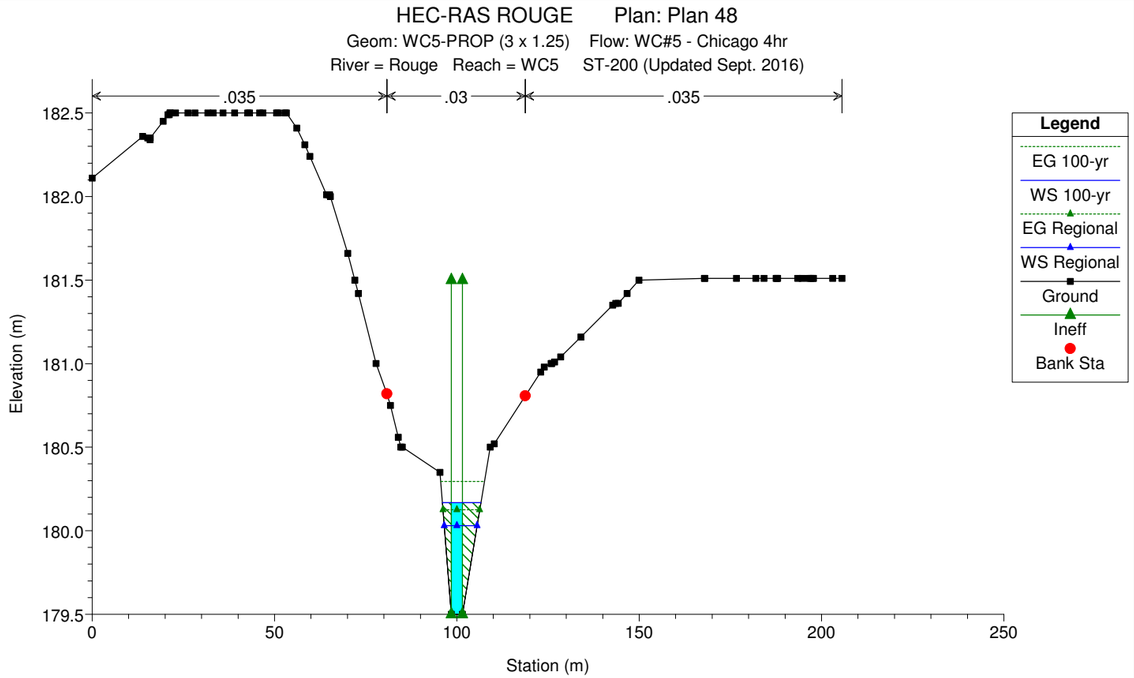
Profile Output Table - Standard Table 2

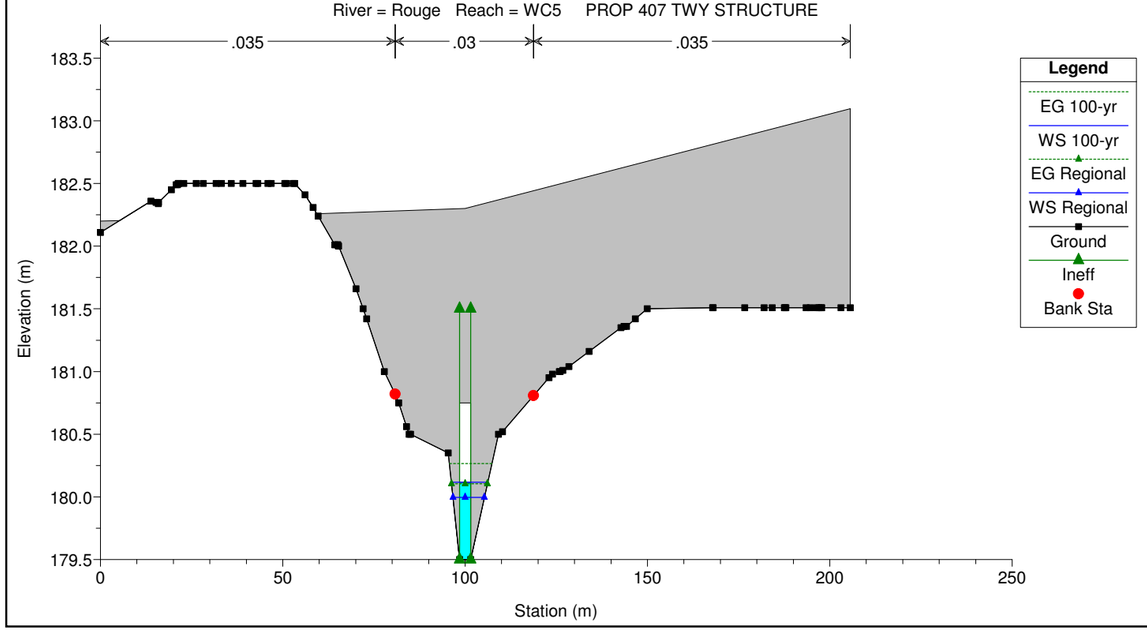
Reach	River Sta	Profile	E.G. Elev (m)	W.S. Elev (m)	Vel Head (m)	Frctn Loss (m)	C & E Loss (m)	Q Left (m3/s)	Q Channel (m3/s)	Q Right (m3/s)	Top Width (m)
WC5	300	2-yr	181.03	181.02	0.01	0.58	0.00		0.98		38.48
WC5	300	5-yr	181.06	181.05	0.02	0.56	0.00		1.68		39.94
WC5	300	10-yr	181.07	181.06	0.02	0.55	0.00		2.02		40.63
WC5	300	25-yr	181.09	181.07	0.02	0.55	0.00		2.48		41.45
WC5	300	50-yr	181.10	181.08	0.02	0.54	0.00		2.81		42.02
WC5	300	100-yr	181.11	181.08	0.02	0.53	0.00		3.16		42.68
WC5	300	Check Flow	181.13	181.10	0.03	0.52	0.00		4.11		44.24
WC5	300	Regional	181.08	181.06	0.02	0.55	0.00		2.17		40.89
WC5	200	2-yr	180.46	180.42	0.04	0.26	0.01		0.98		15.83
WC5	200	5-yr	180.50	180.46	0.04	0.26	0.01		1.68		19.86
WC5	200	10-yr	180.52	180.47	0.05	0.26	0.01		2.02		21.23
WC5	200	25-yr	180.54	180.49	0.05	0.26	0.01		2.48		23.06
WC5	200	50-yr	180.56	180.50	0.06	0.26	0.01		2.81		24.54
WC5	200	100-yr	180.57	180.51	0.06	0.26	0.01		3.16		25.25
WC5	200	Check Flow	180.60	180.53	0.07	0.25	0.01		4.11		26.47
WC5	200	Regional	180.53	180.48	0.05	0.26	0.01		2.17		21.91
WC5	100	2-yr	179.79	179.78	0.02	0.55	0.01		0.98		8.23
WC5	100	5-yr	179.88	179.86	0.03	0.55	0.01		1.68		9.56
WC5	100	10-yr	179.92	179.89	0.03	0.55	0.01		2.02		10.02
WC5	100	25-yr	179.96	179.93	0.03	0.54	0.01		2.48		10.65
WC5	100	50-yr	179.99	179.95	0.04	0.55	0.01		2.81		11.02
WC5	100	100-yr	180.02	179.98	0.04	0.54	0.01		3.16		11.41
WC5	100	Check Flow	180.09	180.04	0.04	0.53	0.01	0.00	4.11	0.00	13.85
WC5	100	Regional	179.93	179.90	0.03	0.55	0.01		2.17		10.25
WC5	10	2-yr	179.23	179.16	0.08				0.98		5.54
WC5	10	5-yr	179.33	179.23	0.10				1.68		6.28
WC5	10	10-yr	179.36	179.26	0.11				2.02		6.59
WC5	10	25-yr	179.41	179.29	0.12				2.48		6.96
WC5	10	50-yr	179.44	179.31	0.13				2.81		7.19
WC5	10	100-yr	179.47	179.34	0.13				3.16		7.46
WC5	10	Check Flow	179.54	179.39	0.15				4.11		8.04
WC5	10	Regional	179.38	179.27	0.11				2.17		6.70

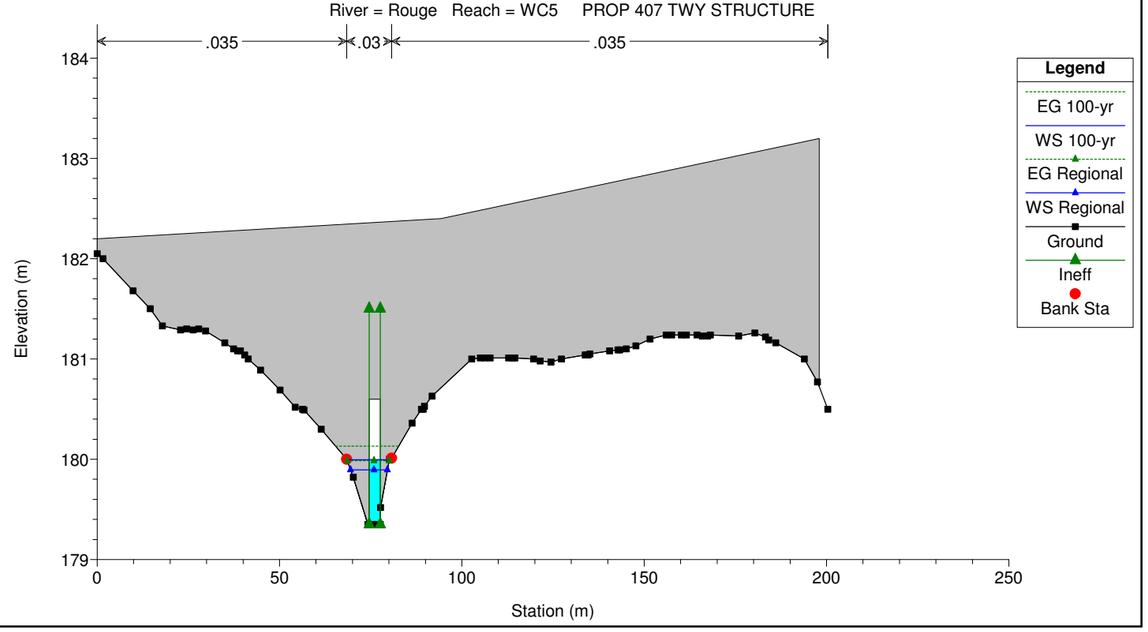
Profile Output Table - Culvert Only

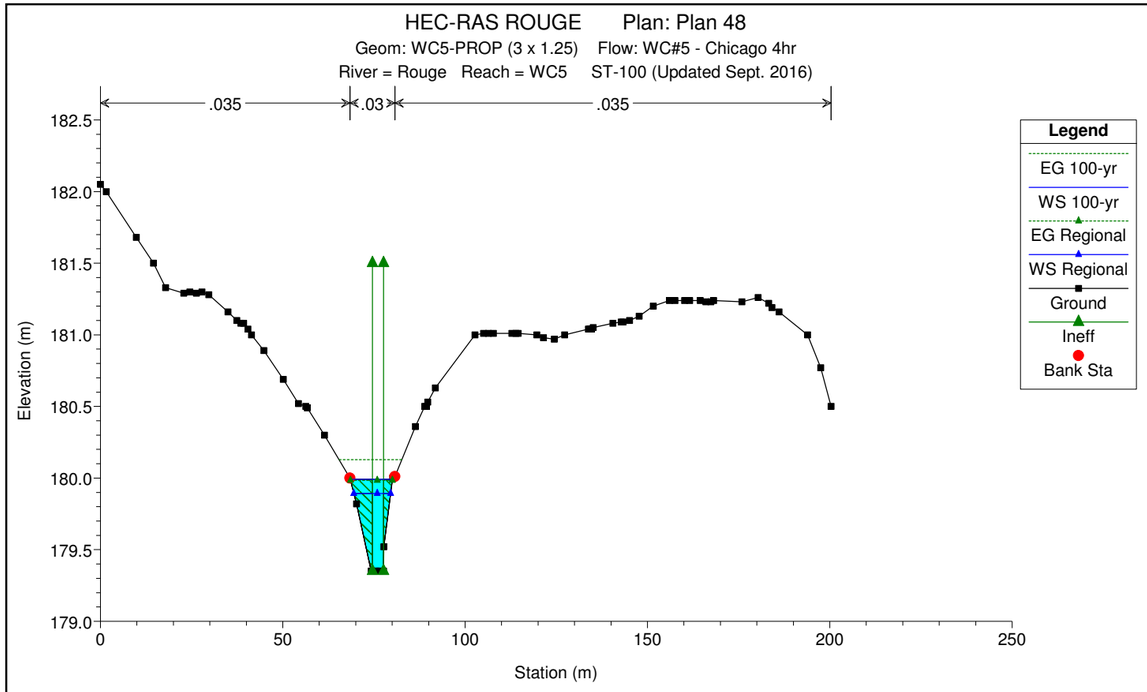
Reach	River Sta	Profile	E.G. US. (m)	W.S. US. (m)	E.G. IC (m)	E.G. OC (m)	Min El Weir Flow (m)	Q Culv Group (m3/s)	Q Weir (m3/s)	Delta WS (m)	Culv Vel US (m/s)	Culv Vel DS (m/s)

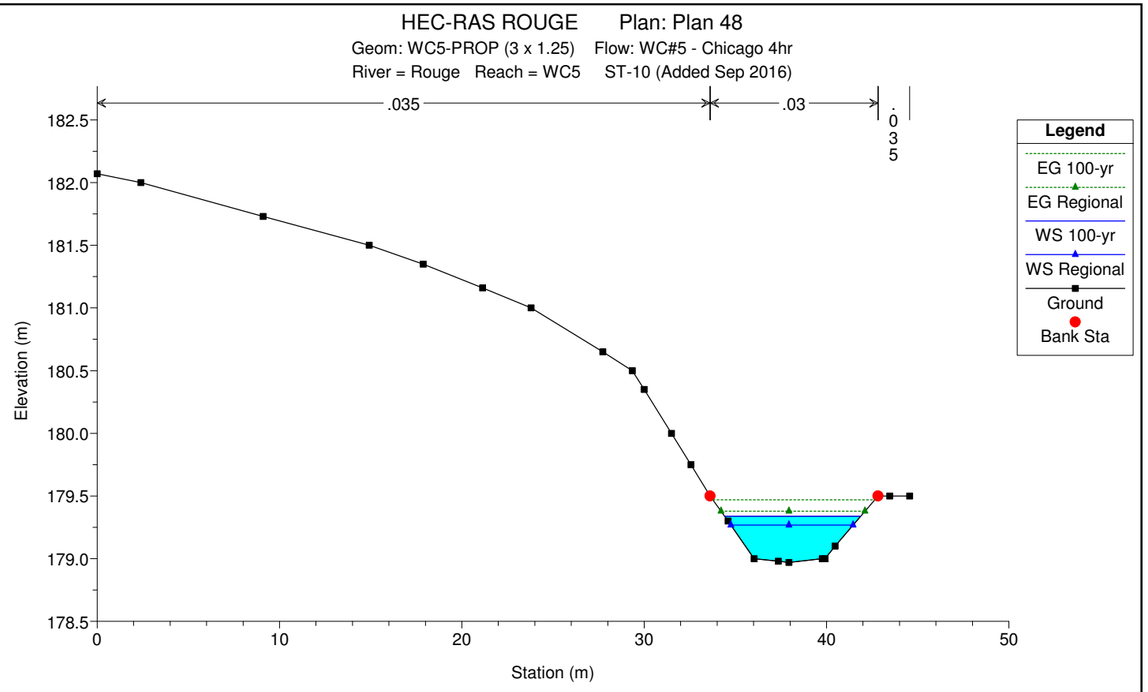

HEC-RAS ROUGE Plan: Plan 48
Geom: WC5-PROP (3 x 1.25) Flow: WC#5 - Chicago 4hr
River = Rouge Reach = WC5 ST-300 (Updated Sept. 2016)
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG 100-yr
EG Regional
WS 100-yr
WS Regional
Ground
Bank Sta


HEC-RAS ROUGE Plan: Plan 48
Geom: WC5-PROP (3 x 1.25) Flow: WC#5 - Chicago 4hr
River = Rouge Reach = WC5 ST-200 (Updated Sept. 2016)
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG 100-yr
WS 100-yr
EG Regional
WS Regional
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 48
Geom: WC5-PROP (3 x 1.25) Flow: WC#5 - Chicago 4hr
River = Rouge Reach = WC5 PROP 407 TWY STRUCTURE
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG 100-yr
WS 100-yr
EG Regional
WS Regional
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 48
Geom: WC5-PROP (3 x 1.25) Flow: WC#5 - Chicago 4hr
River = Rouge Reach = WC5 PROP 407 TWY STRUCTURE
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG 100-yr
WS 100-yr
EG Regional
WS Regional
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 48
Geom: WC5-PROP (3 x 1.25) Flow: WC#5 - Chicago 4hr
River = Rouge Reach = WC5 ST-100 (Updated Sept. 2016)
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG 100-yr
WS 100-yr
EG Regional
WS Regional
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 48
Geom: WC5-PROP (3 x 1.25) Flow: WC#5 - Chicago 4hr
River = Rouge Reach = WC5 ST-10 (Added Sep 2016)
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG 100-yr
EG Regional
WS 100-yr
WS Regional
Ground
Bank Sta

HEC-RAS Plan: WC5-PROP (4HR CH) River: Rouge Reach: WC5

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC5	300	2-yr	0.98	180.93	181.03	181.03	181.03	0.007620	0.44	2.24	38.52	0.58
WC5	300	5-yr	1.68	180.93	181.03	181.03	181.05	0.016893	0.69	2.45	38.89	0.87
WC5	300	10-yr	2.02	180.93	181.03	181.03	181.07	0.030776	0.89	2.28	38.58	1.17
WC5	300	25-yr	2.48	180.93	181.04	181.04	181.08	0.021368	0.85	2.91	39.71	1.01
WC5	300	50-yr	2.81	180.93	181.05	181.05	181.09	0.020462	0.88	3.19	40.21	1.00
WC5	300	100-yr	3.16	180.93	181.05	181.05	181.10	0.023642	0.96	3.28	40.38	1.08
WC5	300	Check Flow	4.11	180.93	181.07	181.07	181.12	0.023699	1.06	3.88	41.41	1.10
WC5	300	Regional	2.17	180.93	181.03	181.03	181.07	0.025596	0.86	2.53	39.03	1.08
WC5	200	2-yr	0.98	179.50	179.82	179.72	179.87	0.004182	1.01	0.97	6.64	0.57
WC5	200	5-yr	1.68	179.50	179.95	179.82	180.03	0.003959	1.24	1.36	8.11	0.59
WC5	200	10-yr	2.02	179.50	180.01	179.86	180.10	0.003913	1.33	1.52	8.73	0.59
WC5	200	25-yr	2.48	179.50	180.08	179.91	180.18	0.003857	1.43	1.73	9.51	0.60
WC5	200	50-yr	2.81	179.50	180.12	179.95	180.24	0.003832	1.50	1.87	10.03	0.61
WC5	200	100-yr	3.16	179.50	180.17	179.98	180.29	0.003843	1.58	2.00	10.54	0.62
WC5	200	Check Flow	4.11	179.50	180.28	180.07	180.44	0.003806	1.75	2.35	11.85	0.63
WC5	200	Regional	2.17	179.50	180.03	179.88	180.13	0.003903	1.36	1.59	8.99	0.60
WC5	150		Culvert									
WC5	100	2-yr	0.98	179.35	179.72	179.57	179.76	0.002619	0.88	1.11	7.67	0.46
WC5	100	5-yr	1.68	179.35	179.83		179.90	0.003190	1.16	1.45	9.22	0.53
WC5	100	10-yr	2.02	179.35	179.88		179.96	0.003472	1.28	1.58	9.86	0.56
WC5	100	25-yr	2.48	179.35	179.93		180.03	0.003791	1.43	1.74	10.67	0.60
WC5	100	50-yr	2.81	179.35	179.96		180.08	0.004042	1.53	1.84	11.17	0.62
WC5	100	100-yr	3.16	179.35	179.99		180.13	0.004396	1.64	1.92	11.60	0.66
WC5	100	Check Flow	4.11	179.35	180.08		180.26	0.004865	1.88	2.18	15.24	0.70
WC5	100	Regional	2.17	179.35	179.89		179.98	0.003620	1.33	1.63	10.11	0.58
WC5	10	2-yr	0.98	178.97	179.16	179.16	179.23	0.017753	1.22	0.80	5.54	1.02
WC5	10	5-yr	1.68	178.97	179.23	179.23	179.33	0.015600	1.38	1.21	6.28	1.01
WC5	10	10-yr	2.02	178.97	179.26	179.26	179.36	0.015022	1.45	1.40	6.59	1.00
WC5	10	25-yr	2.48	178.97	179.29	179.29	179.41	0.014369	1.51	1.64	6.96	1.00
WC5	10	50-yr	2.81	178.97	179.31	179.31	179.44	0.014353	1.57	1.79	7.19	1.01
WC5	10	100-yr	3.16	178.97	179.34	179.34	179.47	0.013859	1.61	1.97	7.46	1.00
WC5	10	Check Flow	4.11	178.97	179.39	179.39	179.54	0.013597	1.72	2.39	8.04	1.01
WC5	10	Regional	2.17	178.97	179.27	179.27	179.38	0.014963	1.48	1.47	6.70	1.01

HEC-RAS HEC-RAS 5.0.1 April 2016
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
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PROJECT DATA
Project Title: HEC-RAS ROUGE
Project File : HEC.prj
Run Date and Time: 9/23/2016 2:45:16 PM

Project in SI units

Project Description:
HEC-RAS model for creek crossings along the proposed 407 TWY Ph 2 started
from scratch

PLAN DATA

Plan Title: Plan 48
Plan File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.p48

Geometry Title: WC5-PROP (3 x 1.25)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g30

Flow Title : WC#5 - Chicago 4hr
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f04

Plan Summary Information:
Number of: Cross Sections = 4 Multiple Openings = 0
Culverts = 1 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: WC#5 - Chicago 4hr
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f04

Flow Data (m3/s)

River	Reach	RS	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Check Flow	Regional
Rouge	WC5	300	.98	1.68	2.02	2.48	2.81	3.16	4.11	2.17

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Rouge	WC5	2-yr		Critical
Rouge	WC5	5-yr		Critical
Rouge	WC5	10-yr		Critical
Rouge	WC5	25-yr		Critical
Rouge	WC5	50-yr		Critical
Rouge	WC5	100-yr		Critical
Rouge	WC5	Check Flow		Critical
Rouge	WC5	Regional		Critical

GEOMETRY DATA

Geometry Title: WC5-PROP (3 x 1.25)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g30

CROSS SECTION

RIVER: Rouge
REACH: WC5 RS: 300

INPUT
Description: ST-300 (Updated Sept. 2016)
Station Elevation Data num= 81

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	182.1	.26	182.1	2.18	182.02	5.78	182.02	5.97	182.02
7.02	182.01	11.57	182	12.3	181.99	12.57	181.99	23.13	181.89
30.63	181.85	36.4	181.89	38.8	181.86	44	181.74	46.07	181.66
47.78	181.61	50.19	181.51	50.56	181.51	50.73	181.5	54.28	181.22
55.67	181.11	57.07	181	58.57	181	60.01	180.99	60.54	180.99
60.96	180.99	63.34	180.99	64.3	180.99	64.97	180.99	68.19	180.93
68.52	180.93	77.5	180.94	77.7	180.94	78.89	180.95	80.12	180.95
80.46	180.95	81.34	180.93	81.4	180.93	82.7	180.96	82.79	180.96
82.86	180.96	82.89	180.96	82.94	180.96	83.05	180.96	90.43	180.99
90.49	180.99	90.5	180.99	90.52	180.99	93.81	181	98.42	181.08
99.82	181.1	102.18	181.15	104.42	181.201	108.32	181.29	111.94	181.38
118.82	181.42	121.51	181.45	126.93	181.5	133.01	181.5	133.2	181.5
134.05	181.52	134.49	181.52	137.51	181.59	138.04	181.6	143.48	181.83
150.78	181.91	151.09	181.91	152.12	181.93	152.9	181.94	157.95	182
163.04	182.13	168.4	182.21	171.08	182.27	173.78	182.33	175.08	182.36
178.27	182.45	182.26	182.49	184.53	182.5	185.47	182.52	186.34	182.53
192.1	182.67								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	54.28	.03	104.42	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
54.28 104.42 45.3 45.3 45.3 .3 .5

CROSS SECTION OUTPUT Profile #2-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	181.03	Element			
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	181.03	Reach Len. (m)	45.30	45.30	45.30
Crit W.S. (m)	181.03	Flow Area (m2)		2.24	
E.G. Slope (m/m)	0.007620	Area (m2)		2.24	
Q Total (m3/s)	0.98	Flow (m3/s)		0.98	
Top Width (m)	38.52	Top Width (m)		38.52	
Vel Total (m/s)	0.44	Avg. Vel. (m/s)		0.44	
Max Chl Dpth (m)	0.10	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	11.2	Conv. (m3/s)		11.2	

Length Wtd. (m)	45.30	Wetted Per. (m)	38.52
Min Ch El (m)	180.93	Shear (N/m2)	4.35
Alpha	1.00	Stream Power (N/m s)	1.90
Frctn Loss (m)	0.25	Cum Volume (1000 m3)	0.26
C & E Loss (m)	0.01	Cum SA (1000 m2)	1.92

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	181.05	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	181.03	Reach Len. (m)	45.30	45.30	45.30
Crit W.S. (m)	181.03	Flow Area (m2)		2.45	
E.G. Slope (m/m)	0.016893	Area (m2)		2.45	
Q Total (m3/s)	1.68	Flow (m3/s)		1.68	
Top Width (m)	38.89	Top Width (m)		38.89	
Vel Total (m/s)	0.69	Avg. Vel. (m/s)		0.69	
Max Chl Dpth (m)	0.10	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	12.9	Conv. (m3/s)		12.9	
Length Wtd. (m)	45.30	Wetted Per. (m)		38.90	
Min Ch El (m)	180.93	Shear (N/m2)		10.43	
Alpha	1.00	Stream Power (N/m s)		7.16	
Frctn Loss (m)	0.33	Cum Volume (1000 m3)		0.36	
C & E Loss (m)	0.02	Cum SA (1000 m2)		2.13	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	181.07	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.030	
W.S. Elev (m)	181.03	Reach Len. (m)	45.30	45.30	45.30
Crit W.S. (m)	181.03	Flow Area (m2)		2.28	
E.G. Slope (m/m)	0.030776	Area (m2)		2.28	
Q Total (m3/s)	2.02	Flow (m3/s)		2.02	
Top Width (m)	38.58	Top Width (m)		38.58	
Vel Total (m/s)	0.89	Avg. Vel. (m/s)		0.89	
Max Chl Dpth (m)	0.10	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	11.5	Conv. (m3/s)		11.5	
Length Wtd. (m)	45.30	Wetted Per. (m)		38.58	
Min Ch El (m)	180.93	Shear (N/m2)		17.82	
Alpha	1.00	Stream Power (N/m s)		15.80	
Frctn Loss (m)	0.39	Cum Volume (1000 m3)		0.40	
C & E Loss (m)	0.01	Cum SA (1000 m2)		2.21	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	181.08	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.030	
W.S. Elev (m)	181.04	Reach Len. (m)	45.30	45.30	45.30
Crit W.S. (m)	181.04	Flow Area (m2)		2.91	
E.G. Slope (m/m)	0.021368	Area (m2)		2.91	
Q Total (m3/s)	2.48	Flow (m3/s)		2.48	
Top Width (m)	39.71	Top Width (m)		39.71	
Vel Total (m/s)	0.85	Avg. Vel. (m/s)		0.85	
Max Chl Dpth (m)	0.11	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	17.0	Conv. (m3/s)		17.0	
Length Wtd. (m)	45.30	Wetted Per. (m)		39.72	
Min Ch El (m)	180.93	Shear (N/m2)		15.34	
Alpha	1.00	Stream Power (N/m s)		13.08	
Frctn Loss (m)	0.34	Cum Volume (1000 m3)		0.48	
C & E Loss (m)	0.02	Cum SA (1000 m2)		2.34	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	181.09	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.030	
W.S. Elev (m)	181.05	Reach Len. (m)	45.30	45.30	45.30
Crit W.S. (m)	181.05	Flow Area (m2)		3.19	
E.G. Slope (m/m)	0.020462	Area (m2)		3.19	
Q Total (m3/s)	2.81	Flow (m3/s)		2.81	
Top Width (m)	40.21	Top Width (m)		40.21	
Vel Total (m/s)	0.88	Avg. Vel. (m/s)		0.88	
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	19.6	Conv. (m3/s)		19.6	
Length Wtd. (m)	45.30	Wetted Per. (m)		40.22	
Min Ch El (m)	180.93	Shear (N/m2)		15.92	
Alpha	1.00	Stream Power (N/m s)		14.02	
Frctn Loss (m)	0.34	Cum Volume (1000 m3)		0.52	
C & E Loss (m)	0.02	Cum SA (1000 m2)		2.42	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	181.10	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.030	
W.S. Elev (m)	181.05	Reach Len. (m)	45.30	45.30	45.30
Crit W.S. (m)	181.05	Flow Area (m2)		3.28	
E.G. Slope (m/m)	0.023642	Area (m2)		3.28	
Q Total (m3/s)	3.16	Flow (m3/s)		3.16	
Top Width (m)	40.38	Top Width (m)		40.38	
Vel Total (m/s)	0.96	Avg. Vel. (m/s)		0.96	
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	20.6	Conv. (m3/s)		20.6	
Length Wtd. (m)	45.30	Wetted Per. (m)		40.38	

Min Ch El (m)	180.93	Shear (N/m2)	18.86
Alpha	1.00	Stream Power (N/m s)	18.14
Frctn Loss (m)	0.35	Cum Volume (1000 m3)	0.57
C & E Loss (m)	0.02	Cum SA (1000 m2)	2.48

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	181.12	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.030	
W.S. Elev (m)	181.07	Reach Len. (m)	45.30	45.30	45.30
Crit W.S. (m)	181.07	Flow Area (m2)		3.88	
E.G. Slope (m/m)	0.023699	Area (m2)		3.88	
Q Total (m3/s)	4.11	Flow (m3/s)		4.11	
Top Width (m)	41.41	Top Width (m)		41.41	
Vel Total (m/s)	1.06	Avg. Vel. (m/s)		1.06	
Max Chl Dpth (m)	0.14	Hydr. Depth (m)		0.09	
Conv. Total (m3/s)	26.7	Conv. (m3/s)		26.7	
Length Wtd. (m)	45.30	Wetted Per. (m)		41.41	
Min Ch El (m)	180.93	Shear (N/m2)		21.78	
Alpha	1.00	Stream Power (N/m s)		23.07	
Frctn Loss (m)	0.35	Cum Volume (1000 m3)	0.00	0.69	0.00
C & E Loss (m)	0.03	Cum SA (1000 m2)	0.11	2.64	0.08

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	181.07	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.030	
W.S. Elev (m)	181.03	Reach Len. (m)	45.30	45.30	45.30
Crit W.S. (m)	181.03	Flow Area (m2)		2.53	
E.G. Slope (m/m)	0.025596	Area (m2)		2.53	
Q Total (m3/s)	2.17	Flow (m3/s)		2.17	
Top Width (m)	39.03	Top Width (m)		39.03	
Vel Total (m/s)	0.86	Avg. Vel. (m/s)		0.86	
Max Chl Dpth (m)	0.10	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	13.6	Conv. (m3/s)		13.6	
Length Wtd. (m)	45.30	Wetted Per. (m)		39.03	
Min Ch El (m)	180.93	Shear (N/m2)		16.24	
Alpha	1.00	Stream Power (N/m s)		13.95	
Frctn Loss (m)	0.37	Cum Volume (1000 m3)		0.43	
C & E Loss (m)	0.02	Cum SA (1000 m2)		2.25	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Rouge
REACH: WC5 RS: 200

INPUT
Description: ST-200 (Updated Sept. 2016)
Station Elevation Data num= 75

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	182.11	13.84	182.36	15.21	182.35	15.87	182.34	15.93	182.35
19.48	182.45	20.8	182.49	21.1	182.49	21.36	182.5	21.38	182.5
22.82	182.5	26.26	182.5	28.16	182.5	31.73	182.5	33.2	182.5
35.88	182.5	39.09	182.5	42.63	182.5	43.14	182.5	45.94	182.5
46.8	182.5	50.53	182.5	50.97	182.5	52.83	182.5	53.26	182.5
56.11	182.41	58.29	182.31	59.7	182.24	64.26	182.01	64.99	182.01
65.12	182.01	65.29	182	70.09	181.66	72.05	181.5	72.97	181.42
77.83	181	80.85	180.82	81.76	180.75	83.93	180.56	84.65	180.5
85.01	180.5	95.38	180.35	98.5	179.5	101.5	179.5	109.12	180.5
110.26	180.52	118.75	180.807	123	180.95	123.94	180.98	125.86	181
126.01	181	126.78	181.01	128.44	181.04	133.99	181.16	142.76	181.35
143.55	181.36	144.28	181.36	146.66	181.42	149.95	181.5	167.9	181.51
168.02	181.51	176.64	181.51	182.01	181.51	184.21	181.51	187.51	181.51
187.76	181.51	187.92	181.51	193.5	181.51	194.67	181.51	196.5	181.51
197.04	181.51	197.59	181.51	197.78	181.51	203.05	181.51	205.64	181.51

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	80.85	.03	118.75	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
80.85	118.75	40.5	40.5	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	98.5	181.5	T
101.5	205.64	181.5	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	179.87	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.030	
W.S. Elev (m)	179.82	Reach Len. (m)	40.50	40.50	40.50
Crit W.S. (m)	179.72	Flow Area (m2)		0.97	
E.G. Slope (m/m)	0.004182	Area (m2)		1.55	
Q Total (m3/s)	0.98	Flow (m3/s)		0.98	
Top Width (m)	6.64	Top Width (m)		6.64	
Vel Total (m/s)	1.01	Avg. Vel. (m/s)		1.01	
Max Chl Dpth (m)	0.32	Hydr. Depth (m)		0.32	
Conv. Total (m3/s)	15.2	Conv. (m3/s)		15.2	
Length Wtd. (m)	40.50	Wetted Per. (m)		3.00	
Min Ch El (m)	179.50	Shear (N/m2)		13.22	
Alpha	1.00	Stream Power (N/m s)		13.40	
Frctn Loss (m)		Cum Volume (1000 m3)		0.17	
C & E Loss (m)		Cum SA (1000 m2)		0.90	

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	180.03	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.		0.030	
W.S. Elev (m)	179.95	Reach Len. (m)	40.50	40.50	40.50
Crit W.S. (m)	179.82	Flow Area (m2)		1.36	
E.G. Slope (m/m)	0.003959	Area (m2)		2.52	
Q Total (m3/s)	1.68	Flow (m3/s)		1.68	
Top Width (m)	8.11	Top Width (m)		8.11	
Vel Total (m/s)	1.24	Avg. Vel. (m/s)		1.24	
Max Chl Dpth (m)	0.45	Hydr. Depth (m)		0.45	
Conv. Total (m3/s)	26.7	Conv. (m3/s)		26.7	
Length Wtd. (m)	40.50	Wetted Per. (m)		3.00	
Min Ch El (m)	179.50	Shear (N/m2)		17.58	

Alpha	1.00	Stream Power (N/m s)	21.74
Frctn Loss (m)		Cum Volume (1000 m3)	0.25
C & E Loss (m)		Cum SA (1000 m2)	1.07

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	180.10	Element	Left OB	Channel	Right OB
Vel Head (m)	0.09	Wt. n-Val.		0.030	
W.S. Elev (m)	180.01	Reach Len. (m)	40.50	40.50	40.50
Crit W.S. (m)	179.86	Flow Area (m2)		1.52	
E.G. Slope (m/m)	0.003913	Area (m2)		2.98	
Q Total (m3/s)	2.02	Flow (m3/s)		2.02	
Top Width (m)	8.73	Top Width (m)		8.73	
Vel Total (m/s)	1.33	Avg. Vel. (m/s)		1.33	
Max Chl Dpth (m)	0.51	Hydr. Depth (m)		0.51	
Conv. Total (m3/s)	32.3	Conv. (m3/s)		32.3	
Length Wtd. (m)	40.50	Wetted Per. (m)		3.00	
Min Ch El (m)	179.50	Shear (N/m2)		19.47	
Alpha	1.00	Stream Power (N/m s)		25.84	
Frctn Loss (m)		Cum Volume (1000 m3)		0.29	
C & E Loss (m)		Cum SA (1000 m2)		1.14	

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	180.18	Element	Left OB	Channel	Right OB
Vel Head (m)	0.10	Wt. n-Val.		0.030	
W.S. Elev (m)	180.08	Reach Len. (m)	40.50	40.50	40.50
Crit W.S. (m)	179.91	Flow Area (m2)		1.73	
E.G. Slope (m/m)	0.003857	Area (m2)		3.61	
Q Total (m3/s)	2.48	Flow (m3/s)		2.48	
Top Width (m)	9.51	Top Width (m)		9.51	
Vel Total (m/s)	1.43	Avg. Vel. (m/s)		1.43	
Max Chl Dpth (m)	0.58	Hydr. Depth (m)		0.58	
Conv. Total (m3/s)	39.9	Conv. (m3/s)		39.9	
Length Wtd. (m)	40.50	Wetted Per. (m)		3.00	
Min Ch El (m)	179.50	Shear (N/m2)		21.80	
Alpha	1.00	Stream Power (N/m s)		31.27	
Frctn Loss (m)		Cum Volume (1000 m3)		0.33	
C & E Loss (m)		Cum SA (1000 m2)		1.22	

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	180.24	Element	Left OB	Channel	Right OB
Vel Head (m)	0.12	Wt. n-Val.		0.030	
W.S. Elev (m)	180.12	Reach Len. (m)	40.50	40.50	40.50
Crit W.S. (m)	179.95	Flow Area (m2)		1.87	
E.G. Slope (m/m)	0.003832	Area (m2)		4.06	
Q Total (m3/s)	2.81	Flow (m3/s)		2.81	
Top Width (m)	10.03	Top Width (m)		10.03	
Vel Total (m/s)	1.50	Avg. Vel. (m/s)		1.50	
Max Chl Dpth (m)	0.62	Hydr. Depth (m)		0.62	
Conv. Total (m3/s)	45.4	Conv. (m3/s)		45.4	
Length Wtd. (m)	40.50	Wetted Per. (m)		3.00	
Min Ch El (m)	179.50	Shear (N/m2)		23.40	
Alpha	1.00	Stream Power (N/m s)		35.20	
Frctn Loss (m)		Cum Volume (1000 m3)		0.36	
C & E Loss (m)		Cum SA (1000 m2)		1.28	

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	180.29	Element	Left OB	Channel	Right OB
Vel Head (m)	0.13	Wt. n-Val.		0.030	
W.S. Elev (m)	180.17	Reach Len. (m)	40.50	40.50	40.50
Crit W.S. (m)	179.98	Flow Area (m2)		2.00	
E.G. Slope (m/m)	0.003843	Area (m2)		4.52	
Q Total (m3/s)	3.16	Flow (m3/s)		3.16	
Top Width (m)	10.54	Top Width (m)		10.54	
Vel Total (m/s)	1.58	Avg. Vel. (m/s)		1.58	
Max Chl Dpth (m)	0.67	Hydr. Depth (m)		0.67	
Conv. Total (m3/s)	51.0	Conv. (m3/s)		51.0	
Length Wtd. (m)	40.50	Wetted Per. (m)		3.00	
Min Ch El (m)	179.50	Shear (N/m2)		25.15	
Alpha	1.00	Stream Power (N/m s)		39.70	
Frctn Loss (m)		Cum Volume (1000 m3)		0.39	
C & E Loss (m)		Cum SA (1000 m2)		1.33	

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	180.44	Element	Left OB	Channel	Right OB
Vel Head (m)	0.16	Wt. n-Val.		0.030	
W.S. Elev (m)	180.28	Reach Len. (m)	40.50	40.50	40.50
Crit W.S. (m)	180.07	Flow Area (m2)		2.35	
E.G. Slope (m/m)	0.003806	Area (m2)		5.82	
Q Total (m3/s)	4.11	Flow (m3/s)		4.11	
Top Width (m)	11.85	Top Width (m)		11.85	
Vel Total (m/s)	1.75	Avg. Vel. (m/s)		1.75	
Max Chl Dpth (m)	0.78	Hydr. Depth (m)		0.78	
Conv. Total (m3/s)	66.6	Conv. (m3/s)		66.6	
Length Wtd. (m)	40.50	Wetted Per. (m)		3.00	
Min Ch El (m)	179.50	Shear (N/m2)		29.25	
Alpha	1.00	Stream Power (N/m s)		51.13	
Frctn Loss (m)		Cum Volume (1000 m3)	0.00	0.47	0.00
C & E Loss (m)		Cum SA (1000 m2)	0.11	1.43	0.08

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	180.13	Element	Left OB	Channel	Right OB
Vel Head (m)	0.09	Wt. n-Val.		0.030	
W.S. Elev (m)	180.03	Reach Len. (m)	40.50	40.50	40.50
Crit W.S. (m)	179.88	Flow Area (m2)		1.59	
E.G. Slope (m/m)	0.003903	Area (m2)		3.18	
Q Total (m3/s)	2.17	Flow (m3/s)		2.17	
Top Width (m)	8.99	Top Width (m)		8.99	
Vel Total (m/s)	1.36	Avg. Vel. (m/s)		1.36	
Max Chl Dpth (m)	0.53	Hydr. Depth (m)		0.53	
Conv. Total (m3/s)	34.7	Conv. (m3/s)		34.7	
Length Wtd. (m)	40.50	Wetted Per. (m)		3.00	
Min Ch El (m)	179.50	Shear (N/m2)		20.29	
Alpha	1.00	Stream Power (N/m s)		27.69	
Frctn Loss (m)		Cum Volume (1000 m3)		0.30	
C & E Loss (m)		Cum SA (1000 m2)		1.16	

CULVERT

RIVER: Rouge
REACH: WC5 RS: 150

INPUT
Description: PROP 407 TWY STRUCTURE
Distance from Upstream XS = 14.6
Deck/Roadway Width = 12
Weir Coefficient = 1.4
Upstream Deck/Roadway Coordinates
num= 3

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	182.2		100	182.3		206	183.1	

Upstream Bridge Cross Section Data
Station Elevation Data num= 75

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	182.11	13.84	182.36	15.21	182.35	15.87	182.34	15.93	182.35
19.48	182.45	20.8	182.49	21.1	182.49	21.36	182.5	21.38	182.5
22.82	182.5	26.26	182.5	28.16	182.5	31.73	182.5	33.2	182.5
35.88	182.5	39.09	182.5	42.63	182.5	43.14	182.5	45.94	182.5
46.8	182.5	50.53	182.5	50.97	182.5	52.83	182.5	53.26	182.5
56.11	182.41	58.29	182.31	59.7	182.24	64.26	182.01	64.99	182.01

65.12	182.01	65.29	182	70.09	181.66	72.05	181.5	72.97	181.42
77.83	181	80.85	180.82	81.76	180.75	83.93	180.56	84.65	180.5
85.01	180.5	95.38	180.35	98.5	179.5	101.5	179.5	109.12	180.5
110.26	180.52	118.75	180.807	123	180.95	123.94	180.98	125.86	181
126.01	181	126.78	181.01	128.44	181.04	133.99	181.16	142.76	181.35
143.55	181.36	144.28	181.36	146.66	181.42	149.95	181.5	167.9	181.51
168.02	181.51	176.64	181.51	182.01	181.51	184.21	181.51	187.51	181.51
187.76	181.51	187.92	181.51	193.5	181.51	194.67	181.51	196.5	181.51
197.04	181.51	197.59	181.51	197.78	181.51	203.05	181.51	205.64	181.51

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	80.85	.03	118.75	.035

Bank Sta: Left Right Coeff Contr. Expan.
80.85 118.75 .3 .5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	98.5	181.5	T
101.5	205.64	181.5	T

Downstream Deck/Roadway Coordinates
num= 3

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	182.2		94.34	182.4		198	183.2	

Downstream Bridge Cross Section Data
Station Elevation Data num= 75

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	182.05	1.58	182	9.83	181.68	14.51	181.5	17.88	181.33
22.83	181.29	24.5	181.3	26.32	181.29	27.81	181.3	29.69	181.28
34.96	181.16	37.38	181.1	38.49	181.08	39.26	181.08	40.46	181.04
41.39	181	44.79	180.89	50.14	180.69	54.31	180.52	56.3	180.5
56.69	180.49	61.45	180.3	68.4	180	70.2	179.82	74.24	179.35
75.48	179.35	75.86	179.35	76.68	179.35	77.6	179.35	77.7	179.52
80.13	180	80.73	180.01	86.35	180.36	88.94	180.5	89.37	180.5
89.75	180.53	91.83	180.63	102.73	181	105.08	181.01	106.36	181.01
107.77	181.01	112.84	181.01	113.94	181.01	114.56	181.01	119.7	181
121.5	180.98	124.43	180.97	127.27	181	133.82	181.04	134.24	181.04
134.27	181.04	134.66	181.04	135.14	181.05	140.54	181.08	142.82	181.09
143.29	181.09	145.11	181.1	147.69	181.13	151.6	181.2	156.04	181.24
157.58	181.24	160.19	181.24	161.58	181.24	164.44	181.24	166.03	181.23
167.4	181.23	168.13	181.24	175.91	181.23	180.35	181.26	183.26	181.22
184.13	181.19	186.06	181.16	193.9	181	197.52	180.77	200.36	180.5

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	68.4	.03	80.73	.035

Bank Sta: Left Right Coeff Contr. Expan.
68.4 80.73 .3 .5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	74.6	181.5	T
77.6	200.36	181.5	T

Upstream Embankment side slope = 2 horiz. to 1.0 vertical
Downstream Embankment side slope = 2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .98
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name	Shape	Rise	Span
Culvert #1	Box	1.25	3

FHWA Chart # 10- 90 degree headwall; Chamfered or beveled inlet
FHWA Scale # 2 - Inlet edges beveled 1/2 inch at 45 degrees (1:1)
Solution Criteria = Highest U.S. EG

Culvert	Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
	3.7	33.8	.013	.025	0	.2	1

Upstream Elevation = 179.5
Centerline Station = 100
Downstream Elevation = 179.35
Centerline Station = 76.1

CULVERT OUTPUT Profile #2-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.98	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.07
Q Barrel (m3/s)	0.98	Culv Vel DS (m/s)	0.88
E.G. US. (m)	179.87	Culv Inv El Up (m)	179.50
W.S. US. (m)	179.82	Culv Inv El Dn (m)	179.35
E.G. DS (m)	179.76	Culv Frctn Ls (m)	0.00
W.S. DS (m)	179.72	Culv Exit Loss (m)	0.00
Delta EG (m)	0.11	Culv Entr Loss (m)	0.01
Delta WS (m)	0.10	Q Weir (m3/s)	
E.G. IC (m)	179.85	Weir Sta Lft (m)	
E.G. OC (m)	179.87	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	179.80	Weir Max Depth (m)	
Culv WS Outlet (m)	179.72	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.29	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.22	Min El Weir Flow (m)	182.20

Warning: During subcritical analysis, with the exit loss set =1.0, the projected WSEL in culvert has a lower energy than the downstream energy. Most likely, the downstream cross section blocks part of the culvert or the ineffective area is set too far in. Instead of projecting the WSEL, the program did an energy balance to get the WSEL inside the culvert at the downstream end.

CULVERT OUTPUT Profile #5-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	1.68	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.32
Q Barrel (m3/s)	1.68	Culv Vel DS (m/s)	1.16
E.G. US. (m)	180.03	Culv Inv El Up (m)	179.50
W.S. US. (m)	179.95	Culv Inv El Dn (m)	179.35
E.G. DS (m)	179.90	Culv Frctn Ls (m)	0.00
W.S. DS (m)	179.83	Culv Exit Loss (m)	0.00
Delta EG (m)	0.13	Culv Entr Loss (m)	0.02
Delta WS (m)	0.12	Q Weir (m3/s)	
E.G. IC (m)	180.00	Weir Sta Lft (m)	
E.G. OC (m)	180.03	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	179.92	Weir Max Depth (m)	
Culv WS Outlet (m)	179.83	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.41	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.32	Min El Weir Flow (m)	182.20

Warning: During subcritical analysis, with the exit loss set =1.0, the projected WSEL in culvert has a lower energy than the downstream energy. Most likely, the downstream cross section blocks part of the culvert or the ineffective area is set too far in. Instead of projecting the WSEL, the program did an energy balance to get the WSEL inside the culvert at the downstream end.

CULVERT OUTPUT Profile #10-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	2.02	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.42
Q Barrel (m3/s)	2.02	Culv Vel DS (m/s)	1.27
E.G. US. (m)	180.10	Culv Inv El Up (m)	179.50
W.S. US. (m)	180.01	Culv Inv El Dn (m)	179.35
E.G. DS (m)	179.96	Culv Frctn Ls (m)	0.00
W.S. DS (m)	179.88	Culv Exit Loss (m)	0.00
Delta EG (m)	0.14	Culv Entr Loss (m)	0.02
Delta WS (m)	0.13	Q Weir (m3/s)	
E.G. IC (m)	180.07	Weir Sta Lft (m)	
E.G. OC (m)	180.10	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	179.97	Weir Max Depth (m)	
Culv WS Outlet (m)	179.88	Weir Avg Depth (m)	

Culv Nml Depth (m)	0.46	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.36	Min El Weir Flow (m)	182.20

Warning: During subcritical analysis, with the exit loss set =1.0, the projected WSEL in culvert has a lower energy than the downstream energy. Most likely, the downstream cross section blocks part of the culvert or the ineffective area is set too far in. Instead of projecting the WSEL, the program did an energy balance to get the WSEL inside the culvert at the downstream end.

CULVERT OUTPUT Profile #25-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	2.48	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.54
Q Barrel (m3/s)	2.48	Culv Vel DS (m/s)	1.42
E.G. US. (m)	180.18	Culv Inv El Up (m)	179.50
W.S. US. (m)	180.08	Culv Inv El Dn (m)	179.35
E.G. DS (m)	180.03	Culv Frctn Ls (m)	0.00
W.S. DS (m)	179.93	Culv Exit Loss (m)	0.00
Delta EG (m)	0.15	Culv Entr Loss (m)	0.02
Delta WS (m)	0.15	Q Weir (m3/s)	
E.G. IC (m)	180.15	Weir Sta Lft (m)	
E.G. OC (m)	180.18	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	180.04	Weir Max Depth (m)	
Culv WS Outlet (m)	179.93	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.52	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.41	Min El Weir Flow (m)	182.20

Warning: During subcritical analysis, with the exit loss set =1.0, the projected WSEL in culvert has a lower energy than the downstream energy. Most likely, the downstream cross section blocks part of the culvert or the ineffective area is set too far in. Instead of projecting the WSEL, the program did an energy balance to get the WSEL inside the culvert at the downstream end.

CULVERT OUTPUT Profile #50-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	2.81	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.62
Q Barrel (m3/s)	2.81	Culv Vel DS (m/s)	1.52
E.G. US. (m)	180.24	Culv Inv El Up (m)	179.50
W.S. US. (m)	180.12	Culv Inv El Dn (m)	179.35
E.G. DS (m)	180.08	Culv Frctn Ls (m)	0.00
W.S. DS (m)	179.96	Culv Exit Loss (m)	0.00
Delta EG (m)	0.16	Culv Entr Loss (m)	0.03
Delta WS (m)	0.16	Q Weir (m3/s)	
E.G. IC (m)	180.20	Weir Sta Lft (m)	
E.G. OC (m)	180.24	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	180.08	Weir Max Depth (m)	
Culv WS Outlet (m)	179.97	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.56	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.45	Min El Weir Flow (m)	182.20

Warning: During subcritical analysis, with the exit loss set =1.0, the projected WSEL in culvert has a lower energy than the downstream energy. Most likely, the downstream cross section blocks part of the culvert or the ineffective area is set too far in. Instead of projecting the WSEL, the program did an energy balance to get the WSEL inside the culvert at the downstream end.

CULVERT OUTPUT Profile #100-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	3.16	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.71
Q Barrel (m3/s)	3.16	Culv Vel DS (m/s)	1.64
E.G. US. (m)	180.30	Culv Inv El Up (m)	179.50
W.S. US. (m)	180.17	Culv Inv El Dn (m)	179.35
E.G. DS (m)	180.13	Culv Frctn Ls (m)	0.00
W.S. DS (m)	179.99	Culv Exit Loss (m)	0.00
Delta EG (m)	0.17	Culv Entr Loss (m)	0.03
Delta WS (m)	0.18	Q Weir (m3/s)	
E.G. IC (m)	180.26	Weir Sta Lft (m)	
E.G. OC (m)	180.30	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	180.12	Weir Max Depth (m)	
Culv WS Outlet (m)	179.99	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.61	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.48	Min El Weir Flow (m)	182.20

Warning: During subcritical analysis, with the exit loss set =1.0, the projected WSEL in culvert has a lower energy than the downstream energy. Most likely, the downstream cross section blocks part of the culvert or the ineffective area is set too far in. Instead of projecting the WSEL, the program did an energy balance to get the WSEL inside the culvert at the downstream end.

CULVERT OUTPUT Profile #Check Flow Culv Group: Culvert #1

Q Culv Group (m3/s)	4.11	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.91
Q Barrel (m3/s)	4.11	Culv Vel DS (m/s)	1.87
E.G. US. (m)	180.44	Culv Inv El Up (m)	179.50
W.S. US. (m)	180.28	Culv Inv El Dn (m)	179.35
E.G. DS (m)	180.26	Culv Frctn Ls (m)	0.00
W.S. DS (m)	180.08	Culv Exit Loss (m)	0.00
Delta EG (m)	0.18	Culv Entr Loss (m)	0.04
Delta WS (m)	0.21	Q Weir (m3/s)	
E.G. IC (m)	180.41	Weir Sta Lft (m)	
E.G. OC (m)	180.44	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	180.22	Weir Max Depth (m)	
Culv WS Outlet (m)	180.08	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.72	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.58	Min El Weir Flow (m)	182.20

Warning: During subcritical analysis, with the exit loss set =1.0, the projected WSEL in culvert has a lower energy than the downstream energy. Most likely, the downstream cross section blocks part of the culvert or the ineffective area is set too far in. Instead of projecting the WSEL, the program did an energy balance to get the WSEL inside the culvert at the downstream end.
Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #Regional Culv Group: Culvert #1

Q Culv Group (m3/s)	2.17	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.46
Q Barrel (m3/s)	2.17	Culv Vel DS (m/s)	1.33
E.G. US. (m)	180.13	Culv Inv El Up (m)	179.50
W.S. US. (m)	180.03	Culv Inv El Dn (m)	179.35
E.G. DS (m)	179.98	Culv Frctn Ls (m)	0.00
W.S. DS (m)	179.89	Culv Exit Loss (m)	0.00
Delta EG (m)	0.14	Culv Entr Loss (m)	0.02
Delta WS (m)	0.14	Q Weir (m3/s)	
E.G. IC (m)	180.09	Weir Sta Lft (m)	
E.G. OC (m)	180.13	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	179.99	Weir Max Depth (m)	
Culv WS Outlet (m)	179.90	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.48	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.38	Min El Weir Flow (m)	182.20

Warning: During subcritical analysis, with the exit loss set =1.0, the projected WSEL in culvert has a lower energy than the downstream energy. Most likely, the downstream cross section blocks part of the culvert or the ineffective area is set too far in. Instead of projecting the WSEL, the program did an energy balance to get the WSEL inside the culvert at the downstream end.

CROSS SECTION

RIVER: Rouge
REACH: WC5 RS: 100

INPUT
Description: ST-100 (Updated Sept. 2016)
Station Elevation Data num= 75

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	182.05	1.58	182	9.83	181.68	14.51	181.5	17.88	181.33
22.83	181.29	24.5	181.3	26.32	181.29	27.81	181.3	29.69	181.28
34.96	181.16	37.38	181.1	38.49	181.08	39.26	181.08	40.46	181.04
41.39	181	44.79	180.89	50.14	180.69	54.31	180.52	56.3	180.5
56.69	180.49	61.45	180.3	68.4	180	70.2	179.82	74.24	179.35
75.48	179.35	75.86	179.35	76.68	179.35	77.6	179.35	77.7	179.52
80.13	180	80.73	180.01	86.35	180.36	88.94	180.5	89.37	180.5
89.75	180.53	91.83	180.63	102.73	181	105.08	181.01	106.36	181.01
107.77	181.01	112.84	181.01	113.94	181.01	114.56	181.01	119.7	181
121.5	180.98	124.43	180.97	127.27	181	133.82	181.04	134.24	181.04
134.27	181.04	134.66	181.04	135.14	181.05	140.54	181.08	142.82	181.09
143.29	181.09	145.11	181.1	147.69	181.13	151.6	181.2	156.04	181.24
157.58	181.24	160.19	181.24	161.58	181.24	164.44	181.24	166.03	181.23
167.4	181.23	168.13	181.24	175.91	181.23	180.35	181.26	183.26	181.22
184.13	181.19	186.06	181.16	193.9	181	197.52	180.77	200.36	180.5

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	68.4	.03	80.73	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
68.4 80.73 77 92.5 108 .3 .5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	74.6	181.5	T
77.6	200.36	181.5	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	179.76	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.030	
W.S. Elev (m)	179.72	Reach Len. (m)	77.00	92.50	108.00
Crit W.S. (m)	179.57	Flow Area (m2)		1.11	
E.G. Slope (m/m)	0.002619	Area (m2)		1.97	
Q Total (m3/s)	0.98	Flow (m3/s)		0.98	
Top Width (m)	7.67	Top Width (m)		7.67	
Vel Total (m/s)	0.88	Avg. Vel. (m/s)		0.88	
Max Chl Dpth (m)	0.37	Hydr. Depth (m)		0.37	
Conv. Total (m3/s)	19.1	Conv. (m3/s)		19.1	
Length Wtd. (m)	92.50	Wetted Per. (m)		3.00	
Min Ch El (m)	179.35	Shear (N/m2)		9.53	
Alpha	1.00	Stream Power (N/m s)		8.39	
Frctn Loss (m)	0.51	Cum Volume (1000 m3)		0.13	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.61	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	179.90	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.030	
W.S. Elev (m)	179.83	Reach Len. (m)	77.00	92.50	108.00
Crit W.S. (m)		Flow Area (m2)		1.45	
E.G. Slope (m/m)	0.003190	Area (m2)		2.91	
Q Total (m3/s)	1.68	Flow (m3/s)		1.68	
Top Width (m)	9.22	Top Width (m)		9.22	
Vel Total (m/s)	1.16	Avg. Vel. (m/s)		1.16	
Max Chl Dpth (m)	0.48	Hydr. Depth (m)		0.48	
Conv. Total (m3/s)	29.7	Conv. (m3/s)		29.7	
Length Wtd. (m)	92.50	Wetted Per. (m)		3.00	
Min Ch El (m)	179.35	Shear (N/m2)		15.11	
Alpha	1.00	Stream Power (N/m s)		17.52	
Frctn Loss (m)	0.56	Cum Volume (1000 m3)		0.19	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.72	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	179.96	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.		0.030	
W.S. Elev (m)	179.88	Reach Len. (m)	77.00	92.50	108.00
Crit W.S. (m)		Flow Area (m2)		1.58	
E.G. Slope (m/m)	0.003472	Area (m2)		3.32	
Q Total (m3/s)	2.02	Flow (m3/s)		2.02	
Top Width (m)	9.86	Top Width (m)		9.86	
Vel Total (m/s)	1.28	Avg. Vel. (m/s)		1.28	
Max Chl Dpth (m)	0.53	Hydr. Depth (m)		0.53	
Conv. Total (m3/s)	34.3	Conv. (m3/s)		34.3	
Length Wtd. (m)	92.50	Wetted Per. (m)		3.00	
Min Ch El (m)	179.35	Shear (N/m2)		17.91	
Alpha	1.00	Stream Power (N/m s)		22.93	
Frctn Loss (m)	0.59	Cum Volume (1000 m3)		0.22	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.76	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	180.03	Element	Left OB	Channel	Right OB
Vel Head (m)	0.10	Wt. n-Val.		0.030	
W.S. Elev (m)	179.93	Reach Len. (m)	77.00	92.50	108.00
Crit W.S. (m)		Flow Area (m2)		1.74	
E.G. Slope (m/m)	0.003791	Area (m2)		3.87	
Q Total (m3/s)	2.48	Flow (m3/s)		2.48	
Top Width (m)	10.67	Top Width (m)		10.67	
Vel Total (m/s)	1.43	Avg. Vel. (m/s)		1.43	
Max Chl Dpth (m)	0.58	Hydr. Depth (m)		0.58	
Conv. Total (m3/s)	40.3	Conv. (m3/s)		40.3	
Length Wtd. (m)	92.50	Wetted Per. (m)		3.00	
Min Ch El (m)	179.35	Shear (N/m2)		21.54	
Alpha	1.00	Stream Power (N/m s)		30.74	
Frctn Loss (m)	0.61	Cum Volume (1000 m3)		0.25	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.82	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	180.08	Element	Left OB	Channel	Right OB
Vel Head (m)	0.12	Wt. n-Val.		0.030	
W.S. Elev (m)	179.96	Reach Len. (m)	77.00	92.50	108.00
Crit W.S. (m)		Flow Area (m2)		1.84	
E.G. Slope (m/m)	0.004042	Area (m2)		4.24	
Q Total (m3/s)	2.81	Flow (m3/s)		2.81	
Top Width (m)	11.17	Top Width (m)		11.17	
Vel Total (m/s)	1.53	Avg. Vel. (m/s)		1.53	
Max Chl Dpth (m)	0.61	Hydr. Depth (m)		0.61	
Conv. Total (m3/s)	44.2	Conv. (m3/s)		44.2	
Length Wtd. (m)	92.50	Wetted Per. (m)		3.00	
Min Ch El (m)	179.35	Shear (N/m2)		24.29	
Alpha	1.00	Stream Power (N/m s)		37.13	
Frctn Loss (m)	0.64	Cum Volume (1000 m3)		0.28	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.85	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than

1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	180.13	Element	Left OB	Channel	Right OB
Vel Head (m)	0.14	Wt. n-Val.		0.030	
W.S. Elev (m)	179.99	Reach Len. (m)	77.00	92.50	108.00
Crit W.S. (m)		Flow Area (m2)		1.92	
E.G. Slope (m/m)	0.004396	Area (m2)		4.56	
Q Total (m3/s)	3.16	Flow (m3/s)		3.16	
Top Width (m)	11.60	Top Width (m)		11.60	
Vel Total (m/s)	1.64	Avg. Vel. (m/s)		1.64	
Max Chl Dpth (m)	0.64	Hydr. Depth (m)		0.64	
Conv. Total (m3/s)	47.7	Conv. (m3/s)		47.7	
Length Wtd. (m)	92.50	Wetted Per. (m)		3.00	
Min Ch El (m)	179.35	Shear (N/m2)		27.64	
Alpha	1.00	Stream Power (N/m s)		45.41	
Frctn Loss (m)	0.67	Cum Volume (1000 m3)		0.30	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.88	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	180.26	Element	Left OB	Channel	Right OB
Vel Head (m)	0.18	Wt. n-Val.		0.030	
W.S. Elev (m)	180.08	Reach Len. (m)	77.00	92.50	108.00
Crit W.S. (m)		Flow Area (m2)		2.18	
E.G. Slope (m/m)	0.004865	Area (m2)	0.07	5.62	0.04
Q Total (m3/s)	4.11	Flow (m3/s)		4.11	
Top Width (m)	15.24	Top Width (m)	1.81	12.33	1.10
Vel Total (m/s)	1.88	Avg. Vel. (m/s)		1.88	
Max Chl Dpth (m)	0.73	Hydr. Depth (m)		0.73	
Conv. Total (m3/s)	58.9	Conv. (m3/s)		58.9	
Length Wtd. (m)	92.50	Wetted Per. (m)		3.00	
Min Ch El (m)	179.35	Shear (N/m2)		34.74	
Alpha	1.00	Stream Power (N/m s)		65.37	
Frctn Loss (m)	0.70	Cum Volume (1000 m3)	0.00	0.37	0.00
C & E Loss (m)	0.01	Cum SA (1000 m2)	0.07	0.94	0.06

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	179.98	Element	Left OB	Channel	Right OB
Vel Head (m)	0.09	Wt. n-Val.		0.030	
W.S. Elev (m)	179.89	Reach Len. (m)	77.00	92.50	108.00
Crit W.S. (m)		Flow Area (m2)		1.63	
E.G. Slope (m/m)	0.003620	Area (m2)		3.49	
Q Total (m3/s)	2.17	Flow (m3/s)		2.17	
Top Width (m)	10.11	Top Width (m)		10.11	
Vel Total (m/s)	1.33	Avg. Vel. (m/s)		1.33	
Max Chl Dpth (m)	0.54	Hydr. Depth (m)		0.54	
Conv. Total (m3/s)	36.1	Conv. (m3/s)		36.1	
Length Wtd. (m)	92.50	Wetted Per. (m)		3.00	
Min Ch El (m)	179.35	Shear (N/m2)		19.25	
Alpha	1.00	Stream Power (N/m s)		25.68	
Frctn Loss (m)	0.60	Cum Volume (1000 m3)		0.23	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.78	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Rouge
REACH: WC5 RS: 10

INPUT
Description: ST-10 (Added Sep 2016)
Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	182.07	2.39	182	9.1	181.73	14.91	181.5	17.88	181.35
21.14	181.16	23.79	181	27.73	180.65	29.35	180.5	30	180.35
31.49	180	32.56	179.75	33.62	179.5	34.6	179.3	36.03	179
37.36	178.98	37.94	178.97	39.76	179	39.91	179	40.47	179.1
42.82	179.5	43.46	179.5	44.55	179.5				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	33.62	.03	42.82	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
33.62	42.82	0	0	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	179.23	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.		0.030	
W.S. Elev (m)	179.16	Reach Len. (m)			
Crit W.S. (m)	179.16	Flow Area (m2)		0.80	
E.G. Slope (m/m)	0.017753	Area (m2)		0.80	
Q Total (m3/s)	0.98	Flow (m3/s)		0.98	
Top Width (m)	5.54	Top Width (m)		5.54	
Vel Total (m/s)	1.22	Avg. Vel. (m/s)		1.22	
Max Chl Dpth (m)	0.19	Hydr. Depth (m)		0.14	
Conv. Total (m3/s)	7.4	Conv. (m3/s)		7.4	
Length Wtd. (m)		Wetted Per. (m)		5.57	
Min Ch El (m)	178.97	Shear (N/m2)		25.08	
Alpha	1.00	Stream Power (N/m s)		30.61	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	179.33	Element	Left OB	Channel	Right OB
Vel Head (m)	0.10	Wt. n-Val.		0.030	
W.S. Elev (m)	179.23	Reach Len. (m)			
Crit W.S. (m)	179.23	Flow Area (m2)		1.21	
E.G. Slope (m/m)	0.015600	Area (m2)		1.21	
Q Total (m3/s)	1.68	Flow (m3/s)		1.68	
Top Width (m)	6.28	Top Width (m)		6.28	
Vel Total (m/s)	1.38	Avg. Vel. (m/s)		1.38	
Max Chl Dpth (m)	0.26	Hydr. Depth (m)		0.19	
Conv. Total (m3/s)	13.5	Conv. (m3/s)		13.5	
Length Wtd. (m)		Wetted Per. (m)		6.33	
Min Ch El (m)	178.97	Shear (N/m2)		29.34	
Alpha	1.00	Stream Power (N/m s)		40.63	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	179.36	Element	Left OB	Channel	Right OB
Vel Head (m)	0.11	Wt. n-Val.		0.030	
W.S. Elev (m)	179.26	Reach Len. (m)			
Crit W.S. (m)	179.26	Flow Area (m2)		1.40	
E.G. Slope (m/m)	0.015022	Area (m2)		1.40	

Q Total (m3/s)	2.02	Flow (m3/s)	2.02
Top Width (m)	6.59	Top Width (m)	6.59
Vel Total (m/s)	1.45	Avg. Vel. (m/s)	1.45
Max Chl Dpth (m)	0.29	Hydr. Depth (m)	0.21
Conv. Total (m3/s)	16.5	Conv. (m3/s)	16.5
Length Wtd. (m)		Wetted Per. (m)	6.63
Min Ch El (m)	178.97	Shear (N/m2)	31.02
Alpha	1.00	Stream Power (N/m s)	44.85
Frctn Loss (m)		Cum Volume (1000 m3)	
C & E Loss (m)		Cum SA (1000 m2)	

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	179.41	Element	Left OB	Channel	Right OB
Vel Head (m)	0.12	Wt. n-Val.		0.030	
W.S. Elev (m)	179.29	Reach Len. (m)			
Crit W.S. (m)	179.29	Flow Area (m2)		1.64	
E.G. Slope (m/m)	0.014369	Area (m2)		1.64	
Q Total (m3/s)	2.48	Flow (m3/s)		2.48	
Top Width (m)	6.96	Top Width (m)		6.96	
Vel Total (m/s)	1.51	Avg. Vel. (m/s)		1.51	
Max Chl Dpth (m)	0.32	Hydr. Depth (m)		0.24	
Conv. Total (m3/s)	20.7	Conv. (m3/s)		20.7	
Length Wtd. (m)		Wetted Per. (m)		7.02	
Min Ch El (m)	178.97	Shear (N/m2)		32.88	
Alpha	1.00	Stream Power (N/m s)		49.78	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	179.44	Element	Left OB	Channel	Right OB
Vel Head (m)	0.13	Wt. n-Val.		0.030	
W.S. Elev (m)	179.31	Reach Len. (m)			
Crit W.S. (m)	179.31	Flow Area (m2)		1.79	
E.G. Slope (m/m)	0.014353	Area (m2)		1.79	
Q Total (m3/s)	2.81	Flow (m3/s)		2.81	
Top Width (m)	7.19	Top Width (m)		7.19	
Vel Total (m/s)	1.57	Avg. Vel. (m/s)		1.57	
Max Chl Dpth (m)	0.34	Hydr. Depth (m)		0.25	
Conv. Total (m3/s)	23.5	Conv. (m3/s)		23.5	
Length Wtd. (m)		Wetted Per. (m)		7.25	
Min Ch El (m)	178.97	Shear (N/m2)		34.72	
Alpha	1.00	Stream Power (N/m s)		54.53	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	179.47	Element	Left OB	Channel	Right OB
Vel Head (m)	0.13	Wt. n-Val.		0.030	
W.S. Elev (m)	179.34	Reach Len. (m)			
Crit W.S. (m)	179.34	Flow Area (m2)		1.97	
E.G. Slope (m/m)	0.013859	Area (m2)		1.97	
Q Total (m3/s)	3.16	Flow (m3/s)		3.16	
Top Width (m)	7.46	Top Width (m)		7.46	
Vel Total (m/s)	1.61	Avg. Vel. (m/s)		1.61	
Max Chl Dpth (m)	0.37	Hydr. Depth (m)		0.26	
Conv. Total (m3/s)	26.8	Conv. (m3/s)		26.8	
Length Wtd. (m)		Wetted Per. (m)		7.52	
Min Ch El (m)	178.97	Shear (N/m2)		35.57	
Alpha	1.00	Stream Power (N/m s)		57.11	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	179.54	Element	Left OB	Channel	Right OB
Vel Head (m)	0.15	Wt. n-Val.		0.030	
W.S. Elev (m)	179.39	Reach Len. (m)			
Crit W.S. (m)	179.39	Flow Area (m2)		2.39	
E.G. Slope (m/m)	0.013597	Area (m2)		2.39	
Q Total (m3/s)	4.11	Flow (m3/s)		4.11	
Top Width (m)	8.04	Top Width (m)		8.04	
Vel Total (m/s)	1.72	Avg. Vel. (m/s)		1.72	
Max Chl Dpth (m)	0.42	Hydr. Depth (m)		0.30	
Conv. Total (m3/s)	35.2	Conv. (m3/s)		35.2	
Length Wtd. (m)		Wetted Per. (m)		8.12	
Min Ch El (m)	178.97	Shear (N/m2)		39.25	
Alpha	1.00	Stream Power (N/m s)		67.52	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	179.38	Element	Left OB	Channel	Right OB
Vel Head (m)	0.11	Wt. n-Val.		0.030	
W.S. Elev (m)	179.27	Reach Len. (m)			
Crit W.S. (m)	179.27	Flow Area (m2)		1.47	
E.G. Slope (m/m)	0.014963	Area (m2)		1.47	
Q Total (m3/s)	2.17	Flow (m3/s)		2.17	
Top Width (m)	6.70	Top Width (m)		6.70	
Vel Total (m/s)	1.48	Avg. Vel. (m/s)		1.48	
Max Chl Dpth (m)	0.30	Hydr. Depth (m)		0.22	
Conv. Total (m3/s)	17.7	Conv. (m3/s)		17.7	
Length Wtd. (m)		Wetted Per. (m)		6.75	
Min Ch El (m)	178.97	Shear (N/m2)		31.95	
Alpha	1.00	Stream Power (N/m s)		47.14	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

SUMMARY OF MANNING'S N VALUES

River:Rouge

Reach	River Sta.	n1	n2	n3
WC5	300	.035	.03	.035
WC5	200	.035	.03	.035
WC5	150	Culvert		
WC5	100	.035	.03	.035
WC5	10	.035	.03	.035

SUMMARY OF REACH LENGTHS

River: Rouge

Reach	River Sta.	Left	Channel	Right
WC5	300	45.3	45.3	45.3
WC5	200	40.5	40.5	40.5
WC5	150	Culvert		
WC5	100	77	92.5	108
WC5	10	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Rouge

Reach	River Sta.	Contr.	Expan.

WC5	300	.3	.5
WC5	200	.3	.5
WC5	150	Culvert	
WC5	100	.3	.5
WC5	10	.1	.3

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
WC5	300	2-yr	0.98	180.93	181.03	181.03	181.03	0.007620	0.44	2.24	38.52	0.58
WC5	300	5-yr	1.68	180.93	181.03	181.03	181.05	0.016893	0.69	2.45	38.89	0.87
WC5	300	10-yr	2.02	180.93	181.03	181.03	181.07	0.030776	0.89	2.28	38.58	1.17
WC5	300	25-yr	2.48	180.93	181.04	181.04	181.08	0.021368	0.85	2.91	39.71	1.01
WC5	300	50-yr	2.81	180.93	181.05	181.05	181.09	0.020462	0.88	3.19	40.21	1.00
WC5	300	100-yr	3.16	180.93	181.05	181.05	181.10	0.023642	0.96	3.28	40.38	1.08
WC5	300	Check Flow	4.11	180.93	181.07	181.07	181.12	0.023699	1.06	3.88	41.41	1.10
WC5	300	Regional	2.17	180.93	181.03	181.03	181.07	0.025596	0.86	2.53	39.03	1.08
WC5	200	2-yr	0.98	179.50	179.82	179.72	179.87	0.004182	1.01	0.97	6.64	0.57
WC5	200	5-yr	1.68	179.50	179.95	179.82	180.03	0.003959	1.24	1.36	8.11	0.59
WC5	200	10-yr	2.02	179.50	180.01	179.86	180.10	0.003913	1.33	1.52	8.73	0.59
WC5	200	25-yr	2.48	179.50	180.08	179.91	180.18	0.003857	1.43	1.73	9.51	0.60
WC5	200	50-yr	2.81	179.50	180.12	179.95	180.24	0.003832	1.50	1.87	10.03	0.61
WC5	200	100-yr	3.16	179.50	180.17	179.98	180.29	0.003843	1.58	2.00	10.54	0.62
WC5	200	Check Flow	4.11	179.50	180.28	180.07	180.44	0.003806	1.75	2.35	11.85	0.63
WC5	200	Regional	2.17	179.50	180.03	179.88	180.13	0.003903	1.36	1.59	8.99	0.60
WC5	150		Culvert									
WC5	100	2-yr	0.98	179.35	179.72	179.57	179.76	0.002619	0.88	1.11	7.67	0.46
WC5	100	5-yr	1.68	179.35	179.83		179.90	0.003190	1.16	1.45	9.22	0.53
WC5	100	10-yr	2.02	179.35	179.88		179.96	0.003472	1.28	1.58	9.86	0.56
WC5	100	25-yr	2.48	179.35	179.93		180.03	0.003791	1.43	1.74	10.67	0.60
WC5	100	50-yr	2.81	179.35	179.96		180.08	0.004042	1.53	1.84	11.17	0.62
WC5	100	100-yr	3.16	179.35	179.99		180.13	0.004396	1.64	1.92	11.60	0.66
WC5	100	Check Flow	4.11	179.35	180.08		180.26	0.004865	1.88	2.18	15.24	0.70
WC5	100	Regional	2.17	179.35	179.89		179.98	0.003620	1.33	1.63	10.11	0.58
WC5	10	2-yr	0.98	178.97	179.16	179.16	179.23	0.017753	1.22	0.80	5.54	1.02
WC5	10	5-yr	1.68	178.97	179.23	179.23	179.33	0.015600	1.38	1.21	6.28	1.01
WC5	10	10-yr	2.02	178.97	179.26	179.26	179.36	0.015022	1.45	1.40	6.59	1.00
WC5	10	25-yr	2.48	178.97	179.29	179.29	179.41	0.014369	1.51	1.64	6.96	1.00
WC5	10	50-yr	2.81	178.97	179.31	179.31	179.44	0.014353	1.57	1.79	7.19	1.01
WC5	10	100-yr	3.16	178.97	179.34	179.34	179.47	0.013859	1.61	1.97	7.46	1.00
WC5	10	Check Flow	4.11	178.97	179.39	179.39	179.54	0.013597	1.72	2.39	8.04	1.01
WC5	10	Regional	2.17	178.97	179.27	179.27	179.38	0.014963	1.48	1.47	6.70	1.01

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (m)	W.S. Elev (m)	Vel Head (m)	Frctn Loss (m)	C & E Loss (m)	Q Left (m3/s)	Q Channel (m3/s)	Q Right (m3/s)	Top Width (m)
WC5	300	2-yr	181.03	181.03	0.01	0.25	0.01		0.98		38.52
WC5	300	5-yr	181.05	181.03	0.02	0.33	0.02		1.68		38.89
WC5	300	10-yr	181.07	181.03	0.04	0.39	0.01		2.02		38.58
WC5	300	25-yr	181.08	181.04	0.04	0.34	0.02		2.48		39.71
WC5	300	50-yr	181.09	181.05	0.04	0.34	0.02		2.81		40.21
WC5	300	100-yr	181.10	181.05	0.05	0.35	0.02		3.16		40.38
WC5	300	Check Flow	181.12	181.07	0.06	0.35	0.03		4.11		41.41
WC5	300	Regional	181.07	181.03	0.04	0.37	0.02		2.17		39.03
WC5	200	2-yr	179.87	179.82	0.05				0.98		6.64
WC5	200	5-yr	180.03	179.95	0.08				1.68		8.11
WC5	200	10-yr	180.10	180.01	0.09				2.02		8.73
WC5	200	25-yr	180.18	180.08	0.10				2.48		9.51
WC5	200	50-yr	180.24	180.12	0.12				2.81		10.03
WC5	200	100-yr	180.29	180.17	0.13				3.16		10.54
WC5	200	Check Flow	180.44	180.28	0.16				4.11		11.85
WC5	200	Regional	180.13	180.03	0.09				2.17		8.99
WC5	150		Culvert								
WC5	100	2-yr	179.76	179.72	0.04	0.51	0.01		0.98		7.67
WC5	100	5-yr	179.90	179.83	0.07	0.56	0.01		1.68		9.22
WC5	100	10-yr	179.96	179.88	0.08	0.59	0.01		2.02		9.86
WC5	100	25-yr	180.03	179.93	0.10	0.61	0.00		2.48		10.67
WC5	100	50-yr	180.08	179.96	0.12	0.64	0.00		2.81		11.17
WC5	100	100-yr	180.13	179.99	0.14	0.67	0.00		3.16		11.60
WC5	100	Check Flow	180.26	180.08	0.18	0.70	0.01		4.11		15.24
WC5	100	Regional	179.98	179.89	0.09	0.60	0.01		2.17		10.11
WC5	10	2-yr	179.23	179.16	0.08				0.98		5.54
WC5	10	5-yr	179.33	179.23	0.10				1.68		6.28
WC5	10	10-yr	179.36	179.26	0.11				2.02		6.59
WC5	10	25-yr	179.41	179.29	0.12				2.48		6.96
WC5	10	50-yr	179.44	179.31	0.13				2.81		7.19
WC5	10	100-yr	179.47	179.34	0.13				3.16		7.46
WC5	10	Check Flow	179.54	179.39	0.15				4.11		8.04
WC5	10	Regional	179.38	179.27	0.11				2.17		6.70

Profile Output Table - Culvert Only

Reach	River Sta	Profile	E.G. US. (m)	W.S. US. (m)	E.G. IC (m)	E.G. OC (m)	Min El Weir Flow (m)	Q Culv Group (m3/s)	Q Weir (m3/s)	Delta WS (m)	Culv Vel US (m/s)	Culv Vel DS (m/s)
WC5	150 Culvert #1	2-yr	179.87	179.82	179.85	179.87	182.20	0.98		0.10	1.07	0.88
WC5	150 Culvert #1	5-yr	180.03	179.95	180.00	180.03	182.20	1.68		0.12	1.32	1.16
WC5	150 Culvert #1	10-yr	180.10	180.01	180.07	180.10	182.20	2.02		0.13	1.42	1.27
WC5	150 Culvert #1	25-yr	180.18	180.08	180.15	180.18	182.20	2.48		0.15	1.54	1.42
WC5	150 Culvert #1	50-yr	180.24	180.12	180.20	180.24	182.20	2.81		0.16	1.62	1.52
WC5	150 Culvert #1	100-yr	180.30	180.17	180.26	180.30	182.20	3.16		0.18	1.71	1.64
WC5	150 Culvert #1	Check Flow	180.44	180.28	180.41	180.44	182.20	4.11		0.21	1.91	1.87
WC5	150 Culvert #1	Regional	180.13	180.03	180.09	180.13	182.20	2.17		0.14	1.46	1.33

ROUGE RIVER

HEC-RAS ANALYSIS WC#11

EXISTING 407 ETR

EX. CULVERT (Ø1850)mm

PROP CULV WC#11
DIAMETER= 800mm
L=28m, S=0.4%
U/S INV= 180.00
D/S INV= 179.90

PROP CHANNEL
CL ELEV = 179.80m

PROPOSED 407 TWY

PROP CHANNEL
CL ELEV = 180.00m

PROP CHANNEL
CL ELEV = 183.96m

180.26	180.22	ST 10	
180.12	179.96		

182.24	180.68	ST 100	
182.19	180.31		

184.19	184.19	ST 200	
184.08	184.07		

LEGEND

- EXISTING 407 ETR
- PROPOSED 407 TWY
- CREEK FLOW DIRECTION
- EXISTING CULVERT
- PROPOSED CULVERT
- PROPOSED REGIONAL FLOODLINE

EX REG | PR REG | HEC ST
EX 100 | PR 100

- CROSS SECTION NUMBER
- PARSONS HEC-RAS SECTION
- PROPOSED WL ELEVATION (m)
- EXISTING UPDATED WL ELEVATION (m)

5m 0m 10m 20m 30m

SCALE HORIZONTAL 1:1000

DATE: SEPTEMBER 2016

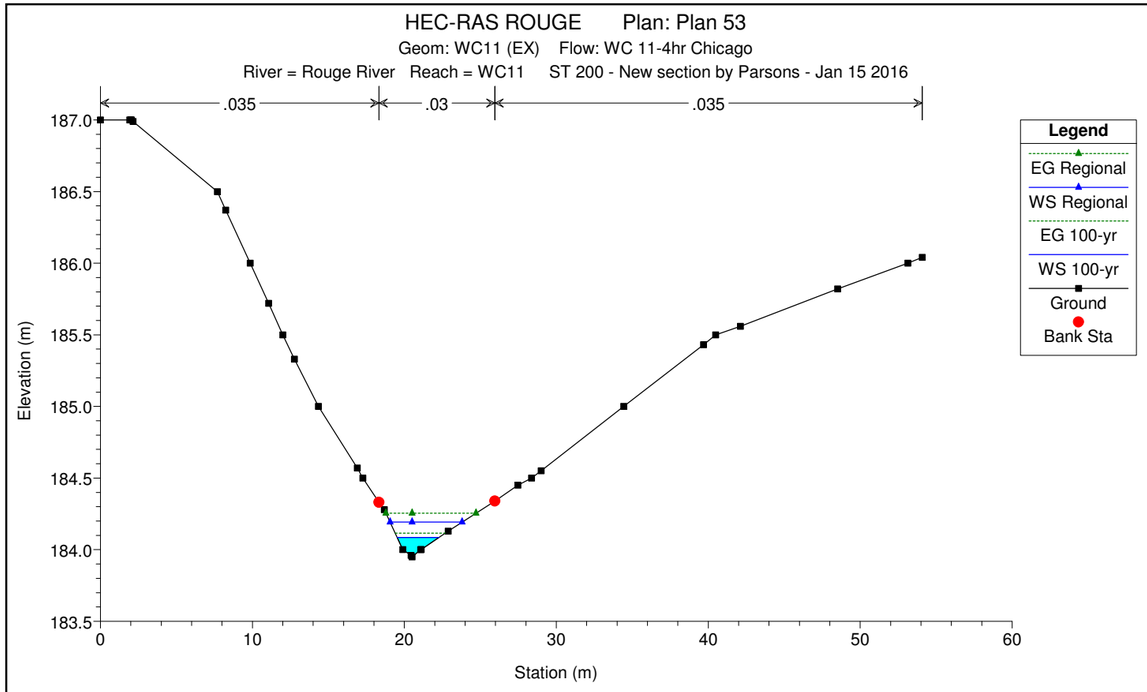
SCALE: 1:1000

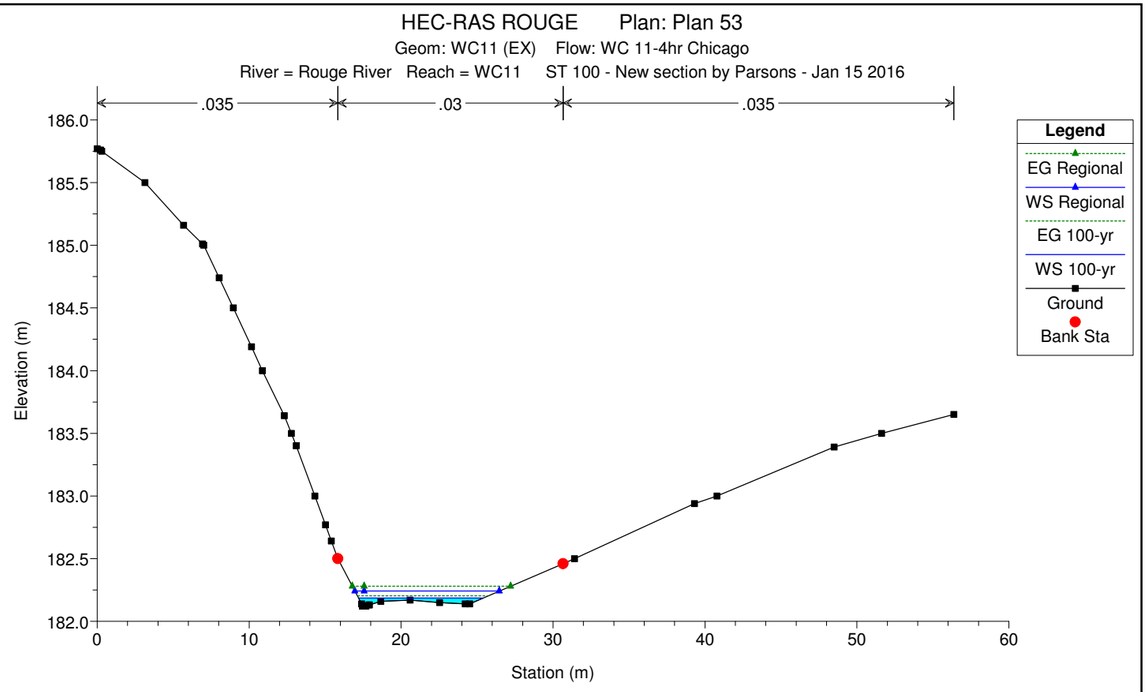
Ontario

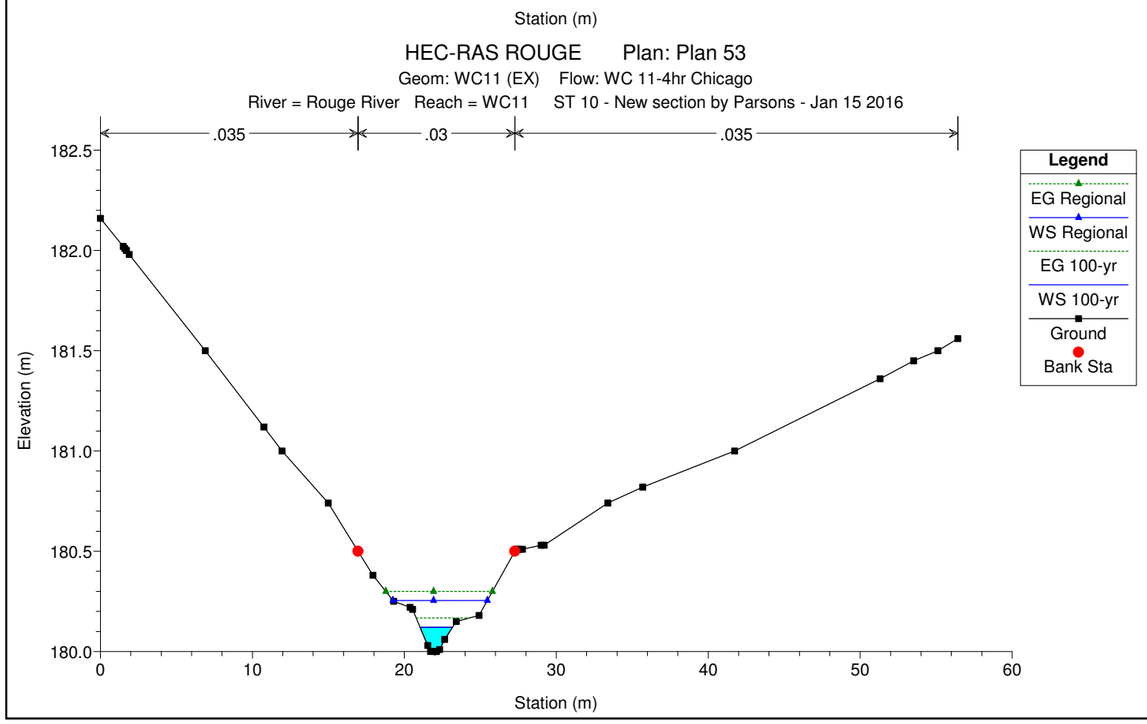
PARSONS
625 COCHRANE DRIVE, SUITE 500
MARKHAM, ONTARIO L3R 9R9
TEL: 905-943-0500
FAX: 905-943-0400

407 TRANSITWAY FROM KENNEDY RD TO BROCK RD

FIGURE 6.4 - HEC-RAS ANALYSIS - ROUGE RIVER (WC#11)


HEC-RAS ROUGE Plan: Plan 53
Geom: WC11 (EX) Flow: WC 11-4hr Chicago
River = Rouge River Reach = WC11 ST 200 - New section by Parsons - Jan 15 2016
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Bank Sta


HEC-RAS ROUGE Plan: Plan 53
Geom: WC11 (EX) Flow: WC 11-4hr Chicago
River = Rouge River Reach = WC11 ST 100 - New section by Parsons - Jan 15 2016
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Bank Sta


HEC-RAS ROUGE Plan: Plan 53
Geom: WC11 (EX) Flow: WC 11-4hr Chicago
River = Rouge River Reach = WC11 ST 10 - New section by Parsons - Jan 15 2016
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Bank Sta

HEC-RAS Plan: WC11-EX-4hr CH River: Rouge River Reach: WC11

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC11	200	2-yr	0.03	183.95	184.03	184.03	184.04	0.008482	0.38	0.08	1.81	0.58
WC11	200	5-yr	0.05	183.95	184.04	184.04	184.05	0.018664	0.58	0.09	1.88	0.87
WC11	200	10-yr	0.07	183.95	184.05	184.04	184.07	0.019650	0.65	0.11	2.08	0.91
WC11	200	25-yr	0.10	183.95	184.07	184.06	184.09	0.015515	0.65	0.15	2.44	0.83
WC11	200	50-yr	0.12	183.95	184.07	184.06	184.10	0.018458	0.73	0.16	2.53	0.91
WC11	200	100-yr	0.15	183.95	184.08	184.07	184.11	0.018346	0.77	0.19	2.73	0.92
WC11	200	Check Flow	0.19	183.95	184.10	184.10	184.13	0.015882	0.78	0.24	3.05	0.88
WC11	200	Regional	0.66	183.95	184.19	184.19	184.26	0.017652	1.11	0.60	4.72	1.00
WC11	100	2-yr	0.03	182.12	182.17	182.17	182.17	0.007844	0.21	0.15	7.86	0.48
WC11	100	5-yr	0.05	182.12	182.17	182.17	182.18	0.021788	0.34	0.15	7.86	0.81
WC11	100	10-yr	0.07	182.12	182.17	182.17	182.18	0.026084	0.41	0.17	7.93	0.90
WC11	100	25-yr	0.10	182.12	182.18	182.18	182.19	0.036868	0.53	0.19	7.99	1.09
WC11	100	50-yr	0.12	182.12	182.18	182.18	182.20	0.028722	0.52	0.23	8.10	0.99
WC11	100	100-yr	0.15	182.12	182.19	182.19	182.20	0.029363	0.57	0.26	8.20	1.03
WC11	100	Check Flow	0.19	182.12	182.19	182.19	182.21	0.036530	0.67	0.28	8.26	1.16
WC11	100	Regional	0.66	182.12	182.24	182.24	182.28	0.020477	0.88	0.75	9.50	1.00
WC11	10	2-yr	0.03	180.00	180.06	180.06	180.08	0.018432	0.55	0.05	1.29	0.85
WC11	10	5-yr	0.05	180.00	180.07	180.07	180.10	0.024223	0.69	0.07	1.46	1.00
WC11	10	10-yr	0.07	180.00	180.08	180.08	180.12	0.028279	0.80	0.09	1.60	1.10
WC11	10	25-yr	0.10	180.00	180.10	180.10	180.14	0.022324	0.80	0.12	1.90	1.00
WC11	10	50-yr	0.12	180.00	180.12	180.12	180.15	0.016050	0.75	0.16	2.15	0.87
WC11	10	100-yr	0.15	180.00	180.12	180.12	180.17	0.026820	0.96	0.16	2.13	1.12
WC11	10	Check Flow	0.19	180.00	180.14	180.14	180.19	0.020138	0.91	0.21	2.44	1.00
WC11	10	Regional	0.66	180.00	180.26	180.26	180.30	0.014585	0.94	0.70	6.22	0.89

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: HEC-RAS ROUGE
Project File : HEC.prj
Run Date and Time: 1/19/2016 3:10:28 PM

Project in SI units

Project Description:
HEC-RAS model for creek crossings along the proposed 407 TWY Ph 2 started from
scratch

PLAN DATA

Plan Title: Plan 06
Plan File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.p06

Geometry Title: WC11 (EX)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g01

Flow Title : WC 11-4hr Chicago
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f11

Plan Summary Information:
Number of: Cross Sections = 3 Multiple Openings = 0
Culverts = 0 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: WC 11-4hr Chicago
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f11

Flow Data (m3/s)

River	Reach	RS	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Check Flow	Regional
Rouge River	WC11	200	.03	.05	.07	.1	.12	.15	.19	.66

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Rouge River	WC11	2-yr		Critical
Rouge River	WC11	5-yr		Critical
Rouge River	WC11	10-yr		Critical
Rouge River	WC11	25-yr		Critical
Rouge River	WC11	50-yr		Critical
Rouge River	WC11	100-yr		Critical
Rouge River	WC11	Check Flow		Critical

GEOMETRY DATA

Geometry Title: WC11 (EX)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g01

CROSS SECTION

RIVER: Rouge River
REACH: WC11 RS: 200

INPUT
Description: ST 200 - New section by Parsons - Jan 15 2016
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	187	1.92	187	2	187	2.02	187	2.14	186.99
7.69	186.5	8.24	186.37	9.86	186	11.07	185.72	12	185.5
12.77	185.33	14.34	185	16.91	184.57	17.27	184.5	18.34	184.33
18.68	184.28	19.9	184	20.44	183.96	20.51	183.95	21.08	184
21.1	184	22.89	184.13	27.47	184.45	28.37	184.5	29.01	184.55
34.43	185	39.69	185.43	40.49	185.5	42.11	185.56	48.52	185.82
53.14	186	54.08	186.04						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	14.34	.03	34.43	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
14.34 34.43 83.4 83.4 83.4 .1 .3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	184.04	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	184.03	Reach Len. (m)	83.40	83.40	83.40
Crit W.S. (m)	184.03	Flow Area (m2)		0.08	
E.G. Slope (m/m)	0.008482	Area (m2)		0.08	
Q Total (m3/s)	0.03	Flow (m3/s)		0.03	
Top Width (m)	1.81	Top Width (m)		1.81	
Vel Total (m/s)	0.38	Avg. Vel. (m/s)		0.38	
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.04	
Conv. Total (m3/s)	0.3	Conv. (m3/s)		0.3	
Length Wtd. (m)	83.40	Wetted Per. (m)		1.82	
Min Ch El (m)	183.95	Shear (N/m2)		3.61	
Alpha	1.00	Stream Power (N/m s)	2589.24	0.00	0.00
Frctn Loss (m)	0.68	Cum Volume (1000 m3)		0.01	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.57	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	184.05	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	184.04	Reach Len. (m)	83.40	83.40	83.40
Crit W.S. (m)	184.04	Flow Area (m2)		0.09	
E.G. Slope (m/m)	0.018664	Area (m2)		0.09	
Q Total (m3/s)	0.05	Flow (m3/s)		0.05	
Top Width (m)	1.88	Top Width (m)		1.88	
Vel Total (m/s)	0.58	Avg. Vel. (m/s)		0.58	
Max Chl Dpth (m)	0.09	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	0.4	Conv. (m3/s)		0.4	
Length Wtd. (m)	83.40	Wetted Per. (m)		1.89	
Min Ch El (m)	183.95	Shear (N/m2)		8.34	
Alpha	1.00	Stream Power (N/m s)	2589.24	0.00	0.00
Frctn Loss (m)	1.68	Cum Volume (1000 m3)		0.01	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.58	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	184.07	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	184.05	Reach Len. (m)	83.40	83.40	83.40
Crit W.S. (m)	184.04	Flow Area (m2)		0.11	
E.G. Slope (m/m)	0.019650	Area (m2)		0.11	
Q Total (m3/s)	0.07	Flow (m3/s)		0.07	
Top Width (m)	2.08	Top Width (m)		2.08	
Vel Total (m/s)	0.65	Avg. Vel. (m/s)		0.65	
Max Chl Dpth (m)	0.10	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	0.5	Conv. (m3/s)		0.5	
Length Wtd. (m)	83.40	Wetted Per. (m)		2.09	
Min Ch El (m)	183.95	Shear (N/m2)		9.95	
Alpha	1.00	Stream Power (N/m s)	2589.24	0.00	0.00
Frctn Loss (m)	1.88	Cum Volume (1000 m3)		0.02	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.59	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	184.09	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	184.07	Reach Len. (m)	83.40	83.40	83.40
Crit W.S. (m)	184.06	Flow Area (m2)		0.15	
E.G. Slope (m/m)	0.015515	Area (m2)		0.15	
Q Total (m3/s)	0.10	Flow (m3/s)		0.10	
Top Width (m)	2.44	Top Width (m)		2.44	
Vel Total (m/s)	0.65	Avg. Vel. (m/s)		0.65	
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	0.8	Conv. (m3/s)		0.8	
Length Wtd. (m)	83.40	Wetted Per. (m)		2.46	
Min Ch El (m)	183.95	Shear (N/m2)		9.48	
Alpha	1.00	Stream Power (N/m s)	2589.24	0.00	0.00
Frctn Loss (m)	1.90	Cum Volume (1000 m3)		0.02	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.62	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	184.10	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.030	
W.S. Elev (m)	184.07	Reach Len. (m)	83.40	83.40	83.40
Crit W.S. (m)	184.06	Flow Area (m2)		0.16	
E.G. Slope (m/m)	0.018458	Area (m2)		0.16	
Q Total (m3/s)	0.12	Flow (m3/s)		0.12	
Top Width (m)	2.53	Top Width (m)		2.53	
Vel Total (m/s)	0.73	Avg. Vel. (m/s)		0.73	
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	0.9	Conv. (m3/s)		0.9	
Length Wtd. (m)	83.40	Wetted Per. (m)		2.54	
Min Ch El (m)	183.95	Shear (N/m2)		11.71	
Alpha	1.00	Stream Power (N/m s)	2589.24	0.00	0.00
Frctn Loss (m)	1.90	Cum Volume (1000 m3)		0.02	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.63	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	184.11	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.030	
W.S. Elev (m)	184.08	Reach Len. (m)	83.40	83.40	83.40
Crit W.S. (m)	184.07	Flow Area (m2)		0.19	
E.G. Slope (m/m)	0.018346	Area (m2)		0.19	
Q Total (m3/s)	0.15	Flow (m3/s)		0.15	
Top Width (m)	2.73	Top Width (m)		2.73	
Vel Total (m/s)	0.77	Avg. Vel. (m/s)		0.77	
Max Chl Dpth (m)	0.13	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	1.1	Conv. (m3/s)		1.1	
Length Wtd. (m)	83.40	Wetted Per. (m)		2.75	
Min Ch El (m)	183.95	Shear (N/m2)		12.72	
Alpha	1.00	Stream Power (N/m s)	2589.24	0.00	0.00
Frctn Loss (m)	1.91	Cum Volume (1000 m3)		0.03	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.65	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	184.13	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.030	
W.S. Elev (m)	184.10	Reach Len. (m)	83.40	83.40	83.40
Crit W.S. (m)	184.10	Flow Area (m2)		0.24	
E.G. Slope (m/m)	0.015882	Area (m2)		0.24	
Q Total (m3/s)	0.19	Flow (m3/s)		0.19	
Top Width (m)	3.05	Top Width (m)		3.05	
Vel Total (m/s)	0.78	Avg. Vel. (m/s)		0.78	
Max Chl Dpth (m)	0.15	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	1.5	Conv. (m3/s)		1.5	
Length Wtd. (m)		Wetted Per. (m)		3.06	
Min Ch El (m)	183.95	Shear (N/m2)		12.41	
Alpha	1.00	Stream Power (N/m s)	2589.24	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)		0.03	
C & E Loss (m)		Cum SA (1000 m2)		0.67	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	184.26	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.06	Wt. n-Val.		0.030		
W.S. Elev (m)	184.19	Reach Len. (m)	83.40	83.40	83.40	
Crit W.S. (m)	184.19	Flow Area (m2)		0.60		
E.G. Slope (m/m)	0.017652	Area (m2)		0.60		
Q Total (m3/s)	0.66	Flow (m3/s)		0.66		
Top Width (m)	4.72	Top Width (m)		4.72		
Vel Total (m/s)	1.11	Avg. Vel. (m/s)		1.11		
Max Chl Dpth (m)	0.24	Hydr. Depth (m)		0.13		
Conv. Total (m3/s)	5.0	Conv. (m3/s)		5.0		
Length Wtd. (m)	83.40	Wetted Per. (m)		4.75		
Min Ch El (m)	183.95	Shear (N/m2)		21.68		
Alpha	1.00	Stream Power (N/m s)	2589.24	0.00	0.00	
Frctn Loss (m)	1.58	Cum Volume (1000 m3)		0.08		
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.88		

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Rouge River
REACH: WC11 RS: 100

INPUT
Description: ST 100 - New section by Parsons - Jan 15 2016
Station Elevation Data num= 35

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	185.77	.21	185.76	.3	185.75	3.14	185.5	5.68	185.16
6.93	185.01	7.01	185	8.03	184.74	8.96	184.5	10.16	184.19
10.87	184	12.31	183.64	12.78	183.5	13.09	183.4	14.32	183
15.02	182.77	15.4	182.64	15.84	182.5	17.4	182.14	17.45	182.12
17.68	182.12	17.88	182.13	17.91	182.13	18.66	182.16	20.59	182.17
22.54	182.15	24.21	182.14	24.51	182.14	30.66	182.46	31.42	182.5
39.31	182.94	40.78	183	48.5	183.39	51.62	183.5	56.38	183.65

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	14.32	.03	40.78	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
14.32	40.78	36.7	36.7	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	182.17	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.00	Wt. n-Val.		0.030		
W.S. Elev (m)	182.17	Reach Len. (m)	36.70	36.70	36.70	
Crit W.S. (m)	182.17	Flow Area (m2)		0.15		
E.G. Slope (m/m)	0.007844	Area (m2)		0.15		
Q Total (m3/s)	0.03	Flow (m3/s)		0.03		
Top Width (m)	7.86	Top Width (m)		7.86		
Vel Total (m/s)	0.21	Avg. Vel. (m/s)		0.21		
Max Chl Dpth (m)	0.05	Hydr. Depth (m)		0.02		
Conv. Total (m3/s)	0.3	Conv. (m3/s)		0.3		
Length Wtd. (m)	36.70	Wetted Per. (m)		7.86		
Min Ch El (m)	182.12	Shear (N/m2)		1.42		
Alpha	1.00	Stream Power (N/m s)	2699.36	0.00	0.00	
Frctn Loss (m)	0.42	Cum Volume (1000 m3)		0.00		
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.17		

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	182.18	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.01	Wt. n-Val.		0.030		
W.S. Elev (m)	182.17	Reach Len. (m)	36.70	36.70	36.70	
Crit W.S. (m)	182.17	Flow Area (m2)		0.15		
E.G. Slope (m/m)	0.021788	Area (m2)		0.15		
Q Total (m3/s)	0.05	Flow (m3/s)		0.05		
Top Width (m)	7.86	Top Width (m)		7.86		
Vel Total (m/s)	0.34	Avg. Vel. (m/s)		0.34		
Max Chl Dpth (m)	0.05	Hydr. Depth (m)		0.02		
Conv. Total (m3/s)	0.3	Conv. (m3/s)		0.3		
Length Wtd. (m)	36.70	Wetted Per. (m)		7.86		
Min Ch El (m)	182.12	Shear (N/m2)		3.95		
Alpha	1.00	Stream Power (N/m s)	2699.36	0.00	0.00	
Frctn Loss (m)	0.84	Cum Volume (1000 m3)		0.00		
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.17		

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	182.18	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.01	Wt. n-Val.		0.030		
W.S. Elev (m)	182.17	Reach Len. (m)	36.70	36.70	36.70	
Crit W.S. (m)	182.17	Flow Area (m2)		0.17		
E.G. Slope (m/m)	0.026084	Area (m2)		0.17		
Q Total (m3/s)	0.07	Flow (m3/s)		0.07		
Top Width (m)	7.93	Top Width (m)		7.93		
Vel Total (m/s)	0.41	Avg. Vel. (m/s)		0.41		
Max Chl Dpth (m)	0.05	Hydr. Depth (m)		0.02		
Conv. Total (m3/s)	0.4	Conv. (m3/s)		0.4		
Length Wtd. (m)	36.70	Wetted Per. (m)		7.94		
Min Ch El (m)	182.12	Shear (N/m2)		5.45		
Alpha	1.00	Stream Power (N/m s)	2699.36	0.00	0.00	
Frctn Loss (m)	1.00	Cum Volume (1000 m3)		0.00		
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.17		

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	182.19	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	182.18	Reach Len. (m)	36.70	36.70	36.70
Crit W.S. (m)	182.18	Flow Area (m2)		0.19	
E.G. Slope (m/m)	0.036868	Area (m2)		0.19	
Q Total (m3/s)	0.10	Flow (m3/s)		0.10	
Top Width (m)	7.99	Top Width (m)		7.99	
Vel Total (m/s)	0.53	Avg. Vel. (m/s)		0.53	
Max Chl Dpth (m)	0.06	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	0.5	Conv. (m3/s)		0.5	
Length Wtd. (m)	36.70	Wetted Per. (m)		8.00	
Min Ch El (m)	182.12	Shear (N/m2)		8.56	
Alpha	1.00	Stream Power (N/m s)	2699.36	0.00	0.00
Frctn Loss (m)	1.04	Cum Volume (1000 m3)		0.01	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.18	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	182.20	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	182.18	Reach Len. (m)	36.70	36.70	36.70
Crit W.S. (m)	182.18	Flow Area (m2)		0.23	
E.G. Slope (m/m)	0.028722	Area (m2)		0.23	
Q Total (m3/s)	0.12	Flow (m3/s)		0.12	
Top Width (m)	8.10	Top Width (m)		8.10	
Vel Total (m/s)	0.52	Avg. Vel. (m/s)		0.52	
Max Chl Dpth (m)	0.06	Hydr. Depth (m)		0.03	
Conv. Total (m3/s)	0.7	Conv. (m3/s)		0.7	
Length Wtd. (m)	36.70	Wetted Per. (m)		8.11	
Min Ch El (m)	182.12	Shear (N/m2)		7.95	
Alpha	1.00	Stream Power (N/m s)	2699.36	0.00	0.00
Frctn Loss (m)	0.77	Cum Volume (1000 m3)		0.01	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.19	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	182.20	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	182.19	Reach Len. (m)	36.70	36.70	36.70
Crit W.S. (m)	182.19	Flow Area (m2)		0.26	
E.G. Slope (m/m)	0.029363	Area (m2)		0.26	
Q Total (m3/s)	0.15	Flow (m3/s)		0.15	
Top Width (m)	8.20	Top Width (m)		8.20	
Vel Total (m/s)	0.57	Avg. Vel. (m/s)		0.57	
Max Chl Dpth (m)	0.07	Hydr. Depth (m)		0.03	
Conv. Total (m3/s)	0.9	Conv. (m3/s)		0.9	
Length Wtd. (m)	36.70	Wetted Per. (m)		8.21	
Min Ch El (m)	182.12	Shear (N/m2)		9.17	
Alpha	1.00	Stream Power (N/m s)	2699.36	0.00	0.00
Frctn Loss (m)	1.03	Cum Volume (1000 m3)		0.01	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.19	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	182.21	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	182.19	Reach Len. (m)	36.70	36.70	36.70
Crit W.S. (m)	182.19	Flow Area (m2)		0.28	
E.G. Slope (m/m)	0.036530	Area (m2)		0.28	
Q Total (m3/s)	0.19	Flow (m3/s)		0.19	
Top Width (m)	8.26	Top Width (m)		8.26	
Vel Total (m/s)	0.67	Avg. Vel. (m/s)		0.67	
Max Chl Dpth (m)	0.07	Hydr. Depth (m)		0.03	
Conv. Total (m3/s)	1.0	Conv. (m3/s)		1.0	
Length Wtd. (m)	36.70	Wetted Per. (m)		8.27	
Min Ch El (m)	182.12	Shear (N/m2)		12.26	
Alpha	1.00	Stream Power (N/m s)	2699.36	0.00	0.00
Frctn Loss (m)	0.97	Cum Volume (1000 m3)		0.01	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.20	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	182.28	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.030	
W.S. Elev (m)	182.24	Reach Len. (m)	36.70	36.70	36.70
Crit W.S. (m)	182.24	Flow Area (m2)		0.75	
E.G. Slope (m/m)	0.020477	Area (m2)		0.75	
Q Total (m3/s)	0.66	Flow (m3/s)		0.66	
Top Width (m)	9.50	Top Width (m)		9.50	
Vel Total (m/s)	0.88	Avg. Vel. (m/s)		0.88	
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	4.6	Conv. (m3/s)		4.6	
Length Wtd. (m)	36.70	Wetted Per. (m)		9.52	
Min Ch El (m)	182.12	Shear (N/m2)		15.86	
Alpha	1.00	Stream Power (N/m s)	2699.36	0.00	0.00
Frctn Loss (m)	0.63	Cum Volume (1000 m3)		0.03	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.29	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Rouge River
REACH: WC11 RS: 10

INPUT

Description: ST 10 - New section by Parsons - Jan 15 2016
Station Elevation Data num= 36

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	182.16	1.49	182.02	1.6	182.01	1.72	182	1.89	181.98
6.89	181.5	10.75	181.12	11.95	181	14.99	180.74	16.95	180.5
17.94	180.38	19.3	180.25	20.38	180.22	20.54	180.21	21.54	180.03
21.72	180	22	180	22.12	180	22.32	180.01	22.65	180.06
23.41	180.15	24.91	180.18	27.27	180.5	27.39	180.51	27.43	180.51
27.59	180.51	27.78	180.51	29.01	180.53	29.21	180.53	33.39	180.74
35.68	180.82	41.74	181	51.3	181.36	53.51	181.45	55.11	181.5
56.43	181.56								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	11.95	.03	41.74	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
11.95	41.74	0	0	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	180.08	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	180.06	Reach Len. (m)			
Crit W.S. (m)	180.06	Flow Area (m2)		0.05	
E.G. Slope (m/m)	0.018432	Area (m2)		0.05	
Q Total (m3/s)	0.03	Flow (m3/s)		0.03	
Top Width (m)	1.29	Top Width (m)		1.29	
Vel Total (m/s)	0.55	Avg. Vel. (m/s)		0.55	
Max Chl Dpth (m)	0.06	Hydr. Depth (m)		0.04	
Conv. Total (m3/s)	0.2	Conv. (m3/s)		0.2	
Length Wtd. (m)		Wetted Per. (m)		1.29	
Min Ch El (m)	180.00	Shear (N/m2)		7.63	
Alpha	1.00	Stream Power (N/m s)	2701.75	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	180.10	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	180.07	Reach Len. (m)			
Crit W.S. (m)	180.07	Flow Area (m2)		0.07	
E.G. Slope (m/m)	0.024223	Area (m2)		0.07	
Q Total (m3/s)	0.05	Flow (m3/s)		0.05	
Top Width (m)	1.46	Top Width (m)		1.46	
Vel Total (m/s)	0.69	Avg. Vel. (m/s)		0.69	
Max Chl Dpth (m)	0.07	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	0.3	Conv. (m3/s)		0.3	
Length Wtd. (m)		Wetted Per. (m)		1.47	
Min Ch El (m)	180.00	Shear (N/m2)		11.62	
Alpha	1.00	Stream Power (N/m s)	2701.75	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	180.12	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.030	
W.S. Elev (m)	180.08	Reach Len. (m)			
Crit W.S. (m)	180.08	Flow Area (m2)		0.09	
E.G. Slope (m/m)	0.028279	Area (m2)		0.09	
Q Total (m3/s)	0.07	Flow (m3/s)		0.07	
Top Width (m)	1.60	Top Width (m)		1.60	
Vel Total (m/s)	0.80	Avg. Vel. (m/s)		0.80	
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	0.4	Conv. (m3/s)		0.4	
Length Wtd. (m)		Wetted Per. (m)		1.61	
Min Ch El (m)	180.00	Shear (N/m2)		15.00	
Alpha	1.00	Stream Power (N/m s)	2701.75	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	180.14	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.030	
W.S. Elev (m)	180.10	Reach Len. (m)			
Crit W.S. (m)	180.10	Flow Area (m2)		0.12	
E.G. Slope (m/m)	0.022324	Area (m2)		0.12	
Q Total (m3/s)	0.10	Flow (m3/s)		0.10	
Top Width (m)	1.90	Top Width (m)		1.90	
Vel Total (m/s)	0.80	Avg. Vel. (m/s)		0.80	
Max Chl Dpth (m)	0.10	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	0.7	Conv. (m3/s)		0.7	
Length Wtd. (m)		Wetted Per. (m)		1.91	
Min Ch El (m)	180.00	Shear (N/m2)		14.22	
Alpha	1.00	Stream Power (N/m s)	2701.75	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	180.15	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.030	
W.S. Elev (m)	180.12	Reach Len. (m)			
Crit W.S. (m)	180.12	Flow Area (m2)		0.16	
E.G. Slope (m/m)	0.016050	Area (m2)		0.16	
Q Total (m3/s)	0.12	Flow (m3/s)		0.12	
Top Width (m)	2.15	Top Width (m)		2.15	
Vel Total (m/s)	0.75	Avg. Vel. (m/s)		0.75	
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	0.9	Conv. (m3/s)		0.9	
Length Wtd. (m)		Wetted Per. (m)		2.17	
Min Ch El (m)	180.00	Shear (N/m2)		11.67	
Alpha	1.00	Stream Power (N/m s)	2701.75	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	180.17	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.030	
W.S. Elev (m)	180.12	Reach Len. (m)			
Crit W.S. (m)	180.12	Flow Area (m2)		0.16	
E.G. Slope (m/m)	0.026820	Area (m2)		0.16	
Q Total (m3/s)	0.15	Flow (m3/s)		0.15	
Top Width (m)	2.13	Top Width (m)		2.13	
Vel Total (m/s)	0.96	Avg. Vel. (m/s)		0.96	
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	0.9	Conv. (m3/s)		0.9	
Length Wtd. (m)		Wetted Per. (m)		2.14	
Min Ch El (m)	180.00	Shear (N/m2)		19.26	
Alpha	1.00	Stream Power (N/m s)	2701.75	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	180.19	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.030	
W.S. Elev (m)	180.14	Reach Len. (m)			
Crit W.S. (m)	180.14	Flow Area (m2)		0.21	
E.G. Slope (m/m)	0.020138	Area (m2)		0.21	
Q Total (m3/s)	0.19	Flow (m3/s)		0.19	
Top Width (m)	2.44	Top Width (m)		2.44	

Vel Total (m/s)	0.91	Avg. Vel. (m/s)		0.91	
Max Chl Dpth (m)	0.14	Hydr. Depth (m)		0.09	
Conv. Total (m3/s)	1.3	Conv. (m3/s)		1.3	
Length Wtd. (m)		Wetted Per. (m)		2.46	
Min Ch El (m)	180.00	Shear (N/m2)		16.71	
Alpha	1.00	Stream Power (N/m s)	2701.75	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	180.30	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.030	
W.S. Elev (m)	180.26	Reach Len. (m)			
Crit W.S. (m)	180.26	Flow Area (m2)		0.70	
E.G. Slope (m/m)	0.014585	Area (m2)		0.70	
Q Total (m3/s)	0.66	Flow (m3/s)		0.66	
Top Width (m)	6.22	Top Width (m)		6.22	
Vel Total (m/s)	0.94	Avg. Vel. (m/s)		0.94	
Max Chl Dpth (m)	0.26	Hydr. Depth (m)		0.11	
Conv. Total (m3/s)	5.5	Conv. (m3/s)		5.5	
Length Wtd. (m)		Wetted Per. (m)		6.26	
Min Ch El (m)	180.00	Shear (N/m2)		16.08	
Alpha	1.00	Stream Power (N/m s)	2701.75	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

SUMMARY OF MANNING'S N VALUES

River:Rouge River

Reach	River Sta.	n1	n2	n3
WC11	200	.035	.03	.035
WC11	100	.035	.03	.035
WC11	10	.035	.03	.035

SUMMARY OF REACH LENGTHS

River: Rouge River

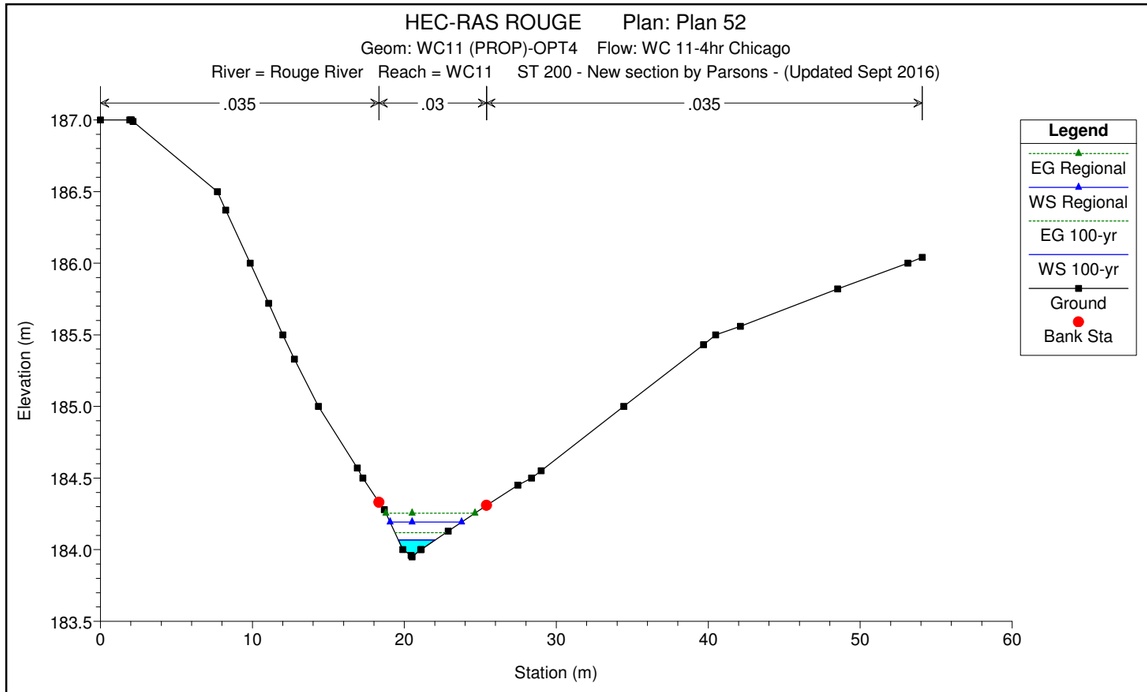
Reach	River Sta.	Left	Channel	Right
WC11	200	83.4	83.4	83.4
WC11	100	36.7	36.7	36.7
WC11	10	0	0	0

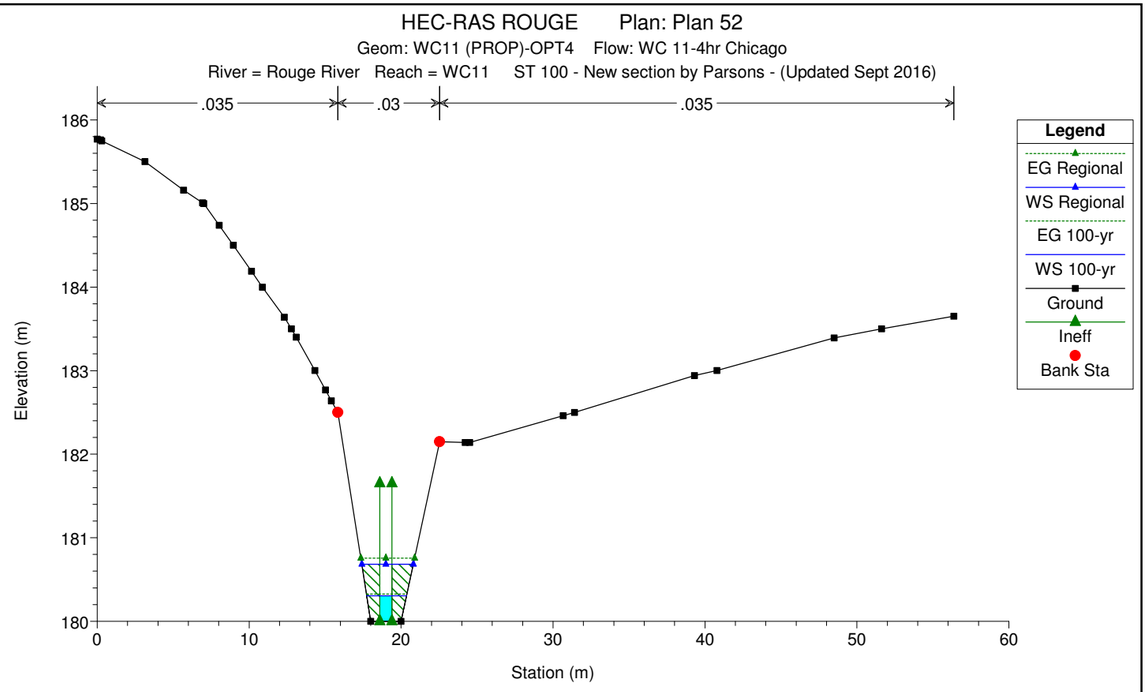
SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Rouge River

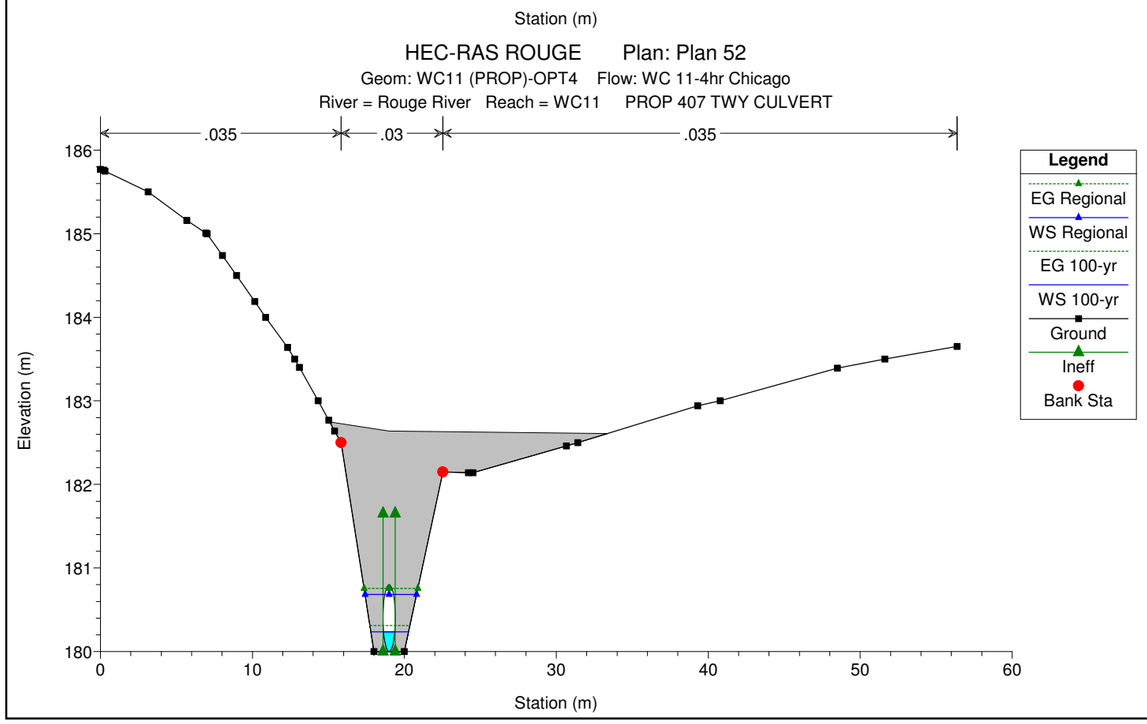
Reach	River Sta.	Contr.	Expan.
WC11	200	.1	.3
WC11	100	.1	.3
WC11	10	.1	.3

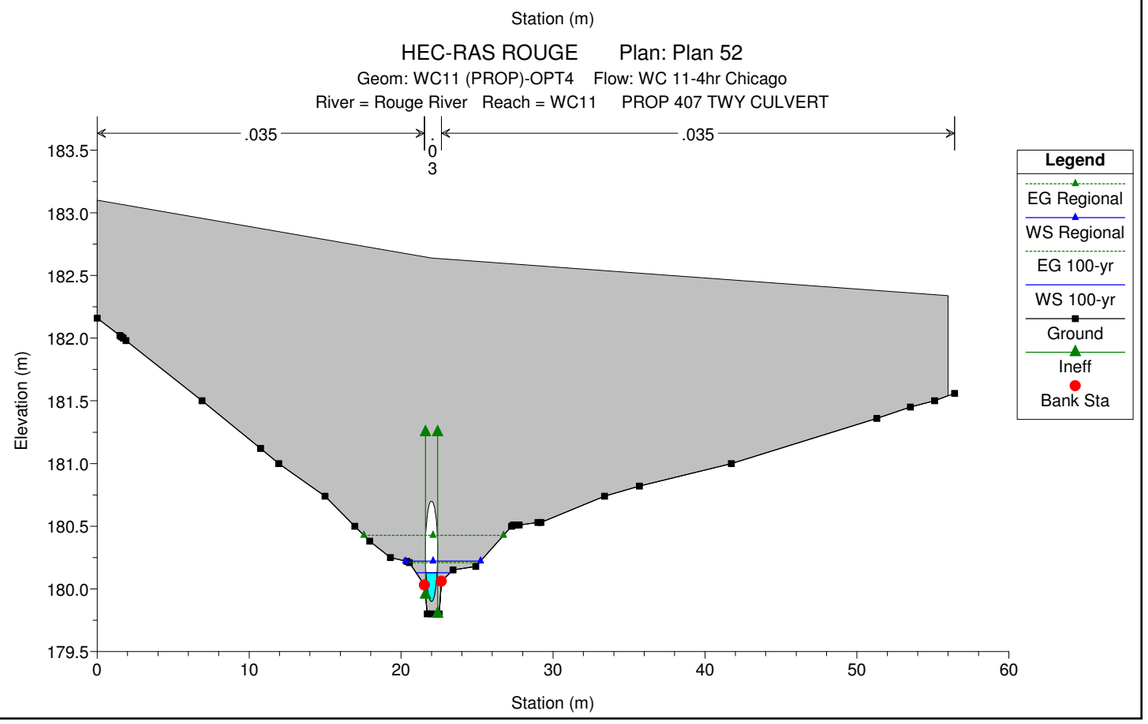
Profile Output Table - Standard Table 1

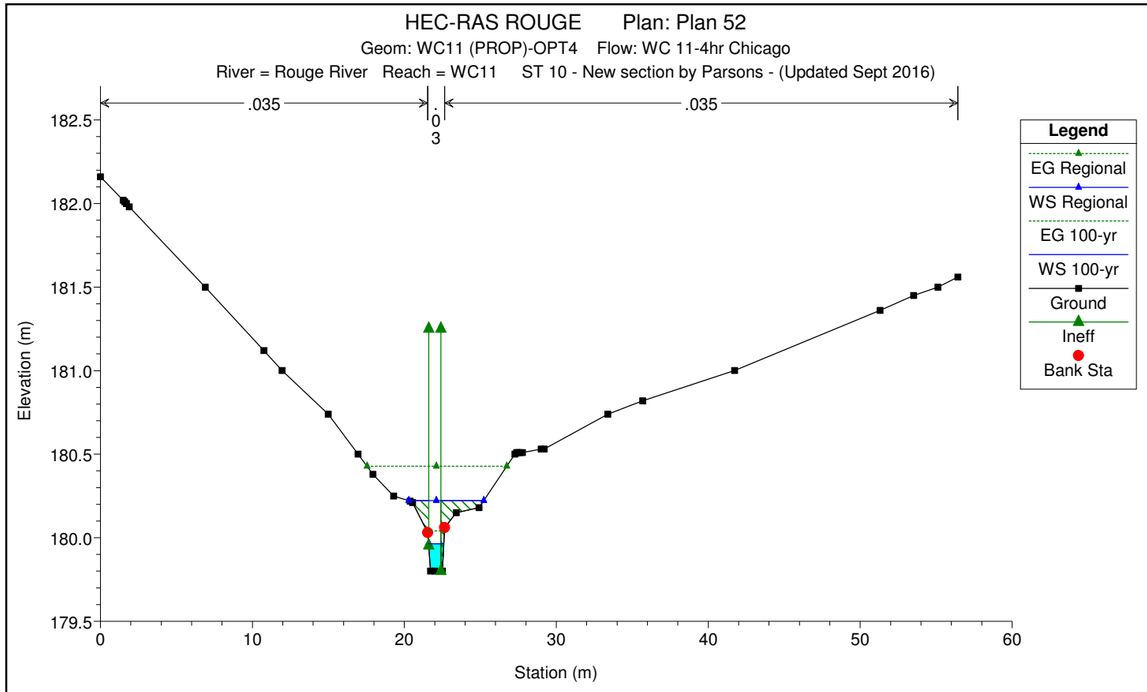
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
WC11	200	2-yr	0.03	183.95	184.03	184.03	184.04	0.008482	0.38	0.08	1.81	0.58
WC11	200	5-yr	0.05	183.95	184.04	184.04	184.05	0.018664	0.58	0.09	1.88	0.87
WC11	200	10-yr	0.07	183.95	184.05	184.04	184.07	0.019650	0.65	0.11	2.08	0.91
WC11	200	25-yr	0.10	183.95	184.07	184.06	184.09	0.015515	0.65	0.15	2.44	0.83
WC11	200	50-yr	0.12	183.95	184.07	184.06	184.10	0.018458	0.73	0.16	2.53	0.91
WC11	200	100-yr	0.15	183.95	184.08	184.07	184.11	0.018346	0.77	0.19	2.73	0.92
WC11	200	Check Flow	0.19	183.95	184.10	184.10	184.13	0.015882	0.78	0.24	3.05	0.88
WC11	200	Regional	0.66	183.95	184.19	184.19	184.26	0.017652	1.11	0.60	4.72	1.00
WC11	100	2-yr	0.03	182.12	182.17	182.17	182.17	0.007844	0.21	0.15	7.86	0.48
WC11	100	5-yr	0.05	182.12	182.17	182.17	182.18	0.021788	0.34	0.15	7.86	0.81
WC11	100	10-yr	0.07	182.12	182.17	182.17	182.18	0.026084	0.41	0.17	7.93	0.90
WC11	100	25-yr	0.10	182.12	182.18	182.18	182.19	0.036868	0.53	0.19	7.99	1.09
WC11	100	50-yr	0.12	182.12	182.18	182.18	182.20	0.028722	0.52	0.23	8.10	0.99
WC11	100	100-yr	0.15	182.12	182.19	182.19	182.20	0.029363	0.57	0.26	8.20	1.03
WC11	100	Check Flow	0.19	182.12	182.19	182.19	182.21	0.036530	0.67	0.28	8.26	1.16
WC11	100	Regional	0.66	182.12	182.24	182.24	182.28	0.020477	0.88	0.75	9.50	1.00
WC11	10	2-yr	0.03	180.00	180.06	180.06	180.08	0.018432	0.55	0.05	1.29	0.85
WC11	10	5-yr	0.05	180.00	180.07	180.07	180.10	0.024223	0.69	0.07	1.46	1.00
WC11	10	10-yr	0.07	180.00	180.08	180.08	180.12	0.028279	0.80	0.09	1.60	1.10
WC11	10	25-yr	0.10	180.00	180.10	180.10	180.14	0.022324	0.80	0.12	1.90	1.00
WC11	10	50-yr	0.12	180.00	180.12	180.12	180.15	0.016050	0.75	0.16	2.15	0.87
WC11	10	100-yr	0.15	180.00	180.12	180.12	180.17	0.026820	0.96	0.16	2.13	1.12
WC11	10	Check Flow	0.19	180.00	180.14	180.14	180.19	0.020138	0.91	0.21	2.44	1.00
WC11	10	Regional	0.66	180.00	180.26	180.26	180.30	0.014585	0.94	0.70	6.22	0.89


HEC-RAS ROUGE Plan: Plan 52
Geom: WC11 (PROP)-OPT4 Flow: WC 11-4hr Chicago
River = Rouge River Reach = WC11 ST 200 - New section by Parsons - (Updated Sept 2016)
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Bank Sta


HEC-RAS ROUGE Plan: Plan 52
Geom: WC11 (PROP)-OPT4 Flow: WC 11-4hr Chicago
River = Rouge River Reach = WC11 ST 100 - New section by Parsons - (Updated Sept 2016)
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 52
Geom: WC11 (PROP)-OPT4 Flow: WC 11-4hr Chicago
River = Rouge River Reach = WC11 PROP 407 TWY CULVERT
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 52
Geom: WC11 (PROP)-OPT4 Flow: WC 11-4hr Chicago
River = Rouge River Reach = WC11 PROP 407 TWY CULVERT
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 52
Geom: WC11 (PROP)-OPT4 Flow: WC 11-4hr Chicago
River = Rouge River Reach = WC11 ST 10 - New section by Parsons - (Updated Sept 2016)
.035
.03
.035
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta
Elevation (m)
Station (m)
182.5
182.0
181.5
181.0
180.5
180.0
179.5
0
10
20
30
40
50
60

HEC-RAS Plan: WC11-PROP-4hr CH River: Rouge River Reach: WC11

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC11	200	2-yr	0.03	183.95	184.03	184.03	184.04	0.008482	0.38	0.08	1.81	0.58
WC11	200	5-yr	0.05	183.95	184.04	184.04	184.05	0.019344	0.59	0.08	1.87	0.88
WC11	200	10-yr	0.07	183.95	184.04	184.04	184.07	0.026903	0.73	0.10	1.98	1.05
WC11	200	25-yr	0.10	183.95	184.06	184.06	184.09	0.024213	0.77	0.13	2.26	1.02
WC11	200	50-yr	0.12	183.95	184.06	184.06	184.10	0.027945	0.85	0.14	2.35	1.11
WC11	200	100-yr	0.15	183.95	184.07	184.07	184.12	0.036912	1.00	0.15	2.42	1.28
WC11	200	Check Flow	0.19	183.95	184.10	184.10	184.13	0.015882	0.78	0.24	3.05	0.88
WC11	200	Regional	0.66	183.95	184.19	184.19	184.26	0.017728	1.11	0.59	4.72	1.00
WC11	100	2-yr	0.03	180.00	180.14	180.05	180.14	0.000943	0.27	0.11	2.28	0.23
WC11	100	5-yr	0.05	180.00	180.18	180.07	180.18	0.001126	0.35	0.14	2.36	0.27
WC11	100	10-yr	0.07	180.00	180.21	180.09	180.22	0.001265	0.42	0.17	2.43	0.29
WC11	100	25-yr	0.10	180.00	180.25	180.12	180.26	0.001431	0.50	0.20	2.51	0.32
WC11	100	50-yr	0.12	180.00	180.27	180.13	180.29	0.001523	0.55	0.22	2.56	0.33
WC11	100	100-yr	0.15	180.00	180.31	180.15	180.32	0.001645	0.61	0.24	2.63	0.35
WC11	100	Check Flow	0.19	180.00	180.34	180.18	180.37	0.001784	0.69	0.27	2.70	0.38
WC11	100	Regional	0.66	180.00	180.68	180.41	180.76	0.002189	1.21	0.55	3.40	0.47
WC11	50		Culvert									
WC11	10	2-yr	0.03	179.80	179.87	179.87	179.89	0.015821	0.65	0.05	0.87	0.82
WC11	10	5-yr	0.05	179.80	179.88	179.88	179.92	0.022053	0.87	0.06	0.89	1.00
WC11	10	10-yr	0.07	179.80	179.89	179.89	179.95	0.026715	1.04	0.07	0.91	1.12
WC11	10	25-yr	0.10	179.80	179.93	179.93	179.99	0.020854	1.10	0.09	0.95	1.02
WC11	10	50-yr	0.12	179.80	179.94	179.94	180.01	0.020558	1.16	0.10	0.97	1.03
WC11	10	100-yr	0.15	179.80	179.96	179.96	180.04	0.018739	1.23	0.12	1.00	1.00
WC11	10	Check Flow	0.19	179.80	179.99	179.99	180.08	0.017564	1.32	0.14	1.04	1.00
WC11	10	Regional	0.66	179.80	180.22	180.22	180.43	0.013382	2.01	0.33	4.93	1.00

HEC-RAS HEC-RAS 5.0.1 April 2016
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X    X
X     X  X        X           X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X           X  X     X    X        X
X     X  X        X    X      X   X    X    X        X
X     X  XXXXXX    XXXX       X    X   X    X   XXXXX
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PROJECT DATA
Project Title: HEC-RAS ROUGE
Project File : HEC.prj
Run Date and Time: 9/7/2016 2:06:29 PM

Project in SI units

Project Description:
HEC-RAS model for creek crossings along the proposed 407 TWY Ph 2 started
from scratch

PLAN DATA

Plan Title: Plan 60
Plan File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.p60

Geometry Title: WC11 (PROP)-OPT4
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g12

Flow Title : WC 11-4hr Chicago
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f11

Plan Summary Information:
Number of: Cross Sections = 3 Multiple Openings = 0
Culverts = 1 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: WC 11-4hr Chicago
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f11

Flow Data (m3/s)

River	Reach	RS	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Check Flow	Regional
Rouge River	WC11	200	.03	.05	.07	.1	.12	.15	.19	.66

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Rouge River	WC11	2-yr		Critical
Rouge River	WC11	5-yr		Critical
Rouge River	WC11	10-yr		Critical
Rouge River	WC11	25-yr		Critical
Rouge River	WC11	50-yr		Critical
Rouge River	WC11	100-yr		Critical
Rouge River	WC11	Check Flow		Critical

GEOMETRY DATA

Geometry Title: WC11 (PROP)-OPT4
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g12

CROSS SECTION

RIVER: Rouge River
REACH: WC11 RS: 200

INPUT
Description: ST 200 - New section by Parsons - (Updated Sept 2016)
lowered
creek bottom by 0.45m
Station Elevation Data num= 32

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	187	1.92	187	2	187	2.02	187	2.14	186.99
7.69	186.5	8.24	186.37	9.86	186	11.07	185.72	12	185.5
12.77	185.33	14.34	185	16.91	184.57	17.27	184.5	18.34	184.33
18.68	184.28	19.9	184	20.44	183.96	20.51	183.95	21.08	184
21.1	184	22.89	184.13	27.47	184.45	28.37	184.5	29.01	184.55
34.43	185	39.69	185.43	40.49	185.5	42.11	185.56	48.52	185.82
53.14	186	54.08	186.04						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	14.34	.03	34.43	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
14.34 34.43 83.4 83.4 83.4 .3 .5

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	184.04	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	184.03	Reach Len. (m)	83.40	83.40	83.40
Crit W.S. (m)	184.03	Flow Area (m2)		0.08	
E.G. Slope (m/m)	0.008482	Area (m2)		0.08	
Q Total (m3/s)	0.03	Flow (m3/s)		0.03	
Top Width (m)	1.81	Top Width (m)		1.81	
Vel Total (m/s)	0.38	Avg. Vel. (m/s)		0.38	
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.04	
Conv. Total (m3/s)	0.3	Conv. (m3/s)		0.3	
Length Wtd. (m)	83.40	Wetted Per. (m)		1.82	
Min Ch El (m)	183.95	Shear (N/m2)		3.61	
Alpha	1.00	Stream Power (N/m s)		1.37	
Frctn Loss (m)	0.18	Cum Volume (1000 m3)		0.02	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.23	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	184.05	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	184.04	Reach Len. (m)	83.40	83.40	83.40
Crit W.S. (m)	184.04	Flow Area (m2)		0.08	
E.G. Slope (m/m)	0.019344	Area (m2)		0.08	
Q Total (m3/s)	0.05	Flow (m3/s)		0.05	
Top Width (m)	1.87	Top Width (m)		1.87	
Vel Total (m/s)	0.59	Avg. Vel. (m/s)		0.59	
Max Chl Dpth (m)	0.09	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	0.4	Conv. (m3/s)		0.4	
Length Wtd. (m)	83.40	Wetted Per. (m)		1.88	
Min Ch El (m)	183.95	Shear (N/m2)		8.58	
Alpha	1.00	Stream Power (N/m s)		5.05	
Frctn Loss (m)	0.24	Cum Volume (1000 m3)		0.02	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.24	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	184.07	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.030	
W.S. Elev (m)	184.04	Reach Len. (m)	83.40	83.40	83.40
Crit W.S. (m)	184.04	Flow Area (m2)		0.10	
E.G. Slope (m/m)	0.026903	Area (m2)		0.10	
Q Total (m3/s)	0.07	Flow (m3/s)		0.07	
Top Width (m)	1.98	Top Width (m)		1.98	
Vel Total (m/s)	0.73	Avg. Vel. (m/s)		0.73	
Max Chl Dpth (m)	0.09	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	0.4	Conv. (m3/s)		0.4	
Length Wtd. (m)	83.40	Wetted Per. (m)		1.99	
Min Ch El (m)	183.95	Shear (N/m2)		12.79	
Alpha	1.00	Stream Power (N/m s)		9.29	
Frctn Loss (m)	0.29	Cum Volume (1000 m3)		0.03	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.24	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	184.09	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.030	
W.S. Elev (m)	184.06	Reach Len. (m)	83.40	83.40	83.40
Crit W.S. (m)	184.06	Flow Area (m2)		0.13	
E.G. Slope (m/m)	0.024213	Area (m2)		0.13	
Q Total (m3/s)	0.10	Flow (m3/s)		0.10	
Top Width (m)	2.26	Top Width (m)		2.26	
Vel Total (m/s)	0.77	Avg. Vel. (m/s)		0.77	
Max Chl Dpth (m)	0.11	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	0.6	Conv. (m3/s)		0.6	
Length Wtd. (m)	83.40	Wetted Per. (m)		2.28	
Min Ch El (m)	183.95	Shear (N/m2)		13.55	
Alpha	1.00	Stream Power (N/m s)		10.42	
Frctn Loss (m)	0.31	Cum Volume (1000 m3)		0.03	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.26	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	184.10	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.030	
W.S. Elev (m)	184.06	Reach Len. (m)	83.40	83.40	83.40
Crit W.S. (m)	184.06	Flow Area (m2)		0.14	
E.G. Slope (m/m)	0.027945	Area (m2)		0.14	
Q Total (m3/s)	0.12	Flow (m3/s)		0.12	
Top Width (m)	2.35	Top Width (m)		2.35	
Vel Total (m/s)	0.85	Avg. Vel. (m/s)		0.85	
Max Chl Dpth (m)	0.11	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	0.7	Conv. (m3/s)		0.7	
Length Wtd. (m)	83.40	Wetted Per. (m)		2.37	
Min Ch El (m)	183.95	Shear (N/m2)		16.34	
Alpha	1.00	Stream Power (N/m s)		13.90	
Frctn Loss (m)	0.33	Cum Volume (1000 m3)		0.04	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.27	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	184.12	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.030	
W.S. Elev (m)	184.07	Reach Len. (m)	83.40	83.40	83.40
Crit W.S. (m)	184.07	Flow Area (m2)		0.15	
E.G. Slope (m/m)	0.036912	Area (m2)		0.15	
Q Total (m3/s)	0.15	Flow (m3/s)		0.15	
Top Width (m)	2.42	Top Width (m)		2.42	
Vel Total (m/s)	1.00	Avg. Vel. (m/s)		1.00	
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	0.8	Conv. (m3/s)		0.8	
Length Wtd. (m)	83.40	Wetted Per. (m)		2.43	
Min Ch El (m)	183.95	Shear (N/m2)		22.31	
Alpha	1.00	Stream Power (N/m s)		22.30	
Frctn Loss (m)	0.37	Cum Volume (1000 m3)		0.04	
C & E Loss (m)	0.02	Cum SA (1000 m2)		0.28	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical

depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	184.13	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.030	
W.S. Elev (m)	184.10	Reach Len. (m)	83.40	83.40	83.40
Crit W.S. (m)	184.10	Flow Area (m2)		0.24	
E.G. Slope (m/m)	0.015882	Area (m2)		0.24	
Q Total (m3/s)	0.19	Flow (m3/s)		0.19	
Top Width (m)	3.05	Top Width (m)		3.05	
Vel Total (m/s)	0.78	Avg. Vel. (m/s)		0.78	
Max Chl Dpth (m)	0.15	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	1.5	Conv. (m3/s)		1.5	
Length Wtd. (m)	83.40	Wetted Per. (m)		3.06	
Min Ch El (m)	183.95	Shear (N/m2)		12.41	
Alpha	1.00	Stream Power (N/m s)		9.65	
Frctn Loss (m)	0.33	Cum Volume (1000 m3)		0.05	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.31	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	184.26	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.030	
W.S. Elev (m)	184.19	Reach Len. (m)	83.40	83.40	83.40
Crit W.S. (m)	184.19	Flow Area (m2)		0.59	
E.G. Slope (m/m)	0.017728	Area (m2)		0.59	
Q Total (m3/s)	0.66	Flow (m3/s)		0.66	
Top Width (m)	4.72	Top Width (m)		4.72	
Vel Total (m/s)	1.11	Avg. Vel. (m/s)		1.11	
Max Chl Dpth (m)	0.24	Hydr. Depth (m)		0.13	
Conv. Total (m3/s)	5.0	Conv. (m3/s)		5.0	
Length Wtd. (m)	83.40	Wetted Per. (m)		4.75	
Min Ch El (m)	183.95	Shear (N/m2)		21.75	
Alpha	1.00	Stream Power (N/m s)		24.15	
Frctn Loss (m)	0.40	Cum Volume (1000 m3)		0.12	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.49	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Rouge River
REACH: WC11 RS: 100

INPUT
Description: ST 100 - New section by Parsons - (Updated Sept 2016)
lowered
creek bottom by 2m
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	185.77	.21	185.76	.3	185.75	3.14	185.5	5.68	185.16
6.93	185.01	7.01	185	8.03	184.74	8.96	184.5	10.16	184.19
10.87	184	12.31	183.64	12.78	183.5	13.09	183.4	14.32	183
15.02	182.77	15.4	182.64	15.84	182.5	18	180	20	180
22.54	182.15	24.21	182.14	24.51	182.14	30.66	182.46	31.42	182.5
39.31	182.94	40.78	183	48.5	183.39	51.62	183.5	56.38	183.65

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	14.32	.03	40.78	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
14.32 40.78 36.7 36.7 36.7 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	18.6	181.65	T
19.4	56.38	181.65	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	180.14	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	180.14	Reach Len. (m)	36.70	36.70	36.70
Crit W.S. (m)	180.05	Flow Area (m2)		0.11	
E.G. Slope (m/m)	0.000943	Area (m2)		0.29	
Q Total (m3/s)	0.03	Flow (m3/s)		0.03	
Top Width (m)	2.28	Top Width (m)		2.28	
Vel Total (m/s)	0.27	Avg. Vel. (m/s)		0.27	
Max Chl Dpth (m)	0.14	Hydr. Depth (m)		0.14	
Conv. Total (m3/s)	1.0	Conv. (m3/s)		1.0	
Length Wtd. (m)	36.70	Wetted Per. (m)		0.80	
Min Ch El (m)	180.00	Shear (N/m2)		1.27	
Alpha	1.00	Stream Power (N/m s)		0.35	
Frctn Loss (m)		Cum Volume (1000 m3)		0.00	
C & E Loss (m)		Cum SA (1000 m2)		0.06	

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	180.18	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	180.18	Reach Len. (m)	36.70	36.70	36.70
Crit W.S. (m)	180.07	Flow Area (m2)		0.14	
E.G. Slope (m/m)	0.001126	Area (m2)		0.39	
Q Total (m3/s)	0.05	Flow (m3/s)		0.05	
Top Width (m)	2.36	Top Width (m)		2.36	
Vel Total (m/s)	0.35	Avg. Vel. (m/s)		0.35	
Max Chl Dpth (m)	0.18	Hydr. Depth (m)		0.18	
Conv. Total (m3/s)	1.5	Conv. (m3/s)		1.5	
Length Wtd. (m)	36.70	Wetted Per. (m)		0.80	
Min Ch El (m)	180.00	Shear (N/m2)		1.96	
Alpha	1.00	Stream Power (N/m s)		0.69	
Frctn Loss (m)		Cum Volume (1000 m3)		0.00	
C & E Loss (m)		Cum SA (1000 m2)		0.06	

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	180.22	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	180.21	Reach Len. (m)	36.70	36.70	36.70
Crit W.S. (m)	180.09	Flow Area (m2)		0.17	
E.G. Slope (m/m)	0.001265	Area (m2)		0.46	
Q Total (m3/s)	0.07	Flow (m3/s)		0.07	
Top Width (m)	2.43	Top Width (m)		2.43	

Vel Total (m/s)	0.42	Avg. Vel. (m/s)	0.42
Max Chl Dpth (m)	0.21	Hydr. Depth (m)	0.21
Conv. Total (m3/s)	2.0	Conv. (m3/s)	2.0
Length Wtd. (m)	36.70	Wetted Per. (m)	0.80
Min Ch El (m)	180.00	Shear (N/m2)	2.60
Alpha	1.00	Stream Power (N/m s)	1.09
Frctn Loss (m)		Cum Volume (1000 m3)	0.00
C & E Loss (m)		Cum SA (1000 m2)	0.06

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	180.26	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	180.25	Reach Len. (m)	36.70	36.70	36.70
Crit W.S. (m)	180.12	Flow Area (m2)		0.20	
E.G. Slope (m/m)	0.001431	Area (m2)		0.56	
Q Total (m3/s)	0.10	Flow (m3/s)		0.10	
Top Width (m)	2.51	Top Width (m)		2.51	
Vel Total (m/s)	0.50	Avg. Vel. (m/s)		0.50	
Max Chl Dpth (m)	0.25	Hydr. Depth (m)		0.25	
Conv. Total (m3/s)	2.6	Conv. (m3/s)		2.6	
Length Wtd. (m)	36.70	Wetted Per. (m)		0.80	
Min Ch El (m)	180.00	Shear (N/m2)		3.51	
Alpha	1.00	Stream Power (N/m s)		1.75	
Frctn Loss (m)		Cum Volume (1000 m3)		0.00	
C & E Loss (m)		Cum SA (1000 m2)		0.06	

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	180.29	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	180.27	Reach Len. (m)	36.70	36.70	36.70
Crit W.S. (m)	180.13	Flow Area (m2)		0.22	
E.G. Slope (m/m)	0.001523	Area (m2)		0.62	
Q Total (m3/s)	0.12	Flow (m3/s)		0.12	
Top Width (m)	2.56	Top Width (m)		2.56	
Vel Total (m/s)	0.55	Avg. Vel. (m/s)		0.55	
Max Chl Dpth (m)	0.27	Hydr. Depth (m)		0.27	
Conv. Total (m3/s)	3.1	Conv. (m3/s)		3.1	
Length Wtd. (m)	36.70	Wetted Per. (m)		0.80	
Min Ch El (m)	180.00	Shear (N/m2)		4.09	
Alpha	1.00	Stream Power (N/m s)		2.24	
Frctn Loss (m)		Cum Volume (1000 m3)		0.00	
C & E Loss (m)		Cum SA (1000 m2)		0.06	

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	180.32	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	180.31	Reach Len. (m)	36.70	36.70	36.70
Crit W.S. (m)	180.15	Flow Area (m2)		0.24	
E.G. Slope (m/m)	0.001645	Area (m2)		0.71	
Q Total (m3/s)	0.15	Flow (m3/s)		0.15	
Top Width (m)	2.63	Top Width (m)		2.63	
Vel Total (m/s)	0.61	Avg. Vel. (m/s)		0.61	
Max Chl Dpth (m)	0.31	Hydr. Depth (m)		0.31	
Conv. Total (m3/s)	3.7	Conv. (m3/s)		3.7	
Length Wtd. (m)	36.70	Wetted Per. (m)		0.80	
Min Ch El (m)	180.00	Shear (N/m2)		4.93	
Alpha	1.00	Stream Power (N/m s)		3.02	
Frctn Loss (m)		Cum Volume (1000 m3)		0.01	
C & E Loss (m)		Cum SA (1000 m2)		0.07	

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	180.37	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	180.34	Reach Len. (m)	36.70	36.70	36.70
Crit W.S. (m)	180.18	Flow Area (m2)		0.27	
E.G. Slope (m/m)	0.001784	Area (m2)		0.81	
Q Total (m3/s)	0.19	Flow (m3/s)		0.19	
Top Width (m)	2.70	Top Width (m)		2.70	
Vel Total (m/s)	0.69	Avg. Vel. (m/s)		0.69	
Max Chl Dpth (m)	0.34	Hydr. Depth (m)		0.34	
Conv. Total (m3/s)	4.5	Conv. (m3/s)		4.5	
Length Wtd. (m)	36.70	Wetted Per. (m)		0.80	
Min Ch El (m)	180.00	Shear (N/m2)		6.01	
Alpha	1.00	Stream Power (N/m s)		4.16	
Frctn Loss (m)		Cum Volume (1000 m3)		0.01	
C & E Loss (m)		Cum SA (1000 m2)		0.07	

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	180.76	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.030	
W.S. Elev (m)	180.68	Reach Len. (m)	36.70	36.70	36.70
Crit W.S. (m)	180.41	Flow Area (m2)		0.55	
E.G. Slope (m/m)	0.002189	Area (m2)		1.84	
Q Total (m3/s)	0.66	Flow (m3/s)		0.66	
Top Width (m)	3.40	Top Width (m)		3.40	
Vel Total (m/s)	1.21	Avg. Vel. (m/s)		1.21	
Max Chl Dpth (m)	0.68	Hydr. Depth (m)		0.68	
Conv. Total (m3/s)	14.1	Conv. (m3/s)		14.1	
Length Wtd. (m)	36.70	Wetted Per. (m)		0.80	
Min Ch El (m)	180.00	Shear (N/m2)		14.65	
Alpha	1.00	Stream Power (N/m s)		17.72	
Frctn Loss (m)		Cum Volume (1000 m3)		0.01	
C & E Loss (m)		Cum SA (1000 m2)		0.15	

CULVERT

RIVER: Rouge River
REACH: WC11 RS: 50

INPUT
Description: PROP 407 TWY CULVERT
Distance from Upstream XS = 12
Deck/Roadway Width = 13
Weir Coefficient = 1.4
Upstream Deck/Roadway Coordinates
num= 3

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	183.16		19	182.64		56	182.56	

Upstream Bridge Cross Section Data
Station Elevation Data num= 30

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	185.77	.21	185.76	.3	185.75	3.14	185.5	5.68	185.16
6.93	185.01	7.01	185	8.03	184.74	8.96	184.5	10.16	184.19
10.87	184	12.31	183.64	12.78	183.5	13.09	183.4	14.32	183
15.02	182.77	15.4	182.64	15.84	182.5	18	180	20	180
22.54	182.15	24.21	182.14	24.51	182.14	30.66	182.46	31.42	182.5
39.31	182.94	40.78	183	48.5	183.39	51.62	183.5	56.38	183.65

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	14.32	.03	40.78	.035

Bank Sta: Left Right Coeff Contr. Expan.
14.32 40.78 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	18.6	181.65	T
19.4	56.38	181.65	T

Downstream Deck/Roadway Coordinates
num= 3

```
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0   183.1               22  182.64               56  182.34

Downstream Bridge Cross Section Data
Station Elevation Data     num=      35
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  182.16    1.49  182.02     1.6  182.01    1.72     182    1.89  181.98
    6.89   181.5   10.75  181.12   11.95     181   14.99  180.74   16.95   180.5
   17.94  180.38    19.3  180.25   20.38  180.22   20.54  180.21   21.54  180.03
   21.72   179.8      22   179.8    22.5   179.8   22.65  180.06   23.41  180.15
   24.91  180.18   27.27   180.5   27.39  180.51   27.43  180.51   27.59  180.51
   27.78  180.51   29.01  180.53   29.21  180.53   33.39  180.74   35.68  180.82
   41.74     181    51.3  181.36   53.51  181.45   55.11   181.5   56.43  181.56

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .035   11.95     .03   41.74    .035

Bank Sta: Left   Right    Coeff Contr.   Expan.
          11.95   41.74          .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0    21.6  181.25       T
    22.4   56.43  181.25       T

Upstream Embankment side slope              =       2 horiz. to 1.0 vertical
Downstream Embankment side slope            =       2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1     Circular      .8
FHWA Chart # 1 - Concrete Pipe Culvert
FHWA Scale # 1 - Square edge entrance with headwall
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                  2      28     .013     .013        0                  .2               1
Upstream   Elevation =  180
           Centerline Station =  19
Downstream Elevation =  179.9
           Centerline Station =  22

CULVERT OUTPUT  Profile #2-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.03    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         0.75
  Q Barrel (m3/s)           0.03    Culv Vel DS (m/s)         0.82
  E.G. US. (m)            180.14    Culv Inv El Up (m)      180.00
  W.S. US. (m)            180.14    Culv Inv El Dn (m)      179.90
  E.G. DS (m)             179.89    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             179.87    Culv Exit Loss (m)        0.15
  Delta EG (m)              0.25    Culv Entr Loss (m)        0.01
  Delta WS (m)              0.27    Q Weir (m3/s)
  E.G. IC (m)             180.13    Weir Sta Lft (m)
  E.G. OC (m)             180.14    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       180.11    Weir Max Depth (m)
  Culv WS Outlet (m)      180.00    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.11    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.10    Min El Weir Flow (m)    182.61


Note:    During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth.  Therefore, the
         inlet will be at normal depth.

CULVERT OUTPUT  Profile #5-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.05    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         0.88
  Q Barrel (m3/s)           0.05    Culv Vel DS (m/s)         0.94
  E.G. US. (m)            180.18    Culv Inv El Up (m)      180.00
  W.S. US. (m)            180.18    Culv Inv El Dn (m)      179.90
  E.G. DS (m)             179.92    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             179.88    Culv Exit Loss (m)        0.16
  Delta EG (m)              0.26    Culv Entr Loss (m)        0.01
  Delta WS (m)              0.30    Q Weir (m3/s)
  E.G. IC (m)             180.17    Weir Sta Lft (m)
  E.G. OC (m)             180.18    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       180.14    Weir Max Depth (m)
  Culv WS Outlet (m)      180.03    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.14    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.13    Min El Weir Flow (m)    182.61


Note:    During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth.  Therefore, the
         inlet will be at normal depth.

CULVERT OUTPUT  Profile #10-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.07    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         0.98
  Q Barrel (m3/s)           0.07    Culv Vel DS (m/s)         1.03
  E.G. US. (m)            180.22    Culv Inv El Up (m)      180.00
  W.S. US. (m)            180.21    Culv Inv El Dn (m)      179.90
  E.G. DS (m)             179.95    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             179.89    Culv Exit Loss (m)        0.16
  Delta EG (m)              0.27    Culv Entr Loss (m)        0.01
  Delta WS (m)              0.32    Q Weir (m3/s)
  E.G. IC (m)             180.21    Weir Sta Lft (m)
  E.G. OC (m)             180.22    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       180.16    Weir Max Depth (m)
  Culv WS Outlet (m)      180.05    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.16    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.15    Min El Weir Flow (m)    182.61


Note:    During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth.  Therefore, the
         inlet will be at normal depth.

CULVERT OUTPUT  Profile #25-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.10    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         1.08
  Q Barrel (m3/s)           0.10    Culv Vel DS (m/s)         1.13
  E.G. US. (m)            180.26    Culv Inv El Up (m)      180.00
  W.S. US. (m)            180.25    Culv Inv El Dn (m)      179.90
  E.G. DS (m)             179.99    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             179.93    Culv Exit Loss (m)        0.16
  Delta EG (m)              0.28    Culv Entr Loss (m)        0.01
  Delta WS (m)              0.32    Q Weir (m3/s)
  E.G. IC (m)             180.25    Weir Sta Lft (m)
  E.G. OC (m)             180.26    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       180.19    Weir Max Depth (m)
  Culv WS Outlet (m)      180.09    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.19    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.19    Min El Weir Flow (m)    182.61


Note:    During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth.  Therefore, the
         inlet will be at normal depth.

CULVERT OUTPUT  Profile #50-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.12    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         1.14
  Q Barrel (m3/s)           0.12    Culv Vel DS (m/s)         1.19
```

E.G. US. (m)	180.29	Culv Inv El Up (m)	180.00
W.S. US. (m)	180.27	Culv Inv El Dn (m)	179.90
E.G. DS (m)	180.01	Culv Frctn Ls (m)	0.00
W.S. DS (m)	179.94	Culv Exit Loss (m)	0.17
Delta EG (m)	0.28	Culv Entr Loss (m)	0.01
Delta WS (m)	0.33	Q Weir (m3/s)	
E.G. IC (m)	180.28	Weir Sta Lft (m)	
E.G. OC (m)	180.29	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	180.21	Weir Max Depth (m)	
Culv WS Outlet (m)	180.10	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.21	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.20	Min El Weir Flow (m)	182.61

Note: During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth. Therefore, the inlet will be at normal depth.

CULVERT OUTPUT Profile #100-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.15	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.21
Q Barrel (m3/s)	0.15	Culv Vel DS (m/s)	1.27
E.G. US. (m)	180.33	Culv Inv El Up (m)	180.00
W.S. US. (m)	180.31	Culv Inv El Dn (m)	179.90
E.G. DS (m)	180.04	Culv Frctn Ls (m)	0.00
W.S. DS (m)	179.96	Culv Exit Loss (m)	0.17
Delta EG (m)	0.28	Culv Entr Loss (m)	0.01
Delta WS (m)	0.34	Q Weir (m3/s)	
E.G. IC (m)	180.31	Weir Sta Lft (m)	
E.G. OC (m)	180.33	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	180.24	Weir Max Depth (m)	
Culv WS Outlet (m)	180.13	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.24	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.23	Min El Weir Flow (m)	182.61

Note: During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth. Therefore, the inlet will be at normal depth.

CULVERT OUTPUT Profile #Check Flow Culv Group: Culvert #1

Q Culv Group (m3/s)	0.19	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.28
Q Barrel (m3/s)	0.19	Culv Vel DS (m/s)	1.36
E.G. US. (m)	180.37	Culv Inv El Up (m)	180.00
W.S. US. (m)	180.34	Culv Inv El Dn (m)	179.90
E.G. DS (m)	180.08	Culv Frctn Ls (m)	0.00
W.S. DS (m)	179.99	Culv Exit Loss (m)	0.17
Delta EG (m)	0.29	Culv Entr Loss (m)	0.02
Delta WS (m)	0.35	Q Weir (m3/s)	
E.G. IC (m)	180.35	Weir Sta Lft (m)	
E.G. OC (m)	180.37	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	180.27	Weir Max Depth (m)	
Culv WS Outlet (m)	180.16	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.27	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.26	Min El Weir Flow (m)	182.61

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #Regional Culv Group: Culvert #1

Q Culv Group (m3/s)	0.66	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.79
Q Barrel (m3/s)	0.66	Culv Vel DS (m/s)	2.03
E.G. US. (m)	180.76	Culv Inv El Up (m)	180.00
W.S. US. (m)	180.68	Culv Inv El Dn (m)	179.90
E.G. DS (m)	180.43	Culv Frctn Ls (m)	0.00
W.S. DS (m)	180.22	Culv Exit Loss (m)	0.18
Delta EG (m)	0.33	Culv Entr Loss (m)	0.04
Delta WS (m)	0.46	Q Weir (m3/s)	
E.G. IC (m)	180.76	Weir Sta Lft (m)	
E.G. OC (m)	180.75	Weir Sta Rgt (m)	
Culvert Control	Inlet	Weir Submerg	
Culv WS Inlet (m)	180.55	Weir Max Depth (m)	
Culv WS Outlet (m)	180.39	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.56	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.49	Min El Weir Flow (m)	182.61

CROSS SECTION

RIVER: Rouge River
REACH: WC11 RS: 10

INPUT
Description: ST 10 - New section by Parsons - (Updated Sept 2016)
lowered
creek bottom by 0.2m
Station Elevation Data num= 35

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	182.16	1.49	182.02	1.6	182.01	1.72	182	1.89	181.98
6.89	181.5	10.75	181.12	11.95	181	14.99	180.74	16.95	180.5
17.94	180.38	19.3	180.25	20.38	180.22	20.54	180.21	21.54	180.03
21.72	179.8	22	179.8	22.5	179.8	22.65	180.06	23.41	180.15
24.91	180.18	27.27	180.5	27.39	180.51	27.43	180.51	27.59	180.51
27.78	180.51	29.01	180.53	29.21	180.53	33.39	180.74	35.68	180.82
41.74	181	51.3	181.36	53.51	181.45	55.11	181.5	56.43	181.56

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	11.95	.03	41.74	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
11.95	41.74	0	0	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	21.6	181.25	T
22.4	56.43	181.25	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	179.89	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	179.87	Reach Len. (m)			
Crit W.S. (m)	179.87	Flow Area (m2)		0.05	
E.G. Slope (m/m)	0.015821	Area (m2)		0.05	
Q Total (m3/s)	0.03	Flow (m3/s)		0.03	
Top Width (m)	0.87	Top Width (m)		0.87	
Vel Total (m/s)	0.65	Avg. Vel. (m/s)		0.65	
Max Chl Dpth (m)	0.07	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	0.2	Conv. (m3/s)		0.2	
Length Wtd. (m)		Wetted Per. (m)		0.76	
Min Ch El (m)	179.80	Shear (N/m2)		9.42	
Alpha	1.00	Stream Power (N/m s)		6.10	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	179.92	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.030	
W.S. Elev (m)	179.88	Reach Len. (m)			
Crit W.S. (m)	179.88	Flow Area (m2)		0.06	
E.G. Slope (m/m)	0.022053	Area (m2)		0.07	
Q Total (m3/s)	0.05	Flow (m3/s)		0.05	
Top Width (m)	0.89	Top Width (m)		0.89	
Vel Total (m/s)	0.87	Avg. Vel. (m/s)		0.87	
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.08	

Conv. Total (m3/s)	0.3	Conv. (m3/s)	0.3
Length Wtd. (m)		Wetted Per. (m)	0.78
Min Ch El (m)	179.80	Shear (N/m2)	15.90
Alpha	1.00	Stream Power (N/m s)	13.81
Frctn Loss (m)		Cum Volume (1000 m3)	
C & E Loss (m)		Cum SA (1000 m2)	

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	179.95	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.030	
W.S. Elev (m)	179.89	Reach Len. (m)			
Crit W.S. (m)	179.89	Flow Area (m2)		0.07	
E.G. Slope (m/m)	0.026715	Area (m2)		0.08	
Q Total (m3/s)	0.07	Flow (m3/s)		0.07	
Top Width (m)	0.91	Top Width (m)		0.91	
Vel Total (m/s)	1.04	Avg. Vel. (m/s)		1.04	
Max Chl Dpth (m)	0.09	Hydr. Depth (m)		0.09	
Conv. Total (m3/s)	0.4	Conv. (m3/s)		0.4	
Length Wtd. (m)		Wetted Per. (m)		0.80	
Min Ch El (m)	179.80	Shear (N/m2)		21.98	
Alpha	1.00	Stream Power (N/m s)		22.96	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	179.99	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.030	
W.S. Elev (m)	179.93	Reach Len. (m)			
Crit W.S. (m)	179.93	Flow Area (m2)		0.09	
E.G. Slope (m/m)	0.020854	Area (m2)		0.11	
Q Total (m3/s)	0.10	Flow (m3/s)		0.10	
Top Width (m)	0.95	Top Width (m)		0.95	
Vel Total (m/s)	1.10	Avg. Vel. (m/s)		1.10	
Max Chl Dpth (m)	0.13	Hydr. Depth (m)		0.12	
Conv. Total (m3/s)	0.7	Conv. (m3/s)		0.7	
Length Wtd. (m)		Wetted Per. (m)		0.84	
Min Ch El (m)	179.80	Shear (N/m2)		22.23	
Alpha	1.00	Stream Power (N/m s)		24.38	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	180.01	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.030	
W.S. Elev (m)	179.94	Reach Len. (m)			
Crit W.S. (m)	179.94	Flow Area (m2)		0.10	
E.G. Slope (m/m)	0.020558	Area (m2)		0.12	
Q Total (m3/s)	0.12	Flow (m3/s)		0.12	
Top Width (m)	0.97	Top Width (m)		0.97	
Vel Total (m/s)	1.16	Avg. Vel. (m/s)		1.16	
Max Chl Dpth (m)	0.14	Hydr. Depth (m)		0.13	
Conv. Total (m3/s)	0.8	Conv. (m3/s)		0.8	
Length Wtd. (m)		Wetted Per. (m)		0.86	
Min Ch El (m)	179.80	Shear (N/m2)		24.22	
Alpha	1.00	Stream Power (N/m s)		28.19	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	180.04	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.		0.030	
W.S. Elev (m)	179.96	Reach Len. (m)			
Crit W.S. (m)	179.96	Flow Area (m2)		0.12	
E.G. Slope (m/m)	0.018739	Area (m2)		0.15	
Q Total (m3/s)	0.15	Flow (m3/s)		0.15	
Top Width (m)	1.00	Top Width (m)		1.00	
Vel Total (m/s)	1.23	Avg. Vel. (m/s)		1.23	
Max Chl Dpth (m)	0.16	Hydr. Depth (m)		0.15	
Conv. Total (m3/s)	1.1	Conv. (m3/s)		1.1	
Length Wtd. (m)		Wetted Per. (m)		0.87	
Min Ch El (m)	179.80	Shear (N/m2)		25.66	
Alpha	1.00	Stream Power (N/m s)		31.51	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	180.08	Element	Left OB	Channel	Right OB
Vel Head (m)	0.09	Wt. n-Val.		0.030	
W.S. Elev (m)	179.99	Reach Len. (m)			
Crit W.S. (m)	179.99	Flow Area (m2)		0.14	
E.G. Slope (m/m)	0.017564	Area (m2)		0.17	
Q Total (m3/s)	0.19	Flow (m3/s)		0.19	
Top Width (m)	1.04	Top Width (m)		1.04	
Vel Total (m/s)	1.32	Avg. Vel. (m/s)		1.32	
Max Chl Dpth (m)	0.19	Hydr. Depth (m)		0.18	
Conv. Total (m3/s)	1.4	Conv. (m3/s)		1.4	
Length Wtd. (m)		Wetted Per. (m)		0.87	
Min Ch El (m)	179.80	Shear (N/m2)		28.26	
Alpha	1.00	Stream Power (N/m s)		37.41	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	180.43	Element	Left OB	Channel	Right OB
Vel Head (m)	0.21	Wt. n-Val.		0.030	
W.S. Elev (m)	180.22	Reach Len. (m)			
Crit W.S. (m)	180.22	Flow Area (m2)		0.33	
E.G. Slope (m/m)	0.013382	Area (m2)		0.71	
Q Total (m3/s)	0.66	Flow (m3/s)		0.66	
Top Width (m)	4.93	Top Width (m)		4.93	
Vel Total (m/s)	2.01	Avg. Vel. (m/s)		2.01	
Max Chl Dpth (m)	0.42	Hydr. Depth (m)		0.41	
Conv. Total (m3/s)	5.7	Conv. (m3/s)		5.7	
Length Wtd. (m)		Wetted Per. (m)		0.87	
Min Ch El (m)	179.80	Shear (N/m2)		49.31	
Alpha	1.00	Stream Power (N/m s)		99.00	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

SUMMARY OF MANNING'S N VALUES

River:Rouge River

Reach	River Sta.	n1	n2	n3
WC11	200	.035	.03	.035
WC11	100	.035	.03	.035
WC11	50	Culvert		
WC11	10	.035	.03	.035

SUMMARY OF REACH LENGTHS

River: Rouge River

Reach	River Sta.	Left	Channel	Right

WC11	200	83.4	83.4	83.4
WC11	100	36.7	36.7	36.7
WC11	50	Culvert		
WC11	10	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Rouge River

Reach	River Sta.	Contr.	Expan.
WC11	200	.3	.5
WC11	100	.3	.5
WC11	50	Culvert	
WC11	10	.3	.5

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
WC11	200	2-yr	0.03	183.95	184.03	184.03	184.04	0.008482	0.38	0.08	1.81	0.58
WC11	200	5-yr	0.05	183.95	184.04	184.04	184.05	0.019344	0.59	0.08	1.87	0.88
WC11	200	10-yr	0.07	183.95	184.04	184.04	184.07	0.026903	0.73	0.10	1.98	1.05
WC11	200	25-yr	0.10	183.95	184.06	184.06	184.09	0.024213	0.77	0.13	2.26	1.02
WC11	200	50-yr	0.12	183.95	184.06	184.06	184.10	0.027945	0.85	0.14	2.35	1.11
WC11	200	100-yr	0.15	183.95	184.07	184.07	184.12	0.036912	1.00	0.15	2.42	1.28
WC11	200	Check Flow	0.19	183.95	184.10	184.10	184.13	0.015882	0.78	0.24	3.05	0.88
WC11	200	Regional	0.66	183.95	184.19	184.19	184.26	0.017728	1.11	0.59	4.72	1.00
WC11	100	2-yr	0.03	180.00	180.14	180.05	180.14	0.000943	0.27	0.11	2.28	0.23
WC11	100	5-yr	0.05	180.00	180.18	180.07	180.18	0.001126	0.35	0.14	2.36	0.27
WC11	100	10-yr	0.07	180.00	180.21	180.09	180.22	0.001265	0.42	0.17	2.43	0.29
WC11	100	25-yr	0.10	180.00	180.25	180.12	180.26	0.001431	0.50	0.20	2.51	0.32
WC11	100	50-yr	0.12	180.00	180.27	180.13	180.29	0.001523	0.55	0.22	2.56	0.33
WC11	100	100-yr	0.15	180.00	180.31	180.15	180.32	0.001645	0.61	0.24	2.63	0.35
WC11	100	Check Flow	0.19	180.00	180.34	180.18	180.37	0.001784	0.69	0.27	2.70	0.38
WC11	100	Regional	0.66	180.00	180.68	180.41	180.76	0.002189	1.21	0.55	3.40	0.47
WC11	50		Culvert									
WC11	10	2-yr	0.03	179.80	179.87	179.87	179.89	0.015821	0.65	0.05	0.87	0.82
WC11	10	5-yr	0.05	179.80	179.88	179.88	179.92	0.022053	0.87	0.06	0.89	1.00
WC11	10	10-yr	0.07	179.80	179.89	179.89	179.95	0.026715	1.04	0.07	0.91	1.12
WC11	10	25-yr	0.10	179.80	179.93	179.93	179.99	0.020854	1.10	0.09	0.95	1.02
WC11	10	50-yr	0.12	179.80	179.94	179.94	180.01	0.020558	1.16	0.10	0.97	1.03
WC11	10	100-yr	0.15	179.80	179.96	179.96	180.04	0.018739	1.23	0.12	1.00	1.00
WC11	10	Check Flow	0.19	179.80	179.99	179.99	180.08	0.017564	1.32	0.14	1.04	1.00
WC11	10	Regional	0.66	179.80	180.22	180.22	180.43	0.013382	2.01	0.33	4.93	1.00

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (m)	W.S. Elev (m)	Vel Head (m)	Frctn Loss (m)	C & E Loss (m)	Q Left (m3/s)	Q Channel (m3/s)	Q Right (m3/s)	Top Width (m)
WC11	200	2-yr	184.04	184.03	0.01	0.18	0.00		0.03		1.81
WC11	200	5-yr	184.05	184.04	0.02	0.24	0.01		0.05		1.87
WC11	200	10-yr	184.07	184.04	0.03	0.29	0.01		0.07		1.98
WC11	200	25-yr	184.09	184.06	0.03	0.31	0.01		0.10		2.26
WC11	200	50-yr	184.10	184.06	0.04	0.33	0.01		0.12		2.35
WC11	200	100-yr	184.12	184.07	0.05	0.37	0.02		0.15		2.42
WC11	200	Check Flow	184.13	184.10	0.03	0.33	0.00		0.19		3.05
WC11	200	Regional	184.26	184.19	0.06	0.40	0.00		0.66		4.72
WC11	100	2-yr	180.14	180.14	0.00				0.03		2.28
WC11	100	5-yr	180.18	180.18	0.01				0.05		2.36
WC11	100	10-yr	180.22	180.21	0.01				0.07		2.43
WC11	100	25-yr	180.26	180.25	0.01				0.10		2.51
WC11	100	50-yr	180.29	180.27	0.02				0.12		2.56
WC11	100	100-yr	180.32	180.31	0.02				0.15		2.63
WC11	100	Check Flow	180.37	180.34	0.02				0.19		2.70
WC11	100	Regional	180.76	180.68	0.07				0.66		3.40
WC11	50		Culvert								
WC11	10	2-yr	179.89	179.87	0.02				0.03		0.87
WC11	10	5-yr	179.92	179.88	0.04				0.05		0.89
WC11	10	10-yr	179.95	179.89	0.06				0.07		0.91
WC11	10	25-yr	179.99	179.93	0.06				0.10		0.95
WC11	10	50-yr	180.01	179.94	0.07				0.12		0.97
WC11	10	100-yr	180.04	179.96	0.08				0.15		1.00
WC11	10	Check Flow	180.08	179.99	0.09				0.19		1.04
WC11	10	Regional	180.43	180.22	0.21				0.66		4.93

Profile Output Table - Culvert Only

Reach	River Sta		Profile	E.G. US. (m)	W.S. US. (m)	E.G. IC (m)	E.G. OC (m)	Min El Weir Flow (m)	Q Culv Group (m3/s)	Q Weir (m3/s)	Delta WS (m)	Culv Vel US (m/s)	Culv Vel DS (m/s)
WC11	50	Culvert #1	2-yr	180.14	180.14	180.13	180.14	182.61	0.03		0.27	0.75	0.82
WC11	50	Culvert #1	5-yr	180.18	180.18	180.17	180.18	182.61	0.05		0.30	0.88	0.94
WC11	50	Culvert #1	10-yr	180.22	180.21	180.21	180.22	182.61	0.07		0.32	0.98	1.03
WC11	50	Culvert #1	25-yr	180.26	180.25	180.25	180.26	182.61	0.10		0.32	1.08	1.13
WC11	50	Culvert #1	50-yr	180.29	180.27	180.28	180.29	182.61	0.12		0.33	1.14	1.19
WC11	50	Culvert #1	100-yr	180.33	180.31	180.31	180.33	182.61	0.15		0.34	1.21	1.27
WC11	50	Culvert #1	Check Flow	180.37	180.34	180.35	180.37	182.61	0.19		0.35	1.28	1.36
WC11	50	Culvert #1	Regional	180.76	180.68	180.76	180.75	182.61	0.66		0.46	1.79	2.03

ROUGE RIVER

HEC-RAS ANALYSIS WC#12

EXISTING 407 ETR

PROP CHANNEL
CL ELEV = 176.65m

PROPOSED 407 TWY

PROP CULV WC#12
DIAMETER= 800mm
L=45m, S=0.3%
U/S INV= 176.80
D/S INV= 176.65

PROP CHANNEL
CL ELEV = 179.00m

PROP CHANNEL
CL ELEV = 176.80m

178.78	177.70	ST 100
178.73	177.18	

177.18	177.15	ST 10
177.14	176.84	

179.70	179.20	ST 200
179.59	179.07	

LEGEND

- EXISTING 407 ETR
- PROPOSED 407 TWY
- CREEK FLOW DIRECTION
- EXISTING CULVERT
- PROPOSED CULVERT
- PROPOSED REGIONAL FLOODLINE

EX REG / EX 100 | PR REG / PR 100 | HEC ST

CROSS SECTION NUMBER

PARSONS HEC-RAS SECTION

PROPOSED WL ELEVATION (m)

EXISTING UPDATED WL ELEVATION (m)

5m 0m 10m 20m 30m

SCALE HORIZONTAL 1:1000

DATE: SEPTEMBER 2016

SCALE: 1:1000

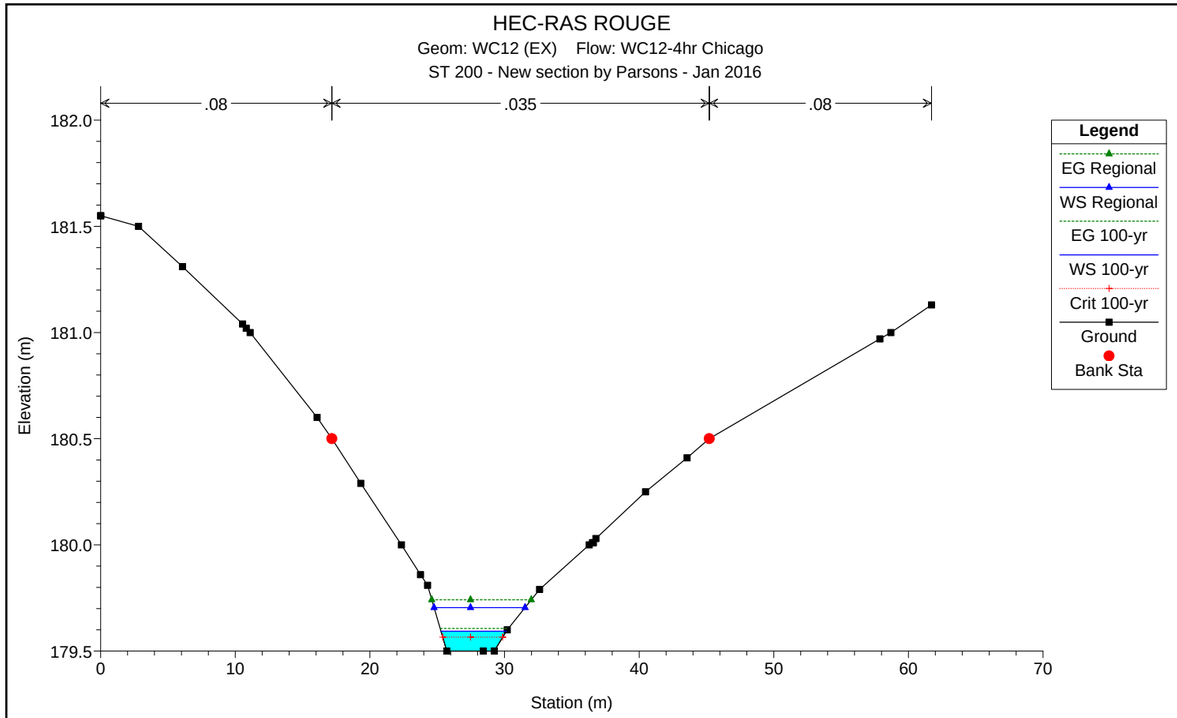
Ontario

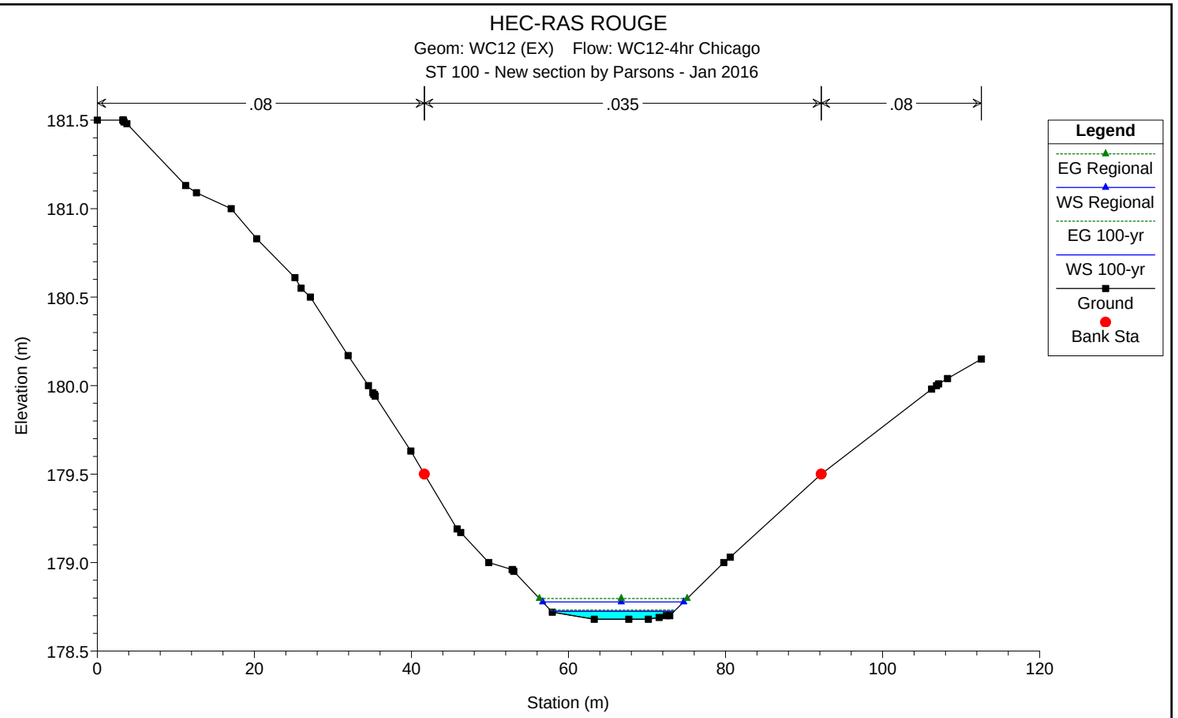
PARSONS

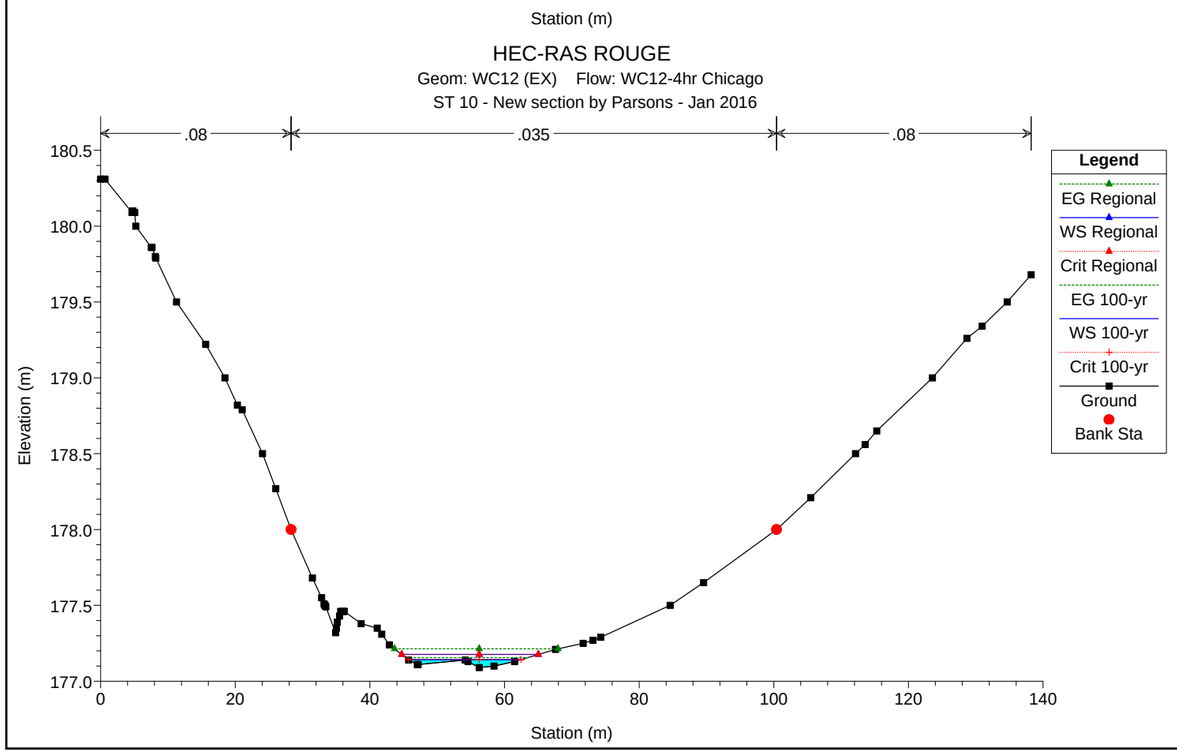
625 COCHRANE DRIVE, SUITE 500
MARKHAM, ONTARIO L3R 9R9
TEL: 905-943-0500
FAX: 905-943-0400

407 TRANSITWAY FROM KENNEDY RD TO BROCK RD

FIGURE 6.5 - HEC-RAS ANALYSIS - ROUGE RIVER (WC#12)


HEC-RAS ROUGE
Geom: WC12 (EX) Flow: WC12-4hr Chicago
ST 200 - New section by Parsons - Jan 2016
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta


HEC-RAS ROUGE
Geom: WC12 (EX) Flow: WC12-4hr Chicago
ST 100 - New section by Parsons - Jan 2016
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Bank Sta


HEC-RAS ROUGE
Geom: WC12 (EX) Flow: WC12-4hr Chicago
ST 10 - New section by Parsons - Jan 2016
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta

HEC-RAS Plan: WC12-EX-4hr CH River: Rouge River Reach: WC 12

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC 12	200	2-yr	0.04	179.50	179.54	179.52	179.54	0.009244	0.29	0.14	4.05	0.50
WC 12	200	5-yr	0.07	179.50	179.56	179.53	179.57	0.004724	0.29	0.25	4.41	0.39
WC 12	200	10-yr	0.10	179.50	179.57	179.54	179.57	0.007005	0.37	0.27	4.49	0.48
WC 12	200	25-yr	0.14	179.50	179.58	179.56	179.59	0.008260	0.44	0.32	4.65	0.53
WC 12	200	50-yr	0.16	179.50	179.58	179.55	179.59	0.011300	0.51	0.32	4.63	0.62
WC 12	200	100-yr	0.20	179.50	179.59	179.57	179.61	0.009246	0.51	0.39	4.86	0.58
WC 12	200	Check Flow	0.25	179.50	179.61	179.58	179.62	0.009037	0.55	0.46	5.07	0.58
WC 12	200	Regional	0.88	179.50	179.70		179.74	0.010810	0.85	1.04	6.76	0.69
WC 12	100	2-yr	0.04	178.68	178.70		178.70	0.013109	0.21	0.19	12.33	0.52
WC 12	100	5-yr	0.07	178.68	178.70	178.69	178.71	0.049570	0.39	0.18	11.61	1.01
WC 12	100	10-yr	0.10	178.68	178.71	178.70	178.71	0.019839	0.32	0.31	13.72	0.68
WC 12	100	25-yr	0.14	178.68	178.72		178.72	0.016415	0.34	0.42	14.86	0.64
WC 12	100	50-yr	0.16	178.68	178.72		178.73	0.011144	0.31	0.51	15.55	0.55
WC 12	100	100-yr	0.20	178.68	178.73		178.73	0.014238	0.36	0.55	15.64	0.62
WC 12	100	Check Flow	0.25	178.68	178.73		178.74	0.015084	0.40	0.62	15.84	0.65
WC 12	100	Regional	0.88	178.68	178.78		178.80	0.013672	0.62	1.43	17.96	0.70
WC 12	10	2-yr	0.04	177.09	177.12	177.12	177.13	0.050761	0.36	0.11	8.49	1.00
WC 12	10	5-yr	0.07	177.09	177.14	177.14	177.14	0.013238	0.24	0.29	14.83	0.55
WC 12	10	10-yr	0.10	177.09	177.14	177.14	177.14	0.027017	0.34	0.29	14.83	0.78
WC 12	10	25-yr	0.14	177.09	177.14	177.14	177.15	0.034401	0.41	0.34	16.15	0.89
WC 12	10	50-yr	0.16	177.09	177.14	177.14	177.15	0.072528	0.56	0.29	14.69	1.27
WC 12	10	100-yr	0.20	177.09	177.14	177.14	177.16	0.043837	0.50	0.40	16.77	1.03
WC 12	10	Check Flow	0.25	177.09	177.15	177.15	177.16	0.039671	0.52	0.48	17.24	1.00
WC 12	10	Regional	0.88	177.09	177.18	177.18	177.21	0.047615	0.85	1.03	20.31	1.21

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X    X
X     X  X        X           X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X           X  X     X    X        X
X     X  X        X    X      X   X    X    X        X
X     X  XXXXXX    XXXX       X    X   X    X   XXXXX
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PROJECT DATA
Project Title: HEC-RAS ROUGE
Project File : HEC.prj
Run Date and Time: 1/19/2016 3:11:56 PM

Project in SI units

Project Description:
HEC-RAS model for creek crossings along the proposed 407 TWY Ph 2 started from
scratch

PLAN DATA

Plan Title: Plan 08
Plan File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.p08

Geometry Title: WC12 (EX)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g13

Flow Title : WC12-4hr Chicago
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f12

Plan Summary Information:
Number of: Cross Sections = 3 Multiple Openings = 0
Culverts = 0 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: WC12-4hr Chicago
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f12

Flow Data (m3/s)

River	Reach	RS	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Check Flow	Regional
Rouge River	WC 12	200	.04	.07	.1	.14	.16	.2	.25	.88

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Rouge River	WC 12	2-yr		Critical
Rouge River	WC 12	5-yr		Critical
Rouge River	WC 12	10-yr		Critical
Rouge River	WC 12	25-yr		Critical
Rouge River	WC 12	50-yr		Critical
Rouge River	WC 12	100-yr		Critical
Rouge River	WC 12	Check Flow		Critical

GEOMETRY DATA

Geometry Title: WC12 (EX)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g13

CROSS SECTION

RIVER: Rouge River
REACH: WC 12 RS: 200

INPUT
Description: ST 200 - New section by Parsons - Jan 2016
Station Elevation Data num= 28

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	181.55	.01	181.55	2.81	181.5	6.08	181.31	10.54	181.04
10.81	181.02	11.11	181	16.08	180.6	17.17	180.5	19.32	180.29
22.34	180	23.76	179.86	24.28	179.81	25.71	179.5	28.42	179.5
29.24	179.5	30.2	179.6	32.6	179.79	36.29	180	36.53	180.01
36.6	180.01	36.79	180.03	40.47	180.25	43.56	180.41	45.21	180.5
57.88	180.97	58.7	181	61.72	181.13				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.08	17.17	.035	45.21	.08

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
17.17 45.21 77.3 77.3 77.3 .1 .3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	179.54	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	179.54	Reach Len. (m)	77.30	77.30	77.30
Crit W.S. (m)	179.52	Flow Area (m2)		0.14	
E.G. Slope (m/m)	0.009244	Area (m2)		0.14	
Q Total (m3/s)	0.04	Flow (m3/s)		0.04	
Top Width (m)	4.05	Top Width (m)		4.05	
Vel Total (m/s)	0.29	Avg. Vel. (m/s)		0.29	
Max Chl Dpth (m)	0.04	Hydr. Depth (m)		0.03	
Conv. Total (m3/s)	0.4	Conv. (m3/s)		0.4	
Length Wtd. (m)	77.30	Wetted Per. (m)		4.06	
Min Ch El (m)	179.50	Shear (N/m2)		3.09	
Alpha	1.00	Stream Power (N/m s)	2955.02	0.00	0.00
Frctn Loss (m)	0.84	Cum Volume (1000 m3)		0.02	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.34	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	179.57	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	179.56	Reach Len. (m)	77.30	77.30	77.30
Crit W.S. (m)	179.53	Flow Area (m2)		0.25	
E.G. Slope (m/m)	0.004724	Area (m2)		0.25	
Q Total (m3/s)	0.07	Flow (m3/s)		0.07	
Top Width (m)	4.41	Top Width (m)		4.41	
Vel Total (m/s)	0.29	Avg. Vel. (m/s)		0.29	
Max Chl Dpth (m)	0.06	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	1.0	Conv. (m3/s)		1.0	
Length Wtd. (m)	77.30	Wetted Per. (m)		4.42	
Min Ch El (m)	179.50	Shear (N/m2)		2.57	
Alpha	1.00	Stream Power (N/m s)	2955.02	0.00	0.00
Frctn Loss (m)	0.85	Cum Volume (1000 m3)		0.03	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.52	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	179.57	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	179.57	Reach Len. (m)	77.30	77.30	77.30
Crit W.S. (m)	179.54	Flow Area (m2)		0.27	
E.G. Slope (m/m)	0.007005	Area (m2)		0.27	
Q Total (m3/s)	0.10	Flow (m3/s)		0.10	
Top Width (m)	4.49	Top Width (m)		4.49	
Vel Total (m/s)	0.37	Avg. Vel. (m/s)		0.37	
Max Chl Dpth (m)	0.07	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	1.2	Conv. (m3/s)		1.2	
Length Wtd. (m)	77.30	Wetted Per. (m)		4.50	
Min Ch El (m)	179.50	Shear (N/m2)		4.15	
Alpha	1.00	Stream Power (N/m s)	2955.02	0.00	0.00
Frctn Loss (m)	0.85	Cum Volume (1000 m3)		0.04	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.68	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	179.59	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	179.58	Reach Len. (m)	77.30	77.30	77.30
Crit W.S. (m)	179.56	Flow Area (m2)		0.32	
E.G. Slope (m/m)	0.008260	Area (m2)		0.32	
Q Total (m3/s)	0.14	Flow (m3/s)		0.14	
Top Width (m)	4.65	Top Width (m)		4.65	
Vel Total (m/s)	0.44	Avg. Vel. (m/s)		0.44	
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	1.5	Conv. (m3/s)		1.5	
Length Wtd. (m)	77.30	Wetted Per. (m)		4.66	
Min Ch El (m)	179.50	Shear (N/m2)		5.58	
Alpha	1.00	Stream Power (N/m s)	2955.02	0.00	0.00
Frctn Loss (m)	0.87	Cum Volume (1000 m3)		0.05	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.81	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	179.59	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	179.58	Reach Len. (m)	77.30	77.30	77.30
Crit W.S. (m)	179.55	Flow Area (m2)		0.32	
E.G. Slope (m/m)	0.011300	Area (m2)		0.32	
Q Total (m3/s)	0.16	Flow (m3/s)		0.16	
Top Width (m)	4.63	Top Width (m)		4.63	
Vel Total (m/s)	0.51	Avg. Vel. (m/s)		0.51	
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	1.5	Conv. (m3/s)		1.5	
Length Wtd. (m)	77.30	Wetted Per. (m)		4.64	
Min Ch El (m)	179.50	Shear (N/m2)		7.54	
Alpha	1.00	Stream Power (N/m s)	2955.02	0.00	0.00
Frctn Loss (m)	0.87	Cum Volume (1000 m3)		0.06	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.81	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	179.61	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	179.59	Reach Len. (m)	77.30	77.30	77.30
Crit W.S. (m)	179.57	Flow Area (m2)		0.39	
E.G. Slope (m/m)	0.009246	Area (m2)		0.39	
Q Total (m3/s)	0.20	Flow (m3/s)		0.20	
Top Width (m)	4.86	Top Width (m)		4.86	
Vel Total (m/s)	0.51	Avg. Vel. (m/s)		0.51	
Max Chl Dpth (m)	0.09	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	2.1	Conv. (m3/s)		2.1	
Length Wtd. (m)	77.30	Wetted Per. (m)		4.87	
Min Ch El (m)	179.50	Shear (N/m2)		7.28	
Alpha	1.00	Stream Power (N/m s)	2955.02	0.00	0.00
Frctn Loss (m)	0.88	Cum Volume (1000 m3)		0.07	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.90	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	179.62	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	179.61	Reach Len. (m)	77.30	77.30	77.30
Crit W.S. (m)	179.58	Flow Area (m2)		0.46	
E.G. Slope (m/m)	0.009037	Area (m2)		0.46	
Q Total (m3/s)	0.25	Flow (m3/s)		0.25	
Top Width (m)	5.07	Top Width (m)		5.07	
Vel Total (m/s)	0.55	Avg. Vel. (m/s)		0.55	
Max Chl Dpth (m)	0.11	Hydr. Depth (m)		0.09	
Conv. Total (m3/s)	2.6	Conv. (m3/s)		2.6	
Length Wtd. (m)	77.30	Wetted Per. (m)		5.09	
Min Ch El (m)	179.50	Shear (N/m2)		7.98	
Alpha	1.00	Stream Power (N/m s)	2955.02	0.00	0.00
Frctn Loss (m)	0.89	Cum Volume (1000 m3)		0.08	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.94	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	179.74	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.035	

W.S. Elev (m)	179.70	Reach Len. (m)	77.30	77.30	77.30	
Crit W.S. (m)		Flow Area (m2)		1.04		
E.G. Slope (m/m)	0.010810	Area (m2)		1.04		
Q Total (m3/s)	0.88	Flow (m3/s)		0.88		
Top Width (m)	6.76	Top Width (m)		6.76		
Vel Total (m/s)	0.85	Avg. Vel. (m/s)		0.85		
Max Chl Dpth (m)	0.20	Hydr. Depth (m)		0.15		
Conv. Total (m3/s)	8.5	Conv. (m3/s)		8.5		
Length Wtd. (m)	77.30	Wetted Per. (m)		6.79		
Min Ch El (m)	179.50	Shear (N/m2)		16.19		
Alpha	1.00	Stream Power (N/m s)	2955.02	0.00	0.00	
Frctn Loss (m)	0.94	Cum Volume (1000 m3)		0.18		
C & E Loss (m)	0.01	Cum SA (1000 m2)		2.26		

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Rouge River
REACH: WC 12 RS: 100

INPUT
Description: ST 100 - New section by Parsons - Jan 2016
Station Elevation Data num= 42

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	181.5	3.24	181.5	3.29	181.5	3.32	181.5	3.4	181.49
3.76	181.48	11.25	181.13	12.63	181.09	17.05	181	20.29	180.83
25.17	180.61	25.95	180.55	27.12	180.5	31.94	180.17	34.53	180
35.09	179.96	35.21	179.95	35.29	179.95	35.39	179.94	39.93	179.63
41.65	179.5	45.81	179.19	46.27	179.17	49.85	179	52.82	178.96
52.89	178.96	53.03	178.95	57.93	178.72	63.27	178.68	67.68	178.68
70.17	178.68	71.54	178.69	72.45	178.7	72.89	178.7	79.77	179
80.59	179.03	92.18	179.5	106.23	179.98	106.87	180	107.13	180.01
108.26	180.04	112.57	180.15						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.08	41.65	.035	92.18	.08

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
41.65	92.18	68.3	68.3	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	178.70	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	178.70	Reach Len. (m)	68.30	68.30	68.30
Crit W.S. (m)		Flow Area (m2)		0.19	
E.G. Slope (m/m)	0.013109	Area (m2)		0.19	
Q Total (m3/s)	0.04	Flow (m3/s)		0.04	
Top Width (m)	12.33	Top Width (m)		12.33	
Vel Total (m/s)	0.21	Avg. Vel. (m/s)		0.21	
Max Chl Dpth (m)	0.02	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	0.3	Conv. (m3/s)		0.3	
Length Wtd. (m)	68.30	Wetted Per. (m)		12.33	
Min Ch El (m)	178.68	Shear (N/m2)		2.03	
Alpha	1.00	Stream Power (N/m s)	5389.61	0.00	0.00
Frctn Loss (m)	1.57	Cum Volume (1000 m3)		0.01	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.71	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	178.71	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	178.70	Reach Len. (m)	68.30	68.30	68.30
Crit W.S. (m)	178.69	Flow Area (m2)		0.18	
E.G. Slope (m/m)	0.049570	Area (m2)		0.18	
Q Total (m3/s)	0.07	Flow (m3/s)		0.07	
Top Width (m)	11.61	Top Width (m)		11.61	
Vel Total (m/s)	0.39	Avg. Vel. (m/s)		0.39	
Max Chl Dpth (m)	0.02	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	0.3	Conv. (m3/s)		0.3	
Length Wtd. (m)	68.30	Wetted Per. (m)		11.61	
Min Ch El (m)	178.68	Shear (N/m2)		7.46	
Alpha	1.00	Stream Power (N/m s)	5389.61	0.00	0.00
Frctn Loss (m)	1.57	Cum Volume (1000 m3)		0.02	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.90	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	178.71	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	178.71	Reach Len. (m)	68.30	68.30	68.30
Crit W.S. (m)	178.70	Flow Area (m2)		0.31	
E.G. Slope (m/m)	0.019839	Area (m2)		0.31	
Q Total (m3/s)	0.10	Flow (m3/s)		0.10	
Top Width (m)	13.72	Top Width (m)		13.72	
Vel Total (m/s)	0.32	Avg. Vel. (m/s)		0.32	
Max Chl Dpth (m)	0.03	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	0.7	Conv. (m3/s)		0.7	
Length Wtd. (m)	68.30	Wetted Per. (m)		13.72	
Min Ch El (m)	178.68	Shear (N/m2)		4.40	
Alpha	1.00	Stream Power (N/m s)	5389.61	0.00	0.00
Frctn Loss (m)	1.57	Cum Volume (1000 m3)		0.02	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.98	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	178.72	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	178.72	Reach Len. (m)	68.30	68.30	68.30
Crit W.S. (m)		Flow Area (m2)		0.42	
E.G. Slope (m/m)	0.016415	Area (m2)		0.42	
Q Total (m3/s)	0.14	Flow (m3/s)		0.14	
Top Width (m)	14.86	Top Width (m)		14.86	
Vel Total (m/s)	0.34	Avg. Vel. (m/s)		0.34	
Max Chl Dpth (m)	0.04	Hydr. Depth (m)		0.03	
Conv. Total (m3/s)	1.1	Conv. (m3/s)		1.1	
Length Wtd. (m)	68.30	Wetted Per. (m)		14.86	
Min Ch El (m)	178.68	Shear (N/m2)		4.50	
Alpha	1.00	Stream Power (N/m s)	5389.61	0.00	0.00
Frctn Loss (m)	1.57	Cum Volume (1000 m3)		0.03	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.06	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	178.73	Element	Left OB	Channel	Right OB

Vel Head (m)	0.00	Wt. n-Val.			0.035	
W.S. Elev (m)	178.72	Reach Len. (m)	68.30	68.30	68.30	
Crit W.S. (m)		Flow Area (m2)		0.51		
E.G. Slope (m/m)	0.011144	Area (m2)		0.51		
Q Total (m3/s)	0.16	Flow (m3/s)		0.16		
Top Width (m)	15.55	Top Width (m)		15.55		
Vel Total (m/s)	0.31	Avg. Vel. (m/s)		0.31		
Max Chl Dpth (m)	0.04	Hydr. Depth (m)		0.03		
Conv. Total (m3/s)	1.5	Conv. (m3/s)		1.5		
Length Wtd. (m)	68.30	Wetted Per. (m)		15.55		
Min Ch El (m)	178.68	Shear (N/m2)		3.62		
Alpha	1.00	Stream Power (N/m s)	5389.61	0.00	0.00	
Frctn Loss (m)	1.57	Cum Volume (1000 m3)		0.03		
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.03		

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	178.73	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.01	Wt. n-Val.		0.035		
W.S. Elev (m)	178.73	Reach Len. (m)	68.30	68.30	68.30	
Crit W.S. (m)		Flow Area (m2)		0.55		
E.G. Slope (m/m)	0.014238	Area (m2)		0.55		
Q Total (m3/s)	0.20	Flow (m3/s)		0.20		
Top Width (m)	15.64	Top Width (m)		15.64		
Vel Total (m/s)	0.36	Avg. Vel. (m/s)		0.36		
Max Chl Dpth (m)	0.05	Hydr. Depth (m)		0.04		
Conv. Total (m3/s)	1.7	Conv. (m3/s)		1.7		
Length Wtd. (m)	68.30	Wetted Per. (m)		15.65		
Min Ch El (m)	178.68	Shear (N/m2)		4.89		
Alpha	1.00	Stream Power (N/m s)	5389.61	0.00	0.00	
Frctn Loss (m)	1.58	Cum Volume (1000 m3)		0.03		
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.11		

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	178.74	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.01	Wt. n-Val.		0.035		
W.S. Elev (m)	178.73	Reach Len. (m)	68.30	68.30	68.30	
Crit W.S. (m)		Flow Area (m2)		0.62		
E.G. Slope (m/m)	0.015084	Area (m2)		0.62		
Q Total (m3/s)	0.25	Flow (m3/s)		0.25		
Top Width (m)	15.84	Top Width (m)		15.84		
Vel Total (m/s)	0.40	Avg. Vel. (m/s)		0.40		
Max Chl Dpth (m)	0.05	Hydr. Depth (m)		0.04		
Conv. Total (m3/s)	2.0	Conv. (m3/s)		2.0		
Length Wtd. (m)	68.30	Wetted Per. (m)		15.84		
Min Ch El (m)	178.68	Shear (N/m2)		5.78		
Alpha	1.00	Stream Power (N/m s)	5389.61	0.00	0.00	
Frctn Loss (m)	1.58	Cum Volume (1000 m3)		0.04		
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.13		

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	178.80	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.02	Wt. n-Val.		0.035		
W.S. Elev (m)	178.78	Reach Len. (m)	68.30	68.30	68.30	
Crit W.S. (m)		Flow Area (m2)		1.43		
E.G. Slope (m/m)	0.013672	Area (m2)		1.43		
Q Total (m3/s)	0.88	Flow (m3/s)		0.88		
Top Width (m)	17.96	Top Width (m)		17.96		
Vel Total (m/s)	0.62	Avg. Vel. (m/s)		0.62		
Max Chl Dpth (m)	0.10	Hydr. Depth (m)		0.08		
Conv. Total (m3/s)	7.5	Conv. (m3/s)		7.5		
Length Wtd. (m)	68.30	Wetted Per. (m)		17.96		
Min Ch El (m)	178.68	Shear (N/m2)		10.64		
Alpha	1.00	Stream Power (N/m s)	5389.61	0.00	0.00	
Frctn Loss (m)	1.58	Cum Volume (1000 m3)		0.08		
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.31		

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Rouge River
REACH: WC 12 RS: 10

INPUT
Description: ST 10 - New section by Parsons - Jan 2016
Station Elevation Data num= 61

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	180.31	.63	180.31	4.66	180.09	4.79	180.1	4.92	180.09
5.06	180.09	5.22	180	7.53	179.86	7.64	179.86	8.12	179.8
8.2	179.79	11.27	179.5	15.61	179.22	18.45	179	20.32	178.82
21.02	178.79	24.04	178.5	26.02	178.27	28.28	178	31.46	177.68
32.82	177.55	33.19	177.51	33.3	177.5	33.33	177.5	33.44	177.49
34.92	177.32	35.03	177.35	35.15	177.39	35.49	177.43	35.67	177.46
36	177.46	36.1	177.46	36.19	177.46	38.7	177.38	41.08	177.35
41.76	177.31	42.9	177.24	45.76	177.14	47.05	177.11	47.16	177.11
54.16	177.14	54.57	177.13	56.24	177.09	58.43	177.1	61.49	177.13
67.57	177.21	71.68	177.25	73.15	177.27	74.28	177.29	84.6	177.5
89.58	177.65	100.42	178	105.48	178.21	112.15	178.5	113.57	178.56
115.29	178.65	123.57	179	128.68	179.26	130.96	179.34	134.67	179.5
138.23	179.68								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.08	28.28	.035	100.42	.08

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
28.28	100.42	0	0	0 .1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	177.13	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.01	Wt. n-Val.		0.035		
W.S. Elev (m)	177.12	Reach Len. (m)				
Crit W.S. (m)	177.12	Flow Area (m2)		0.11		
E.G. Slope (m/m)	0.050761	Area (m2)		0.11		
Q Total (m3/s)	0.04	Flow (m3/s)		0.04		
Top Width (m)	8.49	Top Width (m)		8.49		
Vel Total (m/s)	0.36	Avg. Vel. (m/s)		0.36		
Max Chl Dpth (m)	0.03	Hydr. Depth (m)		0.01		
Conv. Total (m3/s)	0.2	Conv. (m3/s)		0.2		
Length Wtd. (m)		Wetted Per. (m)		8.50		
Min Ch El (m)	177.09	Shear (N/m2)		6.54		
Alpha	1.00	Stream Power (N/m s)	6618.15	0.00	0.00	
Frctn Loss (m)		Cum Volume (1000 m3)				
C & E Loss (m)		Cum SA (1000 m2)				

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	177.14	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	177.14	Reach Len. (m)			
Crit W.S. (m)	177.14	Flow Area (m2)		0.29	
E.G. Slope (m/m)	0.013238	Area (m2)		0.29	
Q Total (m3/s)	0.07	Flow (m3/s)		0.07	
Top Width (m)	14.83	Top Width (m)		14.83	
Vel Total (m/s)	0.24	Avg. Vel. (m/s)		0.24	
Max Chl Dpth (m)	0.05	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	0.6	Conv. (m3/s)		0.6	
Length Wtd. (m)		Wetted Per. (m)		14.83	
Min Ch El (m)	177.09	Shear (N/m2)		2.56	
Alpha	1.00	Stream Power (N/m s)	6618.15	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	177.14	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	177.14	Reach Len. (m)			
Crit W.S. (m)	177.14	Flow Area (m2)		0.29	
E.G. Slope (m/m)	0.027017	Area (m2)		0.29	
Q Total (m3/s)	0.10	Flow (m3/s)		0.10	
Top Width (m)	14.83	Top Width (m)		14.83	
Vel Total (m/s)	0.34	Avg. Vel. (m/s)		0.34	
Max Chl Dpth (m)	0.05	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	0.6	Conv. (m3/s)		0.6	
Length Wtd. (m)		Wetted Per. (m)		14.83	
Min Ch El (m)	177.09	Shear (N/m2)		5.22	
Alpha	1.00	Stream Power (N/m s)	6618.15	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	177.15	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	177.14	Reach Len. (m)			
Crit W.S. (m)	177.14	Flow Area (m2)		0.34	
E.G. Slope (m/m)	0.034401	Area (m2)		0.34	
Q Total (m3/s)	0.14	Flow (m3/s)		0.14	
Top Width (m)	16.15	Top Width (m)		16.15	
Vel Total (m/s)	0.41	Avg. Vel. (m/s)		0.41	
Max Chl Dpth (m)	0.05	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	0.8	Conv. (m3/s)		0.8	
Length Wtd. (m)		Wetted Per. (m)		16.15	
Min Ch El (m)	177.09	Shear (N/m2)		7.18	
Alpha	1.00	Stream Power (N/m s)	6618.15	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	177.15	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	177.14	Reach Len. (m)			
Crit W.S. (m)	177.14	Flow Area (m2)		0.29	
E.G. Slope (m/m)	0.072528	Area (m2)		0.29	
Q Total (m3/s)	0.16	Flow (m3/s)		0.16	
Top Width (m)	14.69	Top Width (m)		14.69	
Vel Total (m/s)	0.56	Avg. Vel. (m/s)		0.56	
Max Chl Dpth (m)	0.05	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	0.6	Conv. (m3/s)		0.6	
Length Wtd. (m)		Wetted Per. (m)		14.69	
Min Ch El (m)	177.09	Shear (N/m2)		13.89	
Alpha	1.00	Stream Power (N/m s)	6618.15	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	177.16	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	177.14	Reach Len. (m)			
Crit W.S. (m)	177.14	Flow Area (m2)		0.40	
E.G. Slope (m/m)	0.043837	Area (m2)		0.40	
Q Total (m3/s)	0.20	Flow (m3/s)		0.20	
Top Width (m)	16.77	Top Width (m)		16.77	
Vel Total (m/s)	0.50	Avg. Vel. (m/s)		0.50	
Max Chl Dpth (m)	0.05	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	1.0	Conv. (m3/s)		1.0	
Length Wtd. (m)		Wetted Per. (m)		16.77	
Min Ch El (m)	177.09	Shear (N/m2)		10.31	
Alpha	1.00	Stream Power (N/m s)	6618.15	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	177.16	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	177.15	Reach Len. (m)			
Crit W.S. (m)	177.15	Flow Area (m2)		0.48	
E.G. Slope (m/m)	0.039671	Area (m2)		0.48	
Q Total (m3/s)	0.25	Flow (m3/s)		0.25	
Top Width (m)	17.24	Top Width (m)		17.24	
Vel Total (m/s)	0.52	Avg. Vel. (m/s)		0.52	
Max Chl Dpth (m)	0.06	Hydr. Depth (m)		0.03	
Conv. Total (m3/s)	1.3	Conv. (m3/s)		1.3	
Length Wtd. (m)		Wetted Per. (m)		17.24	
Min Ch El (m)	177.09	Shear (N/m2)		10.81	
Alpha	1.00	Stream Power (N/m s)	6618.15	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	177.21	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.035	
W.S. Elev (m)	177.18	Reach Len. (m)			
Crit W.S. (m)	177.18	Flow Area (m2)		1.03	
E.G. Slope (m/m)	0.047615	Area (m2)		1.03	
Q Total (m3/s)	0.88	Flow (m3/s)		0.88	
Top Width (m)	20.31	Top Width (m)		20.31	
Vel Total (m/s)	0.85	Avg. Vel. (m/s)		0.85	
Max Chl Dpth (m)	0.09	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	4.0	Conv. (m3/s)		4.0	
Length Wtd. (m)		Wetted Per. (m)		20.31	
Min Ch El (m)	177.09	Shear (N/m2)		23.68	
Alpha	1.00	Stream Power (N/m s)	6618.15	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

SUMMARY OF MANNING'S N VALUES

River:Rouge River

Reach	River Sta.	n1	n2	n3
WC 12	200	.08	.035	.08
WC 12	100	.08	.035	.08
WC 12	10	.08	.035	.08

SUMMARY OF REACH LENGTHS

River: Rouge River

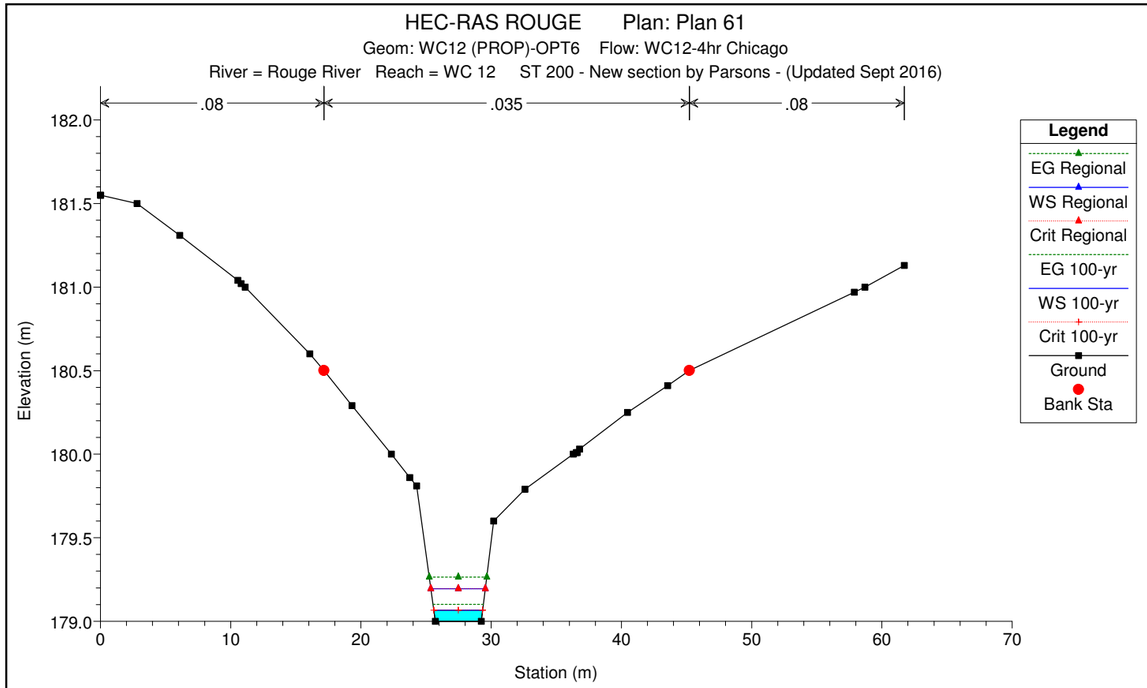
Reach	River Sta.	Left	Channel	Right
WC 12	200	77.3	77.3	77.3
WC 12	100	68.3	68.3	68.3
WC 12	10	0	0	0

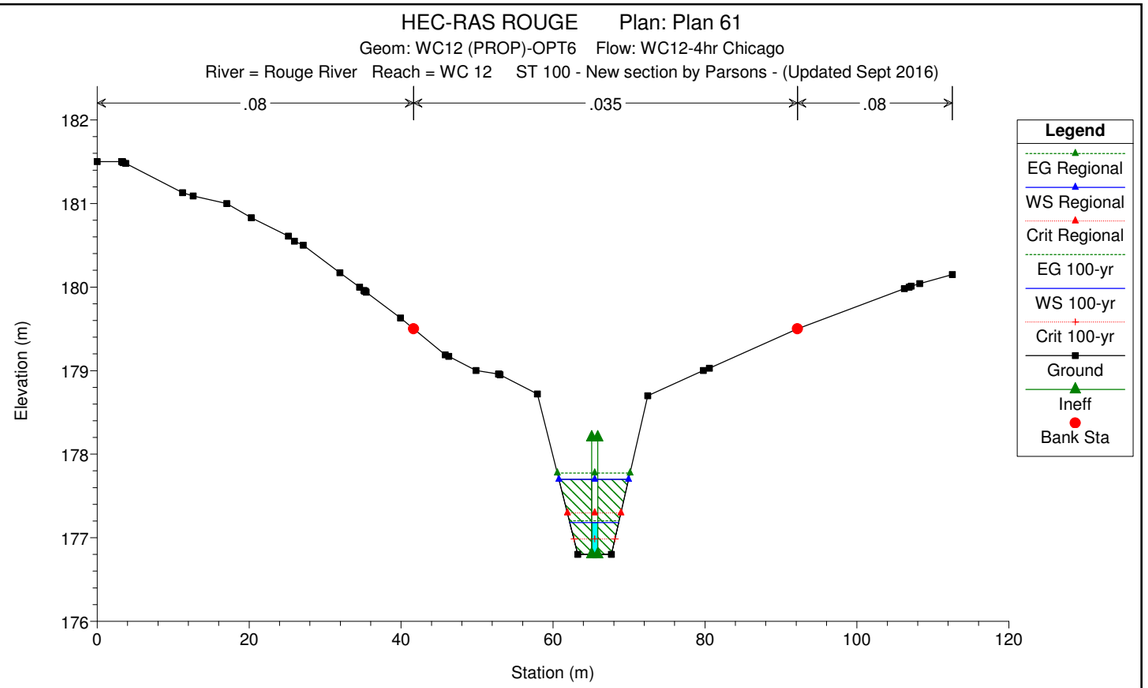
SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Rouge River

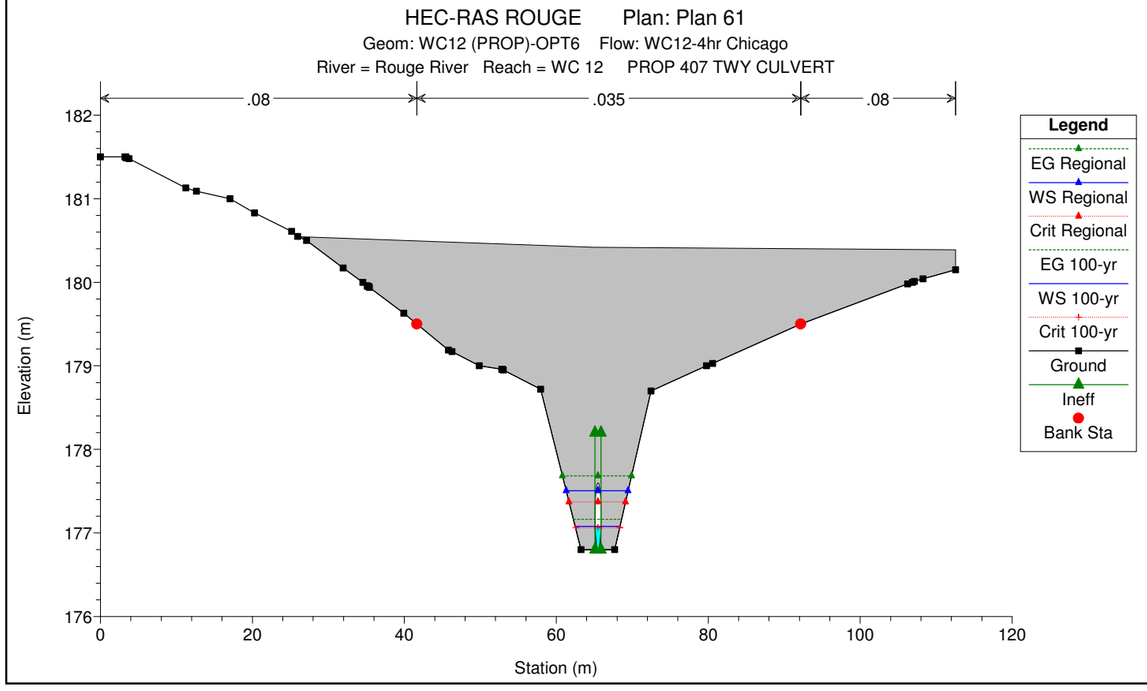
Reach	River Sta.	Contr.	Expan.
WC 12	200	.1	.3
WC 12	100	.1	.3
WC 12	10	.1	.3

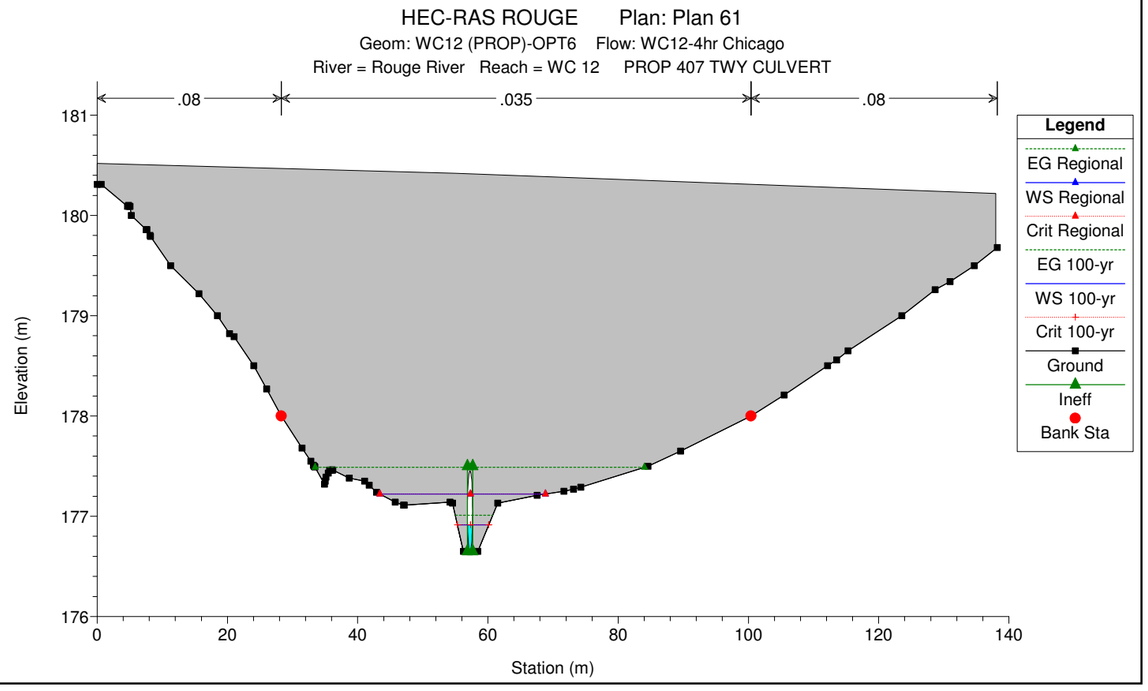
Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
WC 12	200	2-yr	0.04	179.50	179.54	179.52	179.54	0.009244	0.29	0.14	4.05	0.50
WC 12	200	5-yr	0.07	179.50	179.56	179.53	179.57	0.004724	0.29	0.25	4.41	0.39
WC 12	200	10-yr	0.10	179.50	179.57	179.54	179.57	0.007005	0.37	0.27	4.49	0.48
WC 12	200	25-yr	0.14	179.50	179.58	179.56	179.59	0.008260	0.44	0.32	4.65	0.53
WC 12	200	50-yr	0.16	179.50	179.58	179.55	179.59	0.011300	0.51	0.32	4.63	0.62
WC 12	200	100-yr	0.20	179.50	179.59	179.57	179.61	0.009246	0.51	0.39	4.86	0.58
WC 12	200	Check Flow	0.25	179.50	179.61	179.58	179.62	0.009037	0.55	0.46	5.07	0.58
WC 12	200	Regional	0.88	179.50	179.70		179.74	0.010810	0.85	1.04	6.76	0.69
WC 12	100	2-yr	0.04	178.68	178.70		178.70	0.013109	0.21	0.19	12.33	0.52
WC 12	100	5-yr	0.07	178.68	178.70	178.69	178.71	0.049570	0.39	0.18	11.61	1.01
WC 12	100	10-yr	0.10	178.68	178.71	178.70	178.71	0.019839	0.32	0.31	13.72	0.68
WC 12	100	25-yr	0.14	178.68	178.72		178.72	0.016415	0.34	0.42	14.86	0.64
WC 12	100	50-yr	0.16	178.68	178.72		178.73	0.011144	0.31	0.51	15.55	0.55
WC 12	100	100-yr	0.20	178.68	178.73		178.73	0.014238	0.36	0.55	15.64	0.62
WC 12	100	Check Flow	0.25	178.68	178.73		178.74	0.015084	0.40	0.62	15.84	0.65
WC 12	100	Regional	0.88	178.68	178.78		178.80	0.013672	0.62	1.43	17.96	0.70
WC 12	10	2-yr	0.04	177.09	177.12	177.12	177.13	0.050761	0.36	0.11	8.49	1.00
WC 12	10	5-yr	0.07	177.09	177.14	177.14	177.14	0.013238	0.24	0.29	14.83	0.55
WC 12	10	10-yr	0.10	177.09	177.14	177.14	177.14	0.027017	0.34	0.29	14.83	0.78
WC 12	10	25-yr	0.14	177.09	177.14	177.14	177.15	0.034401	0.41	0.34	16.15	0.89
WC 12	10	50-yr	0.16	177.09	177.14	177.14	177.15	0.072528	0.56	0.29	14.69	1.27
WC 12	10	100-yr	0.20	177.09	177.14	177.14	177.16	0.043837	0.50	0.40	16.77	1.03
WC 12	10	Check Flow	0.25	177.09	177.15	177.15	177.16	0.039671	0.52	0.48	17.24	1.00
WC 12	10	Regional	0.88	177.09	177.18	177.18	177.21	0.047615	0.85	1.03	20.31	1.21


HEC-RAS ROUGE Plan: Plan 61
Geom: WC12 (PROP)-OPT6 Flow: WC12-4hr Chicago
River = Rouge River Reach = WC 12 ST 200 - New section by Parsons - (Updated Sept 2016)
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta


HEC-RAS ROUGE Plan: Plan 61
Geom: WC12 (PROP)-OPT6 Flow: WC12-4hr Chicago
River = Rouge River Reach = WC 12 ST 100 - New section by Parsons - (Updated Sept 2016)
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Ineff
Bank Sta

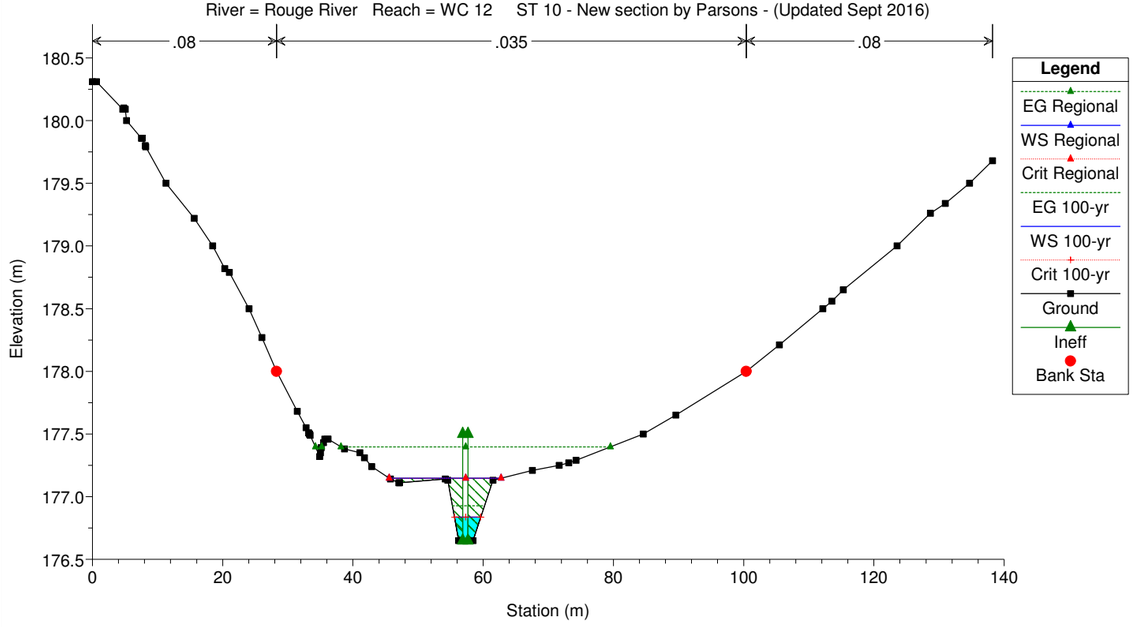

HEC-RAS ROUGE Plan: Plan 61
Geom: WC12 (PROP)-OPT6 Flow: WC12-4hr Chicago
River = Rouge River Reach = WC 12 PROP 407 TWY CULVERT
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 61
Geom: WC12 (PROP)-OPT6 Flow: WC12-4hr Chicago
River = Rouge River Reach = WC 12 PROP 407 TWY CULVERT
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Ineff
Bank Sta

HEC-RAS ROUGE Plan: Plan 61

Geom: WC12 (PROP)-OPT6 Flow: WC12-4hr Chicago

River = Rouge River Reach = WC 12 ST 10 - New section by Parsons - (Updated Sept 2016)



HEC-RAS Plan: WC12-PROP-4hr CH River: Rouge River Reach: WC 12

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC 12	200	2-yr	0.04	179.00	179.02	179.02	179.04	0.045614	0.49	0.08	3.61	1.03
WC 12	200	5-yr	0.07	179.00	179.04	179.04	179.05	0.027238	0.52	0.13	3.66	0.87
WC 12	200	10-yr	0.10	179.00	179.04	179.04	179.06	0.034913	0.64	0.16	3.68	1.00
WC 12	200	25-yr	0.14	179.00	179.05	179.05	179.08	0.037761	0.75	0.19	3.70	1.07
WC 12	200	50-yr	0.16	179.00	179.07	179.07	179.09	0.017058	0.62	0.26	3.77	0.76
WC 12	200	100-yr	0.20	179.00	179.07	179.07	179.10	0.033371	0.83	0.24	3.75	1.05
WC 12	200	Check Flow	0.25	179.00	179.08	179.08	179.12	0.031013	0.88	0.28	3.79	1.03
WC 12	200	Regional	0.88	179.00	179.20	179.20	179.26	0.016976	1.17	0.75	4.19	0.88
WC 12	100	2-yr	0.04	176.80	176.97	176.86	176.97	0.001145	0.30	0.14	5.30	0.23
WC 12	100	5-yr	0.07	176.80	177.02	176.89	177.03	0.001364	0.39	0.18	5.60	0.26
WC 12	100	10-yr	0.10	176.80	177.07	176.92	177.08	0.001529	0.47	0.21	5.83	0.29
WC 12	100	25-yr	0.14	176.80	177.12	176.95	177.13	0.001705	0.55	0.25	6.09	0.31
WC 12	100	50-yr	0.16	176.80	177.14	176.96	177.16	0.001768	0.59	0.27	6.21	0.32
WC 12	100	100-yr	0.20	176.80	177.18	176.98	177.20	0.001898	0.66	0.31	6.43	0.34
WC 12	100	Check Flow	0.25	176.80	177.23	177.02	177.26	0.002024	0.73	0.34	6.68	0.36
WC 12	100	Regional	0.88	176.80	177.70	177.30	177.77	0.002127	1.23	0.72	9.16	0.41
WC 12	50		Culvert									
WC 12	10	2-yr	0.04	176.65	176.71	176.71	176.75	0.029976	0.79	0.05	2.82	1.00
WC 12	10	5-yr	0.07	176.65	176.75	176.75	176.79	0.019462	0.87	0.08	3.19	0.87
WC 12	10	10-yr	0.10	176.65	176.77	176.77	176.83	0.024988	1.08	0.09	3.34	1.01
WC 12	10	25-yr	0.14	176.65	176.80	176.80	176.87	0.022692	1.20	0.12	3.63	1.00
WC 12	10	50-yr	0.16	176.65	176.81	176.81	176.89	0.022327	1.26	0.13	3.76	1.00
WC 12	10	100-yr	0.20	176.65	176.84	176.84	176.93	0.020981	1.35	0.15	4.02	1.00
WC 12	10	Check Flow	0.25	176.65	176.87	176.87	176.97	0.019964	1.45	0.17	4.31	1.00
WC 12	10	Regional	0.88	176.65	177.15	177.15	177.40	0.015299	2.22	0.40	17.16	1.00

HEC-RAS HEC-RAS 5.0.1 April 2016
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: HEC-RAS ROUGE
Project File : HEC.prj
Run Date and Time: 9/7/2016 2:20:47 PM

Project in SI units

Project Description:
HEC-RAS model for creek crossings along the proposed 407 TWY Ph 2 started
from scratch

PLAN DATA

Plan Title: Plan 61
Plan File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.p61

Geometry Title: WC12 (PROP)-OPT6
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g14

Flow Title : WC12-4hr Chicago
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f12

Plan Summary Information:
Number of: Cross Sections = 3 Multiple Openings = 0
Culverts = 1 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: WC12-4hr Chicago
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f12

Flow Data (m3/s)

River	Reach	RS	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Check Flow	Regional
Rouge River	WC 12	200	.04	.07	.1	.14	.16	.2	.25	.88

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Rouge River	WC 12	2-yr		Critical
Rouge River	WC 12	5-yr		Critical
Rouge River	WC 12	10-yr		Critical
Rouge River	WC 12	25-yr		Critical
Rouge River	WC 12	50-yr		Critical
Rouge River	WC 12	100-yr		Critical
Rouge River	WC 12	Check Flow		Critical

GEOMETRY DATA

Geometry Title: WC12 (PROP)-OPT6
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g14

CROSS SECTION

RIVER: Rouge River
REACH: WC 12 RS: 200

INPUT
Description: ST 200 - New section by Parsons - (Updated Sept 2016)
Station Elevation Data num= 27

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	181.55	.01	181.55	2.81	181.5	6.08	181.31	10.54	181.04
10.81	181.02	11.11	181	16.08	180.6	17.17	180.5	19.32	180.29
22.34	180	23.76	179.86	24.28	179.81	25.71	179	29.24	179
30.2	179.6	32.6	179.79	36.29	180	36.53	180.01	36.6	180.01
36.79	180.03	40.47	180.25	43.56	180.41	45.21	180.5	57.88	180.97
58.7	181	61.72	181.13						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.08	17.17	.035	45.21	.08

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
17.17	45.21	77.3	77.3	.3	.5

CROSS SECTION OUTPUT Profile #2-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	179.04	Element			
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	179.02	Reach Len. (m)	77.30	77.30	77.30
Crit W.S. (m)	179.02	Flow Area (m2)		0.08	
E.G. Slope (m/m)	0.045614	Area (m2)		0.08	
Q Total (m3/s)	0.04	Flow (m3/s)		0.04	
Top Width (m)	3.61	Top Width (m)		3.61	
Vel Total (m/s)	0.49	Avg. Vel. (m/s)		0.49	
Max Chl Dpth (m)	0.02	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	0.2	Conv. (m3/s)		0.2	
Length Wtd. (m)	77.30	Wetted Per. (m)		3.62	
Min Ch El (m)	179.00	Shear (N/m2)		10.12	
Alpha	1.00	Stream Power (N/m s)		4.94	
Frctn Loss (m)	0.26	Cum Volume (1000 m3)		0.04	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.58	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate

the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	179.05	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	179.04	Reach Len. (m)	77.30	77.30	77.30
Crit W.S. (m)	179.04	Flow Area (m2)		0.13	
E.G. Slope (m/m)	0.027238	Area (m2)		0.13	
Q Total (m3/s)	0.07	Flow (m3/s)		0.07	
Top Width (m)	3.66	Top Width (m)		3.66	
Vel Total (m/s)	0.52	Avg. Vel. (m/s)		0.52	
Max Chl Dpth (m)	0.04	Hydr. Depth (m)		0.04	
Conv. Total (m3/s)	0.4	Conv. (m3/s)		0.4	
Length Wtd. (m)	77.30	Wetted Per. (m)		3.68	
Min Ch El (m)	179.00	Shear (N/m2)		9.78	
Alpha	1.00	Stream Power (N/m s)		5.09	
Frctn Loss (m)	0.28	Cum Volume (1000 m3)		0.06	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.61	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	179.06	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	179.04	Reach Len. (m)	77.30	77.30	77.30
Crit W.S. (m)	179.04	Flow Area (m2)		0.16	
E.G. Slope (m/m)	0.034913	Area (m2)		0.16	
Q Total (m3/s)	0.10	Flow (m3/s)		0.10	
Top Width (m)	3.68	Top Width (m)		3.68	
Vel Total (m/s)	0.64	Avg. Vel. (m/s)		0.64	
Max Chl Dpth (m)	0.04	Hydr. Depth (m)		0.04	
Conv. Total (m3/s)	0.5	Conv. (m3/s)		0.5	
Length Wtd. (m)	77.30	Wetted Per. (m)		3.70	
Min Ch El (m)	179.00	Shear (N/m2)		14.36	
Alpha	1.00	Stream Power (N/m s)		9.26	
Frctn Loss (m)	0.32	Cum Volume (1000 m3)		0.07	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.63	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	179.08	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	179.05	Reach Len. (m)	77.30	77.30	77.30
Crit W.S. (m)	179.05	Flow Area (m2)		0.19	
E.G. Slope (m/m)	0.037761	Area (m2)		0.19	
Q Total (m3/s)	0.14	Flow (m3/s)		0.14	
Top Width (m)	3.70	Top Width (m)		3.70	
Vel Total (m/s)	0.75	Avg. Vel. (m/s)		0.75	
Max Chl Dpth (m)	0.05	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	0.7	Conv. (m3/s)		0.7	
Length Wtd. (m)	77.30	Wetted Per. (m)		3.73	
Min Ch El (m)	179.00	Shear (N/m2)		18.47	
Alpha	1.00	Stream Power (N/m s)		13.89	
Frctn Loss (m)	0.36	Cum Volume (1000 m3)		0.09	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.66	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	179.09	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	179.07	Reach Len. (m)	77.30	77.30	77.30
Crit W.S. (m)	179.07	Flow Area (m2)		0.26	
E.G. Slope (m/m)	0.017058	Area (m2)		0.26	
Q Total (m3/s)	0.16	Flow (m3/s)		0.16	
Top Width (m)	3.77	Top Width (m)		3.77	
Vel Total (m/s)	0.62	Avg. Vel. (m/s)		0.62	
Max Chl Dpth (m)	0.07	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	1.2	Conv. (m3/s)		1.2	
Length Wtd. (m)	77.30	Wetted Per. (m)		3.81	
Min Ch El (m)	179.00	Shear (N/m2)		11.34	
Alpha	1.00	Stream Power (N/m s)		7.03	
Frctn Loss (m)	0.31	Cum Volume (1000 m3)		0.10	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.67	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	179.10	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.035	
W.S. Elev (m)	179.07	Reach Len. (m)	77.30	77.30	77.30
Crit W.S. (m)	179.07	Flow Area (m2)		0.24	
E.G. Slope (m/m)	0.033371	Area (m2)		0.24	
Q Total (m3/s)	0.20	Flow (m3/s)		0.20	
Top Width (m)	3.75	Top Width (m)		3.75	
Vel Total (m/s)	0.83	Avg. Vel. (m/s)		0.83	
Max Chl Dpth (m)	0.07	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	1.1	Conv. (m3/s)		1.1	
Length Wtd. (m)	77.30	Wetted Per. (m)		3.79	
Min Ch El (m)	179.00	Shear (N/m2)		20.79	
Alpha	1.00	Stream Power (N/m s)		17.27	
Frctn Loss (m)	0.38	Cum Volume (1000 m3)		0.11	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.69	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	179.12	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.035	
W.S. Elev (m)	179.08	Reach Len. (m)	77.30	77.30	77.30
Crit W.S. (m)	179.08	Flow Area (m2)		0.28	
E.G. Slope (m/m)	0.031013	Area (m2)		0.28	
Q Total (m3/s)	0.25	Flow (m3/s)		0.25	
Top Width (m)	3.79	Top Width (m)		3.79	
Vel Total (m/s)	0.88	Avg. Vel. (m/s)		0.88	
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	1.4	Conv. (m3/s)		1.4	
Length Wtd. (m)	77.30	Wetted Per. (m)		3.83	
Min Ch El (m)	179.00	Shear (N/m2)		22.42	
Alpha	1.00	Stream Power (N/m s)		19.84	
Frctn Loss (m)	0.40	Cum Volume (1000 m3)		0.12	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.72	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	179.26	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.035	
W.S. Elev (m)	179.20	Reach Len. (m)	77.30	77.30	77.30
Crit W.S. (m)	179.20	Flow Area (m2)		0.75	
E.G. Slope (m/m)	0.016976	Area (m2)		0.75	
Q Total (m3/s)	0.88	Flow (m3/s)		0.88	
Top Width (m)	4.19	Top Width (m)		4.19	
Vel Total (m/s)	1.17	Avg. Vel. (m/s)		1.17	
Max Chl Dpth (m)	0.20	Hydr. Depth (m)		0.18	
Conv. Total (m3/s)	6.8	Conv. (m3/s)		6.8	
Length Wtd. (m)	77.30	Wetted Per. (m)		4.30	
Min Ch El (m)	179.00	Shear (N/m2)		29.22	
Alpha	1.00	Stream Power (N/m s)		34.11	
Frctn Loss (m)	0.36	Cum Volume (1000 m3)		0.32	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.27	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Rouge River
REACH: WC 12 RS: 100

INPUT
Description: ST 100 - New section by Parsons - (Updated Sept 2016)
Station Elevation Data num= 39

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	181.5	3.24	181.5	3.29	181.5	3.32	181.5	3.4	181.49
3.76	181.48	11.25	181.13	12.63	181.09	17.05	181	20.29	180.83
25.17	180.61	25.95	180.55	27.12	180.5	31.94	180.17	34.53	180
35.09	179.96	35.21	179.95	35.29	179.95	35.39	179.94	39.93	179.63
41.65	179.5	45.81	179.19	46.27	179.17	49.85	179	52.82	178.96
52.89	178.96	53.03	178.95	57.93	178.72	63.27	176.8	67.68	176.8
72.45	178.7	79.77	179	80.59	179.03	92.18	179.5	106.23	179.98
106.87	180	107.13	180.01	108.26	180.04	112.57	180.15		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.08	41.65	.035	92.18	.08

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
41.65 92.18 57.4 57.4 57.4 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	65.1	178.2	T
65.9	112.57	178.2	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	176.97	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	176.97	Reach Len. (m)	57.40	57.40	57.40
Crit W.S. (m)	176.86	Flow Area (m2)		0.14	
E.G. Slope (m/m)	0.001145	Area (m2)		0.82	
Q Total (m3/s)	0.04	Flow (m3/s)		0.04	
Top Width (m)	5.30	Top Width (m)		5.30	
Vel Total (m/s)	0.30	Avg. Vel. (m/s)		0.30	
Max Chl Dpth (m)	0.17	Hydr. Depth (m)		0.17	
Conv. Total (m3/s)	1.2	Conv. (m3/s)		1.2	
Length Wtd. (m)	57.40	Wetted Per. (m)		0.80	
Min Ch El (m)	176.80	Shear (N/m2)		1.90	
Alpha	1.00	Stream Power (N/m s)		0.56	
Frctn Loss (m)		Cum Volume (1000 m3)		0.01	
C & E Loss (m)		Cum SA (1000 m2)		0.23	

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	177.03	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	177.02	Reach Len. (m)	57.40	57.40	57.40
Crit W.S. (m)	176.89	Flow Area (m2)		0.18	
E.G. Slope (m/m)	0.001364	Area (m2)		1.12	
Q Total (m3/s)	0.07	Flow (m3/s)		0.07	
Top Width (m)	5.60	Top Width (m)		5.60	
Vel Total (m/s)	0.39	Avg. Vel. (m/s)		0.39	
Max Chl Dpth (m)	0.22	Hydr. Depth (m)		0.22	
Conv. Total (m3/s)	1.9	Conv. (m3/s)		1.9	
Length Wtd. (m)	57.40	Wetted Per. (m)		0.80	
Min Ch El (m)	176.80	Shear (N/m2)		3.00	
Alpha	1.00	Stream Power (N/m s)		1.17	
Frctn Loss (m)		Cum Volume (1000 m3)		0.01	
C & E Loss (m)		Cum SA (1000 m2)		0.25	

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	177.08	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	177.07	Reach Len. (m)	57.40	57.40	57.40
Crit W.S. (m)	176.92	Flow Area (m2)		0.21	
E.G. Slope (m/m)	0.001529	Area (m2)		1.38	
Q Total (m3/s)	0.10	Flow (m3/s)		0.10	
Top Width (m)	5.83	Top Width (m)		5.83	
Vel Total (m/s)	0.47	Avg. Vel. (m/s)		0.47	
Max Chl Dpth (m)	0.27	Hydr. Depth (m)		0.27	
Conv. Total (m3/s)	2.6	Conv. (m3/s)		2.6	

Length Wtd. (m)	57.40	Wetted Per. (m)	0.80
Min Ch El (m)	176.80	Shear (N/m2)	4.03
Alpha	1.00	Stream Power (N/m s)	1.87
Frctn Loss (m)		Cum Volume (1000 m3)	0.01
C & E Loss (m)		Cum SA (1000 m2)	0.26

CROSS SECTION OUTPUT Profile #25-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	177.13	Element			
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	177.12	Reach Len. (m)	57.40	57.40	57.40
Crit W.S. (m)	176.95	Flow Area (m2)		0.25	
E.G. Slope (m/m)	0.001705	Area (m2)		1.67	
Q Total (m3/s)	0.14	Flow (m3/s)		0.14	
Top Width (m)	6.09	Top Width (m)		6.09	
Vel Total (m/s)	0.55	Avg. Vel. (m/s)		0.55	
Max Chl Dpth (m)	0.32	Hydr. Depth (m)		0.32	
Conv. Total (m3/s)	3.4	Conv. (m3/s)		3.4	
Length Wtd. (m)	57.40	Wetted Per. (m)		0.80	
Min Ch El (m)	176.80	Shear (N/m2)		5.32	
Alpha	1.00	Stream Power (N/m s)		2.93	
Frctn Loss (m)		Cum Volume (1000 m3)		0.01	
C & E Loss (m)		Cum SA (1000 m2)		0.28	

CROSS SECTION OUTPUT Profile #50-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	177.16	Element			
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	177.14	Reach Len. (m)	57.40	57.40	57.40
Crit W.S. (m)	176.96	Flow Area (m2)		0.27	
E.G. Slope (m/m)	0.001768	Area (m2)		1.81	
Q Total (m3/s)	0.16	Flow (m3/s)		0.16	
Top Width (m)	6.21	Top Width (m)		6.21	
Vel Total (m/s)	0.59	Avg. Vel. (m/s)		0.59	
Max Chl Dpth (m)	0.34	Hydr. Depth (m)		0.34	
Conv. Total (m3/s)	3.8	Conv. (m3/s)		3.8	
Length Wtd. (m)	57.40	Wetted Per. (m)		0.80	
Min Ch El (m)	176.80	Shear (N/m2)		5.91	
Alpha	1.00	Stream Power (N/m s)		3.47	
Frctn Loss (m)		Cum Volume (1000 m3)		0.02	
C & E Loss (m)		Cum SA (1000 m2)		0.29	

CROSS SECTION OUTPUT Profile #100-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	177.20	Element			
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	177.18	Reach Len. (m)	57.40	57.40	57.40
Crit W.S. (m)	176.98	Flow Area (m2)		0.31	
E.G. Slope (m/m)	0.001898	Area (m2)		2.07	
Q Total (m3/s)	0.20	Flow (m3/s)		0.20	
Top Width (m)	6.43	Top Width (m)		6.43	
Vel Total (m/s)	0.66	Avg. Vel. (m/s)		0.66	
Max Chl Dpth (m)	0.38	Hydr. Depth (m)		0.38	
Conv. Total (m3/s)	4.6	Conv. (m3/s)		4.6	
Length Wtd. (m)	57.40	Wetted Per. (m)		0.80	
Min Ch El (m)	176.80	Shear (N/m2)		7.10	
Alpha	1.00	Stream Power (N/m s)		4.65	
Frctn Loss (m)		Cum Volume (1000 m3)		0.02	
C & E Loss (m)		Cum SA (1000 m2)		0.30	

CROSS SECTION OUTPUT Profile #Check Flow

			Left OB	Channel	Right OB
E.G. Elev (m)	177.26	Element			
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	177.23	Reach Len. (m)	57.40	57.40	57.40
Crit W.S. (m)	177.02	Flow Area (m2)		0.34	
E.G. Slope (m/m)	0.002024	Area (m2)		2.37	
Q Total (m3/s)	0.25	Flow (m3/s)		0.25	
Top Width (m)	6.68	Top Width (m)		6.68	
Vel Total (m/s)	0.73	Avg. Vel. (m/s)		0.73	
Max Chl Dpth (m)	0.43	Hydr. Depth (m)		0.43	
Conv. Total (m3/s)	5.6	Conv. (m3/s)		5.6	
Length Wtd. (m)	57.40	Wetted Per. (m)		0.80	
Min Ch El (m)	176.80	Shear (N/m2)		8.50	
Alpha	1.00	Stream Power (N/m s)		6.20	
Frctn Loss (m)		Cum Volume (1000 m3)		0.02	
C & E Loss (m)		Cum SA (1000 m2)		0.32	

CROSS SECTION OUTPUT Profile #Regional

			Left OB	Channel	Right OB
E.G. Elev (m)	177.77	Element			
Vel Head (m)	0.08	Wt. n-Val.		0.035	
W.S. Elev (m)	177.70	Reach Len. (m)	57.40	57.40	57.40
Crit W.S. (m)	177.30	Flow Area (m2)		0.72	
E.G. Slope (m/m)	0.002127	Area (m2)		6.09	
Q Total (m3/s)	0.88	Flow (m3/s)		0.88	
Top Width (m)	9.16	Top Width (m)		9.16	
Vel Total (m/s)	1.23	Avg. Vel. (m/s)		1.23	
Max Chl Dpth (m)	0.90	Hydr. Depth (m)		0.90	
Conv. Total (m3/s)	19.1	Conv. (m3/s)		19.1	
Length Wtd. (m)	57.40	Wetted Per. (m)		0.80	
Min Ch El (m)	176.80	Shear (N/m2)		18.72	
Alpha	1.00	Stream Power (N/m s)		22.95	
Frctn Loss (m)		Cum Volume (1000 m3)		0.05	
C & E Loss (m)		Cum SA (1000 m2)		0.76	

CULVERT

RIVER: Rouge River
REACH: WC 12 RS: 50

INPUT
Description: PROP 407 TWY CULVERT
Distance from Upstream XS = 12.5
Deck/Roadway Width = 30
Weir Coefficient = 1.4
Upstream Deck/Roadway Coordinates
num= 3

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	180.63		65	180.42		113	180.39	

Upstream Bridge Cross Section Data
Station Elevation Data num= 39

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	181.5	3.24	181.5	3.29	181.5	3.32	181.5	3.4	181.49
3.76	181.48	11.25	181.13	12.63	181.09	17.05	181	20.29	180.83
25.17	180.61	25.95	180.55	27.12	180.5	31.94	180.17	34.53	180
35.09	179.96	35.21	179.95	35.29	179.95	35.39	179.94	39.93	179.63
41.65	179.5	45.81	179.19	46.27	179.17	49.85	179	52.82	178.96
52.89	178.96	53.03	178.95	57.93	178.72	63.27	176.8	67.68	176.8
72.45	178.7	79.77	179	80.59	179.03	92.18	179.5	106.23	179.98
106.87	180	107.13	180.01	108.26	180.04	112.57	180.15		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.08	41.65	.035	92.18	.08

Bank Sta: Left Right Coeff Contr. Expan.
41.65 92.18 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	65.1	178.2	T
65.9	112.57	178.2	T

Downstream Deck/Roadway Coordinates
num= 3

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord

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      0  180.52              55  180.42             138  180.22

Downstream Bridge Cross Section Data
Station Elevation Data    num=       61
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  180.31     .63  180.31    4.66  180.09    4.79   180.1    4.92  180.09
    5.06  180.09    5.22     180    7.53  179.86    7.64  179.86    8.12   179.8
     8.2  179.79   11.27   179.5   15.61  179.22   18.45     179   20.32  178.82
   21.02  178.79   24.04   178.5   26.02  178.27   28.28     178   31.46  177.68
   32.82  177.55   33.19  177.51    33.3   177.5   33.33   177.5   33.44  177.49
   34.92  177.32   35.03  177.35   35.15  177.39   35.49  177.43   35.67  177.46
      36  177.46    36.1  177.46   36.19  177.46    38.7  177.38   41.08  177.35
   41.76  177.31    42.9  177.24   45.76  177.14   47.05  177.11   47.16  177.11
   54.16  177.14   54.57  177.13   56.24  176.65   58.43  176.65   61.49  177.13
   67.57  177.21   71.68  177.25   73.15  177.27   74.28  177.29    84.6   177.5
   89.58  177.65  100.42     178  105.48  178.21  112.15   178.5  113.57  178.56
  115.29  178.65  123.57     179  128.68  179.26  130.96  179.34  134.67   179.5
  138.23  179.68

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .08   28.28    .035  100.42     .08

Bank Sta: Left   Right    Coeff Contr.   Expan.
          28.28  100.42            .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   56.85   177.5       T
   57.65  138.23   177.5       T

Upstream Embankment side slope             =       2 horiz. to 1.0 vertical
Downstream Embankment side slope           =       2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins        =
Energy head used in spillway design        =
Spillway height used in design             =
Weir crest shape                           = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1      Circular      .8
FHWA Chart # 1 - Concrete Pipe Culvert
FHWA Scale # 3 - Groove end entrance; pipe projecting from fill
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                  5      45     .013     .013        0                  .5               1
Upstream   Elevation =  176.8
           Centerline Station =  65.5
Downstream Elevation =  176.65
           Centerline Station =  57.25

CULVERT OUTPUT  Profile #2-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.04    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         0.80
  Q Barrel (m3/s)           0.04    Culv Vel DS (m/s)         0.89
  E.G. US. (m)            176.97    Culv Inv El Up (m)      176.80
  W.S. US. (m)            176.97    Culv Inv El Dn (m)      176.65
  E.G. DS (m)             176.75    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             176.71    Culv Exit Loss (m)        0.06
  Delta EG (m)              0.23    Culv Entr Loss (m)        0.02
  Delta WS (m)              0.26    Q Weir (m3/s)
  E.G. IC (m)             176.95    Weir Sta Lft (m)
  E.G. OC (m)             176.97    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       176.92    Weir Max Depth (m)
  Culv WS Outlet (m)      176.77    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.12    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.12    Min El Weir Flow (m)    180.39


Note:    During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth.  Therefore, the
         inlet will be at normal depth.

CULVERT OUTPUT  Profile #5-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.07    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         0.95
  Q Barrel (m3/s)           0.07    Culv Vel DS (m/s)         1.03
  E.G. US. (m)            177.03    Culv Inv El Up (m)      176.80
  W.S. US. (m)            177.02    Culv Inv El Dn (m)      176.65
  E.G. DS (m)             176.79    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             176.75    Culv Exit Loss (m)        0.07
  Delta EG (m)              0.24    Culv Entr Loss (m)        0.02
  Delta WS (m)              0.27    Q Weir (m3/s)
  E.G. IC (m)             177.01    Weir Sta Lft (m)
  E.G. OC (m)             177.03    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       176.96    Weir Max Depth (m)
  Culv WS Outlet (m)      176.80    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.16    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.15    Min El Weir Flow (m)    180.39


Note:    During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth.  Therefore, the
         inlet will be at normal depth.

CULVERT OUTPUT  Profile #10-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.10    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         1.05
  Q Barrel (m3/s)           0.10    Culv Vel DS (m/s)         1.13
  E.G. US. (m)            177.08    Culv Inv El Up (m)      176.80
  W.S. US. (m)            177.07    Culv Inv El Dn (m)      176.65
  E.G. DS (m)             176.83    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             176.77    Culv Exit Loss (m)        0.08
  Delta EG (m)              0.25    Culv Entr Loss (m)        0.03
  Delta WS (m)              0.30    Q Weir (m3/s)
  E.G. IC (m)             177.05    Weir Sta Lft (m)
  E.G. OC (m)             177.08    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       176.99    Weir Max Depth (m)
  Culv WS Outlet (m)      176.84    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.19    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.19    Min El Weir Flow (m)    180.39


Note:    During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth.  Therefore, the
         inlet will be at normal depth.

CULVERT OUTPUT  Profile #25-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.14    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         1.15
  Q Barrel (m3/s)           0.14    Culv Vel DS (m/s)         1.24
  E.G. US. (m)            177.13    Culv Inv El Up (m)      176.80
  W.S. US. (m)            177.12    Culv Inv El Dn (m)      176.65
  E.G. DS (m)             176.87    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             176.80    Culv Exit Loss (m)        0.08
  Delta EG (m)              0.26    Culv Entr Loss (m)        0.03
  Delta WS (m)              0.32    Q Weir (m3/s)
  E.G. IC (m)             177.10    Weir Sta Lft (m)
  E.G. OC (m)             177.13    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       177.03    Weir Max Depth (m)
  Culv WS Outlet (m)      176.87    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.23    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.22    Min El Weir Flow (m)    180.39


Note:    During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT  Profile #50-yr  Culv Group:  Culvert #1
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Q Culv Group (m3/s)	0.16	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.21
Q Barrel (m3/s)	0.16	Culv Vel DS (m/s)	1.29
E.G. US. (m)	177.16	Culv Inv El Up (m)	176.80
W.S. US. (m)	177.14	Culv Inv El Dn (m)	176.65
E.G. DS (m)	176.89	Culv Frctn Ls (m)	0.00
W.S. DS (m)	176.81	Culv Exit Loss (m)	0.08
Delta EG (m)	0.27	Culv Entr Loss (m)	0.04
Delta WS (m)	0.33	Q Weir (m3/s)	
E.G. IC (m)	177.12	Weir Sta Lft (m)	
E.G. OC (m)	177.16	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	177.05	Weir Max Depth (m)	
Culv WS Outlet (m)	176.89	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.25	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.24	Min El Weir Flow (m)	180.39

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #100-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.20	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.28
Q Barrel (m3/s)	0.20	Culv Vel DS (m/s)	1.38
E.G. US. (m)	177.20	Culv Inv El Up (m)	176.80
W.S. US. (m)	177.18	Culv Inv El Dn (m)	176.65
E.G. DS (m)	176.93	Culv Frctn Ls (m)	0.00
W.S. DS (m)	176.84	Culv Exit Loss (m)	0.08
Delta EG (m)	0.28	Culv Entr Loss (m)	0.04
Delta WS (m)	0.35	Q Weir (m3/s)	
E.G. IC (m)	177.16	Weir Sta Lft (m)	
E.G. OC (m)	177.20	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	177.08	Weir Max Depth (m)	
Culv WS Outlet (m)	176.91	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.28	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.26	Min El Weir Flow (m)	180.39

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #Check Flow Culv Group: Culvert #1

Q Culv Group (m3/s)	0.25	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.36
Q Barrel (m3/s)	0.25	Culv Vel DS (m/s)	1.47
E.G. US. (m)	177.26	Culv Inv El Up (m)	176.80
W.S. US. (m)	177.23	Culv Inv El Dn (m)	176.65
E.G. DS (m)	176.97	Culv Frctn Ls (m)	0.00
W.S. DS (m)	176.87	Culv Exit Loss (m)	0.08
Delta EG (m)	0.28	Culv Entr Loss (m)	0.05
Delta WS (m)	0.36	Q Weir (m3/s)	
E.G. IC (m)	177.21	Weir Sta Lft (m)	
E.G. OC (m)	177.26	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	177.12	Weir Max Depth (m)	
Culv WS Outlet (m)	176.95	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.32	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.30	Min El Weir Flow (m)	180.39

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #Regional Culv Group: Culvert #1

Q Culv Group (m3/s)	0.88	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.88
Q Barrel (m3/s)	0.88	Culv Vel DS (m/s)	2.29
E.G. US. (m)	177.77	Culv Inv El Up (m)	176.80
W.S. US. (m)	177.70	Culv Inv El Dn (m)	176.65
E.G. DS (m)	177.40	Culv Frctn Ls (m)	0.00
W.S. DS (m)	177.15	Culv Exit Loss (m)	0.09
Delta EG (m)	0.38	Culv Entr Loss (m)	0.09
Delta WS (m)	0.55	Q Weir (m3/s)	
E.G. IC (m)	177.68	Weir Sta Lft (m)	
E.G. OC (m)	177.77	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	177.50	Weir Max Depth (m)	
Culv WS Outlet (m)	177.22	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.80	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.57	Min El Weir Flow (m)	180.39

Note: The normal depth exceeds the height of the culvert. The program assumes that the normal depth is equal to the height of the culvert.

CROSS SECTION

RIVER: Rouge River
REACH: WC 12 RS: 10

INPUT
Description: ST 10 - New section by Parsons - (Updated Sept 2016)
Station Elevation Data num= 61

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	180.31	.63	180.31	4.66	180.09	4.79	180.1	4.92	180.09
5.06	180.09	5.22	180	7.53	179.86	7.64	179.86	8.12	179.8
8.2	179.79	11.27	179.5	15.61	179.22	18.45	179	20.32	178.82
21.02	178.79	24.04	178.5	26.02	178.27	28.28	178	31.46	177.68
32.82	177.55	33.19	177.51	33.3	177.5	33.33	177.5	33.44	177.49
34.92	177.32	35.03	177.35	35.15	177.39	35.49	177.43	35.67	177.46
36	177.46	36.1	177.46	36.19	177.46	38.7	177.38	41.08	177.35
41.76	177.31	42.9	177.24	45.76	177.14	47.05	177.11	47.16	177.11
54.16	177.14	54.57	177.13	56.24	176.65	58.43	176.65	61.49	177.13
67.57	177.21	71.68	177.25	73.15	177.27	74.28	177.29	84.6	177.5
89.58	177.65	100.42	178	105.48	178.21	112.15	178.5	113.57	178.56
115.29	178.65	123.57	179	128.68	179.26	130.96	179.34	134.67	179.5
138.23	179.68								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.08	28.28	.035	100.42	.08

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
28.28 100.42 0 0 0 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	56.85	177.5	T
57.65	138.23	177.5	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	176.75	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	176.71	Reach Len. (m)			
Crit W.S. (m)	176.71	Flow Area (m2)		0.05	
E.G. Slope (m/m)	0.029976	Area (m2)		0.16	
Q Total (m3/s)	0.04	Flow (m3/s)		0.04	
Top Width (m)	2.82	Top Width (m)		2.82	
Vel Total (m/s)	0.79	Avg. Vel. (m/s)		0.79	
Max Chl Dpth (m)	0.06	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	0.2	Conv. (m3/s)		0.2	
Length Wtd. (m)		Wetted Per. (m)		0.80	
Min Ch El (m)	176.65	Shear (N/m2)		18.67	
Alpha	1.00	Stream Power (N/m s)		14.70	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	176.79	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.035	
W.S. Elev (m)	176.75	Reach Len. (m)			
Crit W.S. (m)	176.75	Flow Area (m2)		0.08	
E.G. Slope (m/m)	0.019462	Area (m2)		0.27	
Q Total (m3/s)	0.07	Flow (m3/s)		0.07	
Top Width (m)	3.19	Top Width (m)		3.19	
Vel Total (m/s)	0.87	Avg. Vel. (m/s)		0.87	
Max Chl Dpth (m)	0.10	Hydr. Depth (m)		0.10	
Conv. Total (m3/s)	0.5	Conv. (m3/s)		0.5	
Length Wtd. (m)		Wetted Per. (m)		0.80	
Min Ch El (m)	176.65	Shear (N/m2)		19.30	
Alpha	1.00	Stream Power (N/m s)		16.70	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	176.83	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.035	
W.S. Elev (m)	176.77	Reach Len. (m)			
Crit W.S. (m)	176.77	Flow Area (m2)		0.09	
E.G. Slope (m/m)	0.024988	Area (m2)		0.32	
Q Total (m3/s)	0.10	Flow (m3/s)		0.10	
Top Width (m)	3.34	Top Width (m)		3.34	
Vel Total (m/s)	1.08	Avg. Vel. (m/s)		1.08	
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.12	
Conv. Total (m3/s)	0.6	Conv. (m3/s)		0.6	
Length Wtd. (m)		Wetted Per. (m)		0.80	
Min Ch El (m)	176.65	Shear (N/m2)		28.48	
Alpha	1.00	Stream Power (N/m s)		30.64	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	176.87	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.035	
W.S. Elev (m)	176.80	Reach Len. (m)			
Crit W.S. (m)	176.80	Flow Area (m2)		0.12	
E.G. Slope (m/m)	0.022692	Area (m2)		0.43	
Q Total (m3/s)	0.14	Flow (m3/s)		0.14	
Top Width (m)	3.63	Top Width (m)		3.63	
Vel Total (m/s)	1.20	Avg. Vel. (m/s)		1.20	
Max Chl Dpth (m)	0.15	Hydr. Depth (m)		0.15	
Conv. Total (m3/s)	0.9	Conv. (m3/s)		0.9	
Length Wtd. (m)		Wetted Per. (m)		0.80	
Min Ch El (m)	176.65	Shear (N/m2)		32.58	
Alpha	1.00	Stream Power (N/m s)		38.95	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	176.89	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.		0.035	
W.S. Elev (m)	176.81	Reach Len. (m)			
Crit W.S. (m)	176.81	Flow Area (m2)		0.13	
E.G. Slope (m/m)	0.022327	Area (m2)		0.47	
Q Total (m3/s)	0.16	Flow (m3/s)		0.16	
Top Width (m)	3.76	Top Width (m)		3.76	
Vel Total (m/s)	1.26	Avg. Vel. (m/s)		1.26	
Max Chl Dpth (m)	0.16	Hydr. Depth (m)		0.16	
Conv. Total (m3/s)	1.1	Conv. (m3/s)		1.1	
Length Wtd. (m)		Wetted Per. (m)		0.80	
Min Ch El (m)	176.65	Shear (N/m2)		34.90	
Alpha	1.00	Stream Power (N/m s)		43.80	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	176.93	Element	Left OB	Channel	Right OB
Vel Head (m)	0.09	Wt. n-Val.		0.035	
W.S. Elev (m)	176.84	Reach Len. (m)			
Crit W.S. (m)	176.84	Flow Area (m2)		0.15	
E.G. Slope (m/m)	0.020981	Area (m2)		0.58	
Q Total (m3/s)	0.20	Flow (m3/s)		0.20	
Top Width (m)	4.02	Top Width (m)		4.02	
Vel Total (m/s)	1.35	Avg. Vel. (m/s)		1.35	
Max Chl Dpth (m)	0.19	Hydr. Depth (m)		0.19	
Conv. Total (m3/s)	1.4	Conv. (m3/s)		1.4	
Length Wtd. (m)		Wetted Per. (m)		0.80	
Min Ch El (m)	176.65	Shear (N/m2)		38.20	
Alpha	1.00	Stream Power (N/m s)		51.45	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	176.97	Element	Left OB	Channel	Right OB
Vel Head (m)	0.11	Wt. n-Val.		0.035	
W.S. Elev (m)	176.87	Reach Len. (m)			
Crit W.S. (m)	176.87	Flow Area (m2)		0.17	
E.G. Slope (m/m)	0.019964	Area (m2)		0.70	
Q Total (m3/s)	0.25	Flow (m3/s)		0.25	
Top Width (m)	4.31	Top Width (m)		4.31	
Vel Total (m/s)	1.45	Avg. Vel. (m/s)		1.45	
Max Chl Dpth (m)	0.22	Hydr. Depth (m)		0.22	
Conv. Total (m3/s)	1.8	Conv. (m3/s)		1.8	
Length Wtd. (m)		Wetted Per. (m)		0.80	
Min Ch El (m)	176.65	Shear (N/m2)		42.18	
Alpha	1.00	Stream Power (N/m s)		61.20	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	177.40	Element	Left OB	Channel	Right OB
Vel Head (m)	0.25	Wt. n-Val.		0.035	
W.S. Elev (m)	177.15	Reach Len. (m)			
Crit W.S. (m)	177.15	Flow Area (m2)		0.40	
E.G. Slope (m/m)	0.015299	Area (m2)		2.50	
Q Total (m3/s)	0.88	Flow (m3/s)		0.88	
Top Width (m)	17.16	Top Width (m)		17.16	
Vel Total (m/s)	2.22	Avg. Vel. (m/s)		2.22	
Max Chl Dpth (m)	0.50	Hydr. Depth (m)		0.50	
Conv. Total (m3/s)	7.1	Conv. (m3/s)		7.1	
Length Wtd. (m)		Wetted Per. (m)		0.80	
Min Ch El (m)	176.65	Shear (N/m2)		74.49	
Alpha	1.00	Stream Power (N/m s)		165.08	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

SUMMARY OF MANNING'S N VALUES

River:Rouge River

Reach	River Sta.	n1	n2	n3
WC 12	200	.08	.035	.08
WC 12	100	.08	.035	.08
WC 12	50	Culvert		
WC 12	10	.08	.035	.08

SUMMARY OF REACH LENGTHS

River: Rouge River

Reach	River Sta.	Left	Channel	Right
WC 12	200	77.3	77.3	77.3
WC 12	100	57.4	57.4	57.4
WC 12	50	Culvert		
WC 12	10	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Rouge River

Reach	River Sta.	Contr.	Expan.
WC 12	200	.3	.5
WC 12	100	.3	.5
WC 12	50	Culvert	
WC 12	10	.3	.5

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
WC 12	200	2-yr	0.04	179.00	179.02	179.02	179.04	0.045614	0.49	0.08	3.61	1.03
WC 12	200	5-yr	0.07	179.00	179.04	179.04	179.05	0.027238	0.52	0.13	3.66	0.87
WC 12	200	10-yr	0.10	179.00	179.04	179.04	179.06	0.034913	0.64	0.16	3.68	1.00
WC 12	200	25-yr	0.14	179.00	179.05	179.05	179.08	0.037761	0.75	0.19	3.70	1.07
WC 12	200	50-yr	0.16	179.00	179.07	179.07	179.09	0.017058	0.62	0.26	3.77	0.76
WC 12	200	100-yr	0.20	179.00	179.07	179.07	179.10	0.033371	0.83	0.24	3.75	1.05
WC 12	200	Check Flow	0.25	179.00	179.08	179.08	179.12	0.031013	0.88	0.28	3.79	1.03
WC 12	200	Regional	0.88	179.00	179.20	179.20	179.26	0.016976	1.17	0.75	4.19	0.88
WC 12	100	2-yr	0.04	176.80	176.97	176.86	176.97	0.001145	0.30	0.14	5.30	0.23
WC 12	100	5-yr	0.07	176.80	177.02	176.89	177.03	0.001364	0.39	0.18	5.60	0.26
WC 12	100	10-yr	0.10	176.80	177.07	176.92	177.08	0.001529	0.47	0.21	5.83	0.29
WC 12	100	25-yr	0.14	176.80	177.12	176.95	177.13	0.001705	0.55	0.25	6.09	0.31
WC 12	100	50-yr	0.16	176.80	177.14	176.96	177.16	0.001768	0.59	0.27	6.21	0.32
WC 12	100	100-yr	0.20	176.80	177.18	176.98	177.20	0.001898	0.66	0.31	6.43	0.34
WC 12	100	Check Flow	0.25	176.80	177.23	177.02	177.26	0.002024	0.73	0.34	6.68	0.36
WC 12	100	Regional	0.88	176.80	177.70	177.30	177.77	0.002127	1.23	0.72	9.16	0.41
WC 12	50		Culvert									
WC 12	10	2-yr	0.04	176.65	176.71	176.71	176.75	0.029976	0.79	0.05	2.82	1.00
WC 12	10	5-yr	0.07	176.65	176.75	176.75	176.79	0.019462	0.87	0.08	3.19	0.87
WC 12	10	10-yr	0.10	176.65	176.77	176.77	176.83	0.024988	1.08	0.09	3.34	1.01
WC 12	10	25-yr	0.14	176.65	176.80	176.80	176.87	0.022692	1.20	0.12	3.63	1.00
WC 12	10	50-yr	0.16	176.65	176.81	176.81	176.89	0.022327	1.26	0.13	3.76	1.00
WC 12	10	100-yr	0.20	176.65	176.84	176.84	176.93	0.020981	1.35	0.15	4.02	1.00
WC 12	10	Check Flow	0.25	176.65	176.87	176.87	176.97	0.019964	1.45	0.17	4.31	1.00
WC 12	10	Regional	0.88	176.65	177.15	177.15	177.40	0.015299	2.22	0.40	17.16	1.00

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (m)	W.S. Elev (m)	Vel Head (m)	Frctn Loss (m)	C & E Loss (m)	Q Left (m3/s)	Q Channel (m3/s)	Q Right (m3/s)	Top Width (m)
WC 12	200	2-yr	179.04	179.02	0.01	0.26	0.00		0.04		3.61
WC 12	200	5-yr	179.05	179.04	0.01	0.28	0.00		0.07		3.66
WC 12	200	10-yr	179.06	179.04	0.02	0.32	0.01		0.10		3.68
WC 12	200	25-yr	179.08	179.05	0.03	0.36	0.01		0.14		3.70
WC 12	200	50-yr	179.09	179.07	0.02	0.31	0.00		0.16		3.77
WC 12	200	100-yr	179.10	179.07	0.04	0.38	0.01		0.20		3.75
WC 12	200	Check Flow	179.12	179.08	0.04	0.40	0.01		0.25		3.79
WC 12	200	Regional	179.26	179.20	0.07	0.36	0.00		0.88		4.19
WC 12	100	2-yr	176.97	176.97	0.00				0.04		5.30
WC 12	100	5-yr	177.03	177.02	0.01				0.07		5.60
WC 12	100	10-yr	177.08	177.07	0.01				0.10		5.83
WC 12	100	25-yr	177.13	177.12	0.02				0.14		6.09
WC 12	100	50-yr	177.16	177.14	0.02				0.16		6.21
WC 12	100	100-yr	177.20	177.18	0.02				0.20		6.43
WC 12	100	Check Flow	177.26	177.23	0.03				0.25		6.68
WC 12	100	Regional	177.77	177.70	0.08				0.88		9.16
WC 12	50		Culvert								
WC 12	10	2-yr	176.75	176.71	0.03				0.04		2.82
WC 12	10	5-yr	176.79	176.75	0.04				0.07		3.19
WC 12	10	10-yr	176.83	176.77	0.06				0.10		3.34
WC 12	10	25-yr	176.87	176.80	0.07				0.14		3.63
WC 12	10	50-yr	176.89	176.81	0.08				0.16		3.76
WC 12	10	100-yr	176.93	176.84	0.09				0.20		4.02
WC 12	10	Check Flow	176.97	176.87	0.11				0.25		4.31
WC 12	10	Regional	177.40	177.15	0.25				0.88		17.16

Profile Output Table - Culvert Only

Reach	River Sta		Profile	E.G. US. (m)	W.S. US. (m)	E.G. IC (m)	E.G. OC (m)	Min El Weir Flow (m)	Q Culv Group (m3/s)	Q Weir (m3/s)	Delta WS (m)	Culv Vel US (m/s)	Culv Vel DS (m/s)
WC 12	50	Culvert #1	2-yr	176.97	176.97	176.95	176.97	180.39	0.04		0.26	0.80	0.89
WC 12	50	Culvert #1	5-yr	177.03	177.02	177.01	177.03	180.39	0.07		0.27	0.95	1.03
WC 12	50	Culvert #1	10-yr	177.08	177.07	177.05	177.08	180.39	0.10		0.30	1.05	1.13
WC 12	50	Culvert #1	25-yr	177.13	177.12	177.10	177.13	180.39	0.14		0.32	1.15	1.24
WC 12	50	Culvert #1	50-yr	177.16	177.14	177.12	177.16	180.39	0.16		0.33	1.21	1.29
WC 12	50	Culvert #1	100-yr	177.20	177.18	177.16	177.20	180.39	0.20		0.35	1.28	1.38
WC 12	50	Culvert #1	Check Flow	177.26	177.23	177.21	177.26	180.39	0.25		0.36	1.36	1.47
WC 12	50	Culvert #1	Regional	177.77	177.70	177.68	177.77	180.39	0.88		0.55	1.88	2.29

ROUGE RIVER

HEC-RAS ANALYSIS WC#13

File: G:\TT4022\DRAWINGS\GENERAL\SHEETS\602282-S-HEC-ROU-1.DWG - Revised by <P006437C>: 9/26/2016 2:35 PM

CHARLOTTE ANGLISS ROAD

EX 407 ETR BRIDGE SPAN = 192m

EX 407 ETR BRIDGE SPAN = 205m

EXISTING 407 ETR

PROPOSED 407 TWY BRIDGE SPAN = 300m

PROPOSED 407 TWY

162.39	162.44	ST 5604.21	
160.62	160.63		
162.34	162.40	ST 5604.20	
160.44	160.44		
162.08	162.17	ST 5604.198	
160.23	160.24		
161.99	162.10	ST 5604.196	
160.05	160.07		
ST 5604.19	161.86	161.86	
	159.83	159.83	
ST 5604.18	161.80	161.80	
	159.74	159.74	
ST 5604.17	161.69	161.69	
	159.55	159.55	
ST 5604.14	161.53	161.53	
	159.49	159.49	
161.55	161.55	ST 5604.13	
159.51	159.51		
161.34	161.34	ST 5604.12	
159.32	159.32		

LEGEND

- EXISTING 407 ETR
- PROPOSED 407 TWY
- CREEK FLOW DIRECTION
- EXISTING CULVERT
- PROPOSED CULVERT
- PROPOSED 407 TWY BRIDGE
- EXISTING TRCA FLOODLINE
- PROPOSED REGIONAL FLOODLINE

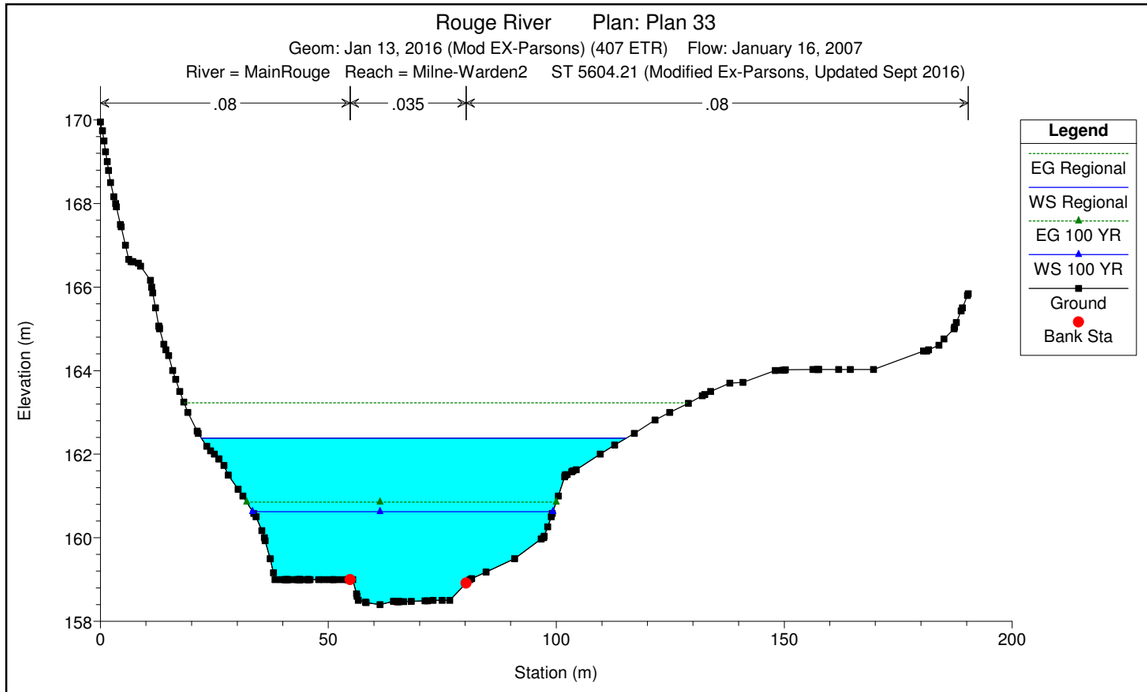
EX REG / EX 100 | PR REG / PR 100 | HEC ST — CROSS SECTION NUMBER — PARSONS HEC-RAS SECTION

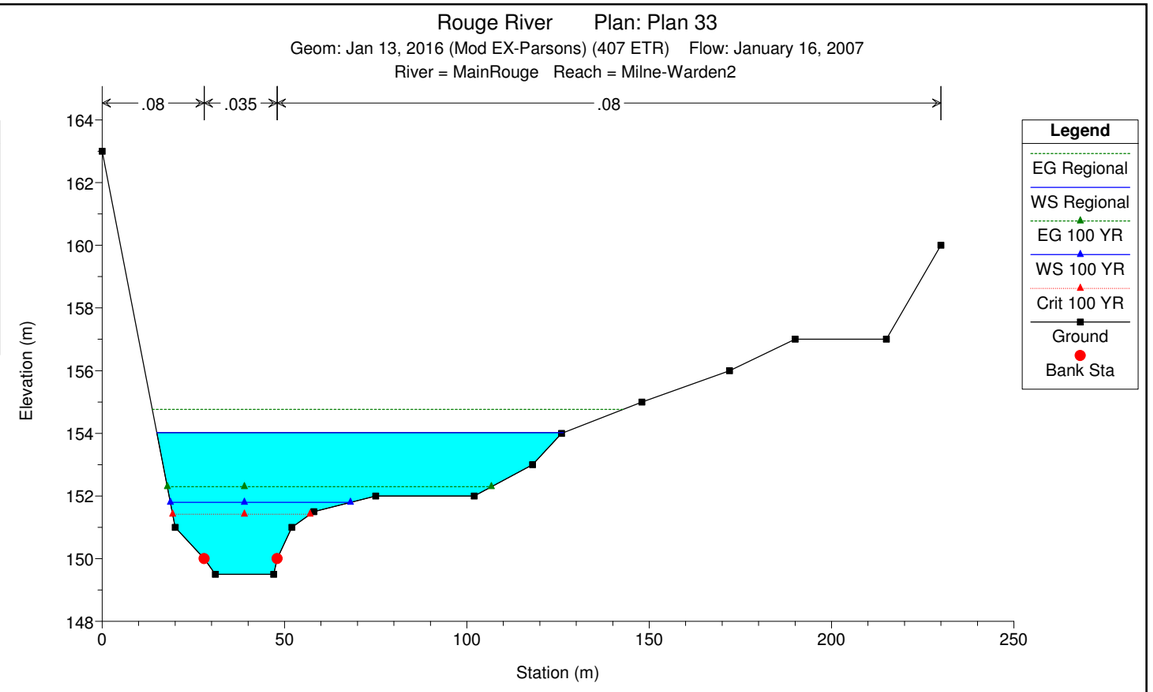
PROPOSED WL ELEVATION (m)

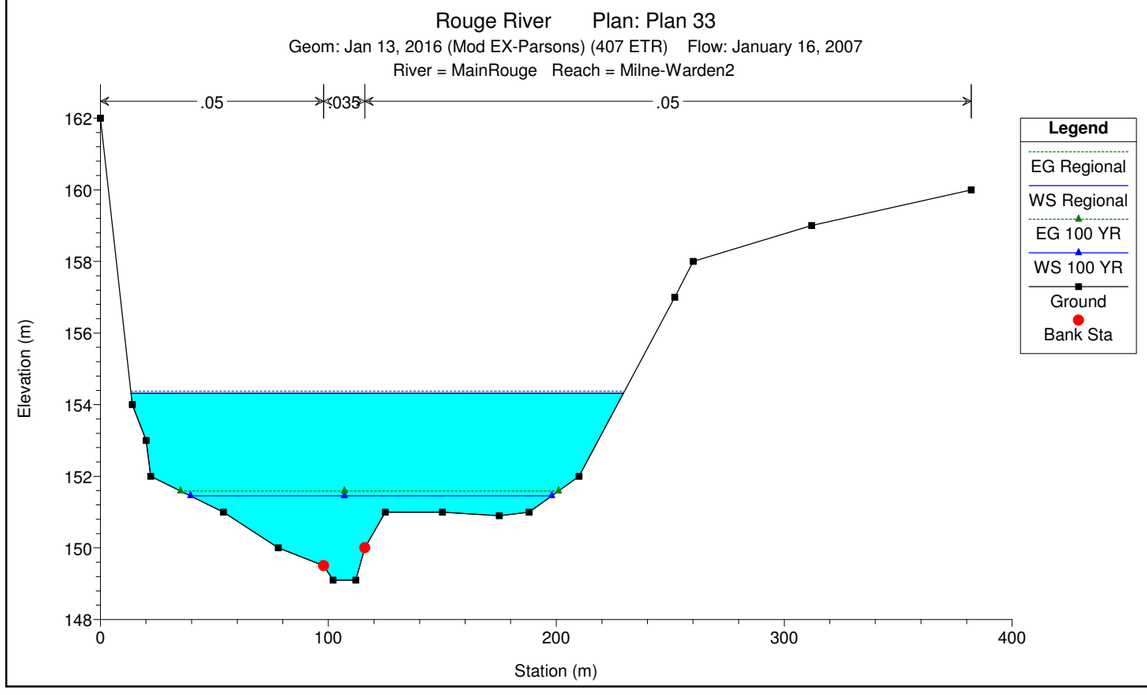
EXISTING UPDATED WL ELEVATION (m)

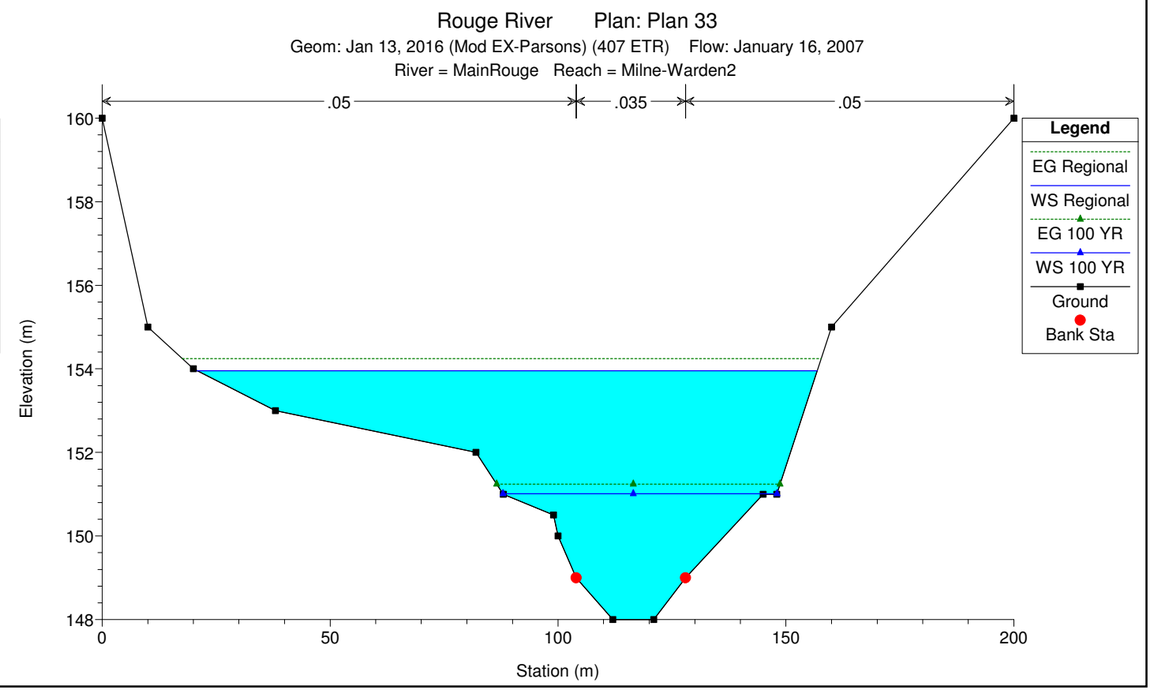
NOTE: MODIFIED EXISTING AND PROPOSED FLOODLINES ARE SIMILAR

DATE: SEPTEMBER 2016	Ontario	PARSONS	407 TRANSITWAY FROM KENNEDY RD TO BROCK RD
SCALE: 1:1000		625 COCHRANE DRIVE, SUITE 500 MARKHAM, ONTARIO L3R 9R9 TEL: 905-943-0500 FAX: 905-943-0400	FIGURE 6.6 - PROPOSED FLOODPLAIN MAPPING - ROUGE RIVER (WC#13)


Rouge River Plan: Plan 33
Geom: Jan 13, 2016 (Mod EX-Parsons) (407 ETR) Flow: January 16, 2007
River = MainRouge Reach = Milne-Warden2 ST 5604.21 (Modified Ex-Parsons, Updated Sept 2016)
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100 YR
WS 100 YR
Ground
Bank Sta


Rouge River Plan: Plan 33
Geom: Jan 13, 2016 (Mod EX-Parsons) (407 ETR) Flow: January 16, 2007
River = MainRouge Reach = Milne-Warden2
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100 YR
WS 100 YR
Crit 100 YR
Ground
Bank Sta

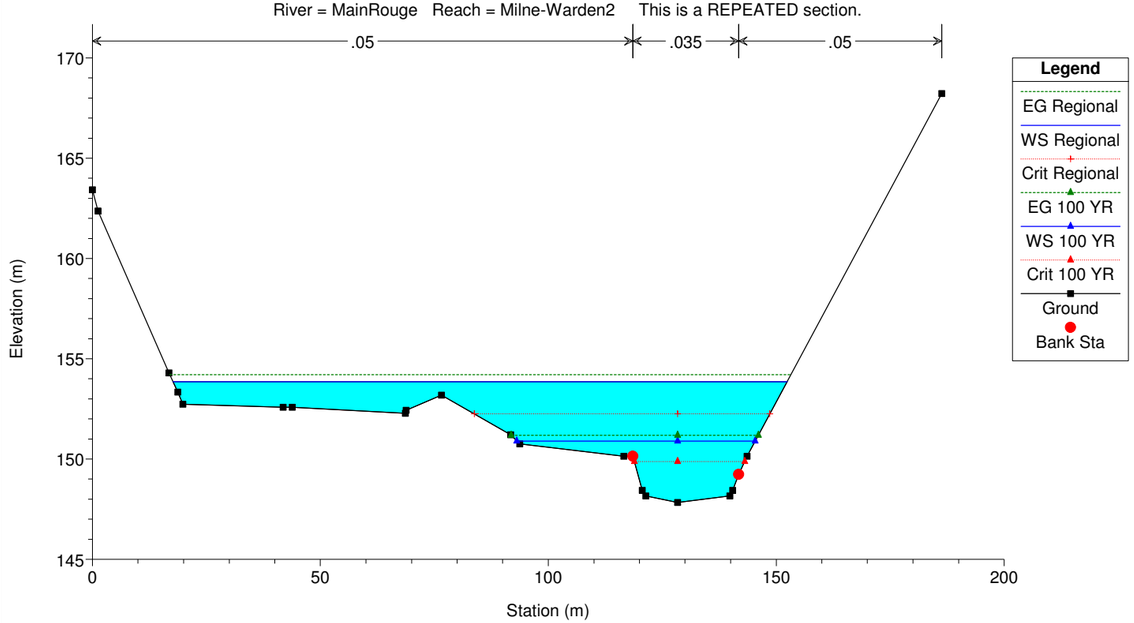

Rouge River Plan: Plan 33
Geom: Jan 13, 2016 (Mod EX-Parsons) (407 ETR) Flow: January 16, 2007
River = MainRouge Reach = Milne-Warden2
.05
.035
.05
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100 YR
WS 100 YR
Ground
Bank Sta


Rouge River Plan: Plan 33
Geom: Jan 13, 2016 (Mod EX-Parsons) (407 ETR) Flow: January 16, 2007
River = MainRouge Reach = Milne-Warden2
.05
.035
.05
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100 YR
WS 100 YR
Ground
Bank Sta

Rouge River Plan: Plan 33

Geom: Jan 13, 2016 (Mod EX-Parsons) (407 ETR) Flow: January 16, 2007

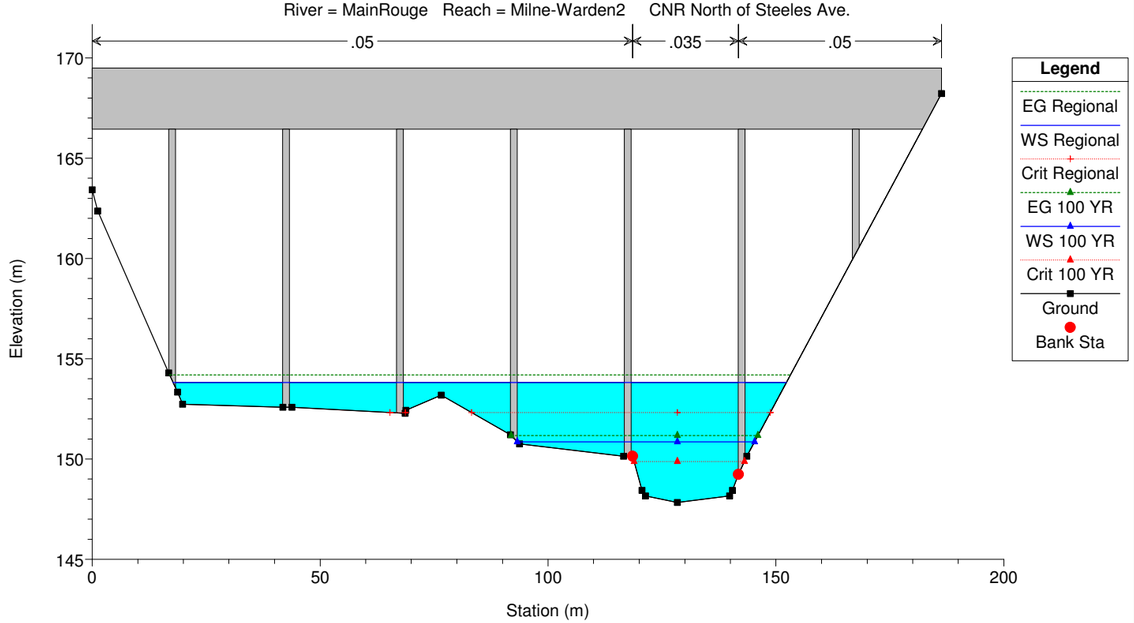
River = MainRouge Reach = Milne-Warden2 This is a REPEATED section.



Rouge River Plan: Plan 33

Geom: Jan 13, 2016 (Mod EX-Parsons) (407 ETR) Flow: January 16, 2007

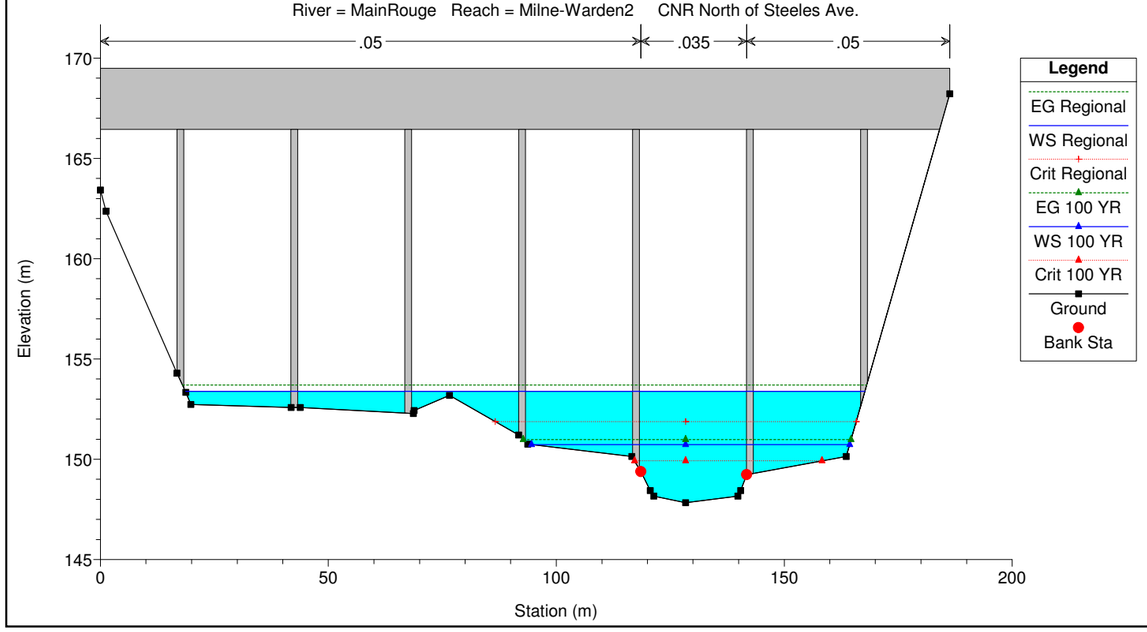
River = MainRouge Reach = Milne-Warden2 CNR North of Steeles Ave.



Rouge River Plan: Plan 33

Geom: Jan 13, 2016 (Mod EX-Parsons) (407 ETR) Flow: January 16, 2007

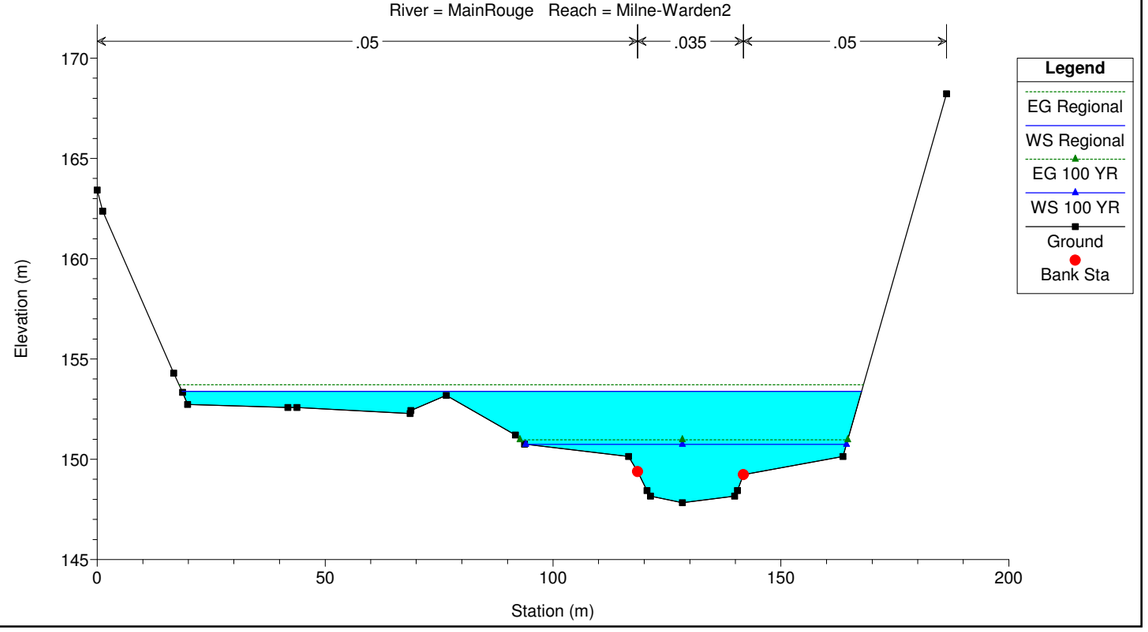
River = MainRouge Reach = Milne-Warden2 CNR North of Steeles Ave.

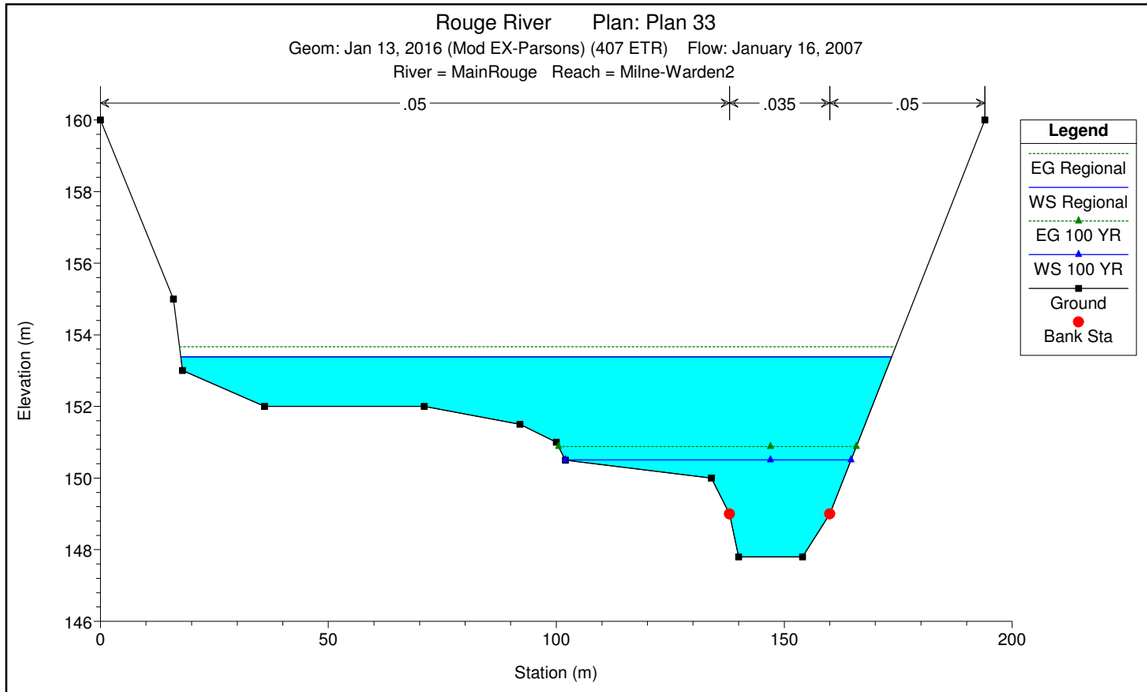


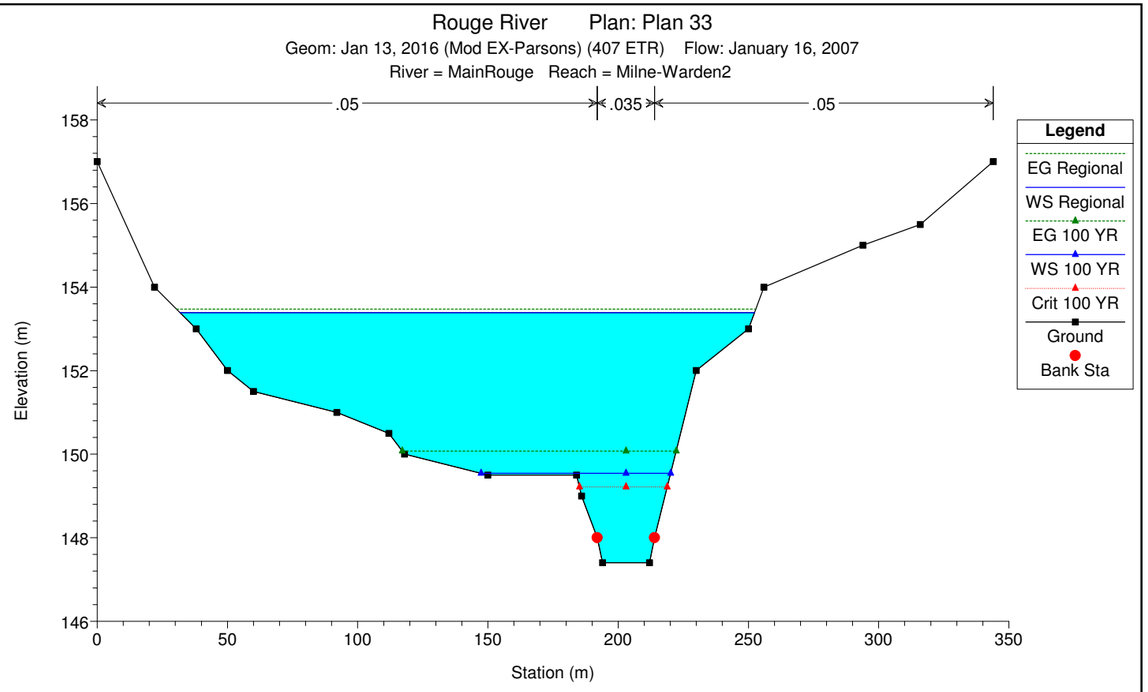
Rouge River Plan: Plan 33

Geom: Jan 13, 2016 (Mod EX-Parsons) (407 ETR) Flow: January 16, 2007

River = MainRouge Reach = Milne-Warden2




Rouge River Plan: Plan 33
Geom: Jan 13, 2016 (Mod EX-Parsons) (407 ETR) Flow: January 16, 2007
River = MainRouge Reach = Milne-Warden2
.05
.035
.05
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100 YR
WS 100 YR
Ground
Bank Sta


Rouge River Plan: Plan 33
Geom: Jan 13, 2016 (Mod EX-Parsons) (407 ETR) Flow: January 16, 2007
River = MainRouge Reach = Milne-Warden2
.05
.035
.05
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100 YR
WS 100 YR
Crit 100 YR
Ground
Bank Sta

HEC-RAS Plan: WC13 - EX Cond River: MainRouge Reach: Milne-Warden2

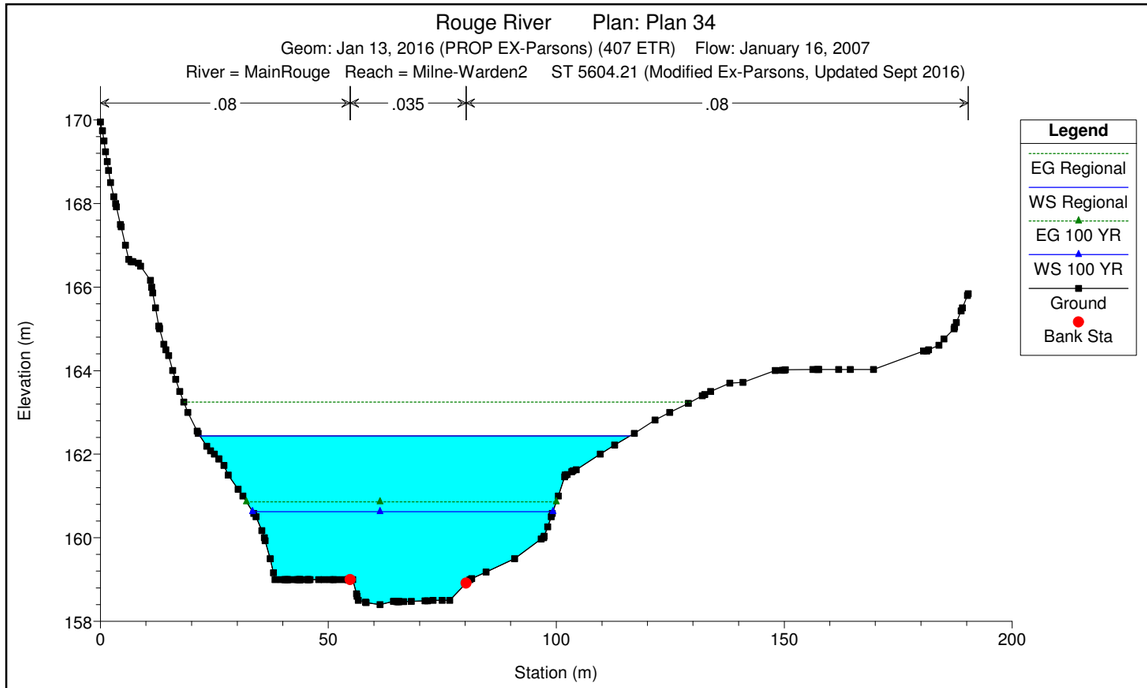
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Milne-Warden2	5604.21	Regional	662.78	158.40	162.39		163.23	0.004610	4.76	239.52	93.21	0.77
Milne-Warden2	5604.21	100 YR	166.11	158.40	160.62		160.85	0.002652	2.40	104.25	65.89	0.53
Milne-Warden2	5604.21	50 YR	144.03	158.40	160.50		160.71	0.002464	2.23	96.59	64.78	0.51
Milne-Warden2	5604.21	25 YR	122.55	158.40	160.32		160.51	0.002571	2.13	84.73	63.49	0.51
Milne-Warden2	5604.21	10 YR	95.30	158.40	160.08		160.24	0.002684	1.97	69.50	61.75	0.51
Milne-Warden2	5604.21	5 YR	74.61	158.40	159.88		160.03	0.002713	1.82	57.72	59.32	0.50
Milne-Warden2	5604.21	2 YR	46.22	158.40	159.58		159.68	0.002675	1.52	40.45	54.82	0.47
Milne-Warden2	5604.2	Regional	662.78	158.00	162.34	161.41	162.70	0.001846	3.04	359.69	171.68	0.49
Milne-Warden2	5604.2	100 YR	166.11	158.00	160.44	159.58	160.61	0.001703	1.87	104.04	82.58	0.42
Milne-Warden2	5604.2	50 YR	144.03	158.00	160.33	159.47	160.48	0.001540	1.72	95.96	76.92	0.40
Milne-Warden2	5604.2	25 YR	122.55	158.00	160.14	159.37	160.27	0.001632	1.65	81.91	65.99	0.40
Milne-Warden2	5604.2	10 YR	95.30	158.00	159.88	159.22	160.00	0.001701	1.51	66.87	53.86	0.40
Milne-Warden2	5604.2	5 YR	74.61	158.00	159.69	159.10	159.78	0.001711	1.37	56.51	51.11	0.39
Milne-Warden2	5604.2	2 YR	46.22	158.00	159.39	158.89	159.45	0.001640	1.12	41.91	47.03	0.37
Milne-Warden2	5604.199		Bridge									
Milne-Warden2	5604.198	Regional	662.78	157.84	162.08	161.29	162.50	0.002254	3.32	349.32	151.74	0.54
Milne-Warden2	5604.198	100 YR	166.11	157.84	160.23	159.44	160.43	0.001976	2.03	102.16	92.30	0.45
Milne-Warden2	5604.198	50 YR	144.03	157.84	160.16	159.32	160.33	0.001685	1.84	95.99	90.16	0.41
Milne-Warden2	5604.198	25 YR	122.55	157.84	159.95	159.19	160.11	0.001835	1.78	79.01	66.72	0.42
Milne-Warden2	5604.198	10 YR	95.30	157.84	159.68	159.03	159.82	0.001964	1.65	62.49	56.16	0.43
Milne-Warden2	5604.198	5 YR	74.61	157.84	159.49	158.88	159.60	0.001951	1.50	52.18	48.93	0.42
Milne-Warden2	5604.198	2 YR	46.22	157.84	159.19	158.61	159.27	0.001740	1.20	38.94	42.04	0.38
Milne-Warden2	5604.197		Bridge									
Milne-Warden2	5604.196	Regional	662.78	157.77	161.99		162.40	0.002439	3.56	374.96	155.61	0.56
Milne-Warden2	5604.196	100 YR	166.11	157.77	160.05		160.33	0.002826	2.48	97.84	96.74	0.54
Milne-Warden2	5604.196	50 YR	144.03	157.77	160.04		160.25	0.002171	2.17	96.71	93.29	0.48
Milne-Warden2	5604.196	25 YR	122.55	157.77	159.81		160.02	0.002468	2.14	78.67	73.14	0.50
Milne-Warden2	5604.196	10 YR	95.30	157.77	159.53		159.73	0.002727	2.02	59.78	60.18	0.51
Milne-Warden2	5604.196	5 YR	74.61	157.77	159.35		159.51	0.002608	1.82	49.35	52.34	0.49
Milne-Warden2	5604.196	2 YR	46.22	157.77	159.09		159.19	0.002035	1.41	37.00	45.24	0.42
Milne-Warden2	5604.19	Regional	662.78	157.50	161.86		162.05	0.001257	2.59	526.98	202.50	0.41
Milne-Warden2	5604.19	100 YR	166.11	157.50	159.83		159.96	0.001598	1.85	152.76	149.15	0.41
Milne-Warden2	5604.19	50 YR	144.03	157.50	159.89		159.99	0.001048	1.53	162.67	151.71	0.33
Milne-Warden2	5604.19	25 YR	122.55	157.50	159.60		159.71	0.001452	1.63	119.33	140.10	0.38
Milne-Warden2	5604.19	10 YR	95.30	157.50	159.20		159.34	0.002398	1.78	76.44	99.84	0.47

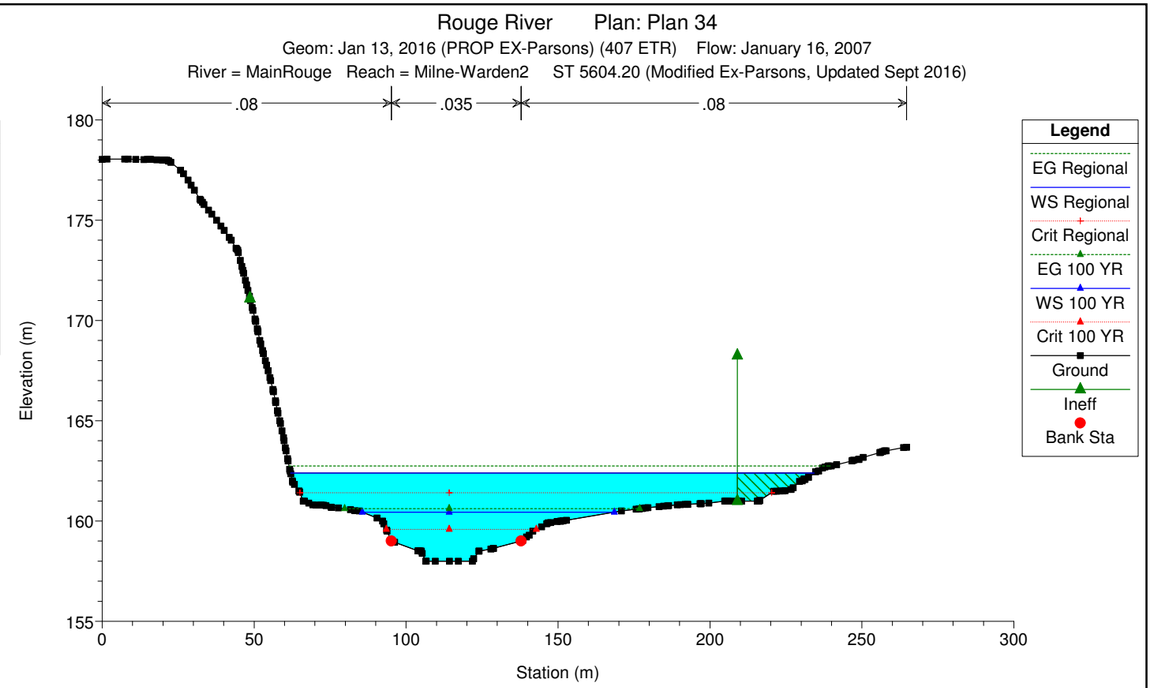
HEC-RAS Plan: WC13 - EX Cond River: MainRouge Reach: Milne-Warden2 (Continued)

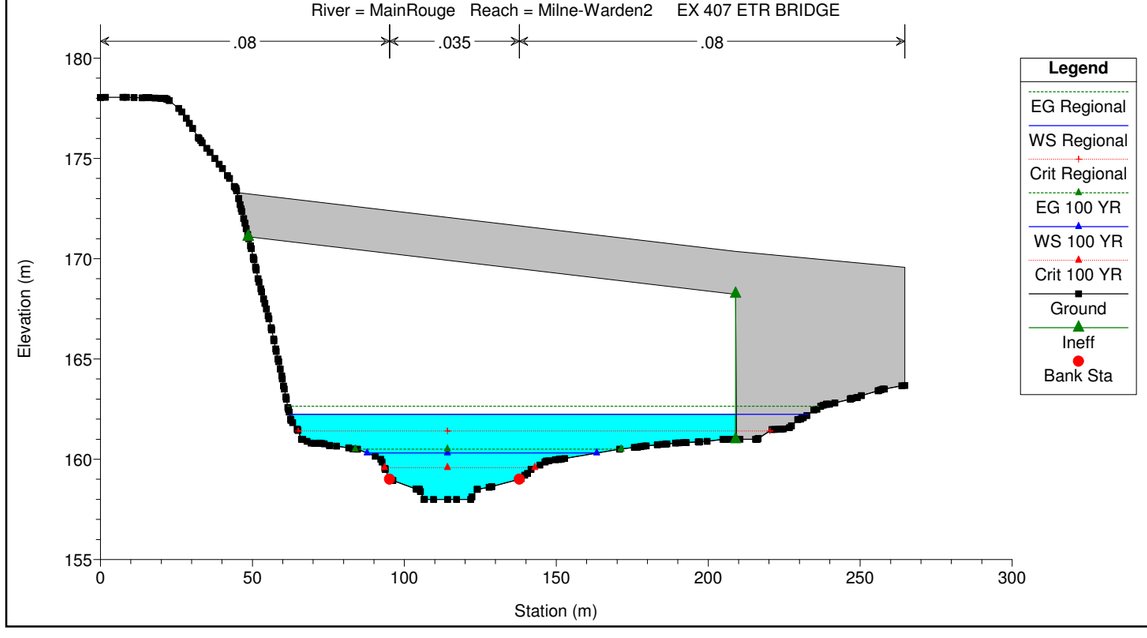
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Milne-Warden2	5604.19	5 YR	74.61	157.50	158.85		159.04	0.004174	1.96	45.78	71.43	0.60
Milne-Warden2	5604.19	2 YR	46.22	157.50	158.43		158.65	0.008379	2.06	22.48	32.11	0.78
Milne-Warden2	5604.18	Regional	662.78	157.00	161.80		162.02	0.001374	2.84	528.90	203.93	0.43
Milne-Warden2	5604.18	100 YR	166.11	157.00	159.74		159.92	0.001774	2.12	147.62	142.44	0.44
Milne-Warden2	5604.18	50 YR	144.03	157.00	159.84		159.96	0.001087	1.71	162.76	148.49	0.35
Milne-Warden2	5604.18	25 YR	122.55	157.00	159.52		159.67	0.001538	1.85	117.30	137.51	0.40
Milne-Warden2	5604.18	10 YR	95.30	157.00	159.05		159.26	0.002862	2.13	62.38	97.51	0.53
Milne-Warden2	5604.18	5 YR	74.61	157.00	158.69		158.93	0.004167	2.20	39.38	52.92	0.61
Milne-Warden2	5604.18	2 YR	46.22	157.00	158.21		158.46	0.007809	2.21	21.19	27.80	0.78
Milne-Warden2	5604.17	Regional	662.78	156.60	161.69	160.88	161.98	0.001628	3.41	512.11	215.41	0.48
Milne-Warden2	5604.17	100 YR	166.11	156.60	159.55	158.69	159.86	0.002085	2.68	119.01	140.28	0.50
Milne-Warden2	5604.17	50 YR	144.03	156.60	159.77	158.50	159.93	0.001051	2.00	150.41	141.87	0.36
Milne-Warden2	5604.17	25 YR	122.55	156.60	159.23	158.31	159.58	0.002349	2.64	47.68	105.80	0.52
Milne-Warden2	5604.17	10 YR	95.30	156.60	158.96	158.04	159.22	0.002053	2.29	42.34	60.08	0.48
Milne-Warden2	5604.17	5 YR	74.61	156.60	158.68	157.82	158.89	0.001902	2.03	37.19	38.59	0.45
Milne-Warden2	5604.17	2 YR	46.22	156.60	158.24	157.49	158.37	0.001619	1.60	29.13	18.09	0.40
Milne-Warden2	5604.155		Bridge									
Milne-Warden2	5604.14	Regional	662.78	156.58	161.53	160.48	161.82	0.001765	3.49	503.26	214.19	0.50
Milne-Warden2	5604.14	100 YR	166.11	156.58	159.49	158.80	159.73	0.001878	2.52	133.14	123.63	0.47
Milne-Warden2	5604.14	50 YR	144.03	156.58	159.16	158.60	159.74	0.004069	3.43	44.77	80.22	0.68
Milne-Warden2	5604.14	25 YR	122.55	156.58	159.05	158.41	159.51	0.003425	3.05	42.71	78.07	0.62
Milne-Warden2	5604.14	10 YR	95.30	156.58	158.83	158.13	159.17	0.002813	2.60	38.79	75.85	0.55
Milne-Warden2	5604.14	5 YR	74.61	156.58	158.59	157.89	158.85	0.002553	2.30	34.26	71.53	0.52
Milne-Warden2	5604.14	2 YR	46.22	156.58	158.18	157.53	158.34	0.002117	1.80	26.76	46.83	0.45
Milne-Warden2	5604.13	Regional	662.78	156.57	161.55		161.76	0.001504	3.07	553.70	226.63	0.44
Milne-Warden2	5604.13	100 YR	166.11	156.57	159.51		159.69	0.001669	2.27	145.59	143.83	0.42
Milne-Warden2	5604.13	50 YR	144.03	156.57	159.35		159.52	0.001629	2.16	128.47	105.80	0.42
Milne-Warden2	5604.13	25 YR	122.55	156.57	159.19		159.35	0.001582	2.05	111.94	94.89	0.41
Milne-Warden2	5604.13	10 YR	95.30	156.57	158.92		159.06	0.001571	1.90	88.91	79.12	0.40
Milne-Warden2	5604.13	5 YR	74.61	156.57	158.64		158.78	0.001652	1.79	68.46	67.61	0.40
Milne-Warden2	5604.13	2 YR	46.22	156.57	158.19		158.31	0.001827	1.59	40.67	57.67	0.40
Milne-Warden2	5604.12	Regional	662.78	156.30	161.34		161.59	0.001494	3.11	522.62	211.35	0.45
Milne-Warden2	5604.12	100 YR	166.11	156.30	159.32	158.27	159.52	0.001477	2.18	151.08	152.48	0.41
Milne-Warden2	5604.12	50 YR	144.03	156.30	159.14	158.10	159.34	0.001582	2.16	123.23	150.36	0.42
Milne-Warden2	5604.12	25 YR	122.55	156.30	158.94	157.92	159.16	0.001682	2.12	94.55	145.86	0.43

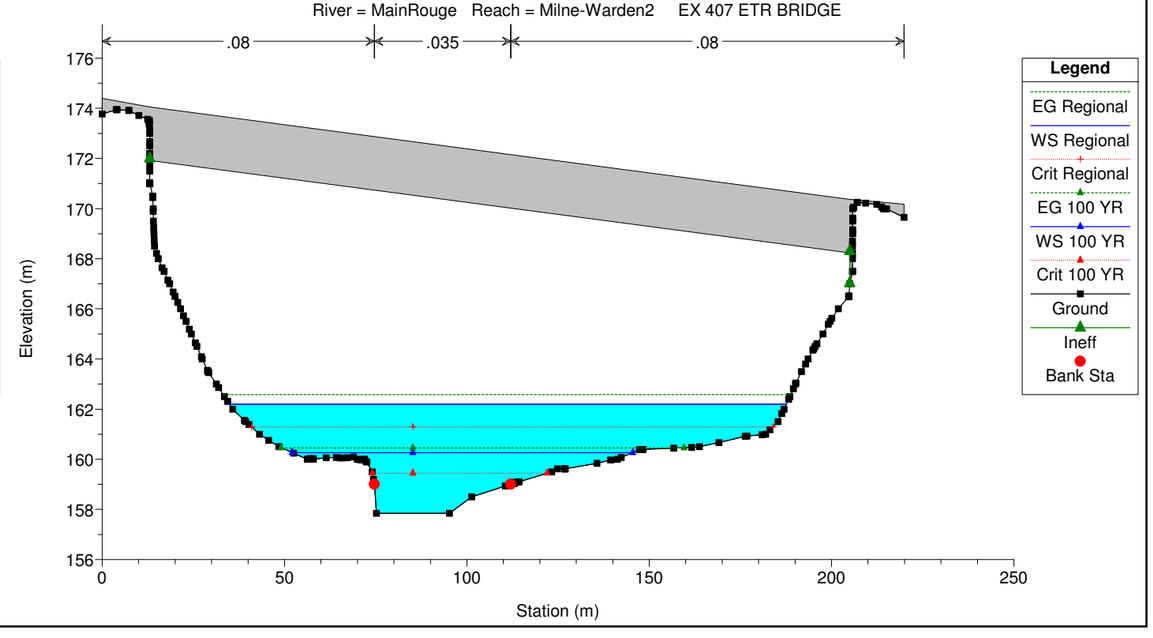
HEC-RAS Plan: WC13 - EX Cond River: MainRouge Reach: Milne-Warden2 (Continued)

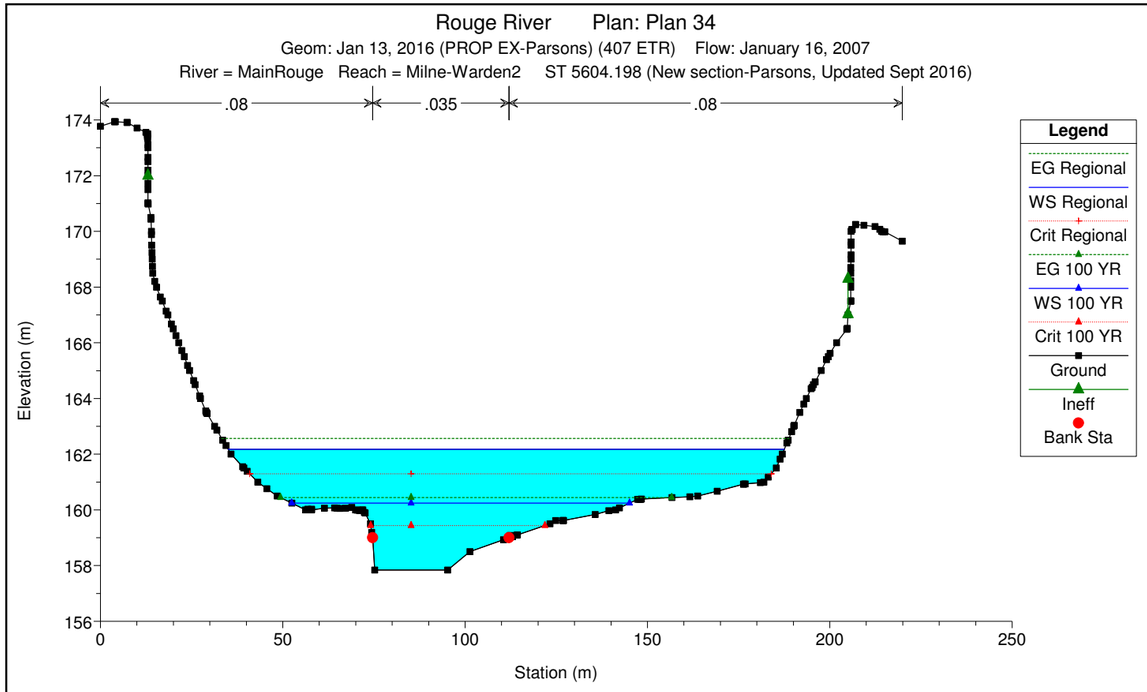
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Milne-Warden2	5604.12	10 YR	95.30	156.30	158.68		158.87	0.001696	1.98	58.36	112.07	0.42
Milne-Warden2	5604.12	5 YR	74.61	156.30	158.45		158.60	0.001520	1.75	44.03	24.52	0.39
Milne-Warden2	5604.12	2 YR	46.22	156.30	158.05		158.14	0.001211	1.35	34.67	22.48	0.34

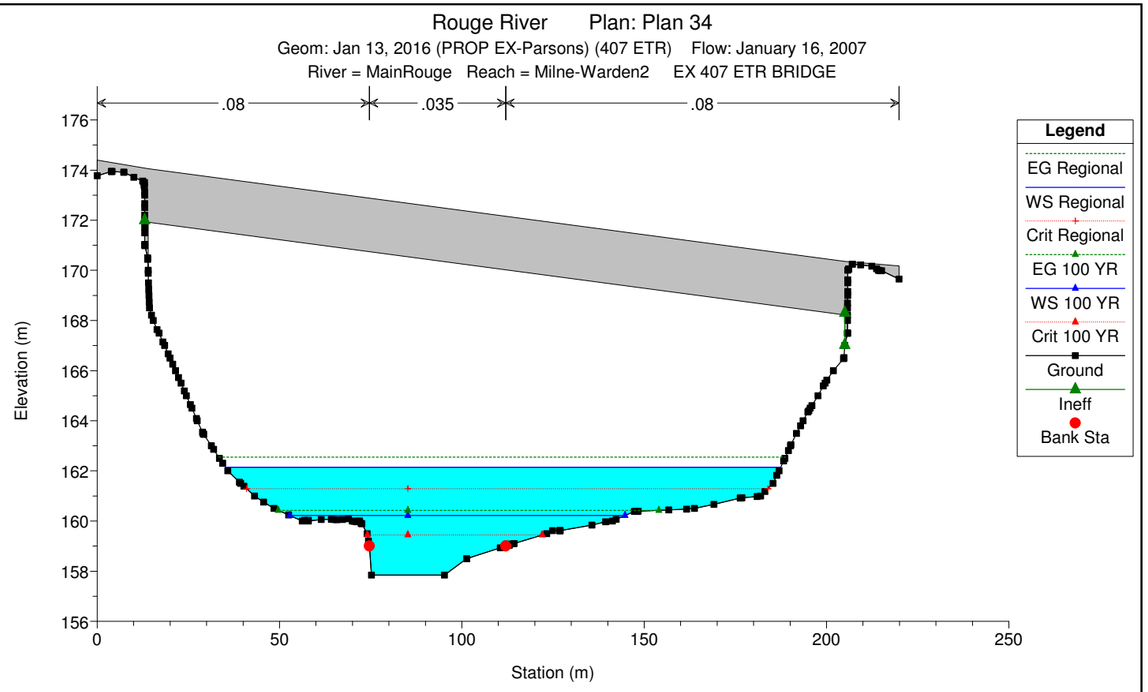

Rouge River Plan: Plan 34
Geom: Jan 13, 2016 (PROP EX-Parsons) (407 ETR) Flow: January 16, 2007
River = MainRouge Reach = Milne-Warden2 ST 5604.21 (Modified Ex-Parsons, Updated Sept 2016)
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100 YR
WS 100 YR
Ground
Bank Sta

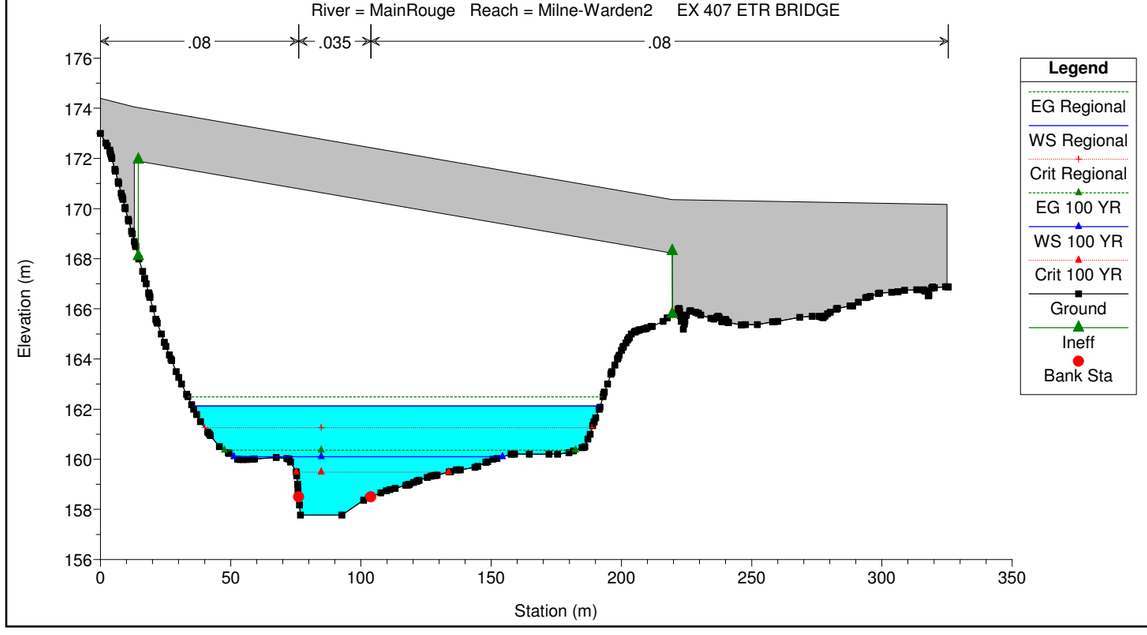

Rouge River Plan: Plan 34
Geom: Jan 13, 2016 (PROP EX-Parsons) (407 ETR) Flow: January 16, 2007
River = MainRouge Reach = Milne-Warden2 ST 5604.20 (Modified Ex-Parsons, Updated Sept 2016)
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100 YR
WS 100 YR
Crit 100 YR
Ground
Ineff
Bank Sta

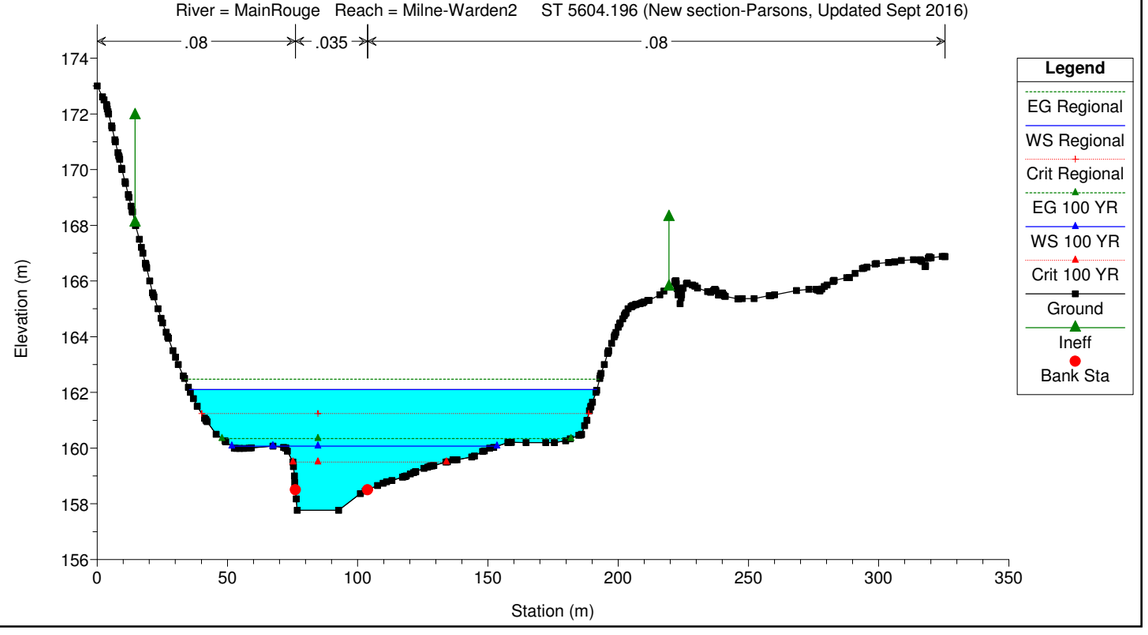

Rouge River Plan: Plan 34
Geom: Jan 13, 2016 (PROP EX-Parsons) (407 ETR) Flow: January 16, 2007
River = MainRouge Reach = Milne-Warden2 EX 407 ETR BRIDGE
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100 YR
WS 100 YR
Crit 100 YR
Ground
Ineff
Bank Sta

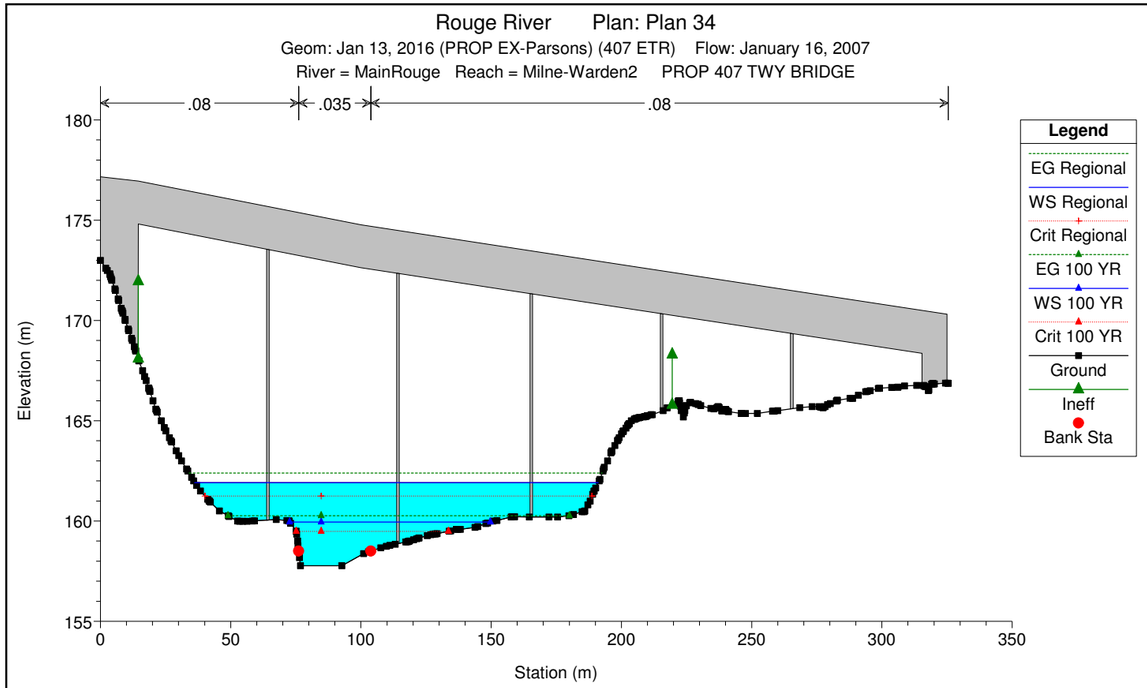

Rouge River Plan: Plan 34
Geom: Jan 13, 2016 (PROP EX-Parsons) (407 ETR) Flow: January 16, 2007
River = MainRouge Reach = Milne-Warden2 EX 407 ETR BRIDGE
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100 YR
WS 100 YR
Crit 100 YR
Ground
Ineff
Bank Sta

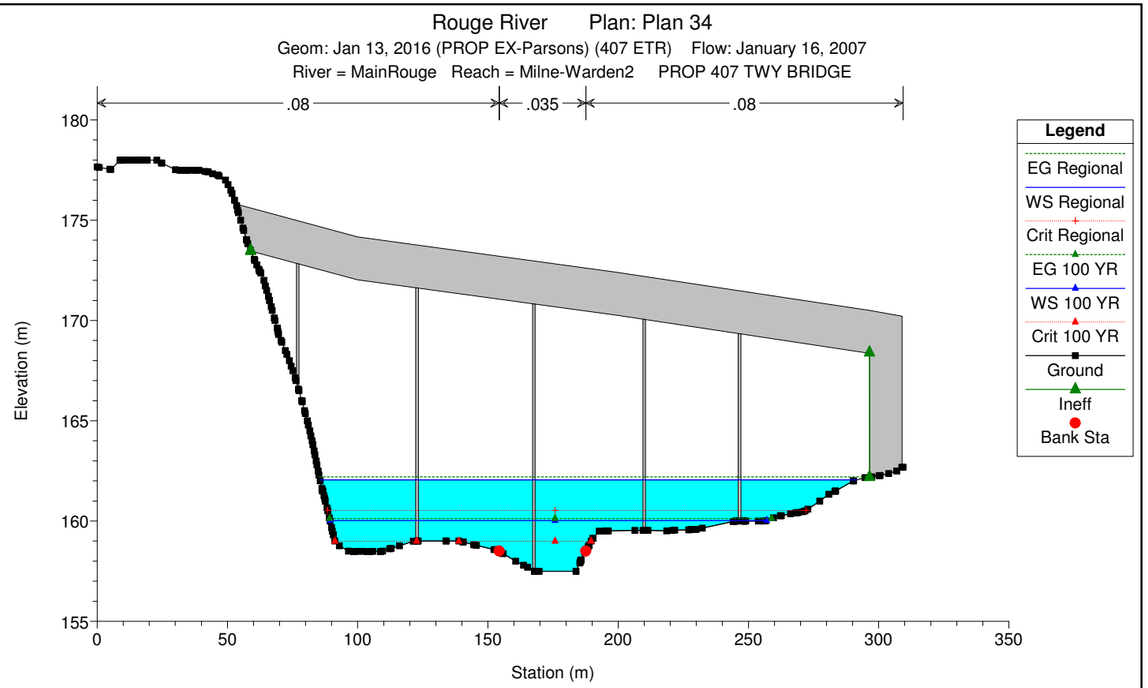

Rouge River Plan: Plan 34
Geom: Jan 13, 2016 (PROP EX-Parsons) (407 ETR) Flow: January 16, 2007
River = MainRouge Reach = Milne-Warden2 ST 5604.198 (New section-Parsons, Updated Sept 2016)
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100 YR
WS 100 YR
Crit 100 YR
Ground
Ineff
Bank Sta

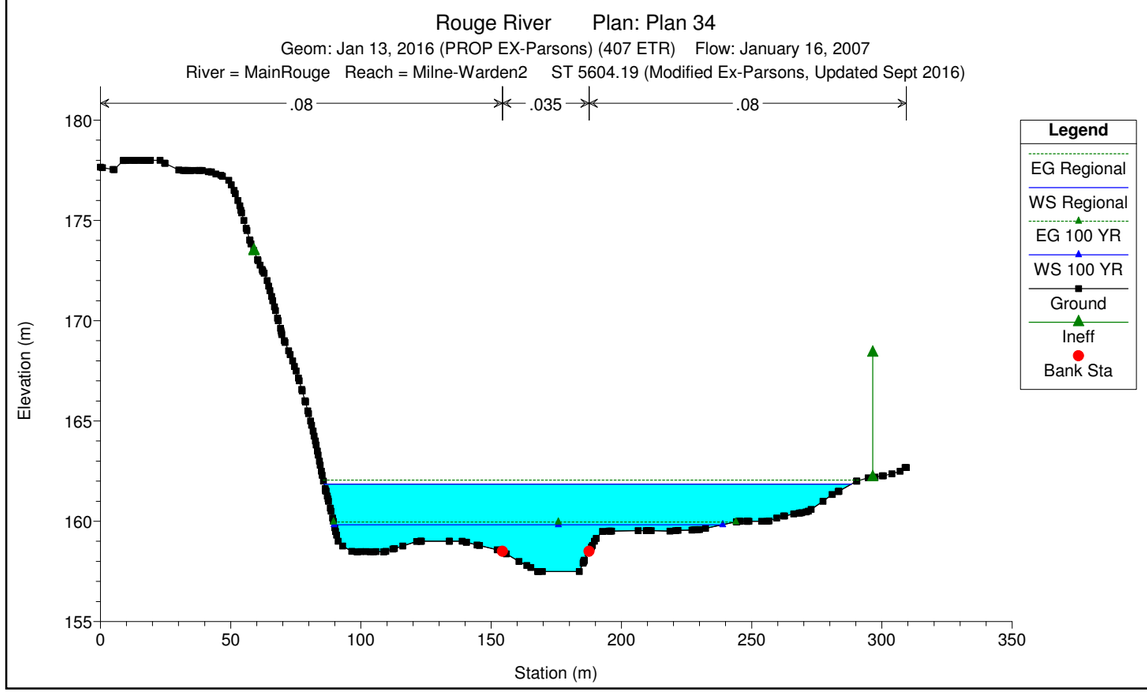

Rouge River Plan: Plan 34
Geom: Jan 13, 2016 (PROP EX-Parsons) (407 ETR) Flow: January 16, 2007
River = MainRouge Reach = Milne-Warden2 EX 407 ETR BRIDGE
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100 YR
WS 100 YR
Crit 100 YR
Ground
Ineff
Bank Sta

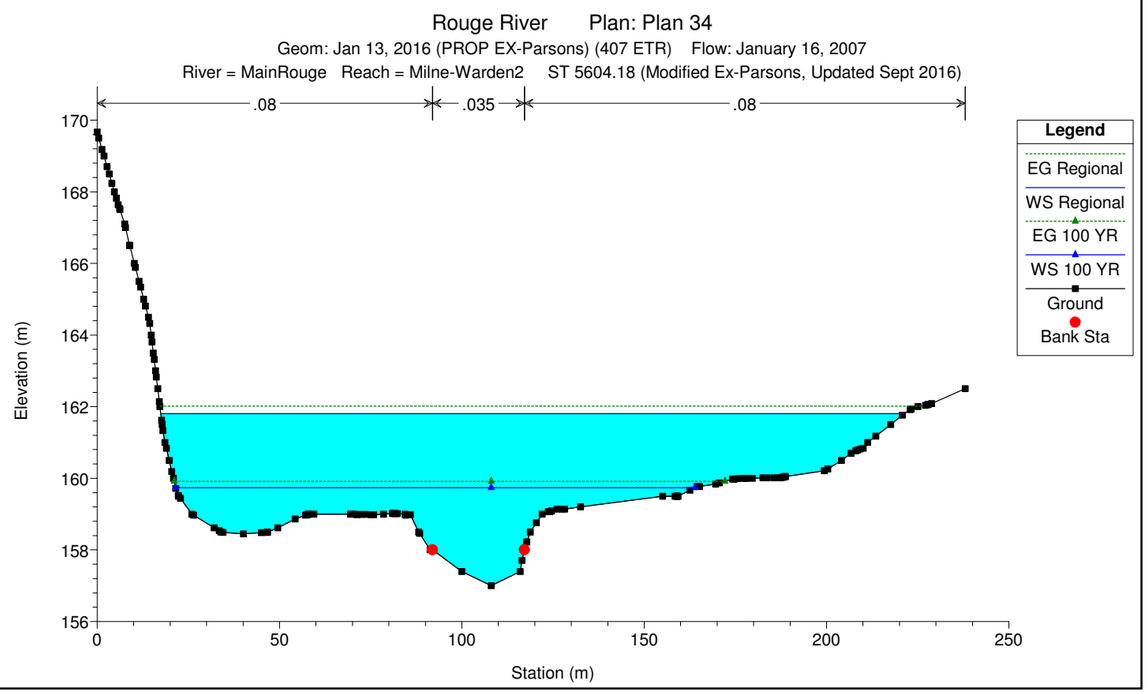

Rouge River Plan: Plan 34
Geom: Jan 13, 2016 (PROP EX-Parsons) (407 ETR) Flow: January 16, 2007
River = MainRouge Reach = Milne-Warden2 EX 407 ETR BRIDGE
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100 YR
WS 100 YR
Crit 100 YR
Ground
Ineff
Bank Sta

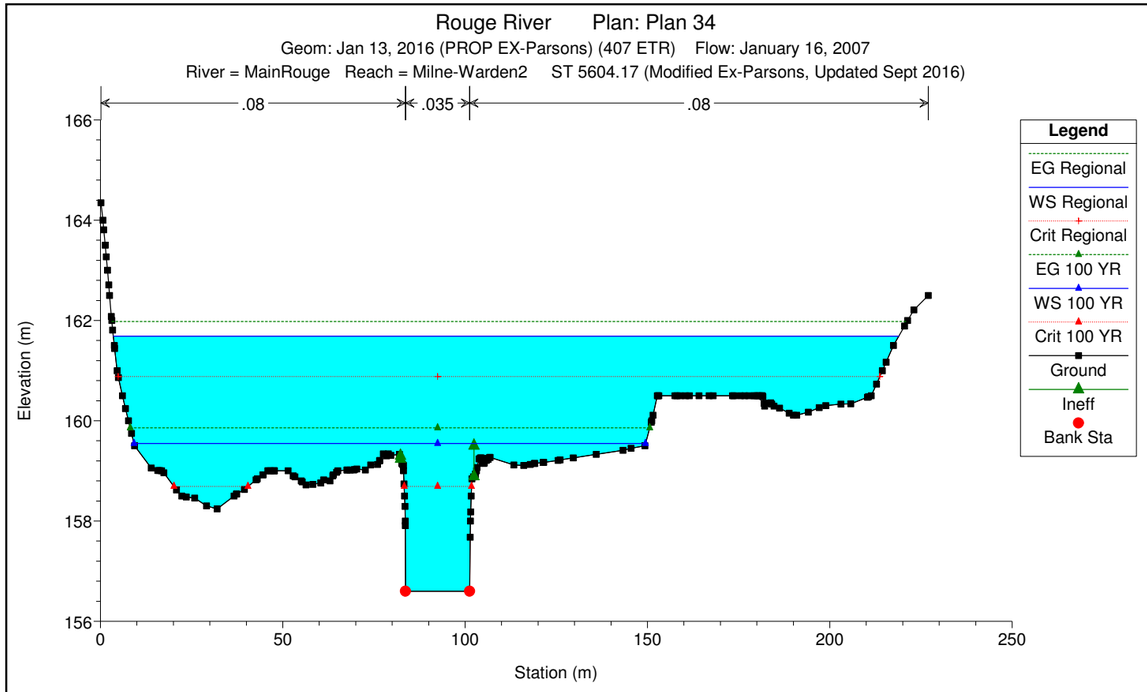

Rouge River Plan: Plan 34
Geom: Jan 13, 2016 (PROP EX-Parsons) (407 ETR) Flow: January 16, 2007
River = MainRouge Reach = Milne-Warden2 ST 5604.196 (New section-Parsons, Updated Sept 2016)
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100 YR
WS 100 YR
Crit 100 YR
Ground
Ineff
Bank Sta

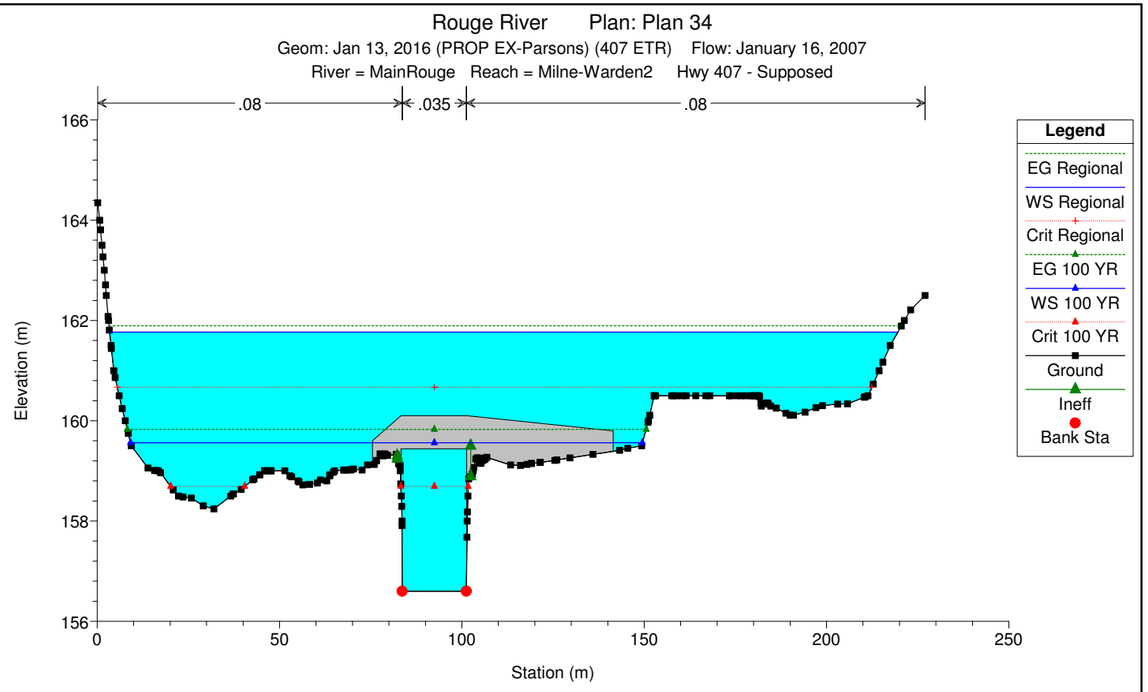

Rouge River Plan: Plan 34
Geom: Jan 13, 2016 (PROP EX-Parsons) (407 ETR) Flow: January 16, 2007
River = MainRouge Reach = Milne-Warden2 PROP 407 TWY BRIDGE
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100 YR
WS 100 YR
Crit 100 YR
Ground
Ineff
Bank Sta

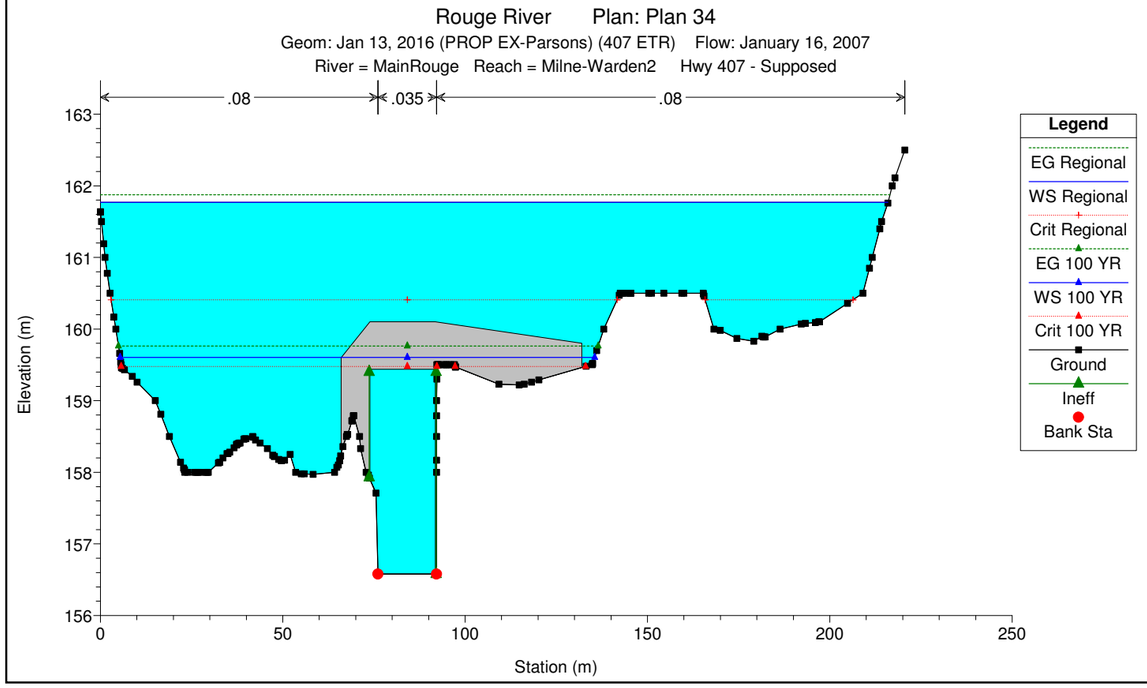

Rouge River Plan: Plan 34
Geom: Jan 13, 2016 (PROP EX-Parsons) (407 ETR) Flow: January 16, 2007
River = MainRouge Reach = Milne-Warden2 PROP 407 TWY BRIDGE
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100 YR
WS 100 YR
Crit 100 YR
Ground
Ineff
Bank Sta

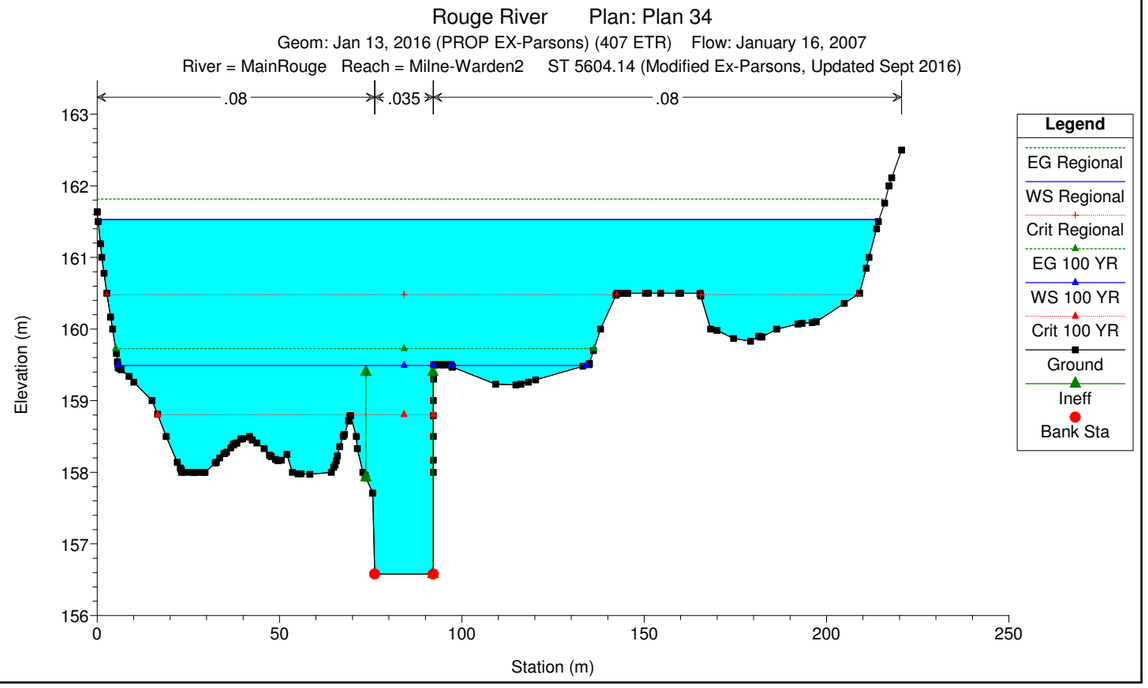

Rouge River Plan: Plan 34
Geom: Jan 13, 2016 (PROP EX-Parsons) (407 ETR) Flow: January 16, 2007
River = MainRouge Reach = Milne-Warden2 ST 5604.19 (Modified Ex-Parsons, Updated Sept 2016)
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100 YR
WS 100 YR
Ground
Ineff
Bank Sta

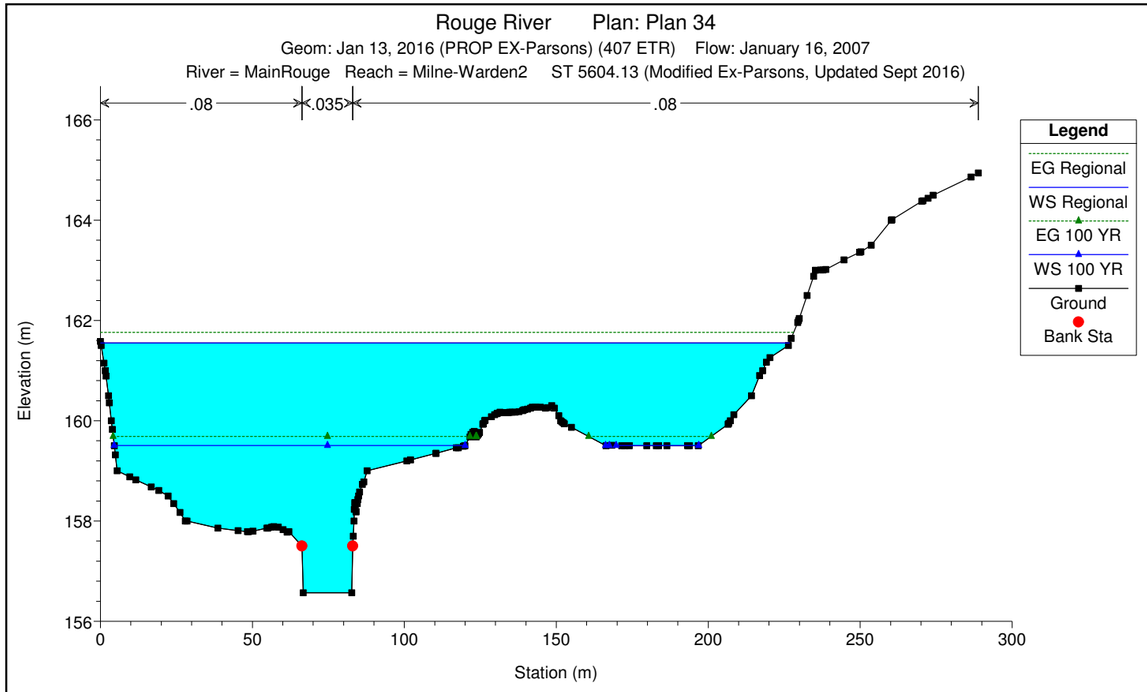

Rouge River Plan: Plan 34
Geom: Jan 13, 2016 (PROP EX-Parsons) (407 ETR) Flow: January 16, 2007
River = MainRouge Reach = Milne-Warden2 ST 5604.18 (Modified Ex-Parsons, Updated Sept 2016)
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100 YR
WS 100 YR
Ground
Bank Sta

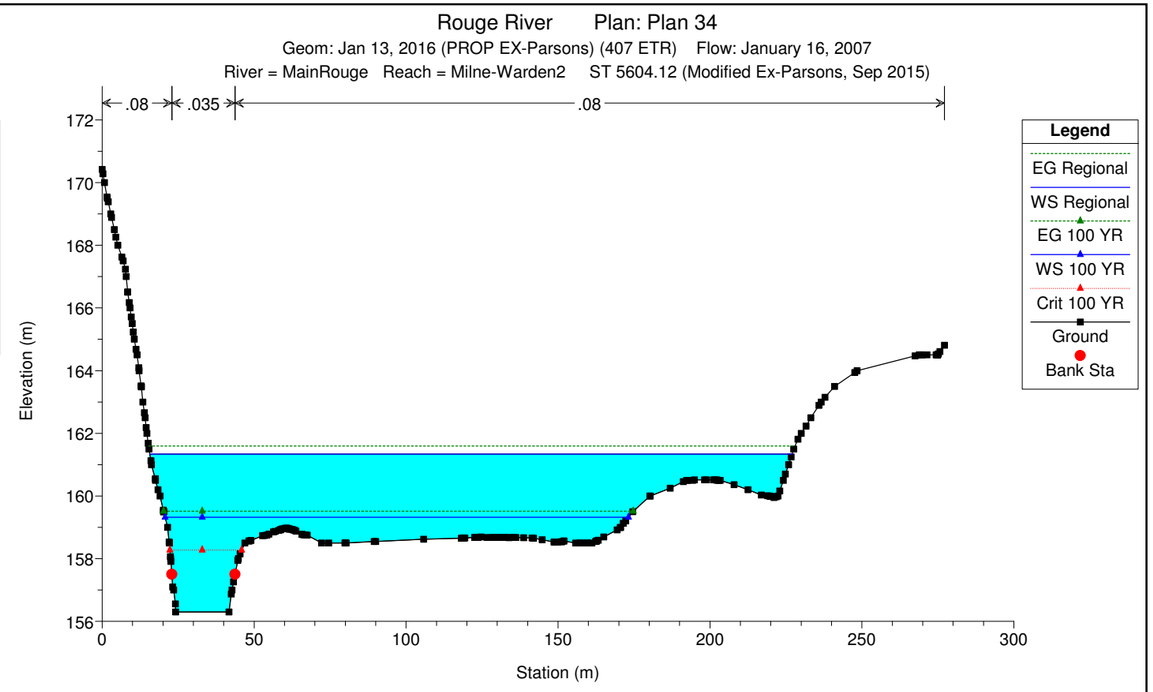

Rouge River Plan: Plan 34
Geom: Jan 13, 2016 (PROP EX-Parsons) (407 ETR) Flow: January 16, 2007
River = MainRouge Reach = Milne-Warden2 ST 5604.17 (Modified Ex-Parsons, Updated Sept 2016)
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100 YR
WS 100 YR
Crit 100 YR
Ground
Ineff
Bank Sta


Rouge River Plan: Plan 34
Geom: Jan 13, 2016 (PROP EX-Parsons) (407 ETR) Flow: January 16, 2007
River = MainRouge Reach = Milne-Warden2 Hwy 407 - Supposed
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100 YR
WS 100 YR
Crit 100 YR
Ground
Ineff
Bank Sta


Rouge River Plan: Plan 34
Geom: Jan 13, 2016 (PROP EX-Parsons) (407 ETR) Flow: January 16, 2007
River = MainRouge Reach = Milne-Warden2 Hwy 407 - Supposed
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100 YR
WS 100 YR
Crit 100 YR
Ground
Ineff
Bank Sta


Rouge River Plan: Plan 34
Geom: Jan 13, 2016 (PROP EX-Parsons) (407 ETR) Flow: January 16, 2007
River = MainRouge Reach = Milne-Warden2 ST 5604.14 (Modified Ex-Parsons, Updated Sept 2016)
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100 YR
WS 100 YR
Crit 100 YR
Ground
Ineff
Bank Sta


Rouge River Plan: Plan 34
Geom: Jan 13, 2016 (PROP EX-Parsons) (407 ETR) Flow: January 16, 2007
River = MainRouge Reach = Milne-Warden2 ST 5604.13 (Modified Ex-Parsons, Updated Sept 2016)
.08
.035
.08
Legend
EG Regional
WS Regional
EG 100 YR
WS 100 YR
Ground
Bank Sta
Elevation (m)
Station (m)
166
164
162
160
158
156
0
50
100
150
200
250
300


Rouge River Plan: Plan 34
Geom: Jan 13, 2016 (PROP EX-Parsons) (407 ETR) Flow: January 16, 2007
River = MainRouge Reach = Milne-Warden2 ST 5604.12 (Modified Ex-Parsons, Sep 2015)
.08
.035
.08
Legend
EG Regional
WS Regional
EG 100 YR
WS 100 YR
Crit 100 YR
Ground
Bank Sta
Elevation (m)
Station (m)
172
170
168
166
164
162
160
158
156
0
50
100
150
200
250
300

HEC-RAS Plan: WC13 -Prop Cond River: MainRouge Reach: Milne-Warden2

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Milne-Warden2	5604.21	Regional	662.78	158.40	162.44		163.25	0.004393	4.68	244.24	94.30	0.76
Milne-Warden2	5604.21	100 YR	166.11	158.40	160.63		160.86	0.002632	2.39	104.54	65.93	0.53
Milne-Warden2	5604.21	50 YR	144.03	158.40	160.50		160.71	0.002461	2.23	96.63	64.79	0.51
Milne-Warden2	5604.21	25 YR	122.55	158.40	160.32		160.51	0.002564	2.13	84.81	63.49	0.51
Milne-Warden2	5604.21	10 YR	95.30	158.40	160.08		160.24	0.002683	1.97	69.51	61.75	0.51
Milne-Warden2	5604.21	5 YR	74.61	158.40	159.88		160.02	0.002739	1.82	57.52	59.27	0.50
Milne-Warden2	5604.21	2 YR	46.22	158.40	159.57		159.68	0.002754	1.54	40.01	54.70	0.48
Milne-Warden2	5604.2	Regional	662.78	158.00	162.40	161.41	162.75	0.001728	2.97	368.80	172.32	0.48
Milne-Warden2	5604.2	100 YR	166.11	158.00	160.44	159.58	160.61	0.001684	1.86	104.58	82.95	0.42
Milne-Warden2	5604.2	50 YR	144.03	158.00	160.33	159.47	160.48	0.001537	1.72	96.04	76.98	0.40
Milne-Warden2	5604.2	25 YR	122.55	158.00	160.14	159.37	160.27	0.001625	1.64	82.04	66.09	0.40
Milne-Warden2	5604.2	10 YR	95.30	158.00	159.88	159.22	160.00	0.001700	1.51	66.89	53.87	0.40
Milne-Warden2	5604.2	5 YR	74.61	158.00	159.68	159.10	159.78	0.001742	1.38	56.17	50.99	0.39
Milne-Warden2	5604.2	2 YR	46.22	158.00	159.37	158.89	159.44	0.001758	1.15	40.98	46.86	0.38
Milne-Warden2	5604.199		Bridge									
Milne-Warden2	5604.198	Regional	662.78	157.84	162.17	161.29	162.56	0.002033	3.21	363.77	152.47	0.51
Milne-Warden2	5604.198	100 YR	166.11	157.84	160.24	159.44	160.44	0.001938	2.02	103.13	92.64	0.45
Milne-Warden2	5604.198	50 YR	144.03	157.84	160.17	159.32	160.33	0.001681	1.84	96.12	90.21	0.41
Milne-Warden2	5604.198	25 YR	122.55	157.84	159.96	159.19	160.11	0.001824	1.78	79.22	66.82	0.42
Milne-Warden2	5604.198	10 YR	95.30	157.84	159.69	159.03	159.82	0.001962	1.65	62.52	56.18	0.43
Milne-Warden2	5604.198	5 YR	74.61	157.84	159.47	158.88	159.59	0.002021	1.51	51.51	48.61	0.42
Milne-Warden2	5604.198	2 YR	46.22	157.84	159.14	158.61	159.22	0.002074	1.26	36.77	40.79	0.41
Milne-Warden2	5604.197		Bridge									
Milne-Warden2	5604.196	Regional	662.78	157.77	162.10	161.24	162.47	0.002172	3.42	391.65	156.45	0.53
Milne-Warden2	5604.196	100 YR	166.11	157.77	160.07	159.50	160.34	0.002740	2.46	99.53	101.67	0.54
Milne-Warden2	5604.196	50 YR	144.03	157.77	160.04	159.33	160.25	0.002173	2.17	96.67	93.17	0.48
Milne-Warden2	5604.196	25 YR	122.55	157.77	159.81	159.21	160.02	0.002456	2.13	78.85	73.20	0.50
Milne-Warden2	5604.196	10 YR	95.30	157.77	159.53	159.02	159.73	0.002730	2.02	59.75	60.16	0.51
Milne-Warden2	5604.196	5 YR	74.61	157.77	159.32	158.85	159.49	0.002770	1.85	48.14	51.66	0.50
Milne-Warden2	5604.196	2 YR	46.22	157.77	159.02	158.60	159.13	0.002570	1.51	33.73	43.44	0.46
Milne-Warden2	5604.195		Bridge									
Milne-Warden2	5604.19	Regional	662.78	157.50	161.86		162.05	0.001258	2.59	526.91	202.49	0.41
Milne-Warden2	5604.19	100 YR	166.11	157.50	159.83		159.96	0.001598	1.85	152.76	149.15	0.41
Milne-Warden2	5604.19	50 YR	144.03	157.50	159.89		159.99	0.001048	1.53	162.67	151.71	0.33

HEC-RAS Plan: WC13 -Prop Cond River: MainRouge Reach: Milne-Warden2 (Continued)

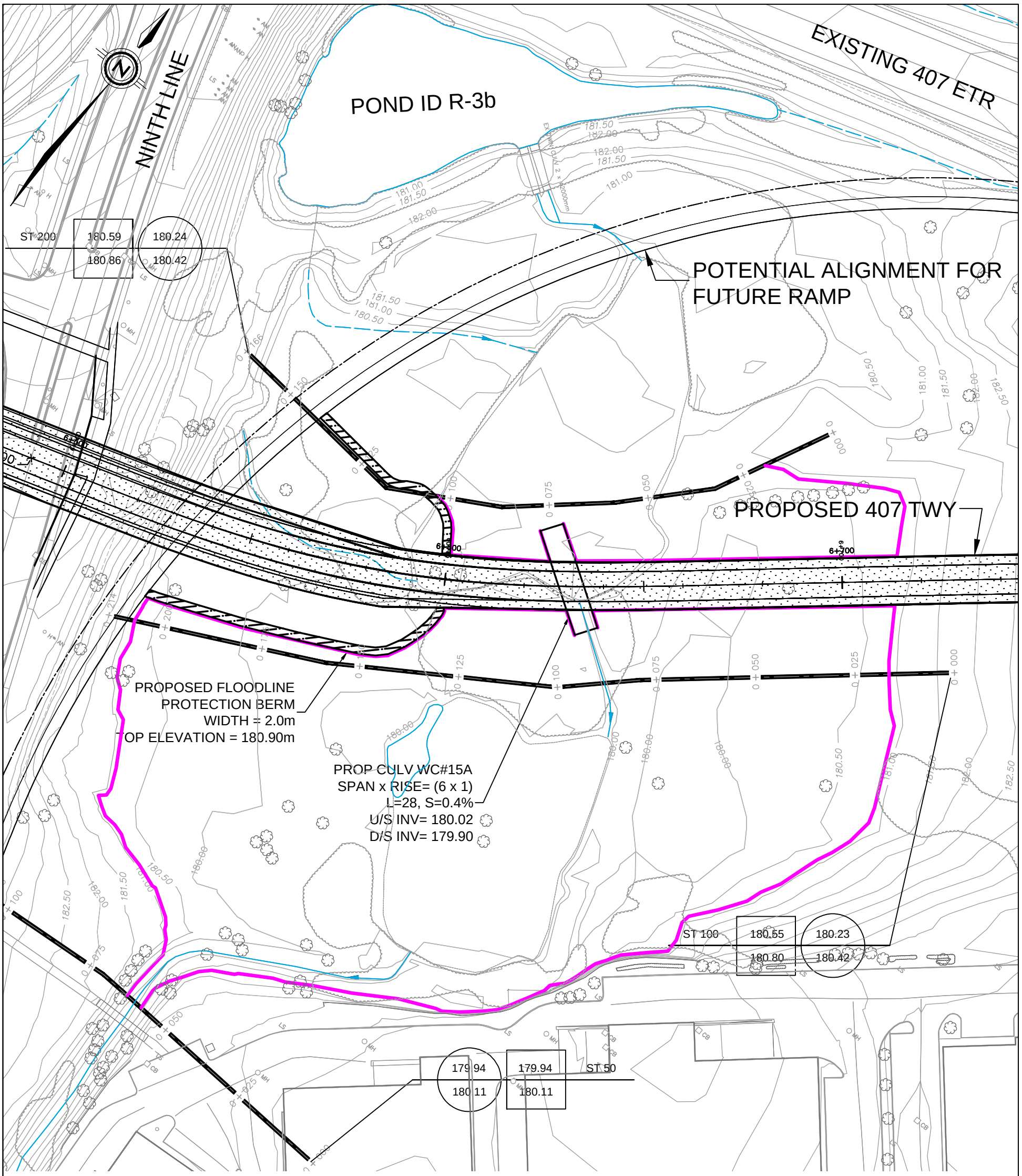
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Milne-Warden2	5604.19	25 YR	122.55	157.50	159.60		159.71	0.001452	1.63	119.33	140.10	0.38
Milne-Warden2	5604.19	10 YR	95.30	157.50	159.20		159.34	0.002398	1.78	76.44	99.84	0.47
Milne-Warden2	5604.19	5 YR	74.61	157.50	158.85		159.04	0.004174	1.96	45.78	71.43	0.60
Milne-Warden2	5604.19	2 YR	46.22	157.50	158.43		158.65	0.008379	2.06	22.48	32.11	0.78
Milne-Warden2	5604.18	Regional	662.78	157.00	161.80		162.02	0.001374	2.84	528.90	203.93	0.43
Milne-Warden2	5604.18	100 YR	166.11	157.00	159.74		159.92	0.001774	2.12	147.62	142.44	0.44
Milne-Warden2	5604.18	50 YR	144.03	157.00	159.84		159.96	0.001087	1.71	162.76	148.49	0.35
Milne-Warden2	5604.18	25 YR	122.55	157.00	159.52		159.67	0.001538	1.85	117.30	137.51	0.40
Milne-Warden2	5604.18	10 YR	95.30	157.00	159.05		159.26	0.002862	2.13	62.38	97.51	0.53
Milne-Warden2	5604.18	5 YR	74.61	157.00	158.69		158.93	0.004167	2.20	39.38	52.92	0.61
Milne-Warden2	5604.18	2 YR	46.22	157.00	158.21		158.46	0.007809	2.21	21.19	27.80	0.78
Milne-Warden2	5604.17	Regional	662.78	156.60	161.69	160.88	161.98	0.001628	3.41	512.11	215.41	0.48
Milne-Warden2	5604.17	100 YR	166.11	156.60	159.55	158.69	159.86	0.002085	2.68	119.01	140.28	0.50
Milne-Warden2	5604.17	50 YR	144.03	156.60	159.77	158.50	159.93	0.001051	2.00	150.41	141.87	0.36
Milne-Warden2	5604.17	25 YR	122.55	156.60	159.23	158.31	159.58	0.002349	2.64	47.68	105.80	0.52
Milne-Warden2	5604.17	10 YR	95.30	156.60	158.96	158.04	159.22	0.002053	2.29	42.34	60.08	0.48
Milne-Warden2	5604.17	5 YR	74.61	156.60	158.68	157.82	158.89	0.001902	2.03	37.19	38.59	0.45
Milne-Warden2	5604.17	2 YR	46.22	156.60	158.24	157.49	158.37	0.001619	1.60	29.13	18.09	0.40
Milne-Warden2	5604.155		Bridge									
Milne-Warden2	5604.14	Regional	662.78	156.58	161.53	160.48	161.82	0.001765	3.49	503.26	214.19	0.50
Milne-Warden2	5604.14	100 YR	166.11	156.58	159.49	158.80	159.73	0.001878	2.52	133.14	123.63	0.47
Milne-Warden2	5604.14	50 YR	144.03	156.58	159.16	158.60	159.74	0.004069	3.43	44.77	80.22	0.68
Milne-Warden2	5604.14	25 YR	122.55	156.58	159.05	158.41	159.51	0.003425	3.05	42.71	78.07	0.62
Milne-Warden2	5604.14	10 YR	95.30	156.58	158.83	158.13	159.17	0.002813	2.60	38.79	75.85	0.55
Milne-Warden2	5604.14	5 YR	74.61	156.58	158.59	157.89	158.85	0.002553	2.30	34.26	71.53	0.52
Milne-Warden2	5604.14	2 YR	46.22	156.58	158.18	157.53	158.34	0.002117	1.80	26.76	46.83	0.45
Milne-Warden2	5604.13	Regional	662.78	156.57	161.55		161.76	0.001504	3.07	553.70	226.63	0.44
Milne-Warden2	5604.13	100 YR	166.11	156.57	159.51		159.69	0.001669	2.27	145.59	143.83	0.42
Milne-Warden2	5604.13	50 YR	144.03	156.57	159.35		159.52	0.001629	2.16	128.47	105.80	0.42
Milne-Warden2	5604.13	25 YR	122.55	156.57	159.19		159.35	0.001582	2.05	111.94	94.89	0.41
Milne-Warden2	5604.13	10 YR	95.30	156.57	158.92		159.06	0.001571	1.90	88.91	79.12	0.40
Milne-Warden2	5604.13	5 YR	74.61	156.57	158.64		158.78	0.001652	1.79	68.46	67.61	0.40
Milne-Warden2	5604.13	2 YR	46.22	156.57	158.19		158.31	0.001827	1.59	40.67	57.67	0.40
Milne-Warden2	5604.12	Regional	662.78	156.30	161.34		161.59	0.001494	3.11	522.62	211.35	0.45
Milne-Warden2	5604.12	100 YR	166.11	156.30	159.32	158.27	159.52	0.001477	2.18	151.08	152.48	0.41

HEC-RAS Plan: WC13 -Prop Cond River: MainRouge Reach: Milne-Warden2 (Continued)

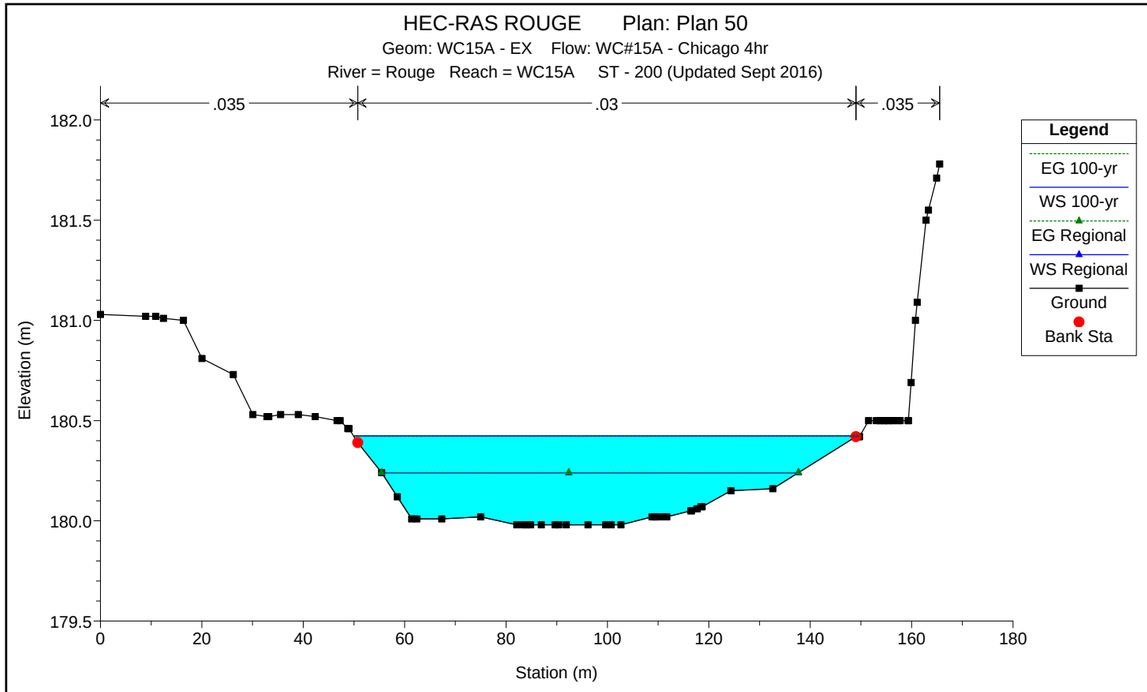
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Milne-Warden2	5604.12	50 YR	144.03	156.30	159.14	158.10	159.34	0.001582	2.16	123.23	150.36	0.42
Milne-Warden2	5604.12	25 YR	122.55	156.30	158.94	157.92	159.16	0.001682	2.12	94.55	145.86	0.43
Milne-Warden2	5604.12	10 YR	95.30	156.30	158.68		158.87	0.001696	1.98	58.36	112.07	0.42
Milne-Warden2	5604.12	5 YR	74.61	156.30	158.45		158.60	0.001520	1.75	44.03	24.52	0.39
Milne-Warden2	5604.12	2 YR	46.22	156.30	158.05		158.14	0.001211	1.35	34.67	22.48	0.34

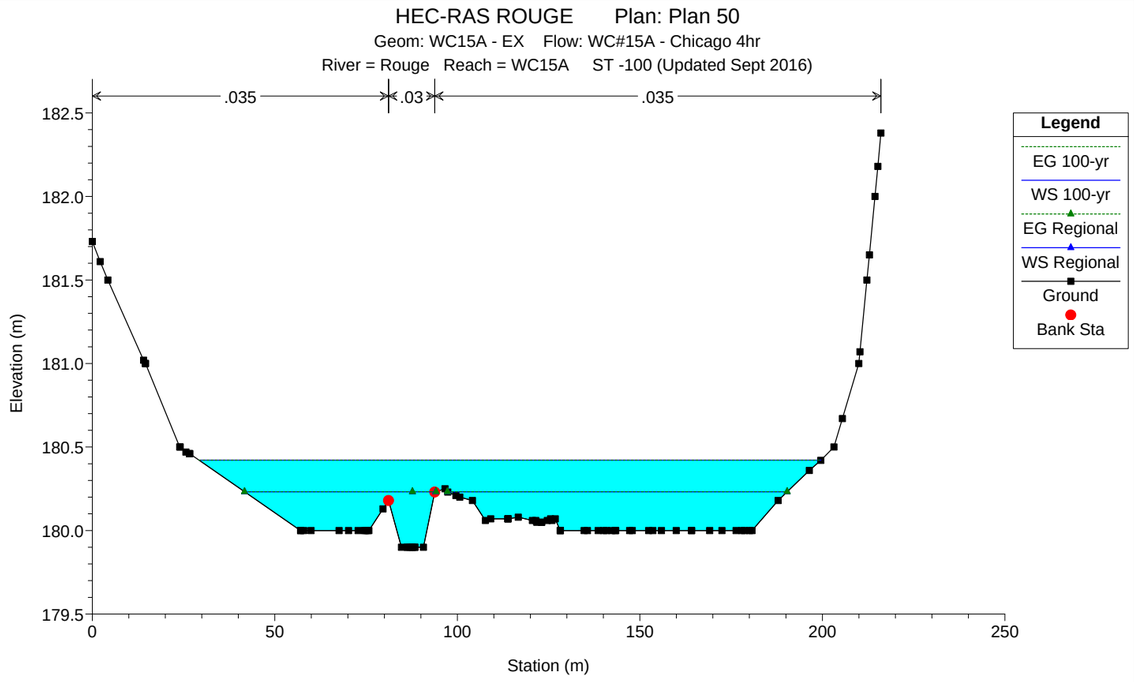
ROUGE RIVER

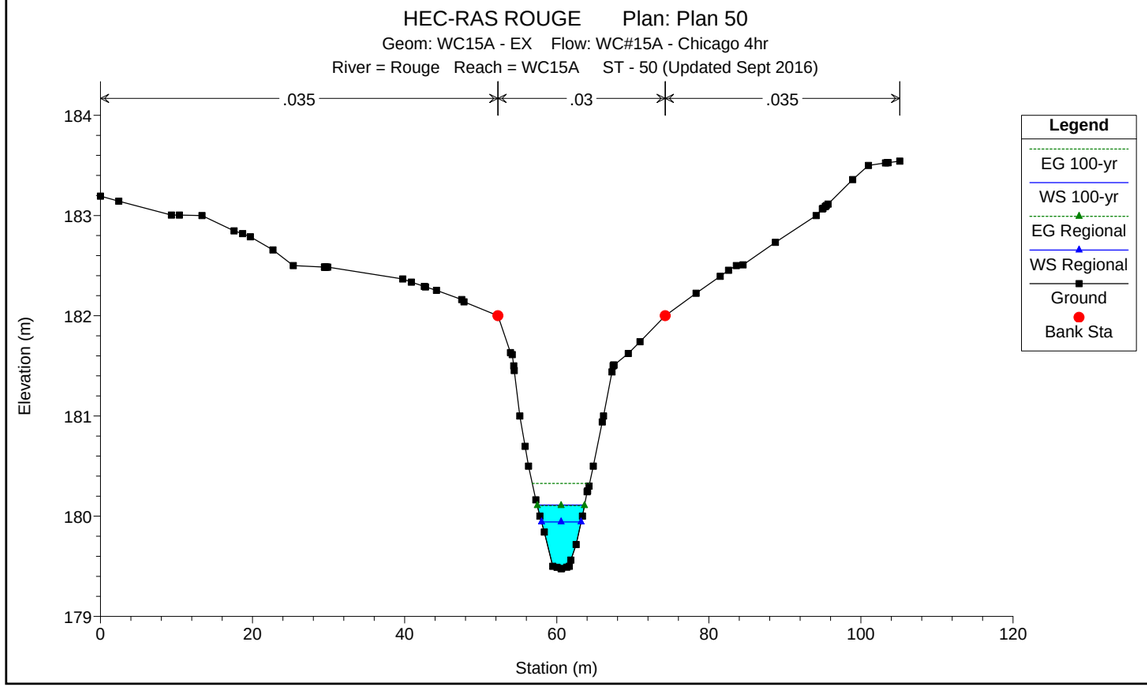
HEC-RAS ANALYSIS WC#15A



DATE: SEPTEMBER 2016	Ontario	PARSONS 625 COCHRANE DRIVE, SUITE 500 MARKHAM, ONTARIO L3R 9R9 TEL: 905-943-0500 FAX: 905-943-0400	407 TRANSITWAY FROM KENNEDY RD TO BROCK RD
SCALE: 1:1000			FIGURE 6.7 - HEC-RAS ANALYSIS - ROUGE RIVER (WC#15A)


HEC-RAS ROUGE Plan: Plan 50
Geom: WC15A - EX Flow: WC#15A - Chicago 4hr
River = Rouge Reach = WC15A ST - 200 (Updated Sept 2016)
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG 100-yr
WS 100-yr
EG Regional
WS Regional
Ground
Bank Sta


HEC-RAS ROUGE Plan: Plan 50
Geom: WC15A - EX Flow: WC#15A - Chicago 4hr
River = Rouge Reach = WC15A ST -100 (Updated Sept 2016)
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG 100-yr
WS 100-yr
EG Regional
WS Regional
Ground
Bank Sta


HEC-RAS ROUGE Plan: Plan 50
Geom: WC15A - EX Flow: WC#15A - Chicago 4hr
River = Rouge Reach = WC15A ST - 50 (Updated Sept 2016)
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG 100-yr
WS 100-yr
EG Regional
WS Regional
Ground
Bank Sta

HEC-RAS Plan: WC15A-EX(4hr CH) River: Rouge Reach: WC15A

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC15A	200	2-yr	1.50	179.98	180.14		180.14	0.000481	0.18	8.20	65.47	0.17
WC15A	200	5-yr	2.39	179.98	180.20		180.20	0.000381	0.19	12.50	78.39	0.15
WC15A	200	10-yr	3.47	179.98	180.27		180.27	0.000235	0.19	18.69	85.29	0.13
WC15A	200	25-yr	4.26	179.98	180.33		180.34	0.000166	0.18	24.09	91.07	0.11
WC15A	200	50-yr	4.84	179.98	180.38		180.38	0.000132	0.17	28.40	95.42	0.10
WC15A	200	100-yr	5.43	179.98	180.42		180.43	0.000108	0.17	32.63	99.87	0.09
WC15A	200	Check Flow	7.06	179.98	180.54		180.54	0.000067	0.16	45.09	129.57	0.08
WC15A	200	Regional	2.99	179.98	180.24		180.24	0.000285	0.19	15.89	82.14	0.14
WC15A	100	2-yr	1.50	179.90	180.12		180.12	0.000296	0.18	12.90	121.13	0.14
WC15A	100	5-yr	2.39	179.90	180.19		180.19	0.000174	0.16	21.05	133.93	0.11
WC15A	100	10-yr	3.47	179.90	180.27		180.27	0.000103	0.15	32.59	152.58	0.09
WC15A	100	25-yr	4.26	179.90	180.33		180.33	0.000068	0.14	42.48	159.78	0.07
WC15A	100	50-yr	4.84	179.90	180.38		180.38	0.000053	0.13	50.13	165.20	0.07
WC15A	100	100-yr	5.43	179.90	180.42		180.42	0.000044	0.13	57.52	170.39	0.06
WC15A	100	Check Flow	7.06	179.90	180.54		180.54	0.000029	0.12	78.04	180.43	0.05
WC15A	100	Regional	2.99	179.90	180.23		180.23	0.000128	0.15	27.35	145.34	0.10
WC15A	50	2-yr	1.50	179.48	179.80	179.80	179.92	0.014668	1.51	0.99	4.27	1.00
WC15A	50	5-yr	2.39	179.48	179.89	179.89	180.04	0.013643	1.68	1.42	4.87	1.00
WC15A	50	10-yr	3.47	179.48	179.98	179.98	180.16	0.013252	1.85	1.87	5.46	1.01
WC15A	50	25-yr	4.26	179.48	180.04	180.04	180.23	0.012786	1.94	2.20	5.81	1.01
WC15A	50	50-yr	4.84	179.48	180.08	180.08	180.28	0.012622	2.00	2.42	6.02	1.01
WC15A	50	100-yr	5.43	179.48	180.11	180.11	180.33	0.012439	2.06	2.64	6.23	1.01
WC15A	50	Check Flow	7.06	179.48	180.20	180.20	180.45	0.011814	2.18	3.25	6.76	1.00
WC15A	50	Regional	2.99	179.48	179.94	179.94	180.11	0.013538	1.79	1.67	5.20	1.01

HEC-RAS HEC-RAS 5.0.1 April 2016
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: HEC-RAS ROUGE
Project File : HEC.prj
Run Date and Time: 9/19/2016 1:56:17 PM

Project in SI units

Project Description:
HEC-RAS model for creek crossings along the proposed 407 TWY Ph 2 started
from scratch

PLAN DATA

Plan Title: Plan 38
Plan File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.p38

Geometry Title: WC15A-EX
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g19

Flow Title : WC#15A - Chicago 4hr
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f05

Plan Summary Information:
Number of: Cross Sections = 2 Multiple Openings = 0
Culverts = 0 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.003
Critical depth calculation tolerance = 0.003
Maximum number of iterations = 20
Maximum difference tolerance = 0.1
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: WC#15A - Chicago 4hr
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f05

Flow Data (m3/s)

River	Reach	RS	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Check Flow	Regional
Rouge	WC15A	200	1.5	2.39	3.47	4.26	4.84	5.43	7.06	2.99

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Rouge	WC15A	2-yr		Critical
Rouge	WC15A	5-yr		Critical
Rouge	WC15A	10-yr		Critical
Rouge	WC15A	25-yr		Critical
Rouge	WC15A	50-yr		Critical
Rouge	WC15A	100-yr		Critical
Rouge	WC15A	Check Flow		Critical
Rouge	WC15A	Regional		Critical

GEOMETRY DATA

Geometry Title: WC15A-EX
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g19

CROSS SECTION

RIVER: Rouge
REACH: WC15A RS: 200

INPUT
Description: ST - 200
Station Elevation Data num= 74

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	181.03	8.92	181.02	10.91	181.02	12.42	181.01	16.36	181
20.02	180.81	26.21	180.73	30.05	180.53	32.84	180.52	33.05	180.52
33.21	180.52	35.55	180.53	39.02	180.53	42.36	180.52	46.68	180.5
47.27	180.5	48.8	180.46	49.01	180.46	50.77	180.39	55.46	180.24
58.56	180.12	61.39	180.01	62.38	180.01	67.33	180.01	74.99	180.02
82.12	179.98	83.45	179.98	84	179.98	84.85	179.98	86.94	179.98
89.68	179.98	90.38	179.98	91.88	179.98	96.17	179.98	99.66	179.98
100.75	179.98	102.66	179.98	108.78	180.02	109.25	180.02	109.51	180.02
109.52	180.02	110.44	180.02	111.7	180.02	116.44	180.05	116.58	180.05
117.69	180.06	118.45	180.07	118.69	180.07	124.35	180.15	132.62	180.16
149.01	180.42	149.58	180.42	149.71	180.42	151.5	180.5	153.04	180.5
153.69	180.5	153.79	180.5	154.51	180.5	154.69	180.5	155.17	180.5
155.49	180.5	156.16	180.5	156.39	180.5	157.4	180.5	157.74	180.5
159.33	180.5	159.34	180.5	159.89	180.69	160.74	181	161.1	181.09
162.83	181.5	163.32	181.55	164.92	181.71	165.53	181.78		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	50.77	.03	149.01	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
50.77 149.01 43.8 43.8 43.8 .1 .3

CROSS SECTION OUTPUT Profile #2-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	180.11	Element			
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	180.11	Reach Len. (m)	43.80	43.80	43.80
Crit W.S. (m)	180.04	Flow Area (m2)		6.48	
E.G. Slope (m/m)	0.000998	Area (m2)		6.48	
Q Total (m3/s)	1.50	Flow (m3/s)		1.50	
Top Width (m)	62.89	Top Width (m)		62.89	
Vel Total (m/s)	0.23	Avg. Vel. (m/s)		0.23	
Max Chl Dpth (m)	0.13	Hydr. Depth (m)		0.10	
Conv. Total (m3/s)	47.5	Conv. (m3/s)		47.5	
Length Wtd. (m)	43.80	Wetted Per. (m)		62.89	
Min Ch El (m)	179.98	Shear (N/m2)		1.01	

Alpha	1.00	Stream Power (N/m s)	0.23
Frctn Loss (m)	0.13	Cum Volume (1000 m3)	0.19
C & E Loss (m)	0.00	Cum SA (1000 m2)	2.24

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	180.15	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	180.14	Reach Len. (m)	43.80	43.80	43.80
Crit W.S. (m)		Flow Area (m2)		8.59	
E.G. Slope (m/m)	0.001056	Area (m2)		8.59	
Q Total (m3/s)	2.39	Flow (m3/s)		2.39	
Top Width (m)	66.05	Top Width (m)		66.05	
Vel Total (m/s)	0.28	Avg. Vel. (m/s)		0.28	
Max Chl Dpth (m)	0.16	Hydr. Depth (m)		0.13	
Conv. Total (m3/s)	73.5	Conv. (m3/s)		73.5	
Length Wtd. (m)	43.80	Wetted Per. (m)		66.06	
Min Ch El (m)	179.98	Shear (N/m2)		1.35	
Alpha	1.00	Stream Power (N/m s)		0.37	
Frctn Loss (m)	0.13	Cum Volume (1000 m3)		0.25	
C & E Loss (m)	0.00	Cum SA (1000 m2)		2.36	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	180.18	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	180.18	Reach Len. (m)	43.80	43.80	43.80
Crit W.S. (m)		Flow Area (m2)		11.08	
E.G. Slope (m/m)	0.001167	Area (m2)		11.08	
Q Total (m3/s)	3.47	Flow (m3/s)		3.47	
Top Width (m)	76.76	Top Width (m)		76.76	
Vel Total (m/s)	0.31	Avg. Vel. (m/s)		0.31	
Max Chl Dpth (m)	0.20	Hydr. Depth (m)		0.14	
Conv. Total (m3/s)	101.6	Conv. (m3/s)		101.6	
Length Wtd. (m)	43.80	Wetted Per. (m)		76.76	
Min Ch El (m)	179.98	Shear (N/m2)		1.65	
Alpha	1.00	Stream Power (N/m s)		0.52	
Frctn Loss (m)	0.14	Cum Volume (1000 m3)		0.33	
C & E Loss (m)	0.00	Cum SA (1000 m2)		2.65	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	180.20	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	180.20	Reach Len. (m)	43.80	43.80	43.80
Crit W.S. (m)		Flow Area (m2)		12.44	
E.G. Slope (m/m)	0.001226	Area (m2)		12.44	
Q Total (m3/s)	4.26	Flow (m3/s)		4.26	
Top Width (m)	78.32	Top Width (m)		78.32	
Vel Total (m/s)	0.34	Avg. Vel. (m/s)		0.34	
Max Chl Dpth (m)	0.22	Hydr. Depth (m)		0.16	
Conv. Total (m3/s)	121.7	Conv. (m3/s)		121.7	
Length Wtd. (m)	43.80	Wetted Per. (m)		78.33	
Min Ch El (m)	179.98	Shear (N/m2)		1.91	
Alpha	1.00	Stream Power (N/m s)		0.65	
Frctn Loss (m)	0.14	Cum Volume (1000 m3)		0.37	0.00
C & E Loss (m)	0.00	Cum SA (1000 m2)		2.73	0.31

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	180.22	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	180.21	Reach Len. (m)	43.80	43.80	43.80
Crit W.S. (m)		Flow Area (m2)		13.46	
E.G. Slope (m/m)	0.001242	Area (m2)		13.46	
Q Total (m3/s)	4.84	Flow (m3/s)		4.84	
Top Width (m)	79.47	Top Width (m)		79.47	
Vel Total (m/s)	0.36	Avg. Vel. (m/s)		0.36	
Max Chl Dpth (m)	0.23	Hydr. Depth (m)		0.17	
Conv. Total (m3/s)	137.3	Conv. (m3/s)		137.3	
Length Wtd. (m)	43.80	Wetted Per. (m)		79.47	
Min Ch El (m)	179.98	Shear (N/m2)		2.06	
Alpha	1.00	Stream Power (N/m s)		0.74	
Frctn Loss (m)	0.14	Cum Volume (1000 m3)		0.40	0.01
C & E Loss (m)	0.00	Cum SA (1000 m2)		2.78	0.31

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	180.23	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	180.22	Reach Len. (m)	43.80	43.80	43.80
Crit W.S. (m)		Flow Area (m2)		14.39	
E.G. Slope (m/m)	0.001272	Area (m2)		14.39	
Q Total (m3/s)	5.43	Flow (m3/s)		5.43	
Top Width (m)	80.50	Top Width (m)		80.50	
Vel Total (m/s)	0.38	Avg. Vel. (m/s)		0.38	
Max Chl Dpth (m)	0.24	Hydr. Depth (m)		0.18	
Conv. Total (m3/s)	152.2	Conv. (m3/s)		152.2	
Length Wtd. (m)	43.80	Wetted Per. (m)		80.51	
Min Ch El (m)	179.98	Shear (N/m2)		2.23	
Alpha	1.00	Stream Power (N/m s)		0.84	
Frctn Loss (m)	0.14	Cum Volume (1000 m3)		0.43	0.01
C & E Loss (m)	0.00	Cum SA (1000 m2)		2.83	0.32

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	180.26	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	180.25	Reach Len. (m)	43.80	43.80	43.80
Crit W.S. (m)		Flow Area (m2)		16.85	
E.G. Slope (m/m)	0.001329	Area (m2)		16.85	
Q Total (m3/s)	7.06	Flow (m3/s)		7.06	
Top Width (m)	83.23	Top Width (m)		83.23	
Vel Total (m/s)	0.42	Avg. Vel. (m/s)		0.42	
Max Chl Dpth (m)	0.27	Hydr. Depth (m)		0.20	
Conv. Total (m3/s)	193.7	Conv. (m3/s)		193.7	
Length Wtd. (m)	43.80	Wetted Per. (m)		83.24	
Min Ch El (m)	179.98	Shear (N/m2)		2.64	
Alpha	1.00	Stream Power (N/m s)		1.11	
Frctn Loss (m)	0.15	Cum Volume (1000 m3)		0.51	0.02
C & E Loss (m)	0.00	Cum SA (1000 m2)		2.94	0.33

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	180.17	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	

W.S. Elev (m)	180.17	Reach Len. (m)	43.80	43.80	43.80
Crit W.S. (m)		Flow Area (m2)		10.13	
E.G. Slope (m/m)	0.001145	Area (m2)		10.13	
Q Total (m3/s)	2.99	Flow (m3/s)		2.99	
Top Width (m)	75.65	Top Width (m)		75.65	
Vel Total (m/s)	0.30	Avg. Vel. (m/s)		0.30	
Max Chl Dpth (m)	0.19	Hydr. Depth (m)		0.13	
Conv. Total (m3/s)	88.4	Conv. (m3/s)		88.4	
Length Wtd. (m)	43.80	Wetted Per. (m)		75.66	
Min Ch El (m)	179.98	Shear (N/m2)		1.50	
Alpha	1.00	Stream Power (N/m s)		0.44	
Frctn Loss (m)	0.14	Cum Volume (1000 m3)		0.30	
C & E Loss (m)	0.00	Cum SA (1000 m2)		2.61	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Rouge
REACH: WC15A RS: 100

INPUT
Description: ST -100
Station Elevation Data num= 35

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	180.46	2.28	180.42	5.83	180.37	5.93	180.37	6.04	180.37
6.09	180.37	19.88	180.159	30.27	179.9	30.38	179.9	34.96	179.9
46.07	179.9	62.71	179.9	79.63	180.11	82.49	180.14	86.5	180.13
86.58	180.13	86.74	180.12	89.18	180.13	92.64	180.11	94.46	180.1
94.71	180.1	95.86	180.1	95.91	180.1	97.33	180.1	98.13	180.11
98.51	180.1	99.33	180.11	100.6	180.04	101.55	180.01	103.99	180
108.35	180	111.44	180	113.89	180	114.42	180	115.3	180

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	19.88	.035	82.49	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
19.88	82.49	0	0	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	179.98	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	179.96	Reach Len. (m)			
Crit W.S. (m)	179.96	Flow Area (m2)		2.09	
E.G. Slope (m/m)	0.031901	Area (m2)		2.09	
Q Total (m3/s)	1.50	Flow (m3/s)		1.50	
Top Width (m)	39.44	Top Width (m)		39.44	
Vel Total (m/s)	0.72	Avg. Vel. (m/s)		0.72	
Max Chl Dpth (m)	0.06	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	8.4	Conv. (m3/s)		8.4	
Length Wtd. (m)		Wetted Per. (m)		39.45	
Min Ch El (m)	179.90	Shear (N/m2)		16.55	
Alpha	1.00	Stream Power (N/m s)		11.90	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	180.01	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	179.98	Reach Len. (m)			
Crit W.S. (m)	179.98	Flow Area (m2)		2.90	
E.G. Slope (m/m)	0.029149	Area (m2)		2.90	
Q Total (m3/s)	2.39	Flow (m3/s)		2.39	
Top Width (m)	41.87	Top Width (m)		41.87	
Vel Total (m/s)	0.82	Avg. Vel. (m/s)		0.82	
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	14.0	Conv. (m3/s)		14.0	
Length Wtd. (m)		Wetted Per. (m)		41.87	
Min Ch El (m)	179.90	Shear (N/m2)		19.82	
Alpha	1.00	Stream Power (N/m s)		16.32	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	180.04	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.035	
W.S. Elev (m)	180.00	Reach Len. (m)			
Crit W.S. (m)	180.00	Flow Area (m2)		3.77	
E.G. Slope (m/m)	0.027663	Area (m2)		3.77	
Q Total (m3/s)	3.47	Flow (m3/s)		3.47	
Top Width (m)	44.30	Top Width (m)		44.30	
Vel Total (m/s)	0.92	Avg. Vel. (m/s)		0.92	
Max Chl Dpth (m)	0.10	Hydr. Depth (m)		0.09	
Conv. Total (m3/s)	20.9	Conv. (m3/s)		20.9	
Length Wtd. (m)		Wetted Per. (m)		44.31	
Min Ch El (m)	179.90	Shear (N/m2)		23.10	
Alpha	1.00	Stream Power (N/m s)		21.25	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	180.06	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.035	0.035
W.S. Elev (m)	180.02	Reach Len. (m)			
Crit W.S. (m)	180.02	Flow Area (m2)		4.60	0.22
E.G. Slope (m/m)	0.022358	Area (m2)		4.60	0.22
Q Total (m3/s)	4.26	Flow (m3/s)		4.20	0.06
Top Width (m)	60.46	Top Width (m)		46.50	13.96
Vel Total (m/s)	0.88	Avg. Vel. (m/s)		0.91	0.27
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.10	0.02
Conv. Total (m3/s)	28.5	Conv. (m3/s)		28.1	0.4
Length Wtd. (m)		Wetted Per. (m)		46.50	13.97
Min Ch El (m)	179.90	Shear (N/m2)		21.69	3.39
Alpha	1.05	Stream Power (N/m s)		19.81	0.90
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	180.07	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.035	0.035
W.S. Elev (m)	180.02	Reach Len. (m)			
Crit W.S. (m)	180.02	Flow Area (m2)		5.00	0.33
E.G. Slope (m/m)	0.022070	Area (m2)		5.00	0.33
Q Total (m3/s)	4.84	Flow (m3/s)		4.72	0.12
Top Width (m)	61.74	Top Width (m)		47.52	14.23
Vel Total (m/s)	0.91	Avg. Vel. (m/s)		0.95	0.35
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.11	0.02
Conv. Total (m3/s)	32.6	Conv. (m3/s)		31.8	0.8
Length Wtd. (m)		Wetted Per. (m)		47.52	14.25
Min Ch El (m)	179.90	Shear (N/m2)		22.75	5.09
Alpha	1.06	Stream Power (N/m s)		21.51	1.77
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	180.08	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	0.035
W.S. Elev (m)	180.03	Reach Len. (m)			
Crit W.S. (m)	180.03	Flow Area (m2)		5.41	0.46
E.G. Slope (m/m)	0.021396	Area (m2)		5.41	0.46
Q Total (m3/s)	5.43	Flow (m3/s)		5.24	0.19
Top Width (m)	63.07	Top Width (m)		48.57	14.50
Vel Total (m/s)	0.92	Avg. Vel. (m/s)		0.97	0.42
Max Chl Dpth (m)	0.13	Hydr. Depth (m)		0.11	0.03
Conv. Total (m3/s)	37.1	Conv. (m3/s)		35.8	1.3
Length Wtd. (m)		Wetted Per. (m)		48.57	14.53
Min Ch El (m)	179.90	Shear (N/m2)		23.38	6.63
Alpha	1.06	Stream Power (N/m s)		22.63	2.77
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	180.11	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	0.035
W.S. Elev (m)	180.05	Reach Len. (m)			
Crit W.S. (m)	180.05	Flow Area (m2)		6.35	0.74
E.G. Slope (m/m)	0.021438	Area (m2)		6.35	0.74
Q Total (m3/s)	7.06	Flow (m3/s)		6.64	0.42
Top Width (m)	65.78	Top Width (m)		50.85	14.93
Vel Total (m/s)	1.00	Avg. Vel. (m/s)		1.05	0.56
Max Chl Dpth (m)	0.15	Hydr. Depth (m)		0.12	0.05
Conv. Total (m3/s)	48.2	Conv. (m3/s)		45.4	2.8
Length Wtd. (m)		Wetted Per. (m)		50.86	14.98
Min Ch El (m)	179.90	Shear (N/m2)		26.27	10.37
Alpha	1.06	Stream Power (N/m s)		27.47	5.83
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	180.03	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.035	
W.S. Elev (m)	179.99	Reach Len. (m)			
Crit W.S. (m)	179.99	Flow Area (m2)		3.41	
E.G. Slope (m/m)	0.027924	Area (m2)		3.41	
Q Total (m3/s)	2.99	Flow (m3/s)		2.99	
Top Width (m)	43.30	Top Width (m)		43.30	
Vel Total (m/s)	0.88	Avg. Vel. (m/s)		0.88	
Max Chl Dpth (m)	0.09	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	17.9	Conv. (m3/s)		17.9	
Length Wtd. (m)		Wetted Per. (m)		43.31	
Min Ch El (m)	179.90	Shear (N/m2)		21.56	
Alpha	1.00	Stream Power (N/m s)		18.91	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

SUMMARY OF MANNING'S N VALUES

River:Rouge

Reach	River Sta.	n1	n2	n3
WC15A	200	.035	.03	.035
WC15A	100	.035	.035	.035

SUMMARY OF REACH LENGTHS

River: Rouge

Reach	River Sta.	Left	Channel	Right
WC15A	200	43.8	43.8	43.8
WC15A	100	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Rouge

Reach	River Sta.	Contr.	Expan.
WC15A	200	.1	.3
WC15A	100	.1	.3

Profile Output Table - Standard Table 1

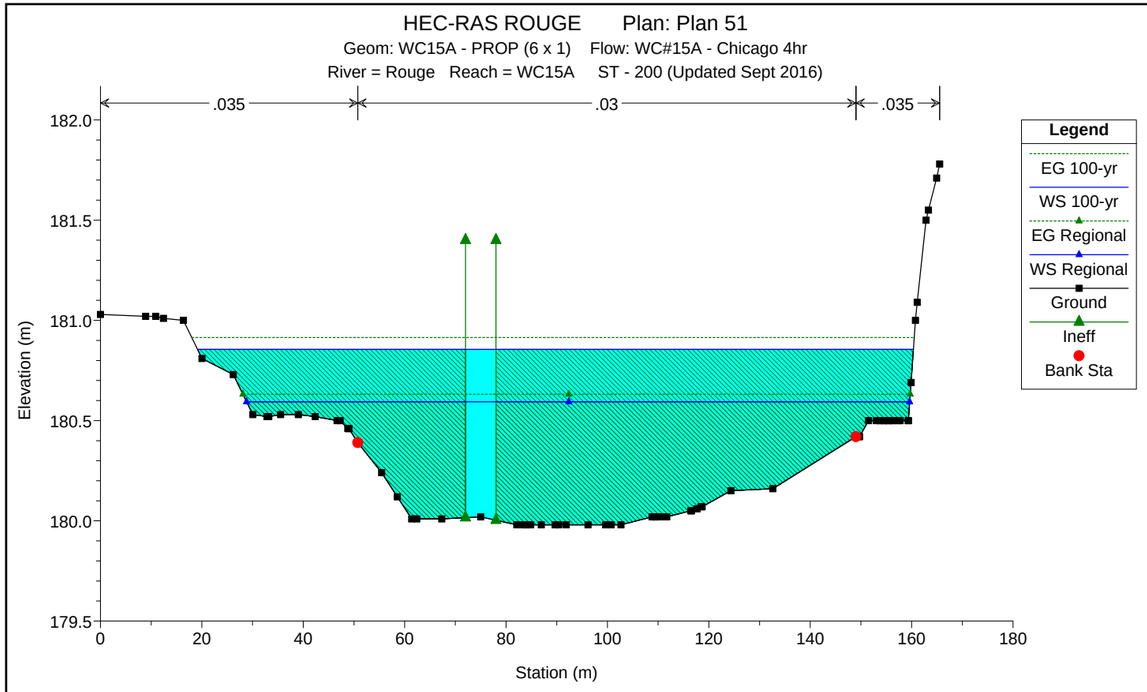
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
WC15A	200	2-yr	1.50	179.98	180.11	180.04	180.11	0.000998	0.23	6.48	62.89	0.23
WC15A	200	5-yr	2.39	179.98	180.14		180.15	0.001056	0.28	8.59	66.05	0.25
WC15A	200	10-yr	3.47	179.98	180.18		180.18	0.001167	0.31	11.08	76.76	0.26
WC15A	200	25-yr	4.26	179.98	180.20		180.20	0.001226	0.34	12.44	78.32	0.27
WC15A	200	50-yr	4.84	179.98	180.21		180.22	0.001242	0.36	13.46	79.47	0.28
WC15A	200	100-yr	5.43	179.98	180.22		180.23	0.001272	0.38	14.39	80.50	0.28
WC15A	200	Check Flow	7.06	179.98	180.25		180.26	0.001329	0.42	16.85	83.23	0.30
WC15A	200	Regional	2.99	179.98	180.17		180.17	0.001145	0.30	10.13	75.65	0.26
WC15A	100	2-yr	1.50	179.90	179.96	179.96	179.98	0.031901	0.72	2.09	39.44	1.00
WC15A	100	5-yr	2.39	179.90	179.98	179.98	180.01	0.029149	0.82	2.90	41.87	1.00
WC15A	100	10-yr	3.47	179.90	180.00	180.00	180.04	0.027663	0.92	3.77	44.30	1.01
WC15A	100	25-yr	4.26	179.90	180.02	180.02	180.06	0.022358	0.91	4.82	60.46	0.93
WC15A	100	50-yr	4.84	179.90	180.02	180.02	180.07	0.022070	0.95	5.33	61.74	0.93
WC15A	100	100-yr	5.43	179.90	180.03	180.03	180.08	0.021396	0.97	5.87	63.07	0.93
WC15A	100	Check Flow	7.06	179.90	180.05	180.05	180.11	0.021438	1.05	7.09	65.78	0.94
WC15A	100	Regional	2.99	179.90	179.99	179.99	180.03	0.027924	0.88	3.41	43.30	1.00

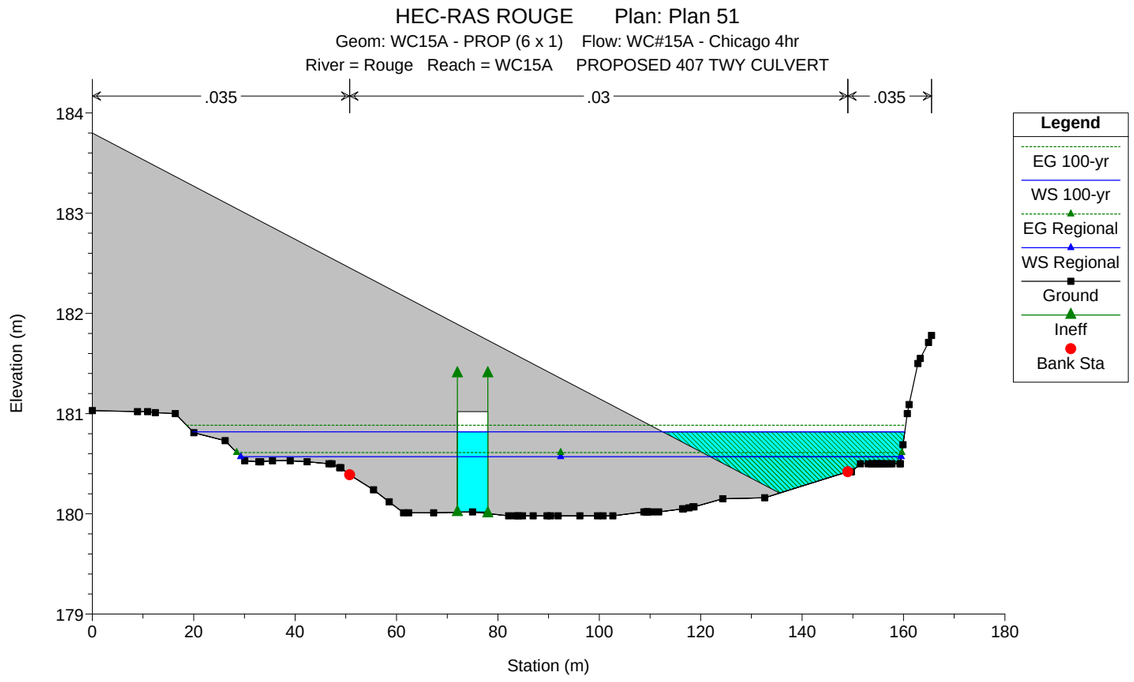
Profile Output Table - Standard Table 2

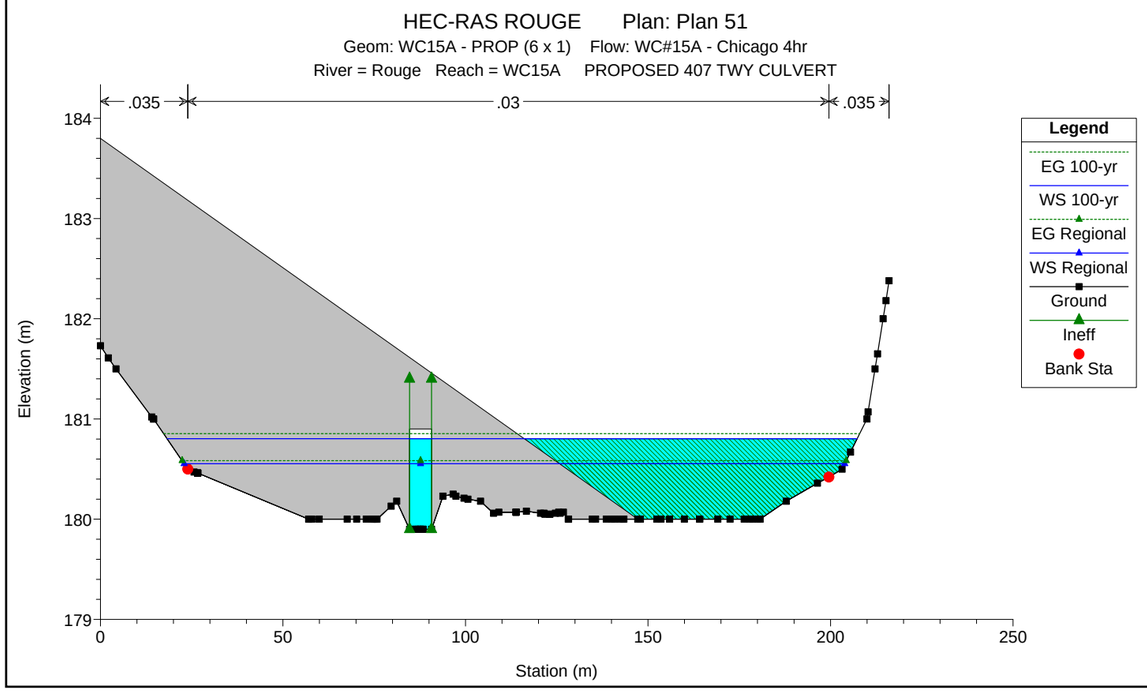
Reach	River Sta	Profile	E.G. Elev (m)	W.S. Elev (m)	Vel Head (m)	Frctn Loss (m)	C & E Loss (m)	Q Left (m3/s)	Q Channel (m3/s)	Q Right (m3/s)	Top Width (m)
WC15A	200	2-yr	180.11	180.11	0.00	0.13	0.00		1.50		62.89
WC15A	200	5-yr	180.15	180.14	0.00	0.13	0.00		2.39		66.05
WC15A	200	10-yr	180.18	180.18	0.01	0.14	0.00		3.47		76.76
WC15A	200	25-yr	180.20	180.20	0.01	0.14	0.00		4.26		78.32
WC15A	200	50-yr	180.22	180.21	0.01	0.14	0.00		4.84		79.47
WC15A	200	100-yr	180.23	180.22	0.01	0.14	0.00		5.43		80.50
WC15A	200	Check Flow	180.26	180.25	0.01	0.15	0.00		7.06		83.23
WC15A	200	Regional	180.17	180.17	0.00	0.14	0.00		2.99		75.65
WC15A	100	2-yr	179.98	179.96	0.03				1.50		39.44
WC15A	100	5-yr	180.01	179.98	0.03				2.39		41.87
WC15A	100	10-yr	180.04	180.00	0.04				3.47		44.30
WC15A	100	25-yr	180.06	180.02	0.04				4.20	0.06	60.46
WC15A	100	50-yr	180.07	180.02	0.04				4.72	0.12	61.74
WC15A	100	100-yr	180.08	180.03	0.05				5.24	0.19	63.07
WC15A	100	Check Flow	180.11	180.05	0.05				6.64	0.42	65.78
WC15A	100	Regional	180.03	179.99	0.04				2.99		43.30

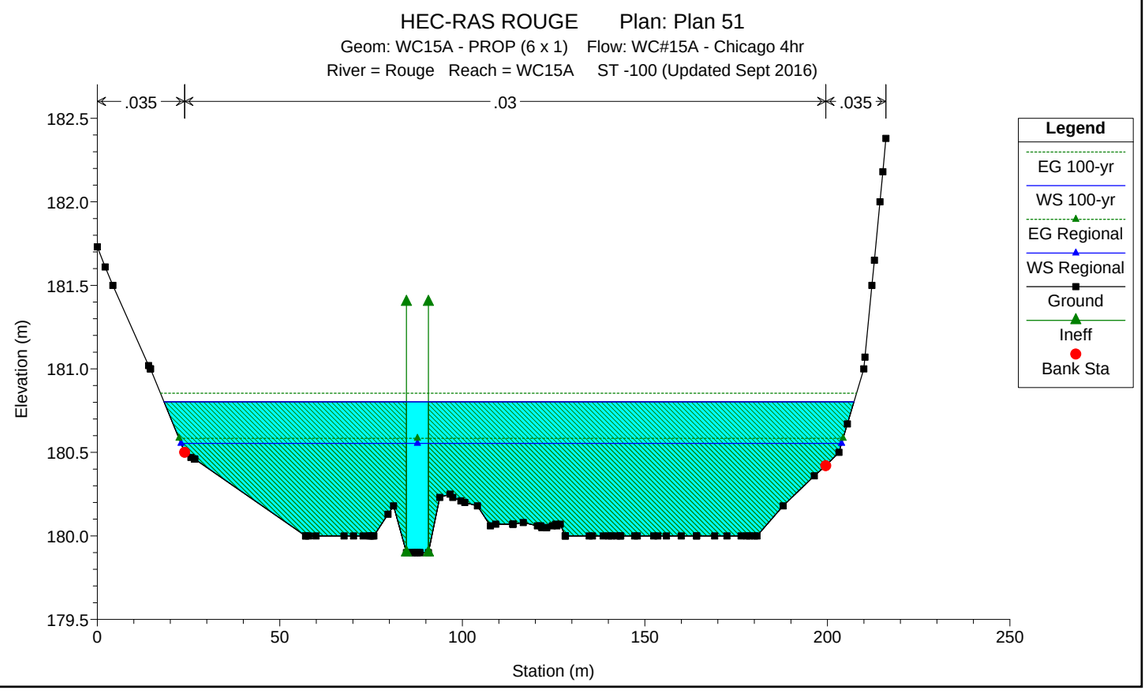
Profile Output Table - Culvert Only

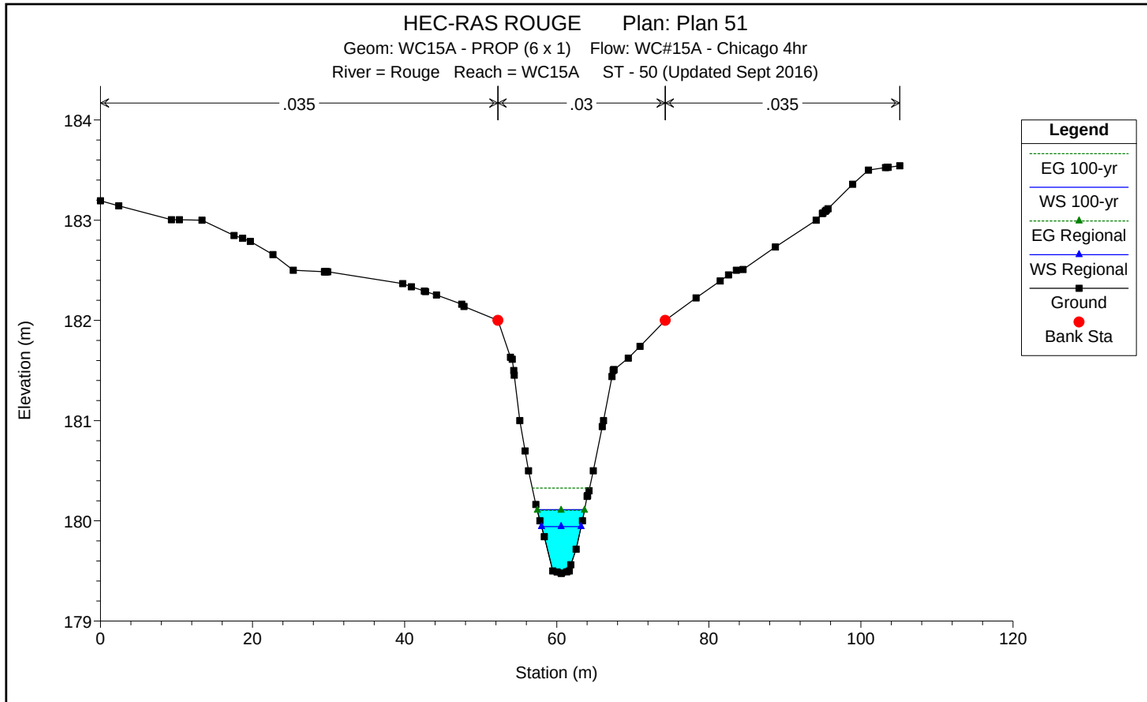
Reach	River Sta	Profile	E.G. US. (m)	W.S. US. (m)	E.G. IC (m)	E.G. OC (m)	Min El Weir Flow (m)	Q Culv Group (m3/s)	Q Weir (m3/s)	Delta WS (m)	Culv Vel US (m/s)	Culv Vel DS (m/s)


HEC-RAS ROUGE Plan: Plan 51
Geom: WC15A - PROP (6 x 1) Flow: WC#15A - Chicago 4hr
River = Rouge Reach = WC15A ST - 200 (Updated Sept 2016)
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG 100-yr
WS 100-yr
EG Regional
WS Regional
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 51
Geom: WC15A - PROP (6 x 1) Flow: WC#15A - Chicago 4hr
River = Rouge Reach = WC15A PROPOSED 407 TWY CULVERT
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG 100-yr
WS 100-yr
EG Regional
WS Regional
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 51
Geom: WC15A - PROP (6 x 1) Flow: WC#15A - Chicago 4hr
River = Rouge Reach = WC15A PROPOSED 407 TWY CULVERT
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG 100-yr
WS 100-yr
EG Regional
WS Regional
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 51
Geom: WC15A - PROP (6 x 1) Flow: WC#15A - Chicago 4hr
River = Rouge Reach = WC15A ST -100 (Updated Sept 2016)
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG 100-yr
WS 100-yr
EG Regional
WS Regional
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 51
Geom: WC15A - PROP (6 x 1) Flow: WC#15A - Chicago 4hr
River = Rouge Reach = WC15A ST - 50 (Updated Sept 2016)
.035
.03
.035
184
183
182
181
180
179
Elevation (m)
0
20
40
60
80
100
120
Station (m)
Legend
EG 100-yr
WS 100-yr
EG Regional
WS Regional
Ground
Bank Sta

HEC-RAS Plan: WC15A - PROP (4hr CH) River: Rouge Reach: WC15A

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC15A	200	2-yr	1.50	179.98	180.38	180.20	180.40	0.001648	0.69	2.18	95.21	0.36
WC15A	200	5-yr	2.39	179.98	180.51	180.27	180.55	0.001451	0.80	2.99	115.64	0.36
WC15A	200	10-yr	3.47	179.98	180.65	180.34	180.69	0.001362	0.91	3.82	132.04	0.36
WC15A	200	25-yr	4.26	179.98	180.74	180.39	180.79	0.001343	0.98	4.33	134.34	0.37
WC15A	200	50-yr	4.84	179.98	180.79	180.42	180.85	0.001342	1.03	4.68	138.96	0.37
WC15A	200	100-yr	5.43	179.98	180.86	180.45	180.91	0.001316	1.08	5.04	141.19	0.38
WC15A	200	Check Flow	7.06	179.98	181.01	180.53	181.08	0.001266	1.18	5.97	148.37	0.38
WC15A	200	Regional	2.99	179.98	180.59	180.31	180.63	0.001382	0.86	3.47	130.79	0.36
WC15A	150		Culvert									
WC15A	100	2-yr	1.50	179.90	180.34		180.36	0.000844	0.56	2.66	161.32	0.27
WC15A	100	5-yr	2.39	179.90	180.48		180.50	0.000896	0.69	3.46	176.79	0.29
WC15A	100	10-yr	3.47	179.90	180.61		180.64	0.000950	0.82	4.25	182.73	0.31
WC15A	100	25-yr	4.26	179.90	180.69		180.73	0.000995	0.90	4.74	185.39	0.32
WC15A	100	50-yr	4.84	179.90	180.74		180.79	0.001029	0.96	5.07	187.14	0.33
WC15A	100	100-yr	5.43	179.90	180.80		180.85	0.001037	1.00	5.42	189.03	0.34
WC15A	100	Check Flow	7.06	179.90	180.93		181.00	0.001121	1.14	6.19	193.23	0.36
WC15A	100	Regional	2.99	179.90	180.55		180.58	0.000919	0.76	3.93	180.97	0.30
WC15A	50	2-yr	1.50	179.48	179.80	179.80	179.92	0.014668	1.51	0.99	4.27	1.00
WC15A	50	5-yr	2.39	179.48	179.89	179.89	180.04	0.013643	1.68	1.42	4.87	1.00
WC15A	50	10-yr	3.47	179.48	179.98	179.98	180.16	0.013252	1.85	1.87	5.46	1.01
WC15A	50	25-yr	4.26	179.48	180.04	180.04	180.23	0.012786	1.94	2.20	5.81	1.01
WC15A	50	50-yr	4.84	179.48	180.08	180.08	180.28	0.012361	1.99	2.44	6.04	1.00
WC15A	50	100-yr	5.43	179.48	180.11	180.11	180.33	0.012451	2.06	2.64	6.23	1.01
WC15A	50	Check Flow	7.06	179.48	180.21	180.21	180.45	0.011778	2.17	3.25	6.77	1.00
WC15A	50	Regional	2.99	179.48	179.94	179.94	180.11	0.013545	1.79	1.67	5.20	1.01

HEC-RAS HEC-RAS 5.0.1 April 2016
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
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PROJECT DATA
Project Title: HEC-RAS ROUGE
Project File : HEC.prj
Run Date and Time: 9/19/2016 1:59:23 PM

Project in SI units

Project Description:
HEC-RAS model for creek crossings along the proposed 407 TWY Ph 2 started
from scratch

PLAN DATA

Plan Title: Plan 39
Plan File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.p39

Geometry Title: WC15A - PROP (6 x 1)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g07

Flow Title : WC#15A - Chicago 4hr
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f05

Plan Summary Information:
Number of: Cross Sections = 2 Multiple Openings = 0
Culverts = 1 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.003
Critical depth calculation tolerance = 0.003
Maximum number of iterations = 20
Maximum difference tolerance = 0.1
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: WC#15A - Chicago 4hr
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f05

Flow Data (m3/s)

River	Reach	RS	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Check Flow	Regional
Rouge	WC15A	200	1.5	2.39	3.47	4.26	4.84	5.43	7.06	2.99

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Rouge	WC15A	2-yr		Critical
Rouge	WC15A	5-yr		Critical
Rouge	WC15A	10-yr		Critical
Rouge	WC15A	25-yr		Critical
Rouge	WC15A	50-yr		Critical
Rouge	WC15A	100-yr		Critical
Rouge	WC15A	Check Flow		Critical
Rouge	WC15A	Regional		Critical

GEOMETRY DATA

Geometry Title: WC15A - PROP (6 x 1)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g07

CROSS SECTION

RIVER: Rouge
REACH: WC15A RS: 200

INPUT
Description: ST - 200 (Updated Sept 2016)
Station Elevation Data num= 74

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	181.03	8.92	181.02	10.91	181.02	12.42	181.01	16.36	181
20.02	180.81	26.21	180.73	30.05	180.53	32.84	180.52	33.05	180.52
33.21	180.52	35.55	180.53	39.02	180.53	42.36	180.52	46.68	180.5
47.27	180.5	48.8	180.46	49.01	180.46	50.77	180.39	55.46	180.24
58.56	180.12	61.39	180.01	62.38	180.01	67.33	180.01	74.99	180.02
82.12	179.98	83.45	179.98	84	179.98	84.85	179.98	86.94	179.98
89.68	179.98	90.38	179.98	91.88	179.98	96.17	179.98	99.66	179.98
100.75	179.98	102.66	179.98	108.78	180.02	109.25	180.02	109.51	180.02
109.52	180.02	110.44	180.02	111.7	180.02	116.44	180.05	116.58	180.05
117.69	180.06	118.45	180.07	118.69	180.07	124.35	180.15	132.62	180.16
149.01	180.42	149.58	180.42	149.71	180.42	151.5	180.5	153.04	180.5
153.69	180.5	153.79	180.5	154.51	180.5	154.69	180.5	155.17	180.5
155.49	180.5	156.16	180.5	156.39	180.5	157.4	180.5	157.74	180.5
159.33	180.5	159.34	180.5	159.89	180.69	160.74	181	161.1	181.09
162.83	181.5	163.32	181.55	164.92	181.71	165.53	181.78		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	50.77	.03	149.01	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
50.77 149.01 43.8 43.8 43.8 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	72	181.4	T
78	165.53	181.4	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	180.34	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.030	
W.S. Elev (m)	180.31	Reach Len. (m)	43.80	43.80	43.80
Crit W.S. (m)	180.20	Flow Area (m2)		1.75	
E.G. Slope (m/m)	0.003389	Area (m2)		21.69	
Q Total (m3/s)	1.50	Flow (m3/s)		1.50	
Top Width (m)	88.55	Top Width (m)		88.55	
Vel Total (m/s)	0.85	Avg. Vel. (m/s)		0.85	

Max Chl Dpth (m)	0.33	Hydr. Depth (m)		0.29	
Conv. Total (m3/s)	25.8	Conv. (m3/s)		25.8	
Length Wtd. (m)	43.80	Wetted Per. (m)		6.00	
Min Ch El (m)	179.98	Shear (N/m2)		9.72	
Alpha	1.00	Stream Power (N/m s)		8.31	
Frctn Loss (m)		Cum Volume (1000 m3)		0.21	
C & E Loss (m)		Cum SA (1000 m2)		3.14	0.34

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	180.46	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.030	
W.S. Elev (m)	180.41	Reach Len. (m)	43.80	43.80	43.80
Crit W.S. (m)	180.27	Flow Area (m2)		2.37	
E.G. Slope (m/m)	0.003156	Area (m2)	0.00	31.27	
Q Total (m3/s)	2.39	Flow (m3/s)		2.39	
Top Width (m)	98.11	Top Width (m)	0.50	97.61	
Vel Total (m/s)	1.01	Avg. Vel. (m/s)		1.01	
Max Chl Dpth (m)	0.43	Hydr. Depth (m)		0.40	
Conv. Total (m3/s)	42.5	Conv. (m3/s)		42.5	
Length Wtd. (m)	43.80	Wetted Per. (m)		6.00	
Min Ch El (m)	179.98	Shear (N/m2)		12.23	
Alpha	1.00	Stream Power (N/m s)		12.33	
Frctn Loss (m)		Cum Volume (1000 m3)		0.29	
C & E Loss (m)		Cum SA (1000 m2)	0.01	3.50	0.72

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	180.58	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.030	
W.S. Elev (m)	180.52	Reach Len. (m)	43.80	43.80	43.80
Crit W.S. (m)	180.34	Flow Area (m2)		3.00	
E.G. Slope (m/m)	0.003025	Area (m2)	0.26	41.62	0.29
Q Total (m3/s)	3.47	Flow (m3/s)		3.47	
Top Width (m)	116.01	Top Width (m)	7.40	98.24	10.37
Vel Total (m/s)	1.16	Avg. Vel. (m/s)		1.16	
Max Chl Dpth (m)	0.54	Hydr. Depth (m)		0.50	
Conv. Total (m3/s)	63.1	Conv. (m3/s)		63.1	
Length Wtd. (m)	43.80	Wetted Per. (m)		6.00	
Min Ch El (m)	179.98	Shear (N/m2)		14.84	
Alpha	1.00	Stream Power (N/m s)		17.15	
Frctn Loss (m)		Cum Volume (1000 m3)		0.38	
C & E Loss (m)		Cum SA (1000 m2)	0.26	3.52	0.95

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	180.66	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.		0.030	
W.S. Elev (m)	180.59	Reach Len. (m)	43.80	43.80	43.80
Crit W.S. (m)	180.39	Flow Area (m2)		3.42	
E.G. Slope (m/m)	0.002948	Area (m2)	1.60	48.49	1.02
Q Total (m3/s)	4.26	Flow (m3/s)		4.26	
Top Width (m)	130.60	Top Width (m)	21.78	98.24	10.58
Vel Total (m/s)	1.24	Avg. Vel. (m/s)		1.24	
Max Chl Dpth (m)	0.61	Hydr. Depth (m)		0.57	
Conv. Total (m3/s)	78.5	Conv. (m3/s)		78.5	
Length Wtd. (m)	43.80	Wetted Per. (m)		6.00	
Min Ch El (m)	179.98	Shear (N/m2)		16.49	
Alpha	1.00	Stream Power (N/m s)		20.52	
Frctn Loss (m)		Cum Volume (1000 m3)		0.46	
C & E Loss (m)		Cum SA (1000 m2)	0.64	3.52	0.95

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	180.72	Element	Left OB	Channel	Right OB
Vel Head (m)	0.09	Wt. n-Val.		0.030	
W.S. Elev (m)	180.63	Reach Len. (m)	43.80	43.80	43.80
Crit W.S. (m)	180.42	Flow Area (m2)		3.71	
E.G. Slope (m/m)	0.002899	Area (m2)	2.68	53.25	1.53
Q Total (m3/s)	4.84	Flow (m3/s)		4.84	
Top Width (m)	131.67	Top Width (m)	22.71	98.24	10.72
Vel Total (m/s)	1.30	Avg. Vel. (m/s)		1.30	
Max Chl Dpth (m)	0.65	Hydr. Depth (m)		0.62	
Conv. Total (m3/s)	89.9	Conv. (m3/s)		89.9	
Length Wtd. (m)	43.80	Wetted Per. (m)		6.00	
Min Ch El (m)	179.98	Shear (N/m2)		17.59	
Alpha	1.00	Stream Power (N/m s)		22.93	
Frctn Loss (m)		Cum Volume (1000 m3)		0.51	
C & E Loss (m)		Cum SA (1000 m2)	0.70	3.52	0.95

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	180.78	Element	Left OB	Channel	Right OB
Vel Head (m)	0.09	Wt. n-Val.		0.030	
W.S. Elev (m)	180.68	Reach Len. (m)	43.80	43.80	43.80
Crit W.S. (m)	180.45	Flow Area (m2)		4.00	
E.G. Slope (m/m)	0.002850	Area (m2)	3.78	57.93	2.05
Q Total (m3/s)	5.43	Flow (m3/s)		5.43	
Top Width (m)	132.72	Top Width (m)	23.63	98.24	10.85
Vel Total (m/s)	1.36	Avg. Vel. (m/s)		1.36	
Max Chl Dpth (m)	0.70	Hydr. Depth (m)		0.67	
Conv. Total (m3/s)	101.7	Conv. (m3/s)		101.7	
Length Wtd. (m)	43.80	Wetted Per. (m)		6.00	
Min Ch El (m)	179.98	Shear (N/m2)		18.63	
Alpha	1.00	Stream Power (N/m s)		25.30	
Frctn Loss (m)		Cum Volume (1000 m3)		0.56	
C & E Loss (m)		Cum SA (1000 m2)	0.77	3.52	0.96

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	180.92	Element	Left OB	Channel	Right OB
Vel Head (m)	0.11	Wt. n-Val.		0.030	
W.S. Elev (m)	180.80	Reach Len. (m)	43.80	43.80	43.80
Crit W.S. (m)	180.53	Flow Area (m2)		4.74	
E.G. Slope (m/m)	0.002737	Area (m2)	7.00	70.04	3.41
Q Total (m3/s)	7.06	Flow (m3/s)		7.06	
Top Width (m)	139.76	Top Width (m)	30.32	98.24	11.19
Vel Total (m/s)	1.49	Avg. Vel. (m/s)		1.49	
Max Chl Dpth (m)	0.82	Hydr. Depth (m)		0.79	
Conv. Total (m3/s)	135.0	Conv. (m3/s)		135.0	
Length Wtd. (m)	43.80	Wetted Per. (m)		6.00	
Min Ch El (m)	179.98	Shear (N/m2)		21.19	
Alpha	1.00	Stream Power (N/m s)		31.58	
Frctn Loss (m)		Cum Volume (1000 m3)		0.70	
C & E Loss (m)		Cum SA (1000 m2)	1.05	3.52	0.96

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	180.53	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.030	
W.S. Elev (m)	180.47	Reach Len. (m)	43.80	43.80	43.80
Crit W.S. (m)	180.31	Flow Area (m2)		2.73	
E.G. Slope (m/m)	0.003082	Area (m2)	0.08	37.17	0.06
Q Total (m3/s)	2.99	Flow (m3/s)		2.99	
Top Width (m)	102.41	Top Width (m)	2.35	98.24	1.82
Vel Total (m/s)	1.09	Avg. Vel. (m/s)		1.09	
Max Chl Dpth (m)	0.49	Hydr. Depth (m)		0.46	
Conv. Total (m3/s)	53.9	Conv. (m3/s)		53.9	
Length Wtd. (m)	43.80	Wetted Per. (m)		6.00	
Min Ch El (m)	179.98	Shear (N/m2)		13.76	
Alpha	1.00	Stream Power (N/m s)		15.06	
Frctn Loss (m)		Cum Volume (1000 m3)		0.34	
C & E Loss (m)		Cum SA (1000 m2)	0.10	3.52	0.76

CULVERT

RIVER: Rouge
REACH: WC15A RS: 150

INPUT
Description: PROPOSED 407 TWY CULVERT
Distance from Upstream XS = 14
Deck/Roadway Width = 14
Weir Coefficient = 1.4
Upstream Deck/Roadway Coordinates
num= 2

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0	183.8	166	179.4

Upstream Bridge Cross Section Data
Station Elevation Data num= 74

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	181.03	8.92	181.02	10.91	181.02	12.42	181.01	16.36	181
20.02	180.81	26.21	180.73	30.05	180.53	32.84	180.52	33.05	180.52
33.21	180.52	35.55	180.53	39.02	180.53	42.36	180.52	46.68	180.5
47.27	180.5	48.8	180.46	49.01	180.46	50.77	180.39	55.46	180.24
58.56	180.12	61.39	180.01	62.38	180.01	67.33	180.01	74.99	180.02
82.12	179.98	83.45	179.98	84	179.98	84.85	179.98	86.94	179.98
89.68	179.98	90.38	179.98	91.88	179.98	96.17	179.98	99.66	179.98
100.75	179.98	102.66	179.98	108.78	180.02	109.25	180.02	109.51	180.02
109.52	180.02	110.44	180.02	111.7	180.02	116.44	180.05	116.58	180.05
117.69	180.06	118.45	180.07	118.69	180.07	124.35	180.15	132.62	180.16
149.01	180.42	149.58	180.42	149.71	180.42	151.5	180.5	153.04	180.5
153.69	180.5	153.79	180.5	154.51	180.5	154.69	180.5	155.17	180.5
155.49	180.5	156.16	180.5	156.39	180.5	157.4	180.5	157.74	180.5
159.33	180.5	159.34	180.5	159.89	180.69	160.74	181	161.1	181.09
162.83	181.5	163.32	181.55	164.92	181.71	165.53	181.78		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	50.77	.03	149.01	.035

Bank Sta: Left Right Coeff Contr. Expan.
50.77 149.01 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	72	181.4	T
78	165.53	181.4	T

Downstream Deck/Roadway Coordinates
num= 2

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0	183.8	115	180.8

Downstream Bridge Cross Section Data
Station Elevation Data num= 35

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	180.46	2.28	180.42	5.83	180.37	5.93	180.37	6.04	180.37
6.09	180.37	19.88	180.159	30.27	179.9	30.38	179.9	34.96	179.9
46.07	179.9	62.71	179.9	79.63	180.11	82.49	180.14	86.5	180.13
86.58	180.13	86.74	180.12	89.18	180.13	92.64	180.11	94.46	180.1
94.71	180.1	95.86	180.1	95.91	180.1	97.33	180.1	98.13	180.11
98.51	180.1	99.33	180.11	100.6	180.04	101.55	180.01	103.99	180
108.35	180	111.44	180	113.89	180	114.42	180	115.3	180

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	19.88	.03	82.49	.035

Bank Sta: Left Right Coeff Contr. Expan.
19.88 82.49 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	57	181.4	T
63	115.3	181.4	T

Upstream Embankment side slope = 2 horiz. to 1.0 vertical
Downstream Embankment side slope = 2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .98
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name	Shape	Rise	Span
Culvert #1	Box	1	6

FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG

Culvert Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
7	30	.013	.025	0	.5	1

Upstream Elevation = 180.02
Centerline Station = 75
Downstream Elevation = 179.9
Centerline Station = 60

CULVERT OUTPUT Profile #2-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	1.50	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	0.99
Q Barrel (m3/s)	1.50	Culv Vel DS (m/s)	1.24
E.G. US. (m)	180.35	Culv Inv El Up (m)	180.02
W.S. US. (m)	180.31	Culv Inv El Dn (m)	179.90
E.G. DS (m)	180.18	Culv Frctn Ls (m)	0.00
W.S. DS (m)	180.08	Culv Exit Loss (m)	0.00
Delta EG (m)	0.17	Culv Entr Loss (m)	0.03
Delta WS (m)	0.22	Q Weir (m3/s)	
E.G. IC (m)	180.31	Weir Sta Lft (m)	
E.G. OC (m)	180.35	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	180.27	Weir Max Depth (m)	
Culv WS Outlet (m)	180.10	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.25	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.19	Min El Weir Flow (m)	181.40

Warning: During subcritical analysis, with the exit loss set =1.0, the projected WSEL in culvert has a lower energy than the downstream energy. Most likely, the downstream cross section blocks part of the culvert or the ineffective area is set too far in. Instead of projecting the WSEL, the program did an energy balance to get the WSEL inside the culvert at the downstream end.
Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #5-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	2.39	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.20
Q Barrel (m3/s)	2.39	Culv Vel DS (m/s)	1.46
E.G. US. (m)	180.46	Culv Inv El Up (m)	180.02
W.S. US. (m)	180.41	Culv Inv El Dn (m)	179.90
E.G. DS (m)	180.28	Culv Frctn Ls (m)	0.00
W.S. DS (m)	180.15	Culv Exit Loss (m)	0.00
Delta EG (m)	0.18	Culv Entr Loss (m)	0.04
Delta WS (m)	0.26	Q Weir (m3/s)	
E.G. IC (m)	180.42	Weir Sta Lft (m)	
E.G. OC (m)	180.46	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	180.35	Weir Max Depth (m)	
Culv WS Outlet (m)	180.17	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.34	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.25	Min El Weir Flow (m)	181.40

Warning: During subcritical analysis, with the exit loss set =1.0, the projected WSEL in culvert has a lower energy than the downstream energy. Most likely, the downstream cross section blocks part of the culvert or the ineffective area is set too far in. Instead of projecting the WSEL, the program did an energy balance to get the WSEL inside the culvert at the downstream end.

CULVERT OUTPUT Profile #10-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	3.47	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.39
Q Barrel (m3/s)	3.47	Culv Vel DS (m/s)	1.67
E.G. US. (m)	180.58	Culv Inv El Up (m)	180.02
W.S. US. (m)	180.52	Culv Inv El Dn (m)	179.90
E.G. DS (m)	180.39	Culv Frctn Ls (m)	0.00
W.S. DS (m)	180.22	Culv Exit Loss (m)	0.00
Delta EG (m)	0.20	Culv Entr Loss (m)	0.05
Delta WS (m)	0.29	Q Weir (m3/s)	
E.G. IC (m)	180.53	Weir Sta Lft (m)	
E.G. OC (m)	180.58	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	180.43	Weir Max Depth (m)	
Culv WS Outlet (m)	180.25	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.42	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.32	Min El Weir Flow (m)	181.40

Warning: During subcritical analysis, with the exit loss set =1.0, the projected WSEL in culvert has a lower energy than the downstream energy. Most likely, the downstream cross section blocks part of the culvert or the ineffective area is set too far in. Instead of projecting the WSEL, the program did an energy balance to get the WSEL inside the culvert at the downstream end.

CULVERT OUTPUT Profile #25-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	4.26	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.51
Q Barrel (m3/s)	4.26	Culv Vel DS (m/s)	1.79
E.G. US. (m)	180.66	Culv Inv El Up (m)	180.02
W.S. US. (m)	180.59	Culv Inv El Dn (m)	179.90
E.G. DS (m)	180.46	Culv Frctn Ls (m)	0.00
W.S. DS (m)	180.27	Culv Exit Loss (m)	0.00
Delta EG (m)	0.21	Culv Entr Loss (m)	0.06
Delta WS (m)	0.31	Q Weir (m3/s)	
E.G. IC (m)	180.61	Weir Sta Lft (m)	
E.G. OC (m)	180.66	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	180.49	Weir Max Depth (m)	
Culv WS Outlet (m)	180.30	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.48	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.37	Min El Weir Flow (m)	181.40

Warning: During subcritical analysis, with the exit loss set =1.0, the projected WSEL in culvert has a lower energy than the downstream energy. Most likely, the downstream cross section blocks part of the culvert or the ineffective area is set too far in. Instead of projecting the WSEL, the program did an energy balance to get the WSEL inside the culvert at the downstream end.

CULVERT OUTPUT Profile #50-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	4.84	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.59
Q Barrel (m3/s)	4.84	Culv Vel DS (m/s)	1.87
E.G. US. (m)	180.72	Culv Inv El Up (m)	180.02
W.S. US. (m)	180.63	Culv Inv El Dn (m)	179.90
E.G. DS (m)	180.51	Culv Frctn Ls (m)	0.00
W.S. DS (m)	180.30	Culv Exit Loss (m)	0.00
Delta EG (m)	0.21	Culv Entr Loss (m)	0.06
Delta WS (m)	0.33	Q Weir (m3/s)	
E.G. IC (m)	180.66	Weir Sta Lft (m)	
E.G. OC (m)	180.72	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	180.53	Weir Max Depth (m)	
Culv WS Outlet (m)	180.33	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.52	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.40	Min El Weir Flow (m)	181.40

Warning: During subcritical analysis, with the exit loss set =1.0, the projected WSEL in culvert has a lower energy than the downstream energy. Most likely, the downstream cross section blocks part of the culvert or the ineffective area is set too far in. Instead of projecting the WSEL, the program did an energy balance to get the WSEL inside the culvert at the downstream end.

CULVERT OUTPUT Profile #100-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	5.43	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.67
Q Barrel (m3/s)	5.43	Culv Vel DS (m/s)	1.95
E.G. US. (m)	180.78	Culv Inv El Up (m)	180.02
W.S. US. (m)	180.68	Culv Inv El Dn (m)	179.90
E.G. DS (m)	180.56	Culv Frctn Ls (m)	0.00
W.S. DS (m)	180.34	Culv Exit Loss (m)	0.00
Delta EG (m)	0.22	Culv Entr Loss (m)	0.07
Delta WS (m)	0.35	Q Weir (m3/s)	
E.G. IC (m)	180.72	Weir Sta Lft (m)	
E.G. OC (m)	180.78	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	180.56	Weir Max Depth (m)	
Culv WS Outlet (m)	180.37	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.55	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.44	Min El Weir Flow (m)	181.40

Warning: During subcritical analysis, with the exit loss set =1.0, the projected WSEL in culvert has a lower energy than the downstream energy. Most likely, the downstream cross section blocks part of the culvert or the ineffective area is set too far in. Instead of projecting the WSEL, the program did an energy balance to get the WSEL inside the culvert at the downstream end.

CULVERT OUTPUT Profile #Check Flow Culv Group: Culvert #1

Q Culv Group (m3/s)	7.06	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.85
Q Barrel (m3/s)	7.06	Culv Vel DS (m/s)	2.14
E.G. US. (m)	180.92	Culv Inv El Up (m)	180.02
W.S. US. (m)	180.80	Culv Inv El Dn (m)	179.90
E.G. DS (m)	180.68	Culv Frctn Ls (m)	0.00
W.S. DS (m)	180.42	Culv Exit Loss (m)	0.00
Delta EG (m)	0.24	Culv Entr Loss (m)	0.09
Delta WS (m)	0.39	Q Weir (m3/s)	
E.G. IC (m)	180.85	Weir Sta Lft (m)	
E.G. OC (m)	180.92	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	180.66	Weir Max Depth (m)	
Culv WS Outlet (m)	180.45	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.65	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.52	Min El Weir Flow (m)	181.40

Warning: During subcritical analysis, with the exit loss set =1.0, the projected WSEL in culvert has a lower energy than the downstream energy. Most likely, the downstream cross section blocks part of the culvert or the ineffective area is set too far in. Instead of projecting the WSEL, the program did an energy balance to get the WSEL inside the culvert at the downstream end.

CULVERT OUTPUT Profile #Regional Culv Group: Culvert #1

Q Culv Group (m3/s)	2.99	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.32
Q Barrel (m3/s)	2.99	Culv Vel DS (m/s)	1.58
E.G. US. (m)	180.53	Culv Inv El Up (m)	180.02
W.S. US. (m)	180.47	Culv Inv El Dn (m)	179.90
E.G. DS (m)	180.34	Culv Frctn Ls (m)	0.00
W.S. DS (m)	180.19	Culv Exit Loss (m)	0.00
Delta EG (m)	0.19	Culv Entr Loss (m)	0.04
Delta WS (m)	0.28	Q Weir (m3/s)	
E.G. IC (m)	180.48	Weir Sta Lft (m)	
E.G. OC (m)	180.53	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	180.40	Weir Max Depth (m)	
Culv WS Outlet (m)	180.21	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.38	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.29	Min El Weir Flow (m)	181.40

Warning: During subcritical analysis, with the exit loss set =1.0, the projected WSEL in culvert has a lower energy than the downstream energy. Most likely, the downstream cross section blocks part of the culvert or the ineffective area is set too far in. Instead of projecting the WSEL, the program did an energy balance to get the WSEL inside the culvert at the downstream end.

CROSS SECTION

RIVER: Rouge
REACH: WC15A RS: 100

INPUT
Description: ST -100 (Updated Sept 2016)
Station Elevation Data num= 35

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	180.46	2.28	180.42	5.83	180.37	5.93	180.37	6.04	180.37
6.09	180.37	19.88	180.159	30.27	179.9	30.38	179.9	34.96	179.9
46.07	179.9	62.71	179.9	79.63	180.11	82.49	180.14	86.5	180.13
86.58	180.13	86.74	180.12	89.18	180.13	92.64	180.11	94.46	180.1
94.71	180.1	95.86	180.1	95.91	180.1	97.33	180.1	98.13	180.11
98.51	180.1	99.33	180.11	100.6	180.04	101.55	180.01	103.99	180
108.35	180	111.44	180	113.89	180	114.42	180	115.3	180

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	19.88	.03	82.49	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
19.88 82.49 0 0 0 .3 .5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	57	181.4	T
63	115.3	181.4	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	180.18	Element	Left OB	Channel	Right OB
Vel Head (m)	0.09	Wt. n-Val.		0.030	
W.S. Elev (m)	180.08	Reach Len. (m)			
Crit W.S. (m)	180.08	Flow Area (m2)		1.11	
E.G. Slope (m/m)	0.015634	Area (m2)		8.06	1.23
Q Total (m3/s)	1.50	Flow (m3/s)		1.50	
Top Width (m)	70.27	Top Width (m)		54.76	15.52
Vel Total (m/s)	1.35	Avg. Vel. (m/s)		1.35	
Max Chl Dpth (m)	0.18	Hydr. Depth (m)		0.18	
Conv. Total (m3/s)	12.0	Conv. (m3/s)		12.0	
Length Wtd. (m)		Wetted Per. (m)		6.00	
Min Ch El (m)	179.90	Shear (N/m2)		28.34	
Alpha	1.00	Stream Power (N/m s)		38.33	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	180.28	Element	Left OB	Channel	Right OB
Vel Head (m)	0.13	Wt. n-Val.		0.030	
W.S. Elev (m)	180.15	Reach Len. (m)			
Crit W.S. (m)	180.15	Flow Area (m2)		1.51	
E.G. Slope (m/m)	0.014098	Area (m2)		12.03	2.88
Q Total (m3/s)	2.39	Flow (m3/s)		2.39	
Top Width (m)	95.15	Top Width (m)		62.34	32.81
Vel Total (m/s)	1.58	Avg. Vel. (m/s)		1.58	
Max Chl Dpth (m)	0.25	Hydr. Depth (m)		0.25	
Conv. Total (m3/s)	20.1	Conv. (m3/s)		20.1	
Length Wtd. (m)		Wetted Per. (m)		6.00	
Min Ch El (m)	179.90	Shear (N/m2)		34.86	
Alpha	1.00	Stream Power (N/m s)		55.07	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	180.39	Element	Left OB	Channel	Right OB
Vel Head (m)	0.16	Wt. n-Val.		0.030	
W.S. Elev (m)	180.22	Reach Len. (m)			
Crit W.S. (m)	180.22	Flow Area (m2)		1.94	
E.G. Slope (m/m)	0.012880	Area (m2)	0.14	16.53	5.24
Q Total (m3/s)	3.47	Flow (m3/s)		3.47	
Top Width (m)	99.67	Top Width (m)	4.25	62.61	32.81
Vel Total (m/s)	1.78	Avg. Vel. (m/s)		1.78	
Max Chl Dpth (m)	0.32	Hydr. Depth (m)		0.32	
Conv. Total (m3/s)	30.6	Conv. (m3/s)		30.6	
Length Wtd. (m)		Wetted Per. (m)		6.00	
Min Ch El (m)	179.90	Shear (N/m2)		40.93	
Alpha	1.00	Stream Power (N/m s)		73.05	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	180.46	Element	Left OB	Channel	Right OB
Vel Head (m)	0.19	Wt. n-Val.		0.030	
W.S. Elev (m)	180.27	Reach Len. (m)			
Crit W.S. (m)	180.27	Flow Area (m2)		2.22	
E.G. Slope (m/m)	0.012396	Area (m2)	0.41	19.45	6.77
Q Total (m3/s)	4.26	Flow (m3/s)		4.26	
Top Width (m)	102.73	Top Width (m)	7.30	62.61	32.81
Vel Total (m/s)	1.92	Avg. Vel. (m/s)		1.92	
Max Chl Dpth (m)	0.37	Hydr. Depth (m)		0.37	
Conv. Total (m3/s)	38.3	Conv. (m3/s)		38.3	
Length Wtd. (m)		Wetted Per. (m)		6.00	
Min Ch El (m)	179.90	Shear (N/m2)		45.06	
Alpha	1.00	Stream Power (N/m s)		86.31	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	180.51	Element	Left OB	Channel	Right OB
Vel Head (m)	0.20	Wt. n-Val.		0.030	
W.S. Elev (m)	180.30	Reach Len. (m)			
Crit W.S. (m)	180.30	Flow Area (m2)		2.42	
E.G. Slope (m/m)	0.012135	Area (m2)	0.68	21.46	7.83
Q Total (m3/s)	4.84	Flow (m3/s)		4.84	
Top Width (m)	104.82	Top Width (m)	9.40	62.61	32.81
Vel Total (m/s)	2.00	Avg. Vel. (m/s)		2.00	
Max Chl Dpth (m)	0.40	Hydr. Depth (m)		0.40	
Conv. Total (m3/s)	43.9	Conv. (m3/s)		43.9	
Length Wtd. (m)		Wetted Per. (m)		6.00	
Min Ch El (m)	179.90	Shear (N/m2)		47.93	
Alpha	1.00	Stream Power (N/m s)		95.99	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	180.56	Element	Left OB	Channel	Right OB
Vel Head (m)	0.22	Wt. n-Val.		0.030	
W.S. Elev (m)	180.34	Reach Len. (m)			
Crit W.S. (m)	180.34	Flow Area (m2)		2.61	
E.G. Slope (m/m)	0.011774	Area (m2)	1.02	23.51	8.90
Q Total (m3/s)	5.43	Flow (m3/s)		5.43	
Top Width (m)	106.96	Top Width (m)	11.54	62.61	32.81
Vel Total (m/s)	2.08	Avg. Vel. (m/s)		2.08	
Max Chl Dpth (m)	0.44	Hydr. Depth (m)		0.44	
Conv. Total (m3/s)	50.0	Conv. (m3/s)		50.0	

Length Wtd. (m)		Wetted Per. (m)	6.00
Min Ch El (m)	179.90	Shear (N/m2)	50.28
Alpha	1.00	Stream Power (N/m s)	104.49
Frctn Loss (m)		Cum Volume (1000 m3)	
C & E Loss (m)		Cum SA (1000 m2)	

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	180.68	Element	Left OB	Channel	Right OB
Vel Head (m)	0.26	Wt. n-Val.		0.030	
W.S. Elev (m)	180.42	Reach Len. (m)			
Crit W.S. (m)	180.42	Flow Area (m2)		3.11	
E.G. Slope (m/m)	0.011094	Area (m2)	2.23	28.73	11.64
Q Total (m3/s)	7.06	Flow (m3/s)		7.06	
Top Width (m)	112.95	Top Width (m)	17.53	62.61	32.81
Vel Total (m/s)	2.27	Avg. Vel. (m/s)		2.27	
Max Chl Dpth (m)	0.52	Hydr. Depth (m)		0.52	
Conv. Total (m3/s)	67.0	Conv. (m3/s)		67.0	
Length Wtd. (m)		Wetted Per. (m)		6.00	
Min Ch El (m)	179.90	Shear (N/m2)		56.46	
Alpha	1.00	Stream Power (N/m s)		128.01	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	180.34	Element	Left OB	Channel	Right OB
Vel Head (m)	0.15	Wt. n-Val.		0.030	
W.S. Elev (m)	180.19	Reach Len. (m)			
Crit W.S. (m)	180.19	Flow Area (m2)		1.75	
E.G. Slope (m/m)	0.013456	Area (m2)	0.04	14.55	4.21
Q Total (m3/s)	2.99	Flow (m3/s)		2.99	
Top Width (m)	97.61	Top Width (m)	2.19	62.61	32.81
Vel Total (m/s)	1.70	Avg. Vel. (m/s)		1.70	
Max Chl Dpth (m)	0.29	Hydr. Depth (m)		0.29	
Conv. Total (m3/s)	25.8	Conv. (m3/s)		25.8	
Length Wtd. (m)		Wetted Per. (m)		6.00	
Min Ch El (m)	179.90	Shear (N/m2)		38.60	
Alpha	1.00	Stream Power (N/m s)		65.76	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

SUMMARY OF MANNING'S N VALUES

River:Rouge

Reach	River Sta.	n1	n2	n3
WC15A	200	.035	.03	.035
WC15A	150	Culvert		
WC15A	100	.035	.03	.035

SUMMARY OF REACH LENGTHS

River: Rouge

Reach	River Sta.	Left	Channel	Right
WC15A	200	43.8	43.8	43.8
WC15A	150	Culvert		
WC15A	100	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Rouge

Reach	River Sta.	Contr.	Expan.
WC15A	200	.3	.5
WC15A	150	Culvert	
WC15A	100	.3	.5

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
WC15A	200	2-yr	1.50	179.98	180.31	180.20	180.34	0.003389	0.85	1.75	88.55	0.50
WC15A	200	5-yr	2.39	179.98	180.41	180.27	180.46	0.003156	1.01	2.37	98.11	0.51
WC15A	200	10-yr	3.47	179.98	180.52	180.34	180.58	0.003025	1.16	3.00	116.01	0.52
WC15A	200	25-yr	4.26	179.98	180.59	180.39	180.66	0.002948	1.24	3.42	130.60	0.53
WC15A	200	50-yr	4.84	179.98	180.63	180.42	180.72	0.002899	1.30	3.71	131.67	0.53
WC15A	200	100-yr	5.43	179.98	180.68	180.45	180.78	0.002850	1.36	4.00	132.72	0.53
WC15A	200	Check Flow	7.06	179.98	180.80	180.53	180.92	0.002737	1.49	4.74	139.76	0.54
WC15A	200	Regional	2.99	179.98	180.47	180.31	180.53	0.003082	1.09	2.73	102.41	0.52
WC15A	150		Culvert									
WC15A	100	2-yr	1.50	179.90	180.08	180.08	180.18	0.015634	1.35	1.11	70.27	1.00
WC15A	100	5-yr	2.39	179.90	180.15	180.15	180.28	0.014098	1.58	1.51	95.15	1.00
WC15A	100	10-yr	3.47	179.90	180.22	180.22	180.39	0.012880	1.78	1.94	99.67	1.00
WC15A	100	25-yr	4.26	179.90	180.27	180.27	180.46	0.012396	1.92	2.22	102.73	1.00
WC15A	100	50-yr	4.84	179.90	180.30	180.30	180.51	0.012135	2.00	2.42	104.82	1.01
WC15A	100	100-yr	5.43	179.90	180.34	180.34	180.56	0.011774	2.08	2.61	106.96	1.01
WC15A	100	Check Flow	7.06	179.90	180.42	180.42	180.68	0.011094	2.27	3.11	112.95	1.01
WC15A	100	Regional	2.99	179.90	180.19	180.19	180.34	0.013456	1.70	1.75	97.61	1.01

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (m)	W.S. Elev (m)	Vel Head (m)	Frctn Loss (m)	C & E Loss (m)	Q Left (m3/s)	Q Channel (m3/s)	Q Right (m3/s)	Top Width (m)
WC15A	200	2-yr	180.34	180.31	0.04				1.50		88.55
WC15A	200	5-yr	180.46	180.41	0.05				2.39		98.11
WC15A	200	10-yr	180.58	180.52	0.07				3.47		116.01
WC15A	200	25-yr	180.66	180.59	0.08				4.26		130.60
WC15A	200	50-yr	180.72	180.63	0.09				4.84		131.67
WC15A	200	100-yr	180.78	180.68	0.09				5.43		132.72
WC15A	200	Check Flow	180.92	180.80	0.11				7.06		139.76
WC15A	200	Regional	180.53	180.47	0.06				2.99		102.41
WC15A	150		Culvert								
WC15A	100	2-yr	180.18	180.08	0.09				1.50		70.27
WC15A	100	5-yr	180.28	180.15	0.13				2.39		95.15
WC15A	100	10-yr	180.39	180.22	0.16				3.47		99.67
WC15A	100	25-yr	180.46	180.27	0.19				4.26		102.73
WC15A	100	50-yr	180.51	180.30	0.20				4.84		104.82
WC15A	100	100-yr	180.56	180.34	0.22				5.43		106.96
WC15A	100	Check Flow	180.68	180.42	0.26				7.06		112.95
WC15A	100	Regional	180.34	180.19	0.15				2.99		97.61

Profile Output Table - Culvert Only

Reach	River Sta		Profile	E.G. US. (m)	W.S. US. (m)	E.G. IC (m)	E.G. OC (m)	Min El Weir Flow (m)	Q Culv Group (m3/s)	Q Weir (m3/s)	Delta WS (m)	Culv Vel US (m/s)	Culv Vel DS (m/s)
WC15A	150	Culvert #1	2-yr	180.35	180.31	180.31	180.35	181.40	1.50		0.22	0.99	1.24
WC15A	150	Culvert #1	5-yr	180.46	180.41	180.42	180.46	181.40	2.39		0.26	1.20	1.46
WC15A	150	Culvert #1	10-yr	180.58	180.52	180.53	180.58	181.40	3.47		0.29	1.39	1.67

WC15A	150	Culvert #1	25-yr	180.66	180.59	180.61	180.66	181.40	4.26	0.31	1.51	1.79
WC15A	150	Culvert #1	50-yr	180.72	180.63	180.66	180.72	181.40	4.84	0.33	1.59	1.87
WC15A	150	Culvert #1	100-yr	180.78	180.68	180.72	180.78	181.40	5.43	0.35	1.67	1.95
WC15A	150	Culvert #1	Check Flow	180.92	180.80	180.85	180.92	181.40	7.06	0.39	1.85	2.14
WC15A	150	Culvert #1	Regional	180.53	180.47	180.48	180.53	181.40	2.99	0.28	1.32	1.58

ROUGE RIVER

HEC-RAS ANALYSIS WC#15B

File: G:\TT4022\DRAWINGS\GENERAL\SHEETS\602282-S-HEC-ROU-1.DWG - Revised by <P006437C>: 9/26/2016 2:35 PM

POND ID 80

POND ID 81

EXISTING 407 ETR

PROPOSED 407 TWY

PROP CULV WC#15B
SPAN x RISE= (6.0 x 2.5)
L=40m, S=0.4%
U/S INV= 183.50
D/S INV= 183.35

EX TWIN CULV 2x (3.0 x 1.5)m

185.86 | 185.86 | ST 6521.30
185.14 | 185.14

185.00 | 184.97 | ST 6521.28
184.68 | 184.36

184.33 | 184.25 | ST 6521.25
184.21 | 183.99

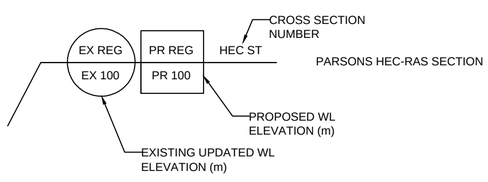
183.78 | 183.78 | ST 6521.24
183.54 | 183.54

COPPER CREEK DR

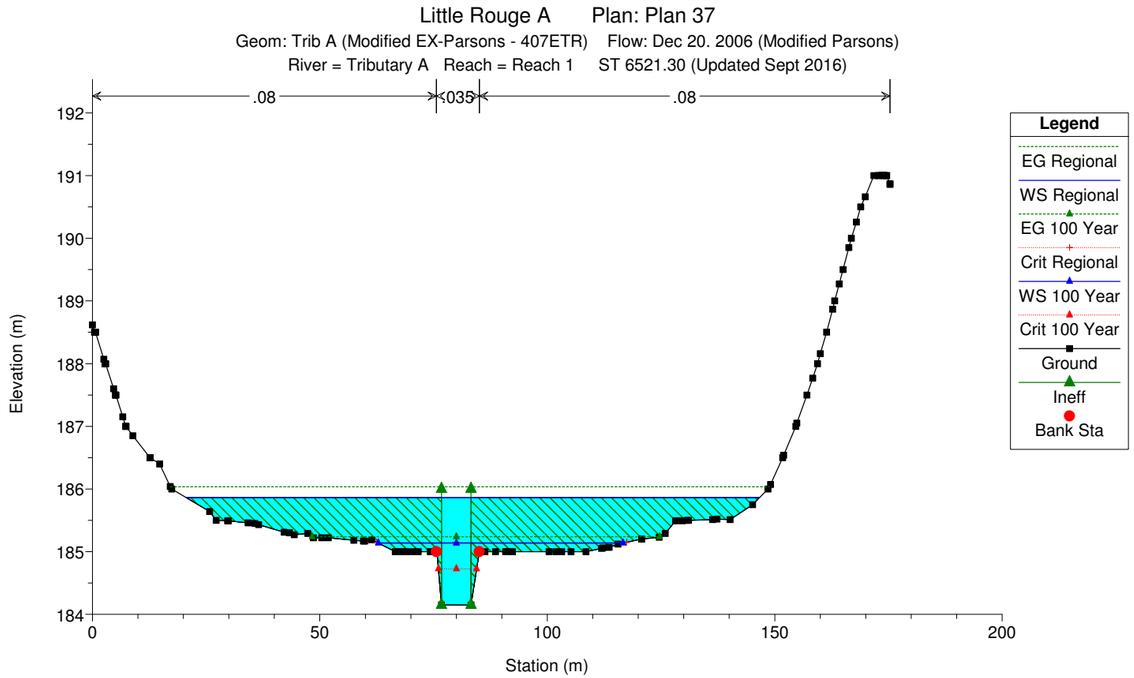
LEGEND

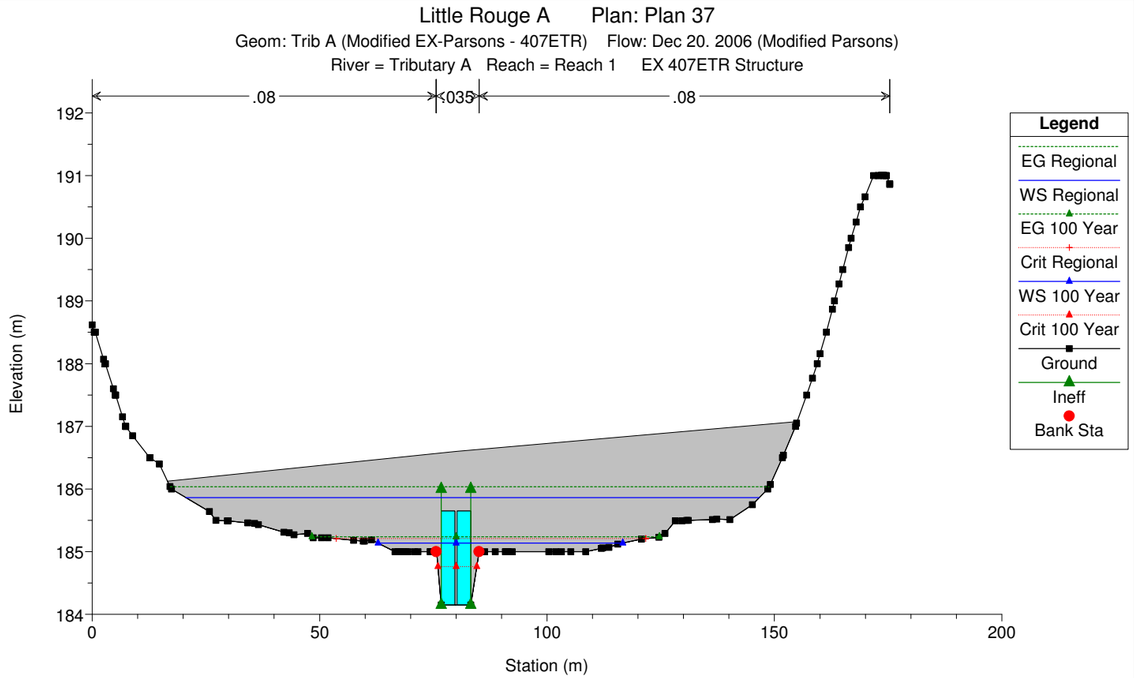
- EXISTING 407 ETR
- PROPOSED 407 TWY
- CREEK FLOW DIRECTION
- EXISTING CULVERT
- PROPOSED CULVERT
- PROPOSED 407 TWY BRIDGE
- EXISTING TRCA FLOODLINE
- PROPOSED REGIONAL FLOODLINE

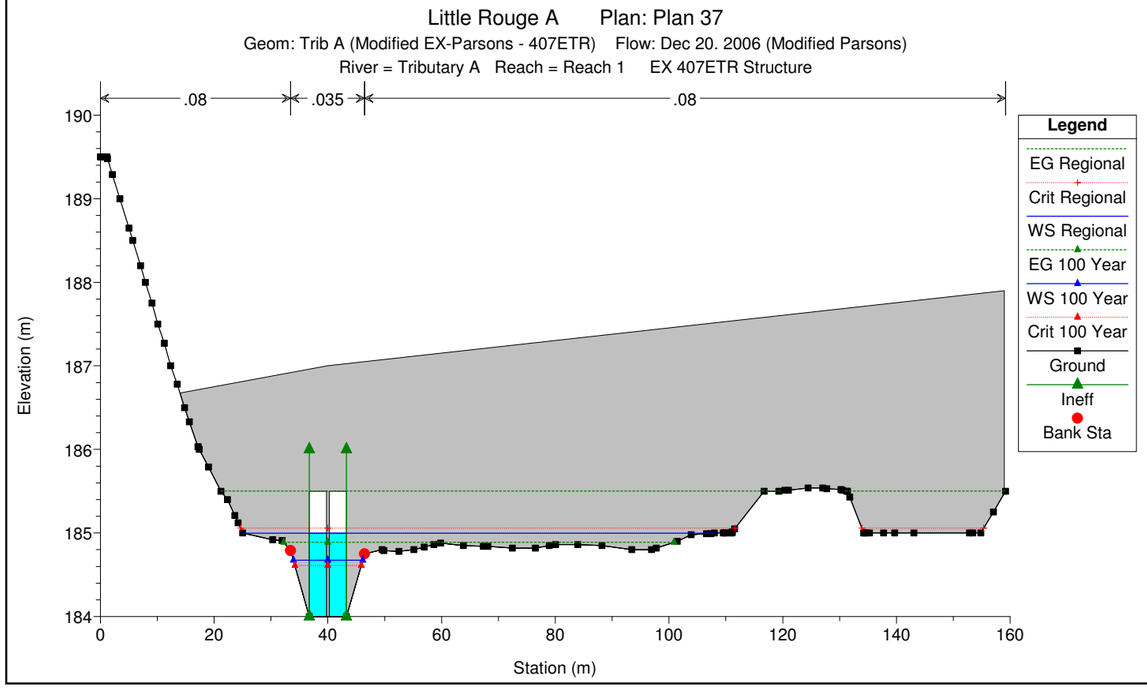
NOTE: MODIFIED EXISTING AND PROPOSED FLOODLINE ARE SIMILAR

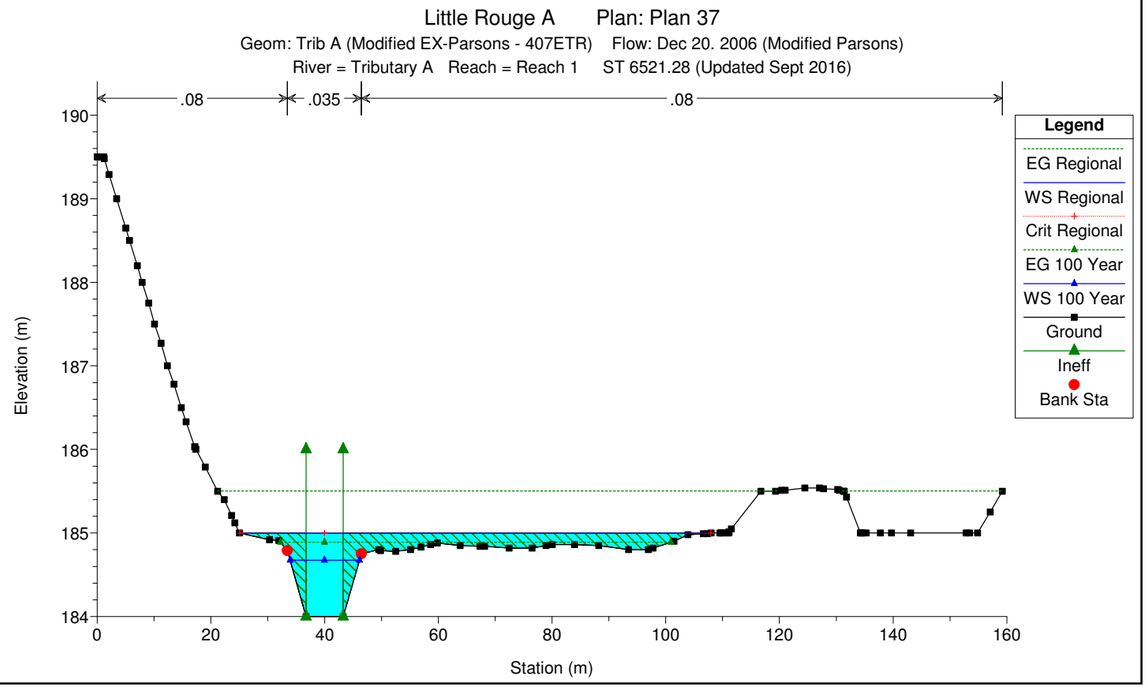


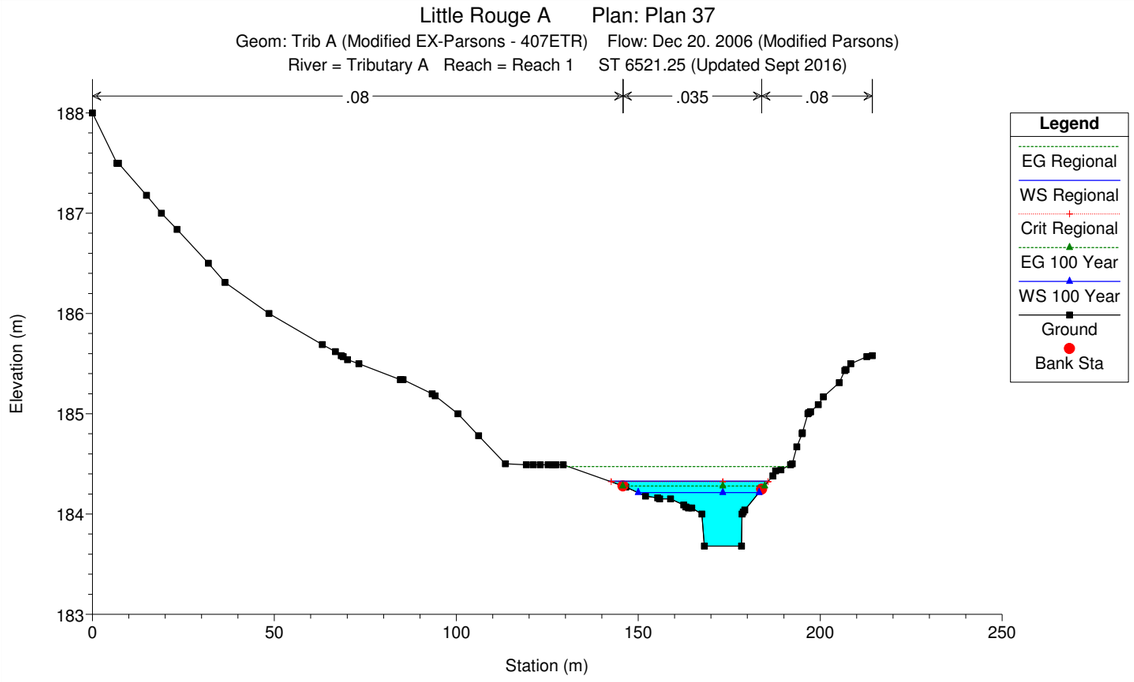
DATE: SEPTEMBER 2016	Ontario	PARSONS	407 TRANSITWAY FROM KENNEDY RD TO BROCK RD
SCALE: 1:1000		625 COCHRANE DRIVE, SUITE 500 MARKHAM, ONTARIO L3R 9R9 TEL: 905-943-0500 FAX: 905-943-0400	FIGURE 6.8 - PROPOSED FLOODPLAIN MAPPING - ROUGE RIVER (WC#15B)

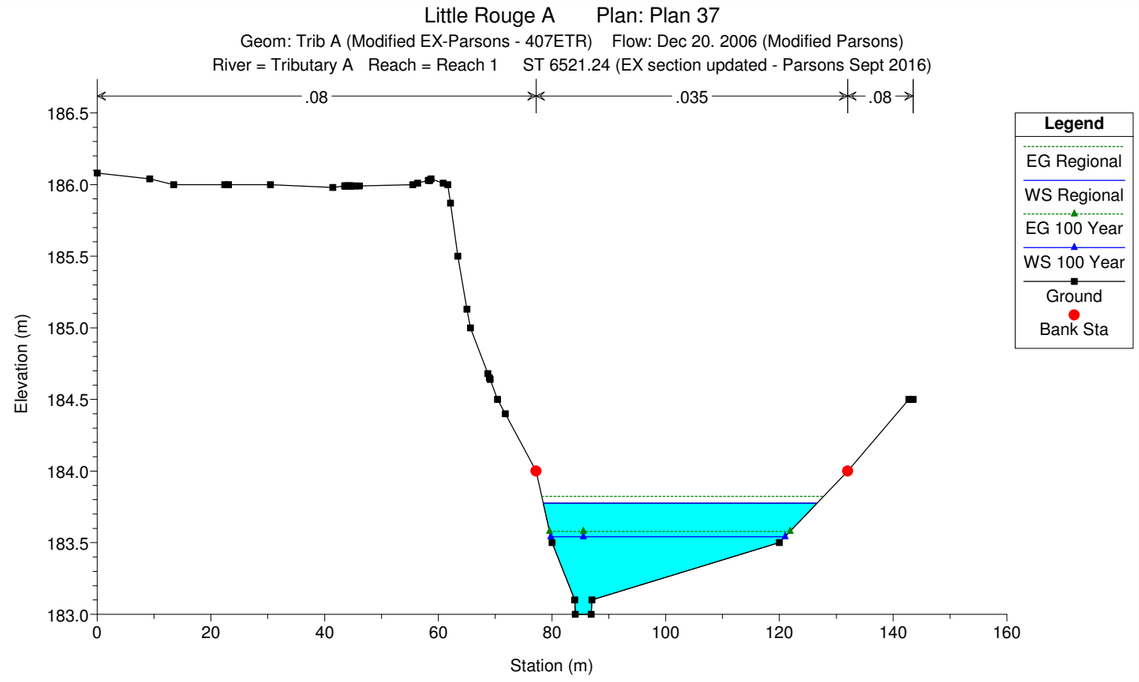

Little Rouge A Plan: Plan 37
Geom: Trib A (Modified EX-Parsons - 407ETR) Flow: Dec 20. 2006 (Modified Parsons)
River = Tributary A Reach = Reach 1 ST 6521.30 (Updated Sept 2016)
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100 Year
Crit Regional
WS 100 Year
Crit 100 Year
Ground
Ineff
Bank Sta


Little Rouge A Plan: Plan 37
Geom: Trib A (Modified EX-Parsons - 407ETR) Flow: Dec 20. 2006 (Modified Parsons)
River = Tributary A Reach = Reach 1 EX 407ETR Structure
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100 Year
Crit Regional
WS 100 Year
Crit 100 Year
Ground
Ineff
Bank Sta


Little Rouge A Plan: Plan 37
Geom: Trib A (Modified EX-Parsons - 407ETR) Flow: Dec 20. 2006 (Modified Parsons)
River = Tributary A Reach = Reach 1 EX 407ETR Structure
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
Crit Regional
WS Regional
EG 100 Year
WS 100 Year
Crit 100 Year
Ground
Ineff
Bank Sta


Little Rouge A Plan: Plan 37
Geom: Trib A (Modified EX-Parsons - 407ETR) Flow: Dec 20. 2006 (Modified Parsons)
River = Tributary A Reach = Reach 1 ST 6521.28 (Updated Sept 2016)
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100 Year
WS 100 Year
Ground
Ineff
Bank Sta


Little Rouge A Plan: Plan 37
Geom: Trib A (Modified EX-Parsons - 407ETR) Flow: Dec 20. 2006 (Modified Parsons)
River = Tributary A Reach = Reach 1 ST 6521.25 (Updated Sept 2016)
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100 Year
WS 100 Year
Ground
Bank Sta


Little Rouge A Plan: Plan 37
Geom: Trib A (Modified EX-Parsons - 407ETR) Flow: Dec 20. 2006 (Modified Parsons)
River = Tributary A Reach = Reach 1 ST 6521.24 (EX section updated - Parsons Sept 2016)
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100 Year
WS 100 Year
Ground
Bank Sta

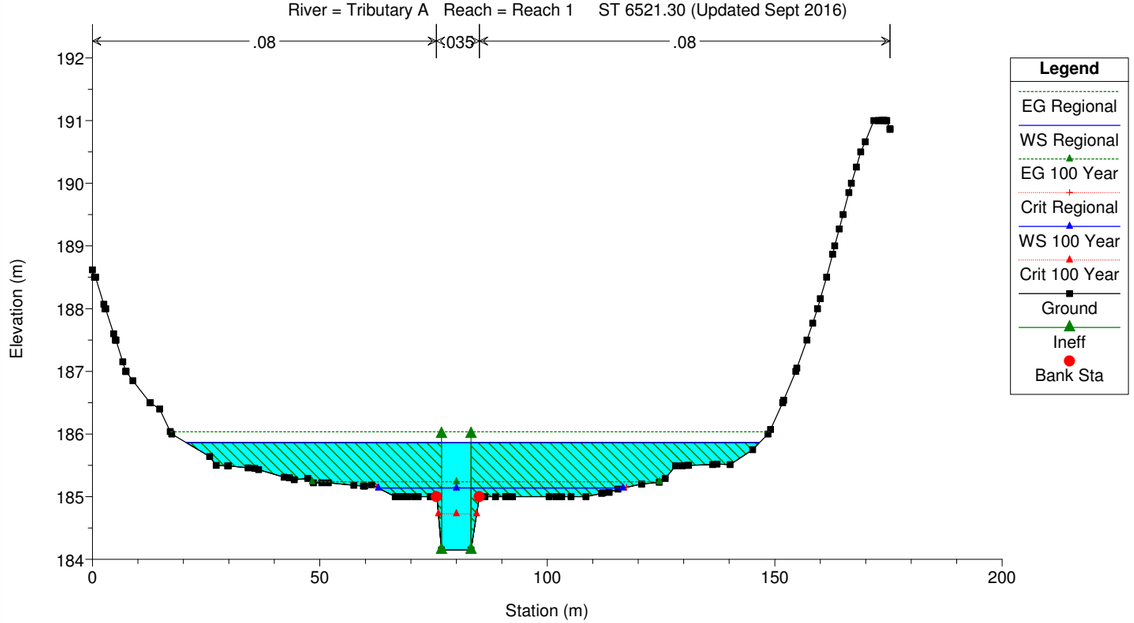
HEC-RAS Plan: WC15B - EX River: Tributary A Reach: Reach 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Reach 1	6521.3	Regional	20.42	184.15	185.86	185.15	186.03	0.002016	1.84	11.13	126.02	0.45
Reach 1	6521.3	100 Year	8.95	184.15	185.14	184.73	185.24	0.002424	1.39	6.42	53.85	0.45
Reach 1	6521.3	50 Year	7.73	184.15	185.05	184.67	185.14	0.002505	1.33	5.82	46.28	0.45
Reach 1	6521.3	25 Year	6.55	184.15	184.95	184.62	185.03	0.002600	1.26	5.21	9.13	0.45
Reach 1	6521.3	10 Year	5.04	184.15	184.82	184.54	184.89	0.002756	1.15	4.37	8.71	0.45
Reach 1	6521.3	5 Year	3.91	184.15	184.72	184.48	184.78	0.002917	1.06	3.69	8.37	0.45
Reach 1	6521.3	2 Year	2.39	184.15	184.56	184.39	184.60	0.003349	0.91	2.64	7.83	0.45
Reach 1	6521.285		Culvert									
Reach 1	6521.28	Regional	20.42	184.00	185.00	185.00	185.50	0.012156	3.15	6.49	82.78	1.01
Reach 1	6521.28	100 Year	8.95	184.00	184.68		184.89	0.008610	2.04	4.39	12.20	0.79
Reach 1	6521.28	50 Year	7.73	184.00	184.63		184.81	0.008038	1.88	4.10	11.83	0.76
Reach 1	6521.28	25 Year	6.55	184.00	184.58		184.74	0.007541	1.73	3.79	11.42	0.72
Reach 1	6521.28	10 Year	5.04	184.00	184.50		184.62	0.007521	1.56	3.24	10.71	0.70
Reach 1	6521.28	5 Year	3.91	184.00	184.42		184.52	0.008108	1.44	2.72	10.03	0.71
Reach 1	6521.28	2 Year	2.39	184.00	184.30		184.38	0.009230	1.23	1.95	9.03	0.72
Reach 1	6521.25	Regional	20.42	183.68	184.33	184.32	184.47	0.016608	1.70	12.18	43.73	0.97
Reach 1	6521.25	100 Year	8.95	183.68	184.21		184.28	0.011111	1.14	7.83	33.26	0.75
Reach 1	6521.25	50 Year	7.73	183.68	184.19		184.25	0.010287	1.07	7.20	31.64	0.72
Reach 1	6521.25	25 Year	6.55	183.68	184.16		184.22	0.009727	1.05	6.22	26.93	0.70
Reach 1	6521.25	10 Year	5.04	183.68	184.10		184.15	0.008286	1.05	4.79	18.37	0.66
Reach 1	6521.25	5 Year	3.91	183.68	184.04		184.09	0.006788	1.01	3.87	13.50	0.60
Reach 1	6521.25	2 Year	2.39	183.68	183.95		183.99	0.005061	0.83	2.89	10.93	0.51
Reach 1	6521.24	Regional	20.42	183.00	183.78		183.82	0.003484	0.97	21.06	48.16	0.47
Reach 1	6521.24	100 Year	8.95	183.00	183.54		183.58	0.005408	0.85	10.57	41.23	0.53
Reach 1	6521.24	50 Year	7.73	183.00	183.51		183.55	0.005796	0.82	9.40	40.38	0.54
Reach 1	6521.24	25 Year	6.55	183.00	183.48		183.52	0.005985	0.79	8.28	38.57	0.55
Reach 1	6521.24	10 Year	5.04	183.00	183.44		183.47	0.006531	0.77	6.57	34.23	0.56
Reach 1	6521.24	5 Year	3.91	183.00	183.39		183.42	0.007559	0.76	5.13	30.08	0.59
Reach 1	6521.24	2 Year	2.39	183.00	183.32		183.35	0.010080	0.76	3.16	23.24	0.66

Little Rouge A Plan: Plan 38

Geom: Trib A and Trib D (PROP - 407ETR) Flow: Dec 20. 2006 (Modified Parsons)

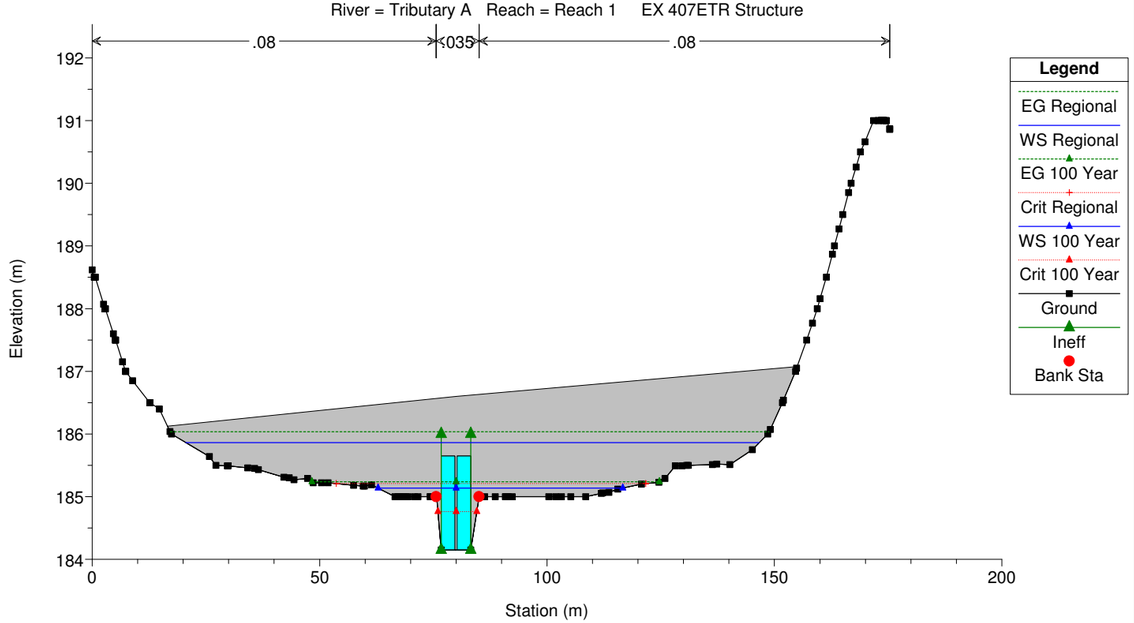
River = Tributary A Reach = Reach 1 ST 6521.30 (Updated Sept 2016)



Little Rouge A Plan: Plan 38

Geom: Trib A and Trib D (PROP - 407ETR) Flow: Dec 20. 2006 (Modified Parsons)

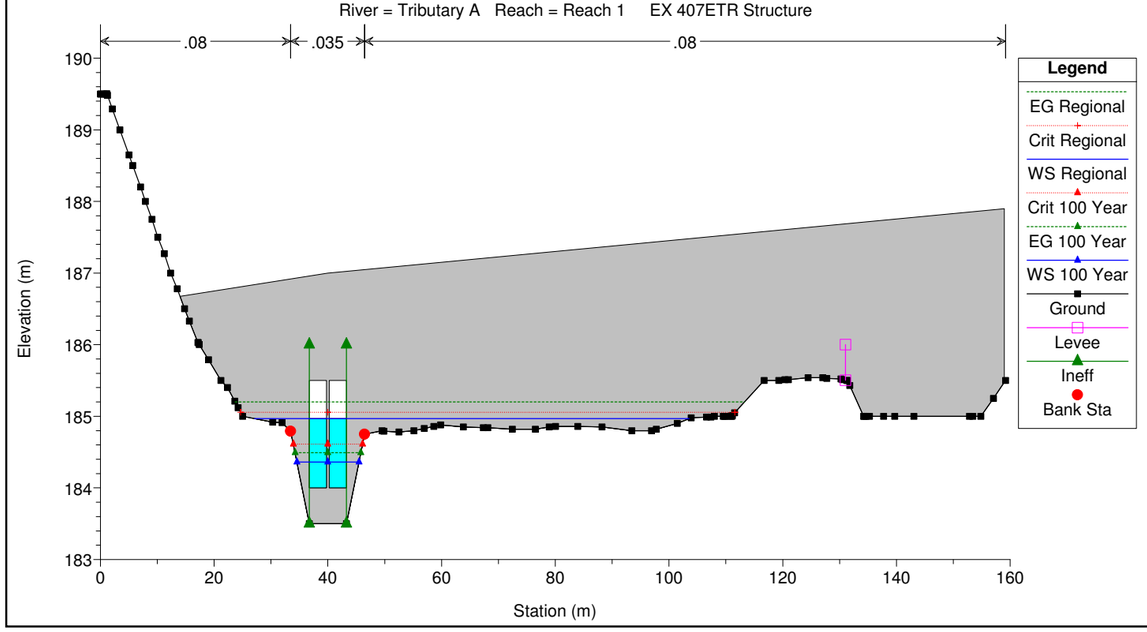
River = Tributary A Reach = Reach 1 EX 407ETR Structure



Little Rouge A Plan: Plan 38

Geom: Trib A and Trib D (PROP - 407ETR) Flow: Dec 20. 2006 (Modified Parsons)

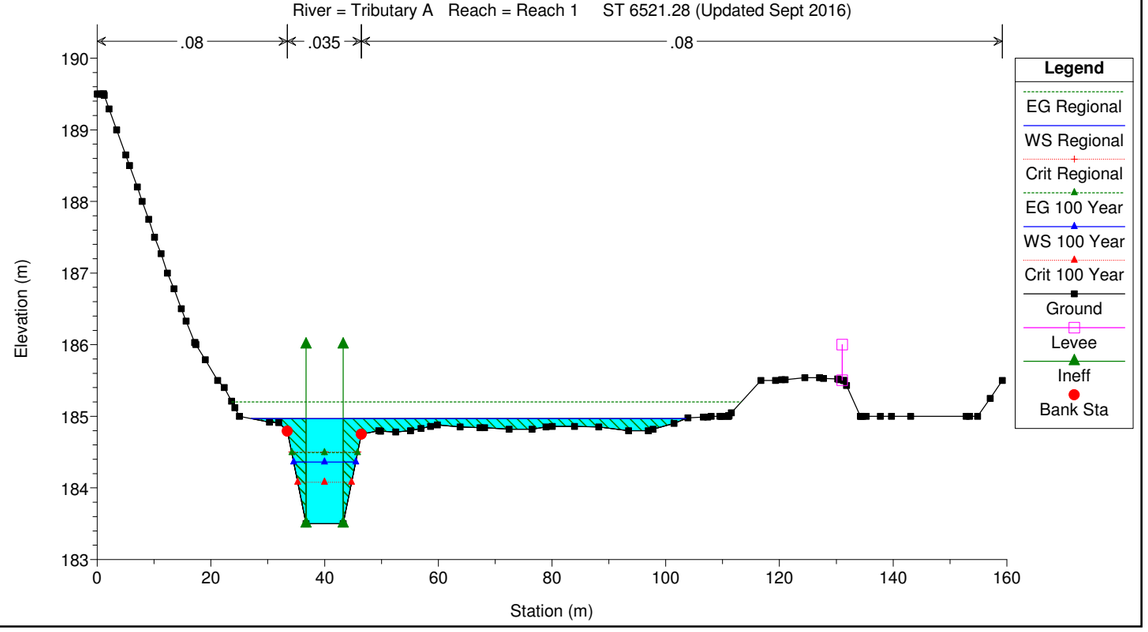
River = Tributary A Reach = Reach 1 EX 407ETR Structure

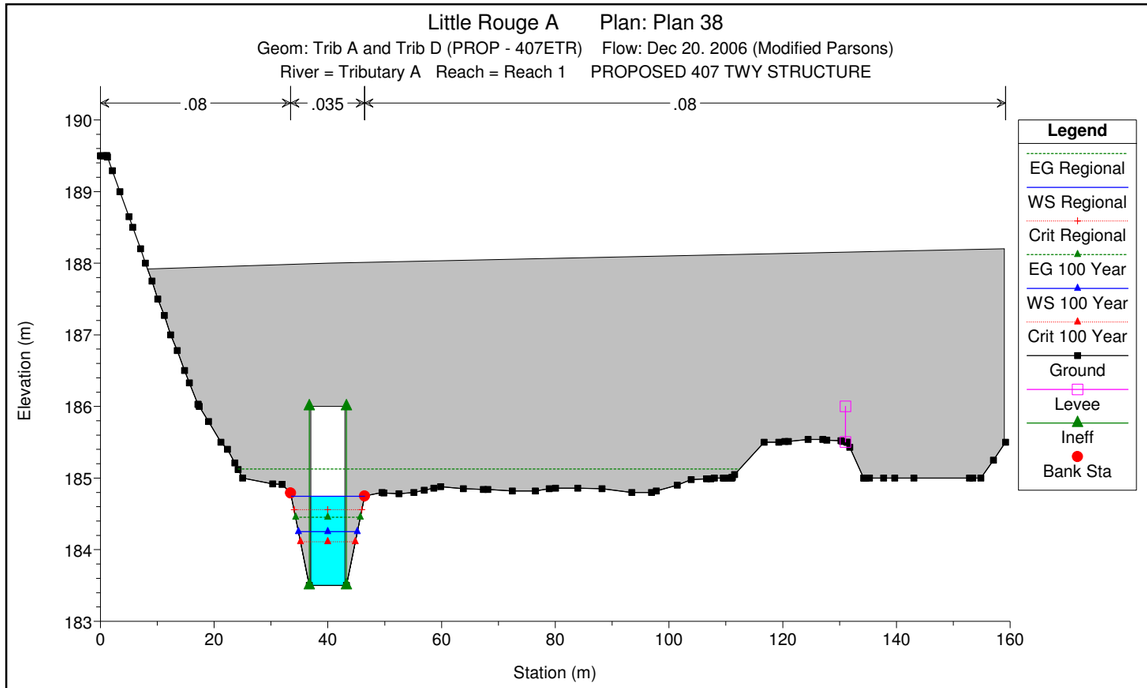


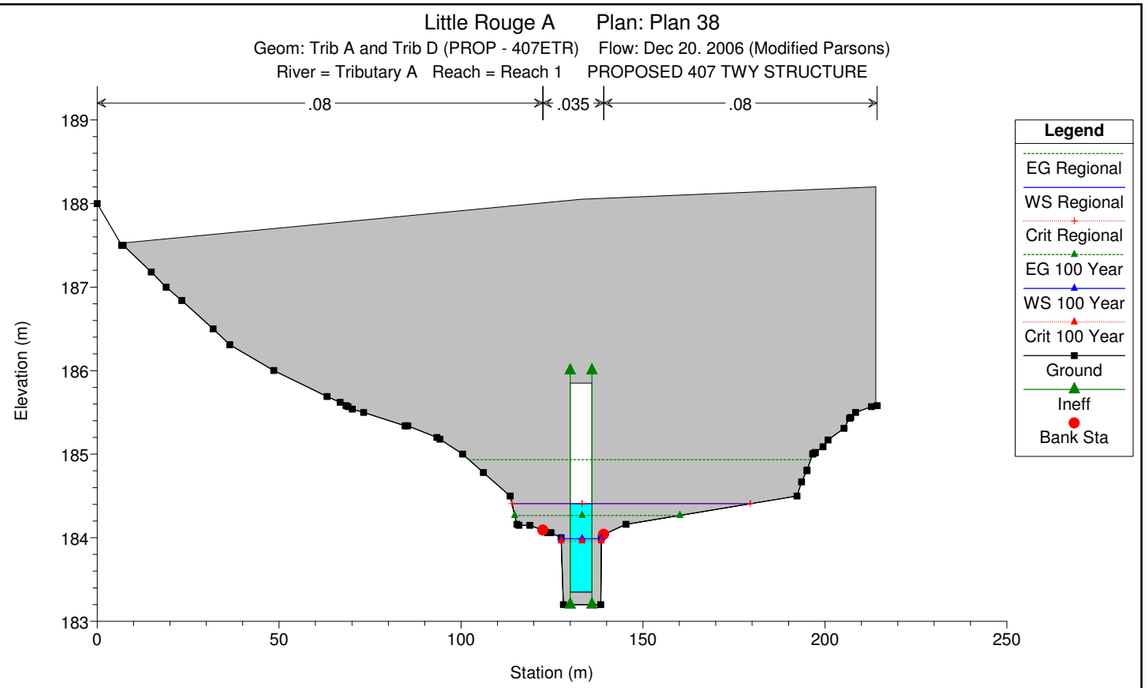
Little Rouge A Plan: Plan 38

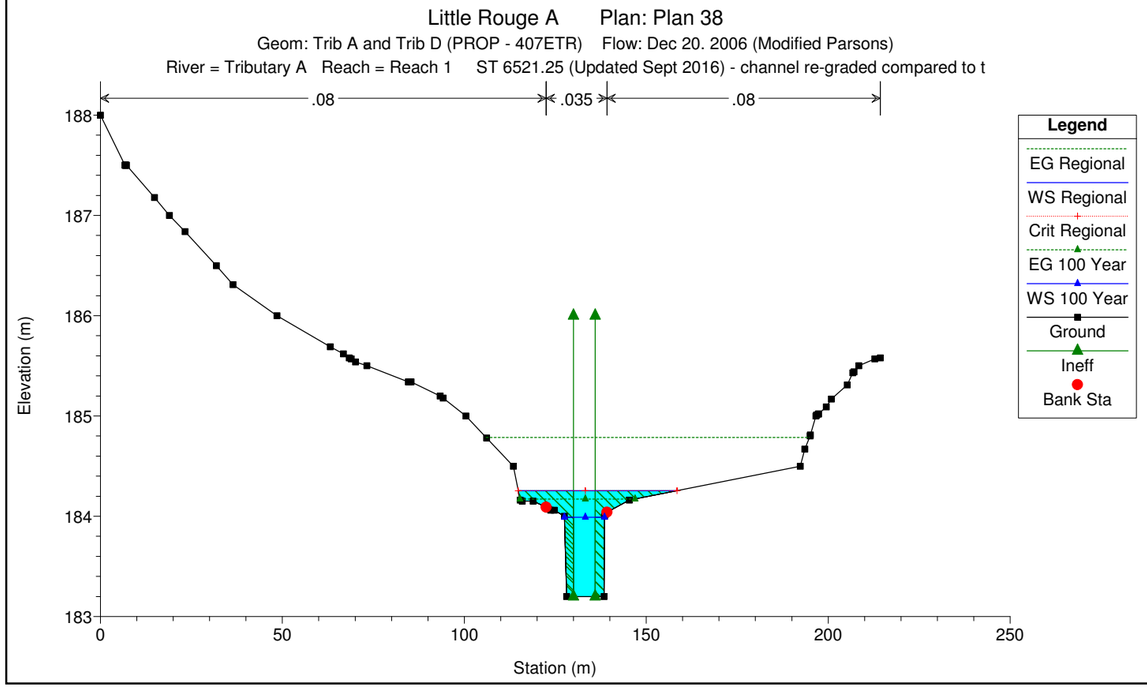
Geom: Trib A and Trib D (PROP - 407ETR) Flow: Dec 20. 2006 (Modified Parsons)

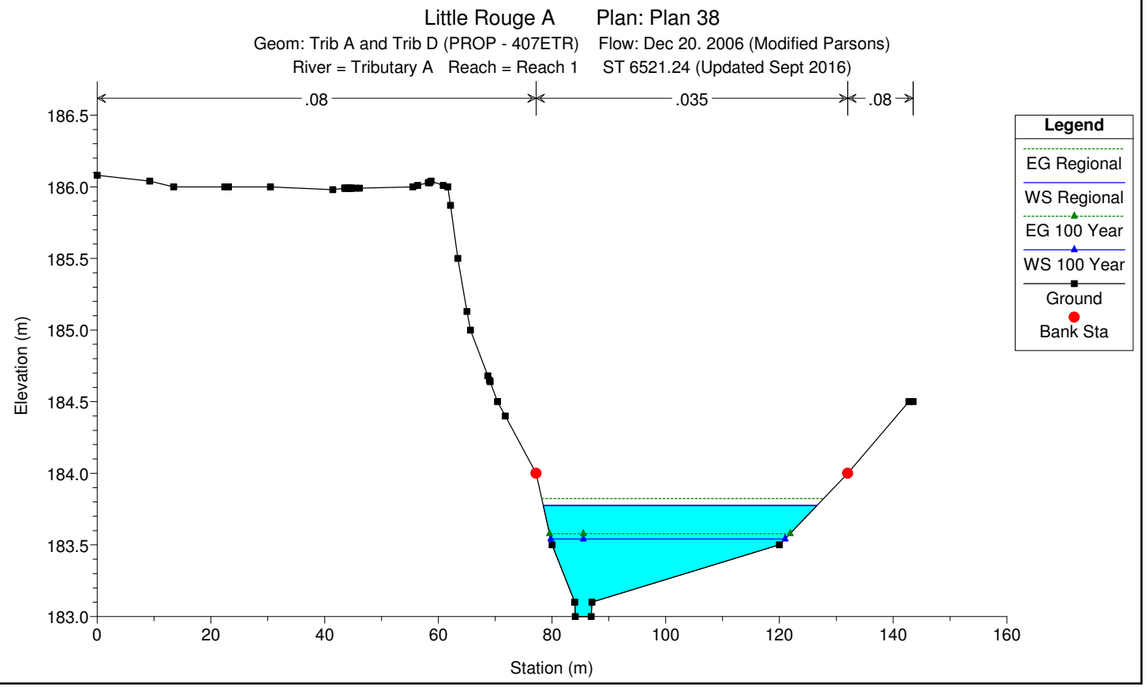
River = Tributary A Reach = Reach 1 ST 6521.28 (Updated Sept 2016)




Little Rouge A Plan: Plan 38
Geom: Trib A and Trib D (PROP - 407ETR) Flow: Dec 20. 2006 (Modified Parsons)
River = Tributary A Reach = Reach 1 PROPOSED 407 TWY STRUCTURE
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100 Year
WS 100 Year
Crit 100 Year
Ground
Levee
Ineff
Bank Sta


Little Rouge A Plan: Plan 38
Geom: Trib A and Trib D (PROP - 407ETR) Flow: Dec 20. 2006 (Modified Parsons)
River = Tributary A Reach = Reach 1 PROPOSED 407 TWY STRUCTURE
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100 Year
WS 100 Year
Crit 100 Year
Ground
Ineff
Bank Sta


Little Rouge A Plan: Plan 38
Geom: Trib A and Trib D (PROP - 407ETR) Flow: Dec 20. 2006 (Modified Parsons)
River = Tributary A Reach = Reach 1 ST 6521.25 (Updated Sept 2016) - channel re-graded compared to t
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100 Year
WS 100 Year
Ground
Ineff
Bank Sta


Little Rouge A Plan: Plan 38
Geom: Trib A and Trib D (PROP - 407ETR) Flow: Dec 20. 2006 (Modified Parsons)
River = Tributary A Reach = Reach 1 ST 6521.24 (Updated Sept 2016)
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100 Year
WS 100 Year
Ground
Bank Sta

HEC-RAS Plan: WC15B - PROP

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Tributary A	Reach 1	6521.3	Regional	20.42	184.15	185.86	185.15	186.03	0.002016	1.84	11.13	126.02	0.45
Tributary A	Reach 1	6521.3	100 Year	8.95	184.15	185.14	184.73	185.24	0.002424	1.39	6.42	53.85	0.45
Tributary A	Reach 1	6521.3	50 Year	7.73	184.15	185.05	184.67	185.14	0.002505	1.33	5.82	46.28	0.45
Tributary A	Reach 1	6521.3	25 Year	6.55	184.15	184.95	184.62	185.03	0.002600	1.26	5.21	9.13	0.45
Tributary A	Reach 1	6521.3	10 Year	5.04	184.15	184.82	184.54	184.89	0.002756	1.15	4.37	8.71	0.45
Tributary A	Reach 1	6521.3	5 Year	3.91	184.15	184.72	184.48	184.78	0.002917	1.06	3.69	8.37	0.45
Tributary A	Reach 1	6521.3	2 Year	2.39	184.15	184.56	184.39	184.60	0.003348	0.91	2.64	7.83	0.45
Tributary A	Reach 1	6521.285		Culvert									
Tributary A	Reach 1	6521.28	Regional	20.42	183.50	184.97	184.50	185.20	0.003357	2.14	9.55	76.49	0.56
Tributary A	Reach 1	6521.28	100 Year	8.95	183.50	184.36	184.08	184.49	0.003801	1.60	5.61	10.92	0.55
Tributary A	Reach 1	6521.28	50 Year	7.73	183.50	184.29	184.02	184.40	0.003868	1.51	5.11	10.52	0.55
Tributary A	Reach 1	6521.28	25 Year	6.55	183.50	184.21	183.97	184.31	0.003936	1.42	4.60	10.12	0.54
Tributary A	Reach 1	6521.28	10 Year	5.04	183.50	184.10	183.89	184.19	0.004043	1.29	3.90	9.57	0.53
Tributary A	Reach 1	6521.28	5 Year	3.91	183.50	184.01	183.83	184.08	0.004126	1.17	3.33	9.12	0.52
Tributary A	Reach 1	6521.28	2 Year	2.39	183.50	183.88	183.74	183.93	0.004291	0.98	2.45	8.43	0.51
Tributary A	Reach 1	6521.255		Culvert									
Tributary A	Reach 1	6521.25	Regional	20.42	183.20	184.25	184.25	184.79	0.011884	3.23	6.33	43.61	1.00
Tributary A	Reach 1	6521.25	100 Year	8.95	183.20	183.99		184.17	0.005987	1.89	4.74	11.04	0.68
Tributary A	Reach 1	6521.25	50 Year	7.73	183.20	183.96		184.10	0.005154	1.70	4.54	11.01	0.63
Tributary A	Reach 1	6521.25	25 Year	6.55	183.20	183.91		184.03	0.004493	1.53	4.28	10.96	0.58
Tributary A	Reach 1	6521.25	10 Year	5.04	183.20	183.85		183.93	0.003661	1.30	3.89	10.89	0.51
Tributary A	Reach 1	6521.25	5 Year	3.91	183.20	183.79		183.85	0.003007	1.10	3.54	10.84	0.46
Tributary A	Reach 1	6521.25	2 Year	2.39	183.20	183.69		183.72	0.002163	0.82	2.91	10.73	0.38
Tributary A	Reach 1	6521.24	Regional	20.42	183.00	183.78		183.82	0.003484	0.97	21.06	48.16	0.47
Tributary A	Reach 1	6521.24	100 Year	8.95	183.00	183.54		183.58	0.005408	0.85	10.57	41.23	0.53
Tributary A	Reach 1	6521.24	50 Year	7.73	183.00	183.51		183.55	0.005796	0.82	9.40	40.38	0.54
Tributary A	Reach 1	6521.24	25 Year	6.55	183.00	183.48		183.52	0.005985	0.79	8.28	38.57	0.55
Tributary A	Reach 1	6521.24	10 Year	5.04	183.00	183.44		183.47	0.006531	0.77	6.57	34.23	0.56
Tributary A	Reach 1	6521.24	5 Year	3.91	183.00	183.39		183.42	0.007559	0.76	5.13	30.08	0.59
Tributary A	Reach 1	6521.24	2 Year	2.39	183.00	183.32		183.35	0.010080	0.76	3.16	23.24	0.66

ROUGE RIVER

HEC-RAS ANALYSIS WC#15C

File: G:\TT4022\DRAWINGS\GENERAL\SHEETS\602282-S-HEC-ROU-1.DWG - Revised by <P006437C>: 9/29/2016 4:15 PM

POND ID 81

EXISTING 407 ETR

PROPOSED 407 TWY

PROP CULV WC#15C
SPAN x RISE= (6.0 x 2.5)
L=47m, S=0.3%
U/S INV= 184.45
D/S INV= 184.33

EX TWIN CULV 2.4m x 1.8m

186.66	186.66	ST 6523.33
186.01	186.01	
185.64	185.78	ST 6523.32
185.42	185.45	
185.72	185.74	ST 6523.31
185.44	185.44	
185.67	185.63	ST 6523.30
185.42	185.42	
185.61	185.61	ST 6523.29
185.40	185.40	
185.59	185.59	ST 6523.28
185.40	185.40	

LEGEND

- EXISTING 407 ETR
- PROPOSED 407 TWY
- CREEK FLOW DIRECTION
- EXISTING CULVERT
- PROPOSED CULVERT
- EXISTING TRCA FLOODLINE
- PROPOSED REGIONAL FLOODLINE

EX REG / EX 100 | PR REG / PR 100 | HEC ST

- CROSS SECTION NUMBER
- PARSONS HEC-RAS SECTION
- PROPOSED WL ELEVATION (m)
- EXISTING UPDATED WL ELEVATION (m)

DATE: SEPTEMBER 2016

SCALE: 1:1000

Ontario

PARSONS
625 COCHRANE DRIVE, SUITE 500
MARKHAM, ONTARIO L3R 9R9
TEL: 905-943-0500
FAX: 905-943-0400

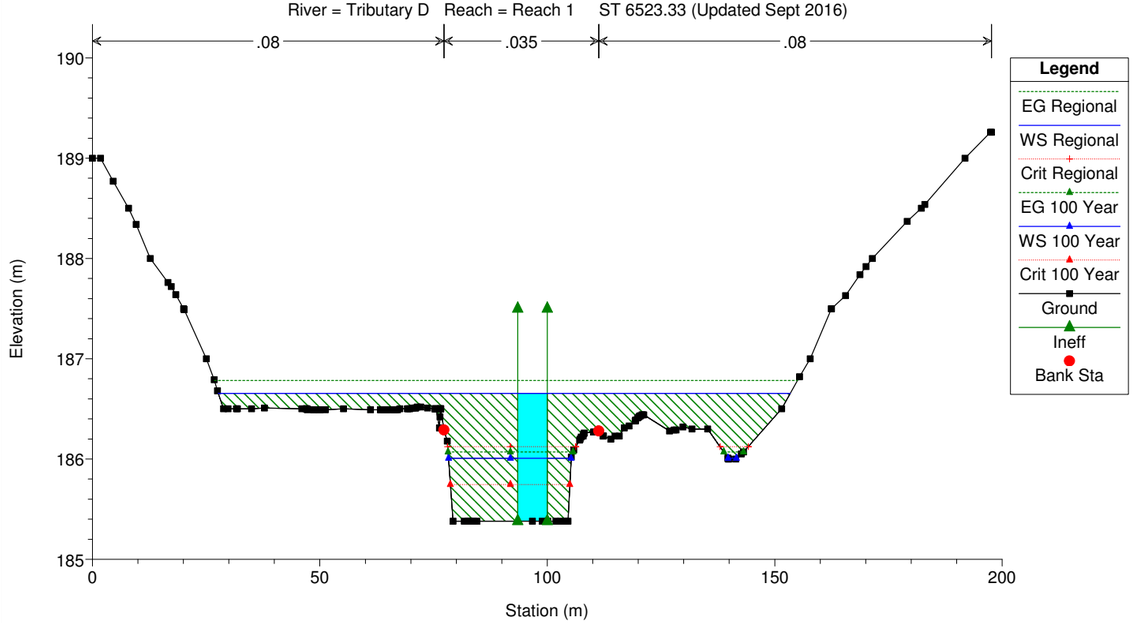
407 TRANSITWAY FROM KENNEDY RD TO BROCK RD

FIGURE 6.9 - PROPOSED FLOODPLAIN MAPPING - ROUGE RIVER (WC#15C)

Little Rouge A Plan: 1) WC15C- PROP

Geom: Trib A (Modified EX-Parsons - 407ETR) Flow: Dec 20. 2006 (Modified Parsons)

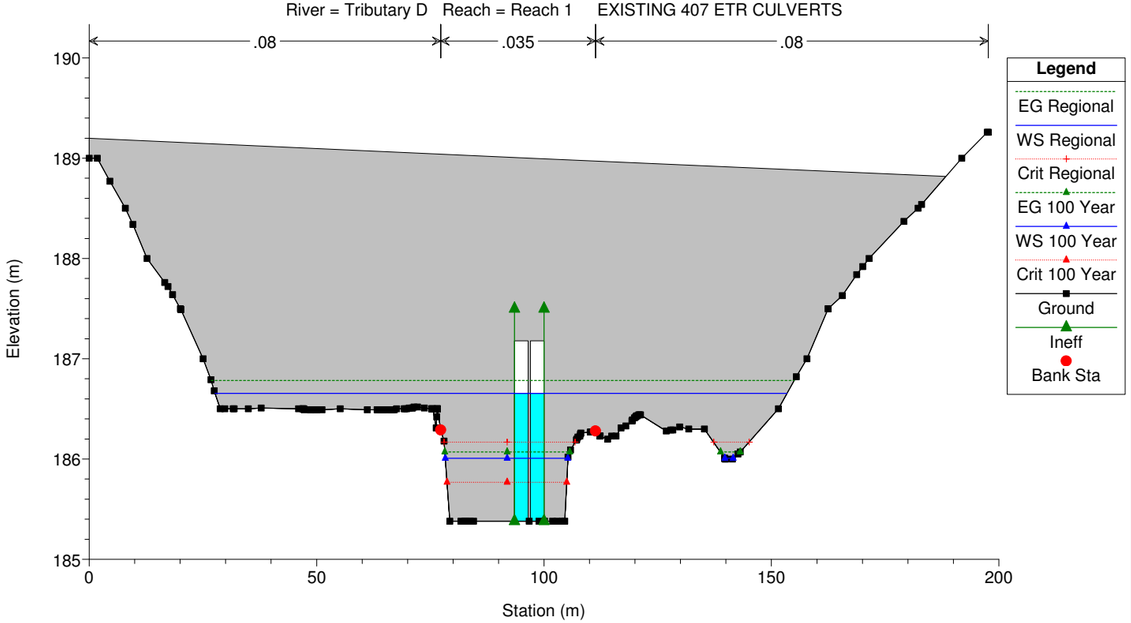
River = Tributary D Reach = Reach 1 ST 6523.33 (Updated Sept 2016)



Little Rouge A Plan: 1) WC15C- PROP

Geom: Trib A (Modified EX-Parsons - 407ETR) Flow: Dec 20. 2006 (Modified Parsons)

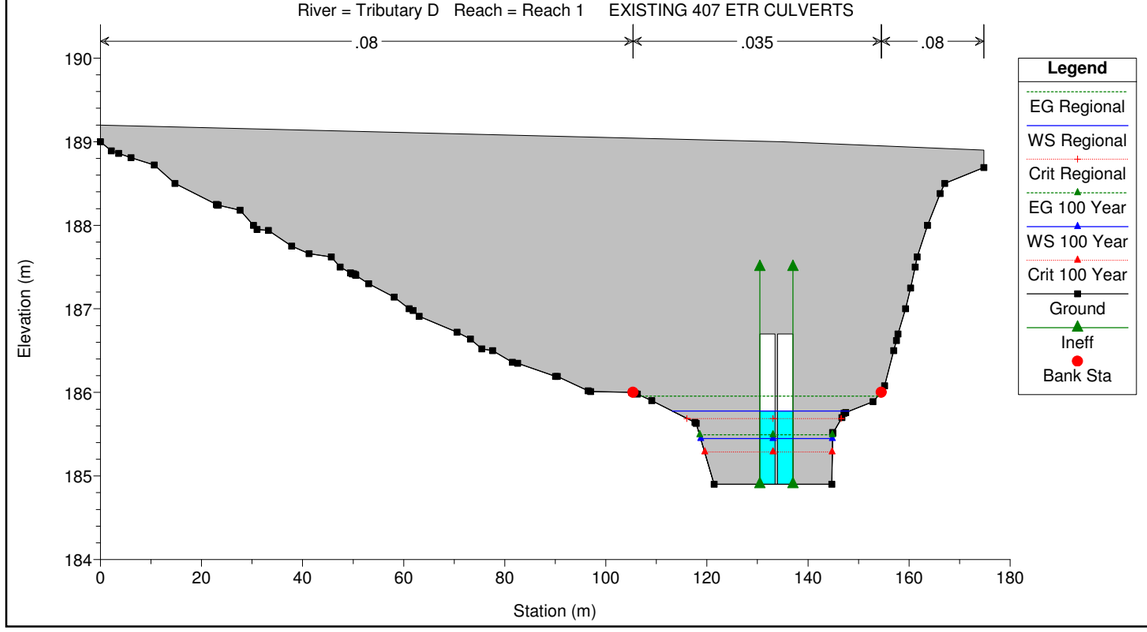
River = Tributary D Reach = Reach 1 EXISTING 407 ETR CULVERTS



Little Rouge A Plan: 1) WC15C- PROP

Geom: Trib A (Modified EX-Parsons - 407ETR) Flow: Dec 20. 2006 (Modified Parsons)

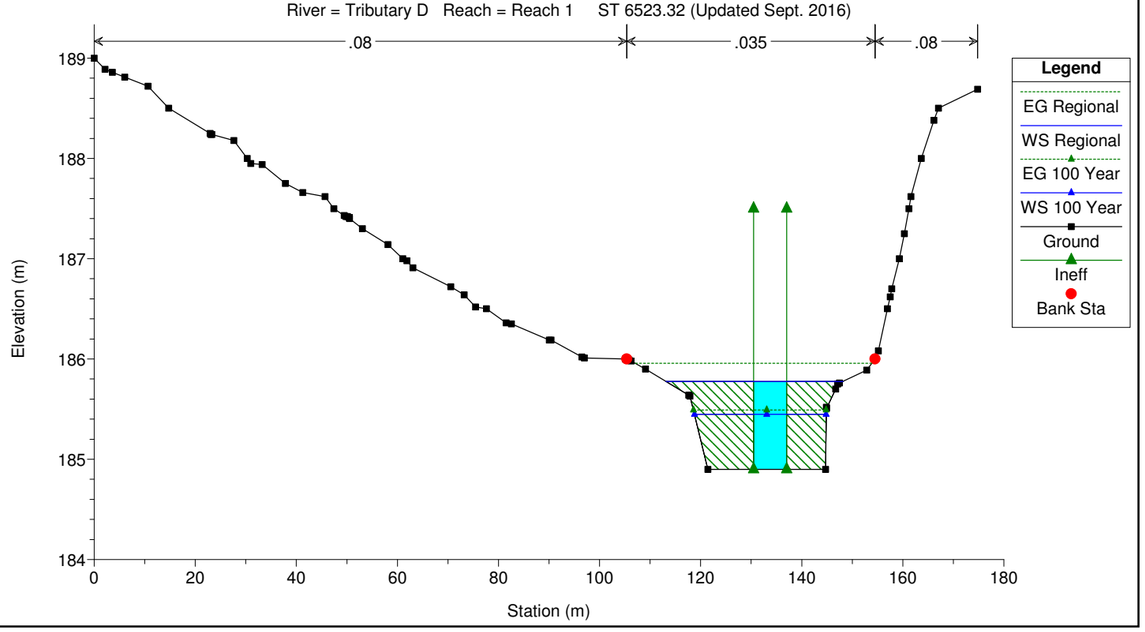
River = Tributary D Reach = Reach 1 EXISTING 407 ETR CULVERTS



Little Rouge A Plan: 1) WC15C- PROP

Geom: Trib A (Modified EX-Parsons - 407ETR) Flow: Dec 20. 2006 (Modified Parsons)

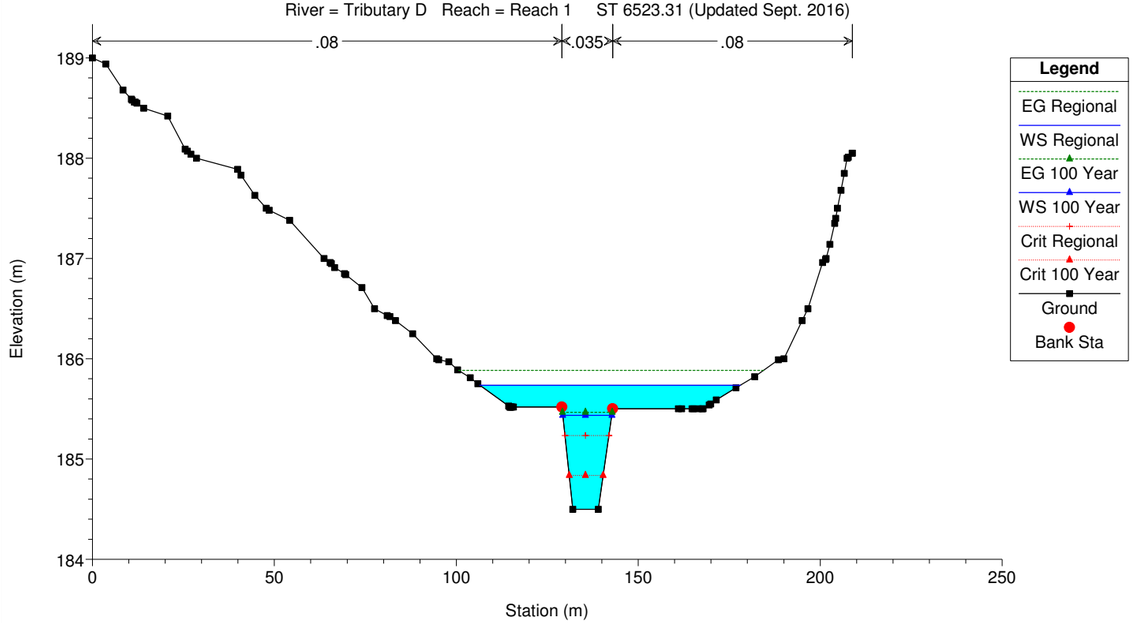
River = Tributary D Reach = Reach 1 ST 6523.32 (Updated Sept. 2016)



Little Rouge A Plan: 1) WC15C- PROP

Geom: Trib A (Modified EX-Parsons - 407ETR) Flow: Dec 20. 2006 (Modified Parsons)

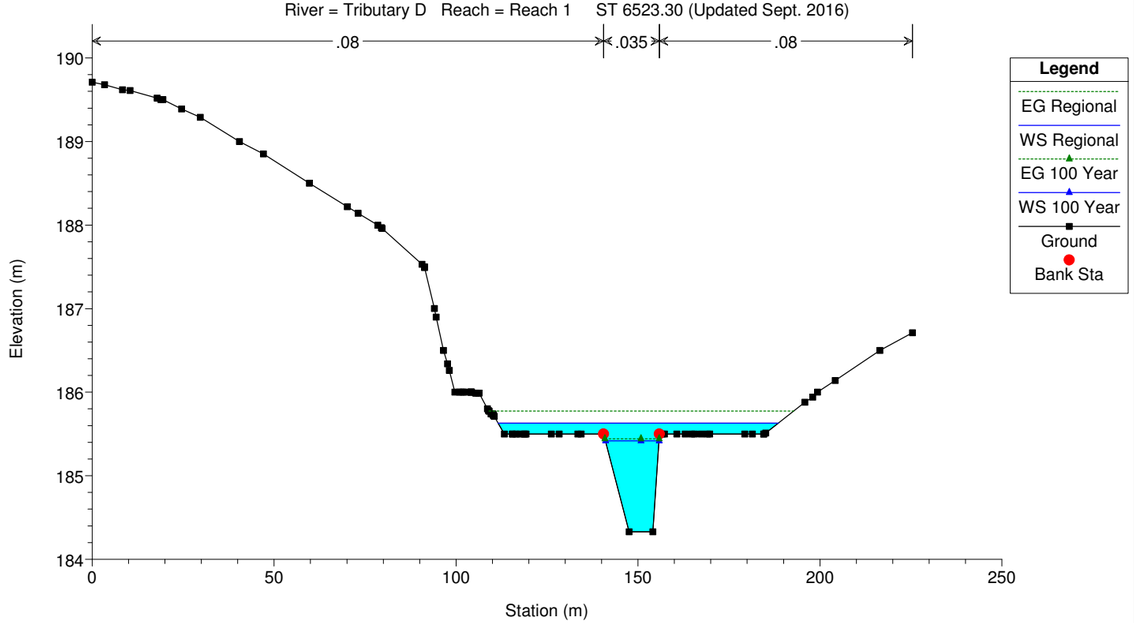
River = Tributary D Reach = Reach 1 ST 6523.31 (Updated Sept. 2016)



Little Rouge A Plan: 1) WC15C- PROP

Geom: Trib A (Modified EX-Parsons - 407ETR) Flow: Dec 20. 2006 (Modified Parsons)

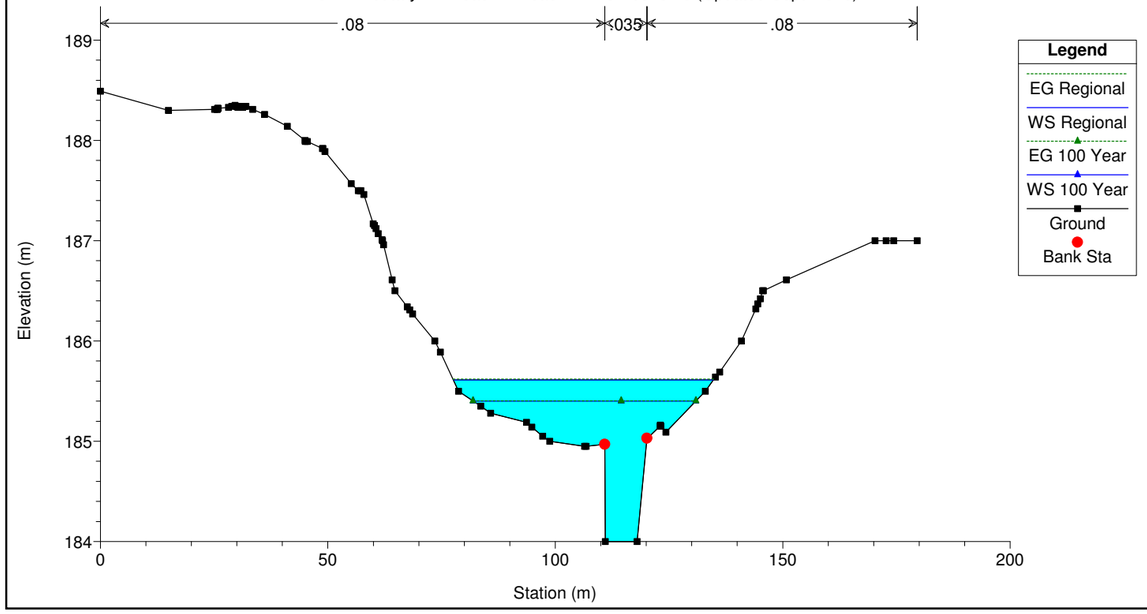
River = Tributary D Reach = Reach 1 ST 6523.30 (Updated Sept. 2016)



Little Rouge A Plan: 1) WC15C- PROP

Geom: Trib A (Modified EX-Parsons - 407ETR) Flow: Dec 20. 2006 (Modified Parsons)

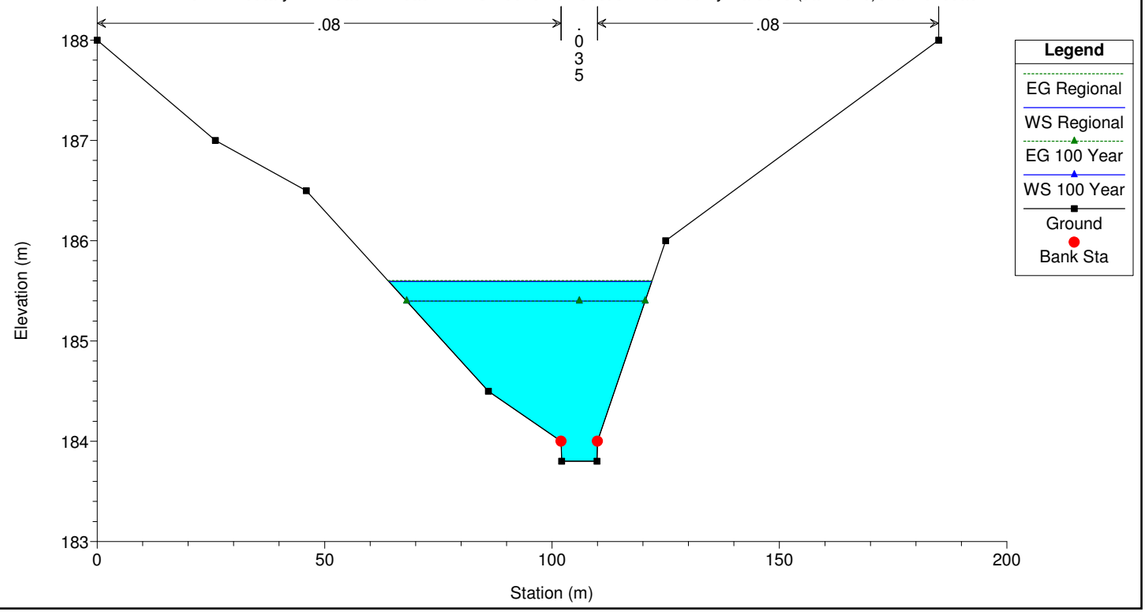
River = Tributary D Reach = Reach 1 ST 6523.29 (Updated Sept. 2016)



Little Rouge A Plan: 1) WC15C- PROP

Geom: Trib A (Modified EX-Parsons - 407ETR) Flow: Dec 20. 2006 (Modified Parsons)

River = Tributary D Reach = Reach 1 ST 6523.28 - section modified by Parsons (Jan 2016)channel botto

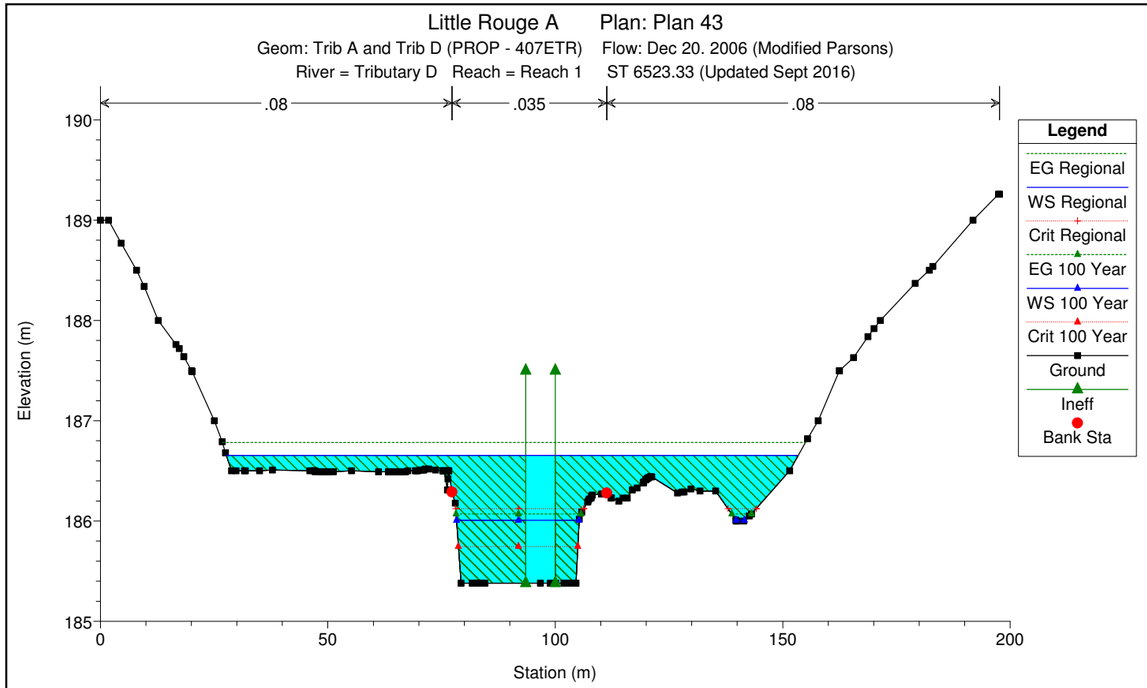


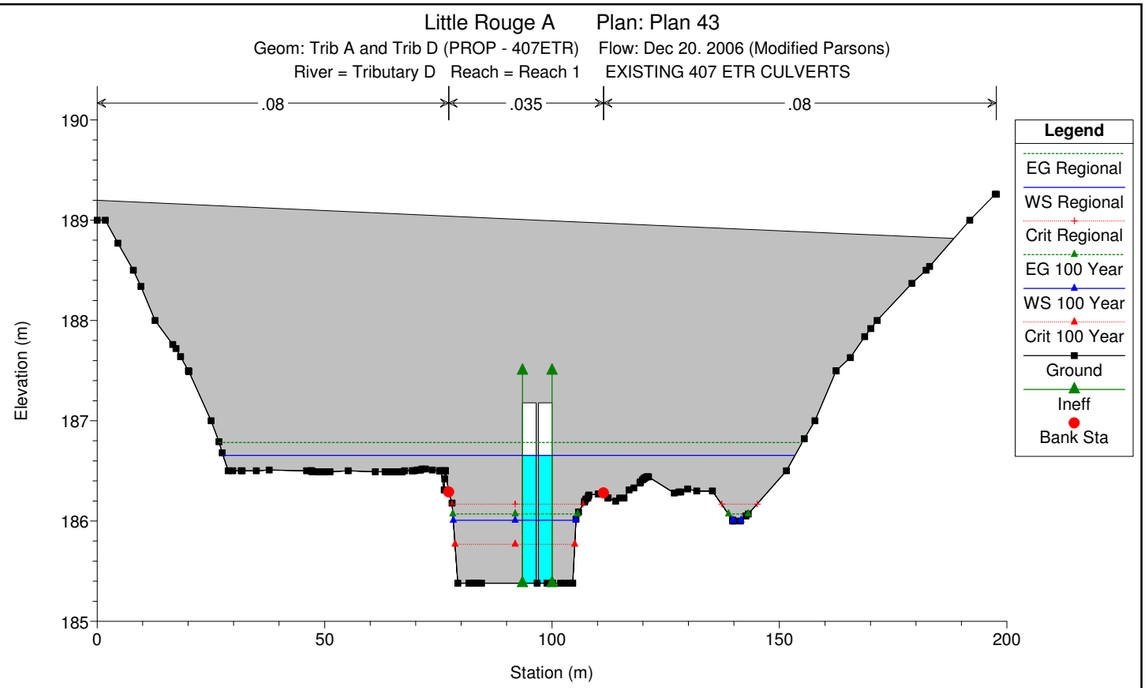
HEC-RAS Plan: WC15C-EX

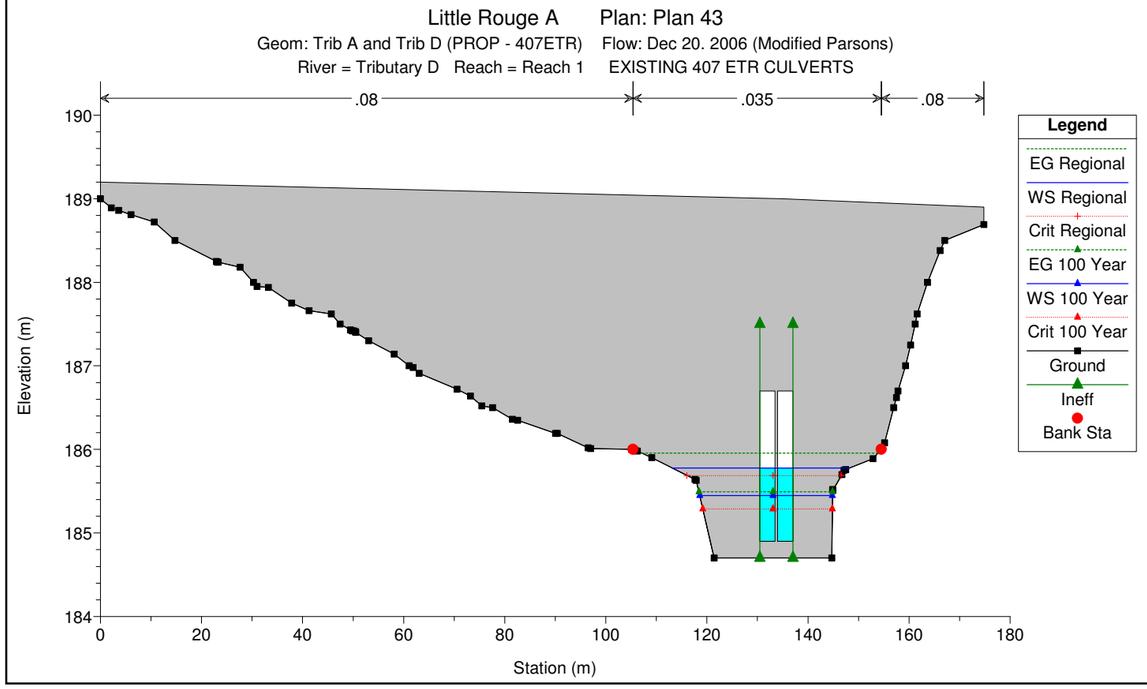
River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Tributary D	Reach 1	6523.33	Regional	13.14	185.38	186.66	186.12	186.78	0.002226	1.59	8.29	125.78	0.45
Tributary D	Reach 1	6523.33	100 Year	4.53	185.38	186.01	185.75	186.07	0.002824	1.11	4.07	28.81	0.45
Tributary D	Reach 1	6523.33	50 Year	2.85	185.38	185.84	185.65	185.89	0.003133	0.95	2.99	26.52	0.45
Tributary D	Reach 1	6523.33	25 Year	2.29	185.38	185.77	185.61	185.82	0.003383	0.89	2.56	26.34	0.45
Tributary D	Reach 1	6523.33	10 Year	1.46	185.38	185.67	185.55	185.70	0.003743	0.77	1.90	26.07	0.45
Tributary D	Reach 1	6523.33	5 Year	1.00	185.38	185.61	185.51	185.63	0.004074	0.68	1.47	25.89	0.45
Tributary D	Reach 1	6523.33	2 Year	0.46	185.38	185.52	185.46	185.53	0.004845	0.52	0.88	25.64	0.45
Tributary D	Reach 1	6523.325		Culvert									
Tributary D	Reach 1	6523.32	Regional	13.14	184.90	185.64	185.64	186.02	0.013394	2.72	4.84	28.71	1.01
Tributary D	Reach 1	6523.32	100 Year	4.53	184.90	185.42		185.51	0.005412	1.35	3.35	25.88	0.60
Tributary D	Reach 1	6523.32	50 Year	2.85	184.90	185.34		185.39	0.003738	1.00	2.84	25.48	0.49
Tributary D	Reach 1	6523.32	25 Year	2.29	184.90	185.30		185.34	0.003252	0.88	2.59	25.29	0.45
Tributary D	Reach 1	6523.32	10 Year	1.46	184.90	185.24		185.26	0.002339	0.67	2.19	24.97	0.37
Tributary D	Reach 1	6523.32	5 Year	1.00	184.90	185.16		185.18	0.002567	0.59	1.69	24.58	0.37
Tributary D	Reach 1	6523.32	2 Year	0.46	184.90	184.98	184.98	185.02	0.027838	0.88	0.52	23.66	1.00
Tributary D	Reach 1	6523.31	Regional	13.14	184.50	185.72		185.76	0.000999	0.87	23.78	70.41	0.28
Tributary D	Reach 1	6523.31	100 Year	4.53	184.50	185.44		185.45	0.000441	0.47	9.60	13.50	0.18
Tributary D	Reach 1	6523.31	50 Year	2.85	184.50	185.35		185.35	0.000253	0.34	8.42	12.88	0.13
Tributary D	Reach 1	6523.31	25 Year	2.29	184.50	185.31		185.31	0.000195	0.29	7.91	12.60	0.12
Tributary D	Reach 1	6523.31	10 Year	1.46	184.50	185.24		185.24	0.000109	0.21	7.09	12.14	0.09
Tributary D	Reach 1	6523.31	5 Year	1.00	184.50	185.16		185.17	0.000076	0.16	6.19	11.61	0.07
Tributary D	Reach 1	6523.31	2 Year	0.46	184.50	184.64		184.65	0.003317	0.43	1.07	7.99	0.37
Tributary D	Reach 1	6523.3	Regional	13.14	184.33	185.67		185.70	0.000785	0.79	25.51	78.74	0.25
Tributary D	Reach 1	6523.3	100 Year	4.53	184.33	185.42		185.43	0.000272	0.39	11.53	14.71	0.14
Tributary D	Reach 1	6523.3	50 Year	2.85	184.33	185.34		185.34	0.000145	0.27	10.37	14.10	0.10
Tributary D	Reach 1	6523.3	25 Year	2.29	184.33	185.30		185.30	0.000108	0.23	9.84	13.82	0.09
Tributary D	Reach 1	6523.3	10 Year	1.46	184.33	185.24		185.24	0.000057	0.16	8.99	13.35	0.06
Tributary D	Reach 1	6523.3	5 Year	1.00	184.33	185.16		185.16	0.000037	0.12	8.01	12.78	0.05
Tributary D	Reach 1	6523.3	2 Year	0.46	184.33	184.55		184.56	0.000867	0.28	1.62	8.16	0.20
Tributary D	Reach 1	6523.29	Regional	13.14	184.00	185.61		185.63	0.000461	0.74	33.46	57.06	0.19
Tributary D	Reach 1	6523.29	100 Year	4.53	184.00	185.40		185.40	0.000114	0.33	22.39	48.84	0.09
Tributary D	Reach 1	6523.29	50 Year	2.85	184.00	185.33		185.33	0.000059	0.23	19.01	44.98	0.07
Tributary D	Reach 1	6523.29	25 Year	2.29	184.00	185.29		185.29	0.000043	0.19	17.47	43.16	0.06
Tributary D	Reach 1	6523.29	10 Year	1.46	184.00	185.23		185.23	0.000022	0.13	15.06	37.42	0.04
Tributary D	Reach 1	6523.29	5 Year	1.00	184.00	185.16		185.16	0.000014	0.10	12.57	31.38	0.03
Tributary D	Reach 1	6523.29	2 Year	0.46	184.00	184.54		184.54	0.000043	0.11	4.10	8.21	0.05
Tributary D	Reach 1	6523.28	Regional	13.14	183.80	185.59		185.60	0.000148	0.50	57.36	57.85	0.12

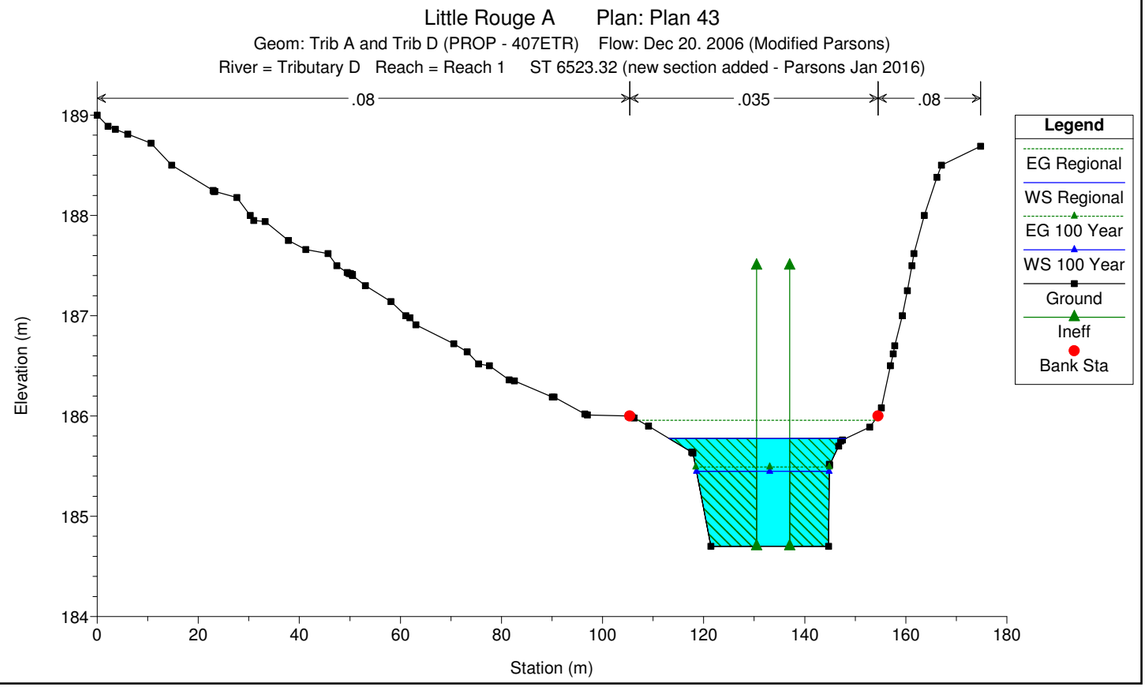
HEC-RAS Plan: WC15C-EX (Continued)

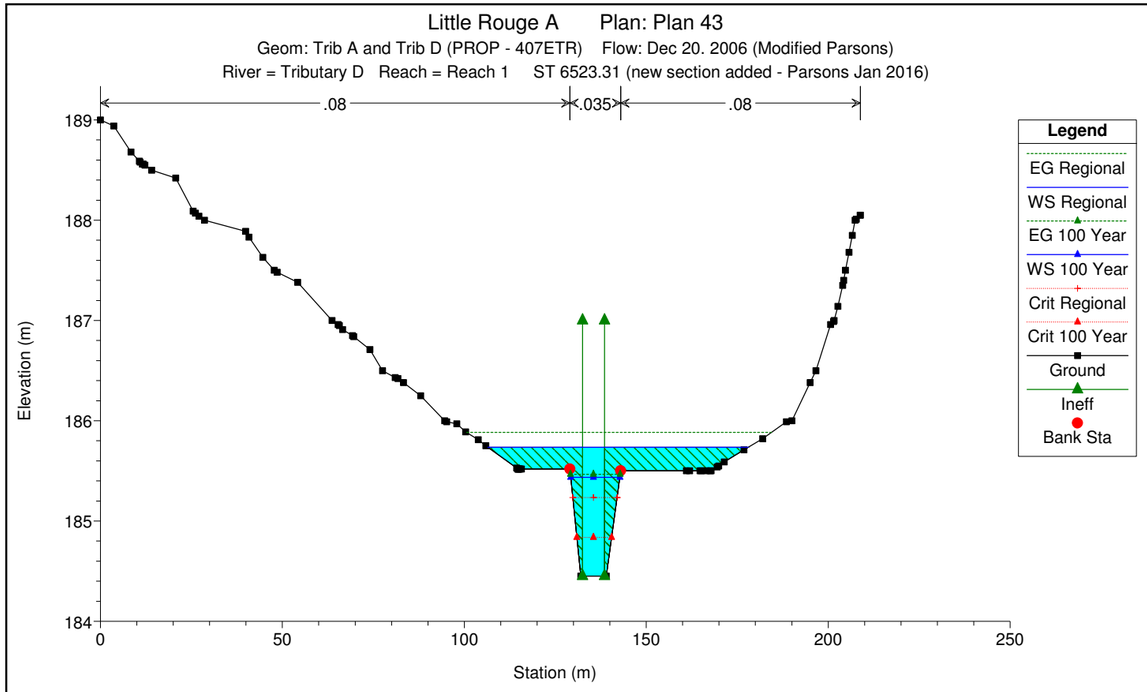
River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Tributary D	Reach 1	6523.28	100 Year	4.53	183.80	185.40		185.40	0.000029	0.21	46.48	52.42	0.05
Tributary D	Reach 1	6523.28	50 Year	2.85	183.80	185.33		185.33	0.000014	0.14	42.83	50.47	0.04
Tributary D	Reach 1	6523.28	25 Year	2.29	183.80	185.29		185.29	0.000010	0.12	41.10	49.52	0.03
Tributary D	Reach 1	6523.28	10 Year	1.46	183.80	185.23		185.23	0.000005	0.08	38.23	47.90	0.02
Tributary D	Reach 1	6523.28	5 Year	1.00	183.80	185.16		185.16	0.000003	0.06	34.79	45.88	0.02
Tributary D	Reach 1	6523.28	2 Year	0.46	183.80	184.54		184.54	0.000008	0.06	11.61	28.81	0.02

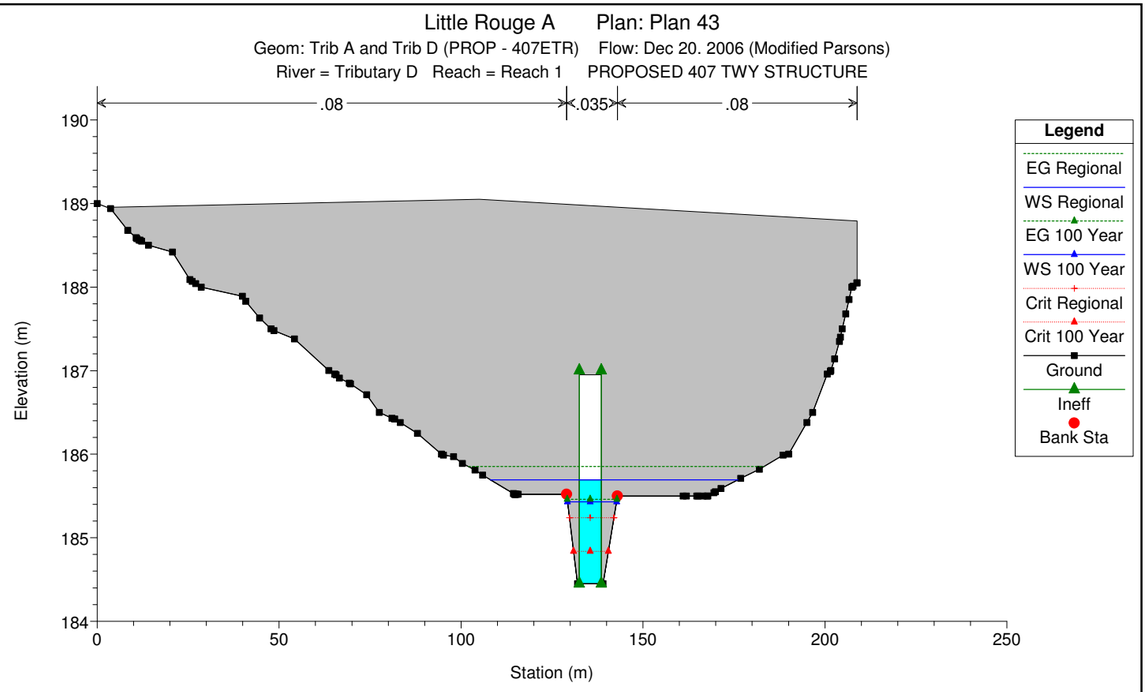

Little Rouge A Plan: Plan 43
Geom: Trib A and Trib D (PROP - 407ETR) Flow: Dec 20. 2006 (Modified Parsons)
River = Tributary D Reach = Reach 1 ST 6523.33 (Updated Sept 2016)
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100 Year
WS 100 Year
Crit 100 Year
Ground
Ineff
Bank Sta

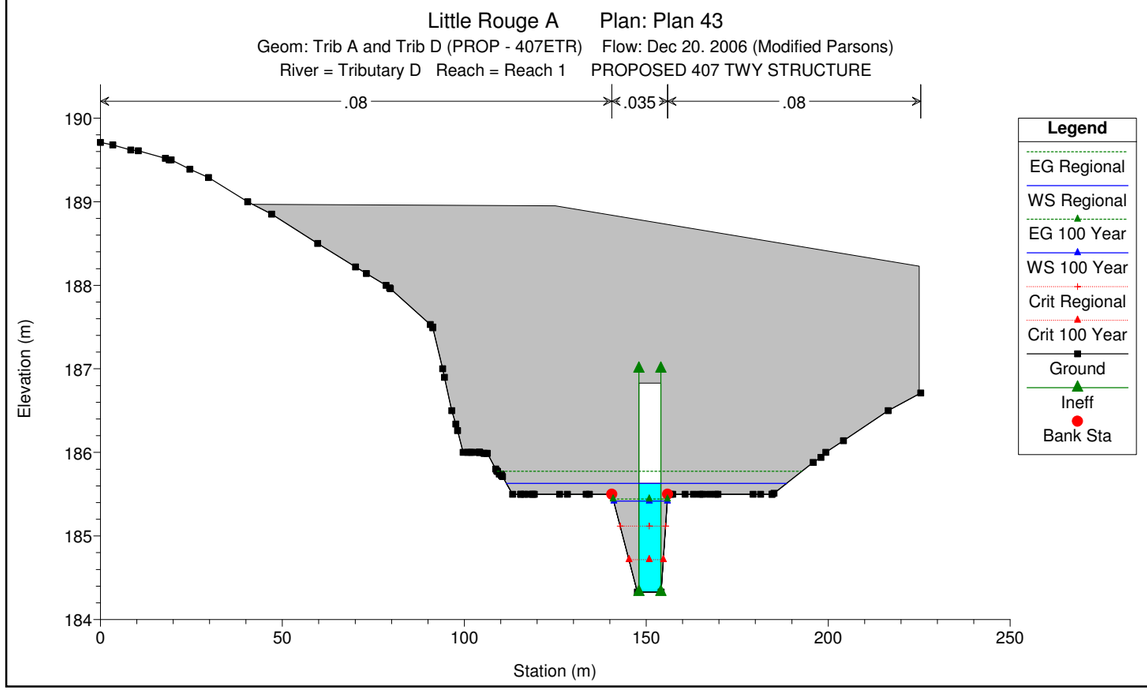

Little Rouge A Plan: Plan 43
Geom: Trib A and Trib D (PROP - 407ETR) Flow: Dec 20. 2006 (Modified Parsons)
River = Tributary D Reach = Reach 1 EXISTING 407 ETR CULVERTS
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100 Year
WS 100 Year
Crit 100 Year
Ground
Ineff
Bank Sta

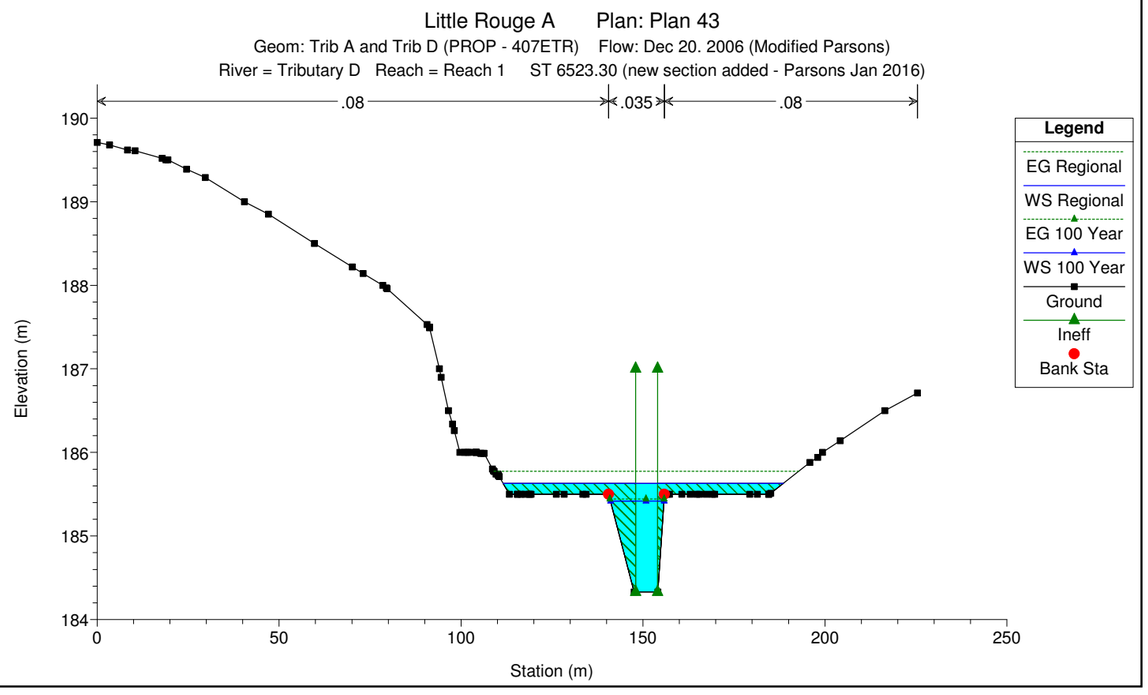

Little Rouge A Plan: Plan 43
Geom: Trib A and Trib D (PROP - 407ETR) Flow: Dec 20. 2006 (Modified Parsons)
River = Tributary D Reach = Reach 1 EXISTING 407 ETR CULVERTS
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100 Year
WS 100 Year
Crit 100 Year
Ground
Ineff
Bank Sta

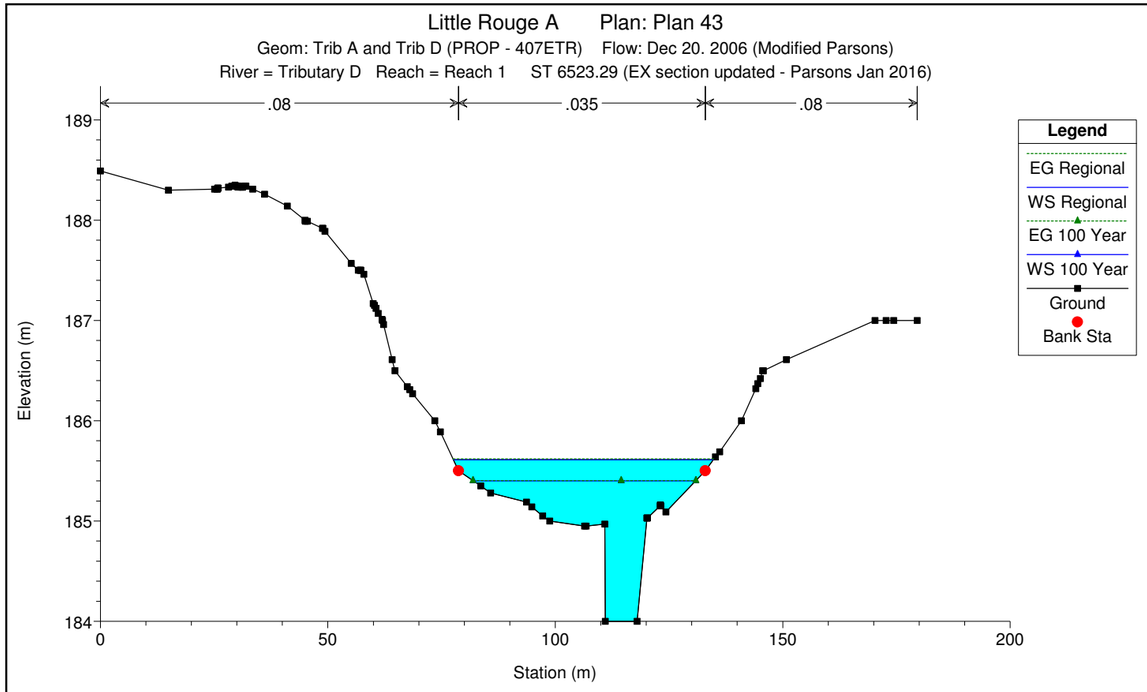

Little Rouge A Plan: Plan 43
Geom: Trib A and Trib D (PROP - 407ETR) Flow: Dec 20. 2006 (Modified Parsons)
River = Tributary D Reach = Reach 1 ST 6523.32 (new section added - Parsons Jan 2016)
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100 Year
WS 100 Year
Crit 100 Year
Ground
Ineff
Bank Sta

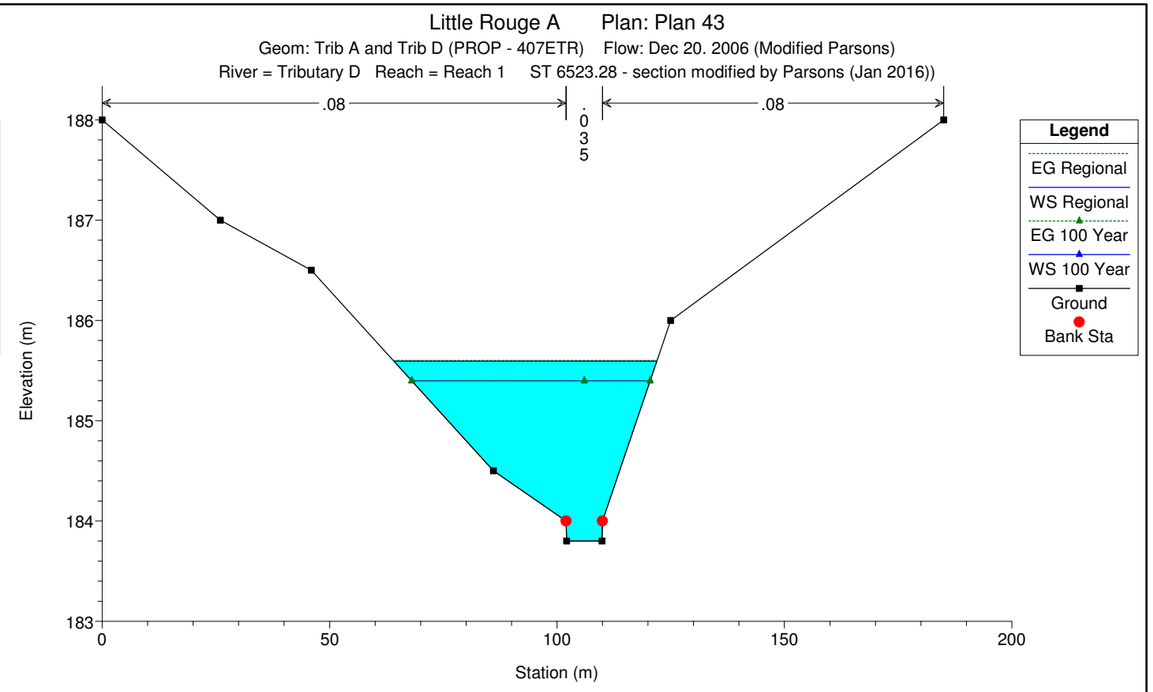

Little Rouge A Plan: Plan 43
Geom: Trib A and Trib D (PROP - 407ETR) Flow: Dec 20. 2006 (Modified Parsons)
River = Tributary D Reach = Reach 1 ST 6523.31 (new section added - Parsons Jan 2016)
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100 Year
WS 100 Year
Crit Regional
Crit 100 Year
Ground
Ineff
Bank Sta


Little Rouge A Plan: Plan 43
Geom: Trib A and Trib D (PROP - 407ETR) Flow: Dec 20. 2006 (Modified Parsons)
River = Tributary D Reach = Reach 1 PROPOSED 407 TWY STRUCTURE
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100 Year
WS 100 Year
Crit Regional
Crit 100 Year
Ground
Ineff
Bank Sta


Little Rouge A Plan: Plan 43
Geom: Trib A and Trib D (PROP - 407ETR) Flow: Dec 20. 2006 (Modified Parsons)
River = Tributary D Reach = Reach 1 PROPOSED 407 TWY STRUCTURE
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100 Year
WS 100 Year
Crit Regional
Crit 100 Year
Ground
Ineff
Bank Sta


Little Rouge A Plan: Plan 43
Geom: Trib A and Trib D (PROP - 407ETR) Flow: Dec 20. 2006 (Modified Parsons)
River = Tributary D Reach = Reach 1 ST 6523.30 (new section added - Parsons Jan 2016)
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100 Year
WS 100 Year
Ground
Ineff
Bank Sta


Little Rouge A Plan: Plan 43
Geom: Trib A and Trib D (PROP - 407ETR) Flow: Dec 20. 2006 (Modified Parsons)
River = Tributary D Reach = Reach 1 ST 6523.29 (EX section updated - Parsons Jan 2016)
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100 Year
WS 100 Year
Ground
Bank Sta


Little Rouge A Plan: Plan 43
Geom: Trib A and Trib D (PROP - 407ETR) Flow: Dec 20. 2006 (Modified Parsons)
River = Tributary D Reach = Reach 1 ST 6523.28 - section modified by Parsons (Jan 2016))
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100 Year
WS 100 Year
Ground
Bank Sta

HEC-RAS Plan: WC15C- PROP

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Tributary D	Reach 1	6523.33	Regional	13.14	185.38	186.66	186.12	186.78	0.002226	1.59	8.29	125.78	0.45
Tributary D	Reach 1	6523.33	100 Year	4.53	185.38	186.01	185.75	186.07	0.002824	1.11	4.07	28.81	0.45
Tributary D	Reach 1	6523.33	50 Year	2.85	185.38	185.84	185.65	185.89	0.003133	0.95	2.99	26.52	0.45
Tributary D	Reach 1	6523.33	25 Year	2.29	185.38	185.77	185.61	185.82	0.003382	0.89	2.56	26.34	0.45
Tributary D	Reach 1	6523.33	10 Year	1.46	185.38	185.67	185.55	185.70	0.003743	0.77	1.90	26.07	0.45
Tributary D	Reach 1	6523.33	5 Year	1.00	185.38	185.61	185.51	185.63	0.004074	0.68	1.47	25.89	0.45
Tributary D	Reach 1	6523.33	2 Year	0.46	185.38	185.52	185.46	185.53	0.004845	0.52	0.88	25.64	0.45
Tributary D	Reach 1	6523.325		Culvert									
Tributary D	Reach 1	6523.32	Regional	13.14	184.70	185.78		185.96	0.003918	1.88	7.00	35.02	0.58
Tributary D	Reach 1	6523.32	100 Year	4.53	184.70	185.45		185.49	0.001566	0.93	4.86	26.24	0.34
Tributary D	Reach 1	6523.32	50 Year	2.85	184.70	185.35		185.38	0.000966	0.67	4.26	25.87	0.26
Tributary D	Reach 1	6523.32	25 Year	2.29	184.70	185.31		185.33	0.000774	0.57	3.99	25.71	0.23
Tributary D	Reach 1	6523.32	10 Year	1.46	184.70	185.24		185.25	0.000469	0.41	3.54	25.43	0.18
Tributary D	Reach 1	6523.32	5 Year	1.00	184.70	185.17		185.17	0.000366	0.33	3.04	25.12	0.15
Tributary D	Reach 1	6523.32	2 Year	0.46	184.70	184.78	184.78	184.82	0.028011	0.89	0.52	23.57	1.00
Tributary D	Reach 1	6523.31	Regional	13.14	184.45	185.74	185.24	185.88	0.002547	1.70	7.71	71.53	0.48
Tributary D	Reach 1	6523.31	100 Year	4.53	184.45	185.44	184.84	185.47	0.000731	0.77	5.92	13.52	0.25
Tributary D	Reach 1	6523.31	50 Year	2.85	184.45	185.35	184.73	185.36	0.000395	0.53	5.39	12.94	0.18
Tributary D	Reach 1	6523.31	25 Year	2.29	184.45	185.31	184.69	185.32	0.000296	0.44	5.15	12.68	0.15
Tributary D	Reach 1	6523.31	10 Year	1.46	184.45	185.24	184.63	185.25	0.000158	0.31	4.75	12.24	0.11
Tributary D	Reach 1	6523.31	5 Year	1.00	184.45	185.17	184.59	185.17	0.000104	0.23	4.29	11.73	0.09
Tributary D	Reach 1	6523.31	2 Year	0.46	184.45	184.60	184.53	184.62	0.003625	0.50	0.93	8.02	0.40
Tributary D	Reach 1	6523.305		Culvert									
Tributary D	Reach 1	6523.3	Regional	13.14	184.33	185.63		185.77	0.002453	1.69	7.80	77.05	0.47
Tributary D	Reach 1	6523.3	100 Year	4.53	184.33	185.42		185.44	0.000527	0.69	6.53	14.72	0.21
Tributary D	Reach 1	6523.3	50 Year	2.85	184.33	185.34		185.35	0.000268	0.47	6.06	14.13	0.15
Tributary D	Reach 1	6523.3	25 Year	2.29	184.33	185.30		185.31	0.000196	0.39	5.83	13.84	0.13
Tributary D	Reach 1	6523.3	10 Year	1.46	184.33	185.24		185.24	0.000100	0.27	5.45	13.36	0.09
Tributary D	Reach 1	6523.3	5 Year	1.00	184.33	185.16		185.17	0.000062	0.20	5.00	12.79	0.07
Tributary D	Reach 1	6523.3	2 Year	0.46	184.33	184.55		184.56	0.001112	0.35	1.32	8.16	0.24
Tributary D	Reach 1	6523.29	Regional	13.14	184.00	185.61		185.62	0.000364	0.39	33.78	57.20	0.16
Tributary D	Reach 1	6523.29	100 Year	4.53	184.00	185.40		185.40	0.000145	0.20	22.48	48.93	0.09
Tributary D	Reach 1	6523.29	50 Year	2.85	184.00	185.33		185.33	0.000089	0.15	19.05	45.03	0.07
Tributary D	Reach 1	6523.29	25 Year	2.29	184.00	185.29		185.29	0.000072	0.13	17.50	43.19	0.07
Tributary D	Reach 1	6523.29	10 Year	1.46	184.00	185.23		185.23	0.000040	0.10	15.07	37.45	0.05
Tributary D	Reach 1	6523.29	5 Year	1.00	184.00	185.16		185.16	0.000027	0.08	12.58	31.39	0.04
Tributary D	Reach 1	6523.29	2 Year	0.46	184.00	184.54		184.54	0.000043	0.11	4.10	8.21	0.05

HEC-RAS Plan: WC15C- PROP (Continued)

River	Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
				(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Tributary D	Reach 1	6523.28	Regional	13.14	183.80	185.59		185.60	0.000148	0.50	57.36	57.85	0.12
Tributary D	Reach 1	6523.28	100 Year	4.53	183.80	185.40		185.40	0.000029	0.21	46.48	52.42	0.05
Tributary D	Reach 1	6523.28	50 Year	2.85	183.80	185.33		185.33	0.000014	0.14	42.83	50.47	0.04
Tributary D	Reach 1	6523.28	25 Year	2.29	183.80	185.29		185.29	0.000010	0.12	41.10	49.52	0.03
Tributary D	Reach 1	6523.28	10 Year	1.46	183.80	185.23		185.23	0.000005	0.08	38.23	47.90	0.02
Tributary D	Reach 1	6523.28	5 Year	1.00	183.80	185.16		185.16	0.000003	0.06	34.79	45.88	0.02
Tributary D	Reach 1	6523.28	2 Year	0.46	183.80	184.54		184.54	0.000008	0.06	11.61	28.81	0.02

ROUGE RIVER

HEC-RAS ANALYSIS WC#16

File: G:\TT4022\DRAWINGS\GENERAL\SHEETS\602282-S-HEC-ROU-1 (WC15A&16).DWG - Revised by <P006437C>: 9/29/2016 1:20 PM

407 ETR EX. CULV
(REFERENCE MATERIAL: STORMWATER MANAGEMENT REPORT - CORNELL COMMUNITY - TRIBUTARY C (MMM, JUNE 2004, REVISED JLY 2005)

EX BOX CULVERT
4.6 x 2.7
U/S INV=187.93
D/S INV= 187.5
(L=94m)

RESOR RD.

EXISTING 407 ETR

EXISTING SWM POND TO BE REGRADED TO SUITE PROPOSED TRANSITWAY PROFILE

RETAINING WALL MAY BE REQUIRED NORTH SIDE OF THE TRANSITWAY

POND ID LR-3

PROPOSED 407 TWY

PROP CULV WC#16
SPAN x RISE= (6 x 2.5)m
L=25.5, S=0.4%
U/S INV=187.00m
D/S INV=186.90m

188.30	188.10	ST 800
188.43	188.37	CHICAGO 4HR

187.81	187.76	ST 700
187.90	187.87	

187.62	187.57	ST 600
187.75	187.71	

187.36	187.40	HEC ST 500
187.44	187.47	

187.27	187.37	HEC ST 400
187.38	187.45	

OUTLET CONTROL STRUCTURE
(SEE DATAIL 2 IN THIS DWG)

187.25	187.36	HEC ST 300
187.37	187.45	

PROP CULV#2
SPAN x RISE= (3 x 0.5)m
U/S INV=186.33m
D/S INV=186.2m

187.23	187.32	HEC ST 200
187.35	187.41	

POND OUTLET
MIN U/S INV=186.55m
MIN D/S INV=186.25m

PROP CULV#3
SPAN x RISE= (3 x 0.5)m
U/S INV=186.13m
D/S INV=186.00m

186.94	187.20	HEC ST 100
187.08	187.27	

PROPOSED DONALD COUSENS STATION

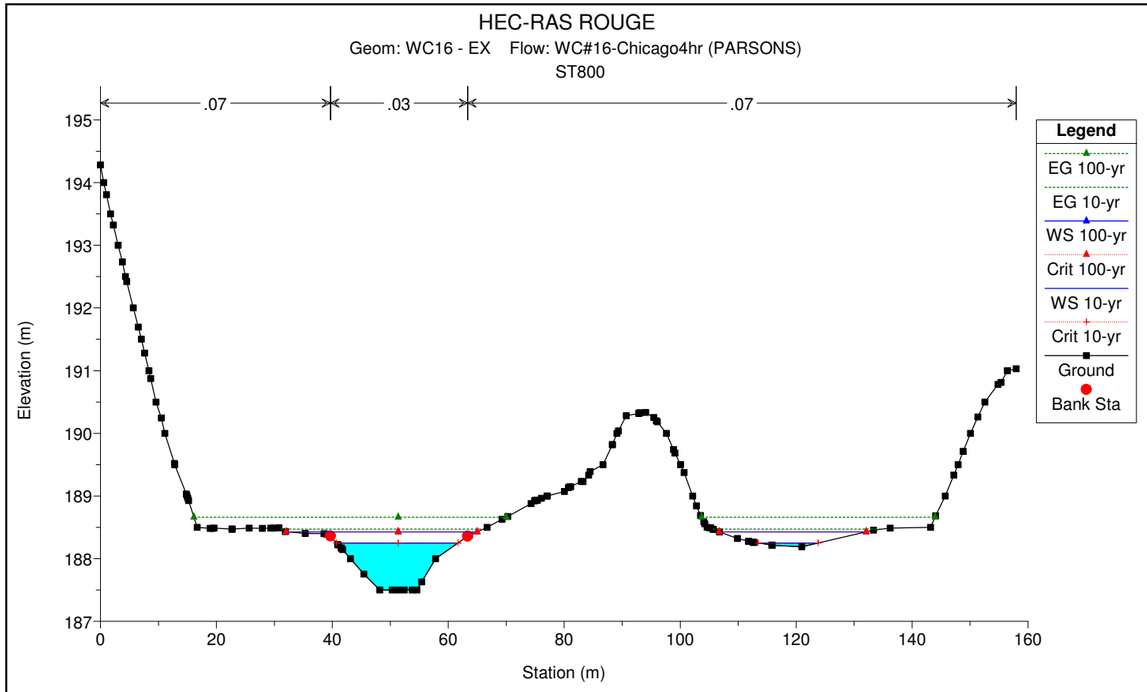
LITY CONTROL FOR THIS AREA
E PROVIDED BY
POSED STC UNIT

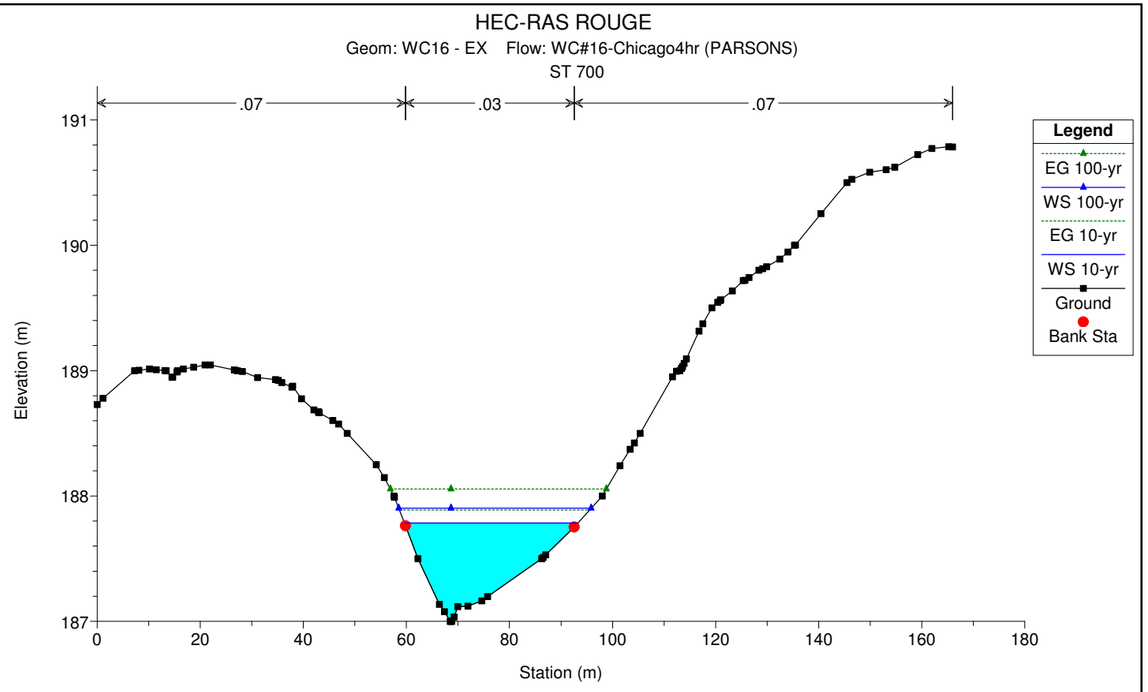
LEGEND

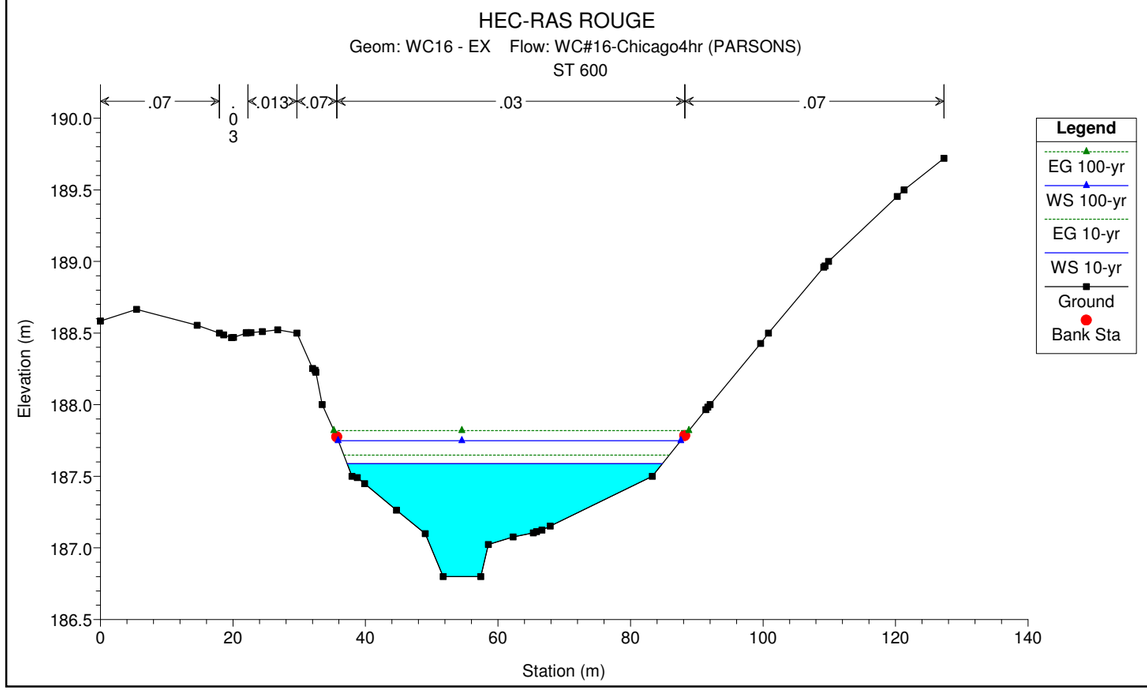
- EXISTING 407 ETR
- PROPOSED 407 TWY
- CREEK FLOW DIRECTION
- EXISTING CULVERT
- PROPOSED CULVERT
- EXISTING TRCA FLOODLINE
- PROPOSED REGIONAL FLOODLINE

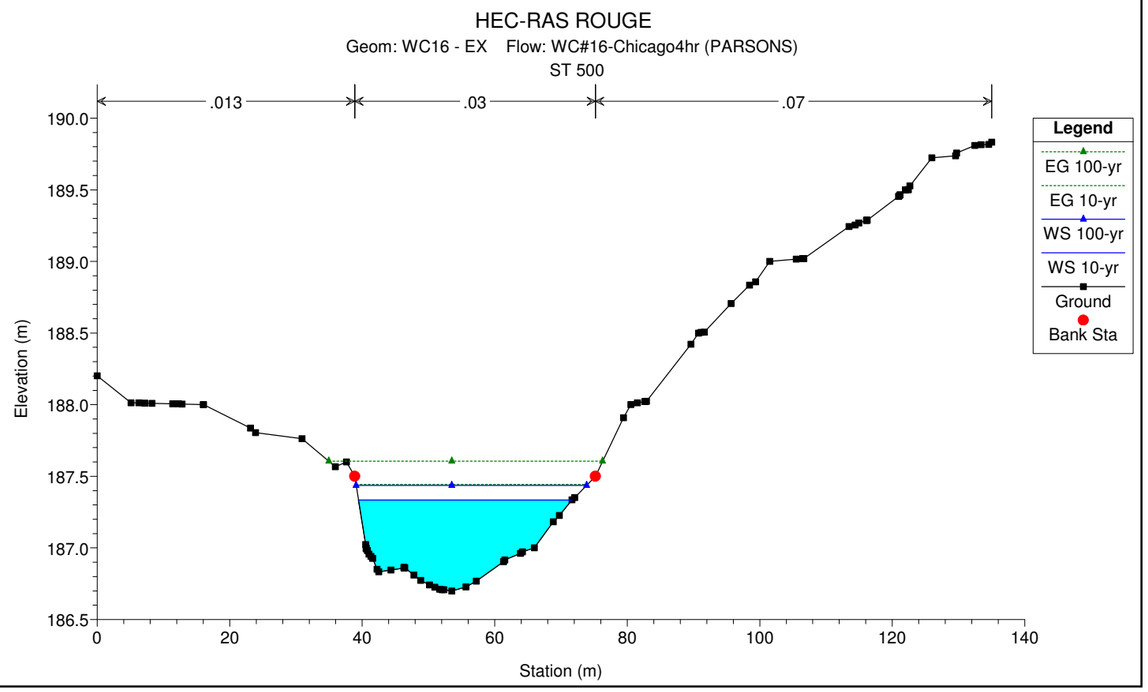
EX REG / EX 100 | PR REG / PR 100 | HEC ST — CROSS SECTION NUMBER — PARSONS HEC-RAS SECTION
PROPOSED WL ELEVATION (m)
EXISTING UPDATED WL ELEVATION (m)

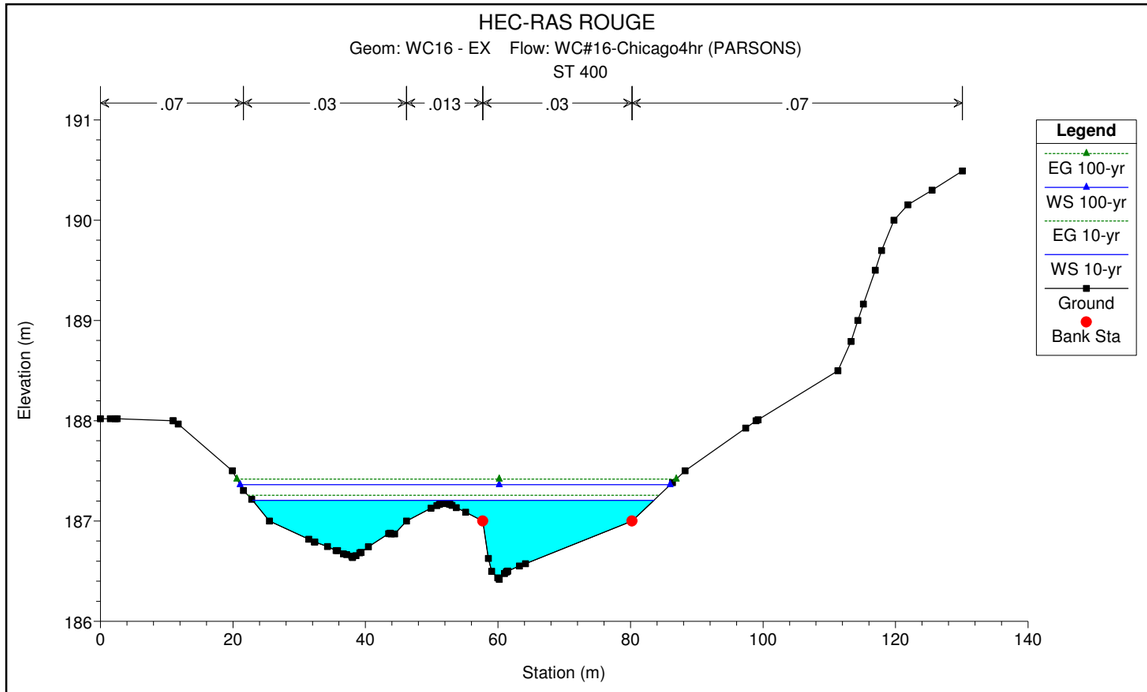
DATE:	SEPTEMBER 2016	625 COCHRANE DRIVE, SUITE 500 MARKHAM, ONTARIO L3R 9R9 TEL: 905-943-0500 FAX: 905-943-0400	407 TRANSITWAY FROM KENNEDY RD TO BROCK RD
SCALE:	1:1000		FIGURE 6.10 - HEC-RAS ANALYSIS - ROUGE RIVER (WC#16)

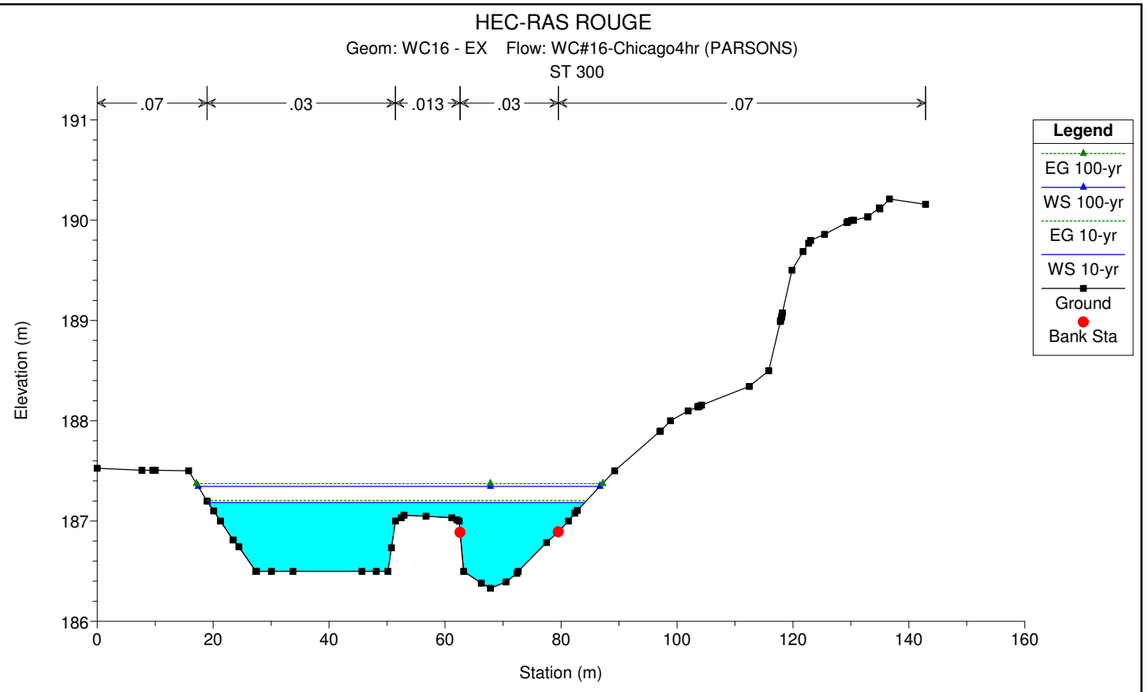

HEC-RAS ROUGE
Geom: WC16 - EX Flow: WC#16-Chicago4hr (PARSONS)
ST800
.07
.03
.07
Elevation (m)
Station (m)
Legend
EG 100-yr
EG 10-yr
WS 100-yr
Crit 100-yr
WS 10-yr
Crit 10-yr
Ground
Bank Sta

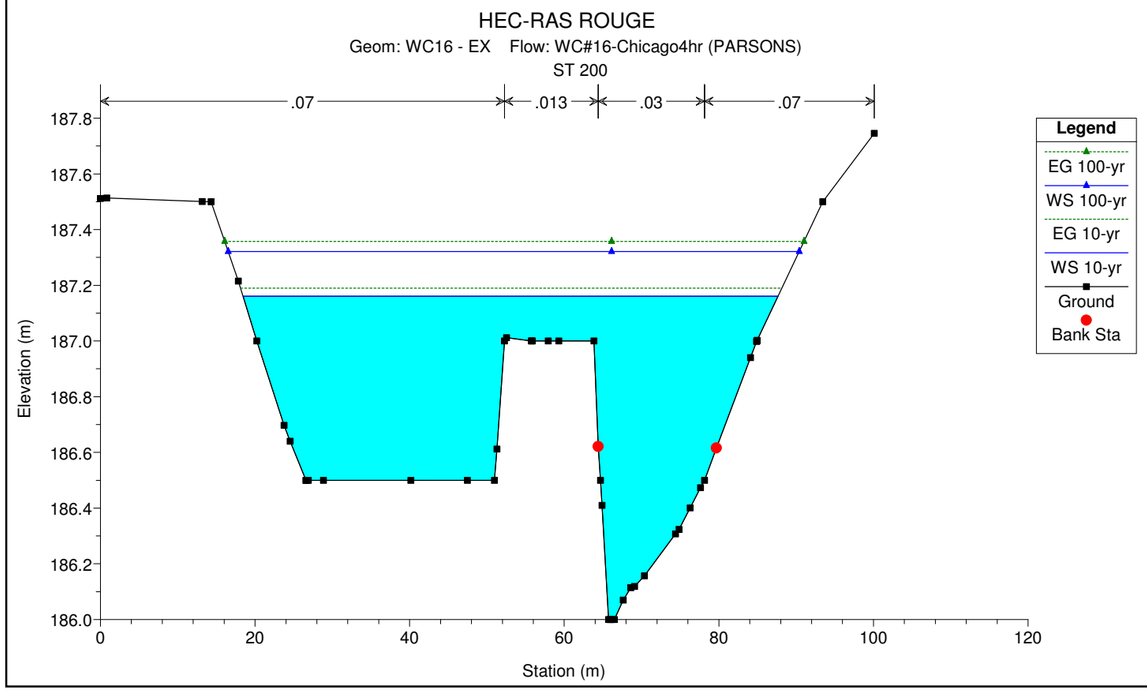

HEC-RAS ROUGE
Geom: WC16 - EX Flow: WC#16-Chicago4hr (PARSONS)
ST 700
.07
.03
.07
Elevation (m)
Station (m)
Legend
EG 100-yr
WS 100-yr
EG 10-yr
WS 10-yr
Ground
Bank Sta

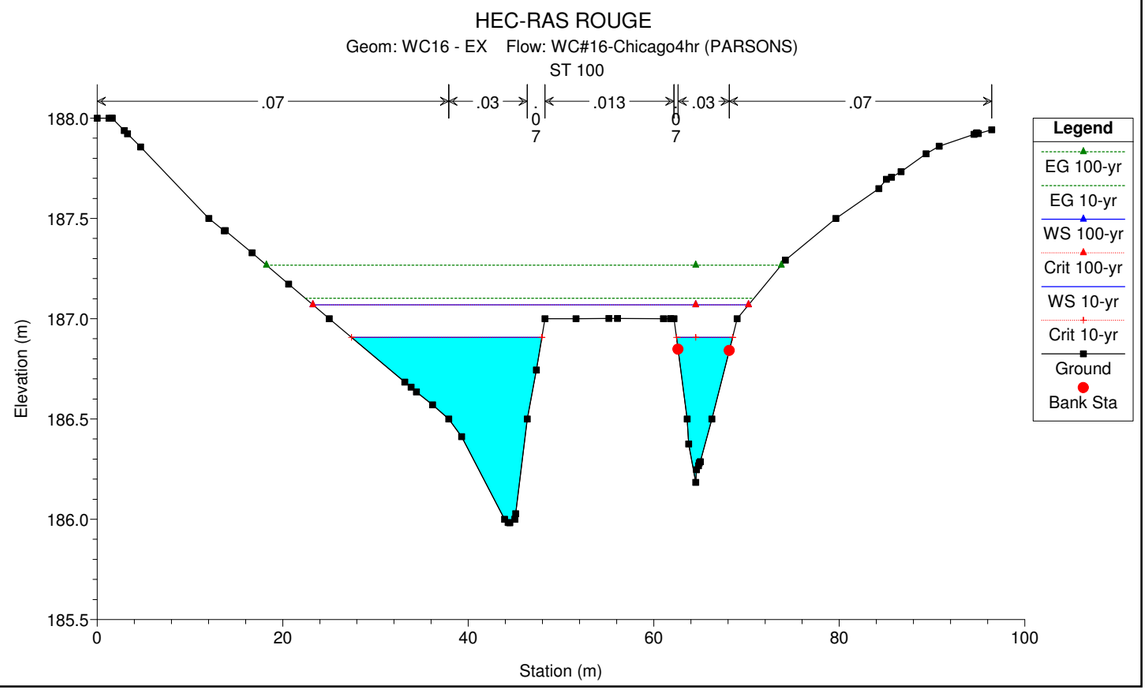

HEC-RAS ROUGE
Geom: WC16 - EX Flow: WC#16-Chicago4hr (PARSONS)
ST 600
.07
.03
.013
.07
.03
.07
Elevation (m)
Station (m)
Legend
EG 100-yr
WS 100-yr
EG 10-yr
WS 10-yr
Ground
Bank Sta


HEC-RAS ROUGE
Geom: WC16 - EX Flow: WC#16-Chicago4hr (PARSONS)
ST 500
.013
.03
.07
Elevation (m)
Station (m)
Legend
EG 100-yr
WS 100-yr
EG 10-yr
WS 10-yr
Ground
Bank Sta


HEC-RAS ROUGE
Geom: WC16 - EX Flow: WC#16-Chicago4hr (PARSONS)
ST 400
.07
.03
.013
.03
.07
Elevation (m)
Station (m)
Legend
EG 100-yr
WS 100-yr
EG 10-yr
WS 10-yr
Ground
Bank Sta


HEC-RAS ROUGE
Geom: WC16 - EX Flow: WC#16-Chicago4hr (PARSONS)
ST 300
.07
.03
.013
.03
.07
Elevation (m)
Station (m)
Legend
EG 100-yr
WS 100-yr
EG 10-yr
WS 10-yr
Ground
Bank Sta


HEC-RAS ROUGE
Geom: WC16 - EX Flow: WC#16-Chicago4hr (PARSONS)
ST 200
.07
.013
.03
.07
Elevation (m)
Station (m)
Legend
EG 100-yr
WS 100-yr
EG 10-yr
WS 10-yr
Ground
Bank Sta


HEC-RAS ROUGE
Geom: WC16 - EX Flow: WC#16-Chicago4hr (PARSONS)
ST 100
.07
.03
.013
.03
.07
Elevation (m)
Station (m)
Legend
EG 100-yr
EG 10-yr
WS 100-yr
Crit 100-yr
WS 10-yr
Crit 10-yr
Ground
Bank Sta

HEC-RAS Plan: WC 16 - EX (4hr CH) River: Rouge Reach: WC16

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC16	800	2-yr	9.39	187.50	187.98	187.98	188.16	0.012832	1.87	5.03	14.38	1.01
WC16	800	5-yr	16.92	187.50	188.17	188.17	188.39	0.011820	2.07	8.18	18.90	1.00
WC16	800	10-yr	20.34	187.50	188.25	188.25	188.47	0.010734	2.07	10.18	31.38	0.97
WC16	800	25-yr	24.83	187.50	188.34	188.34	188.55	0.009675	2.08	13.40	41.66	0.93
WC16	800	50-yr	28.14	187.50	188.38	188.38	188.61	0.009426	2.14	15.35	46.69	0.93
WC16	800	100-yr	31.57	187.50	188.43	188.43	188.66	0.008576	2.16	17.98	59.00	0.90
WC16	800	Check Flow	41.04	187.50	188.57	188.57	188.78	0.006378	2.14	28.70	90.99	0.80
WC16	800	Regional	22.45	187.50	188.30	188.30	188.51	0.010065	2.07	11.73	37.05	0.94
WC16	700	2-yr	9.39	187.00	187.61		187.67	0.004723	1.07	8.82	27.77	0.60
WC16	700	5-yr	16.92	187.00	187.74		187.83	0.005370	1.32	12.84	32.32	0.67
WC16	700	10-yr	20.34	187.00	187.78		187.89	0.005641	1.43	14.21	33.65	0.69
WC16	700	25-yr	24.83	187.00	187.83		187.96	0.005846	1.57	15.92	35.21	0.72
WC16	700	50-yr	28.14	187.00	187.87		188.01	0.005967	1.66	17.15	36.28	0.74
WC16	700	100-yr	31.57	187.00	187.90		188.06	0.006074	1.75	18.39	37.33	0.75
WC16	700	Check Flow	41.04	187.00	187.98	187.89	188.18	0.006504	1.98	21.46	39.82	0.79
WC16	700	Regional	22.45	187.00	187.81		187.92	0.005744	1.50	15.02	34.40	0.71
WC16	600	2-yr	9.39	186.80	187.38		187.43	0.004420	0.94	10.03	36.48	0.57
WC16	600	5-yr	16.92	186.80	187.54		187.59	0.003744	1.03	16.51	46.27	0.55
WC16	600	10-yr	20.34	186.80	187.59		187.65	0.003487	1.07	19.06	47.67	0.54
WC16	600	25-yr	24.83	186.80	187.66		187.72	0.003231	1.11	22.29	49.39	0.53
WC16	600	50-yr	28.14	186.80	187.70		187.77	0.003111	1.15	24.53	50.54	0.53
WC16	600	100-yr	31.57	186.80	187.75		187.82	0.002998	1.18	26.82	51.69	0.52
WC16	600	Check Flow	41.04	186.80	187.86		187.94	0.002728	1.26	32.58	54.59	0.51
WC16	600	Regional	22.45	186.80	187.62		187.68	0.003346	1.09	20.61	48.51	0.53
WC16	500	2-yr	9.39	186.70	187.20		187.24	0.003639	0.96	9.73	29.25	0.53
WC16	500	5-yr	16.92	186.70	187.30		187.39	0.005316	1.33	12.73	31.41	0.67
WC16	500	10-yr	20.34	186.70	187.33		187.44	0.005860	1.46	13.95	32.22	0.71
WC16	500	25-yr	24.83	186.70	187.38		187.51	0.006393	1.60	15.55	33.48	0.75
WC16	500	50-yr	28.14	186.70	187.41		187.56	0.006944	1.71	16.49	34.15	0.78
WC16	500	100-yr	31.57	186.70	187.44		187.61	0.007353	1.80	17.51	34.88	0.81
WC16	500	Check Flow	41.04	186.70	187.52	187.46	187.73	0.008154	2.03	20.20	36.69	0.87
WC16	500	Regional	22.45	186.70	187.36		187.48	0.006150	1.53	14.70	32.85	0.73
WC16	400	2-yr	9.39	186.42	186.97		187.03	0.006778	1.14	9.11	40.88	0.70
WC16	400	5-yr	16.92	186.42	187.16		187.21	0.002764	1.02	18.38	57.45	0.49
WC16	400	10-yr	20.34	186.42	187.23		187.27	0.002177	0.99	22.51	61.27	0.44
WC16	400	25-yr	24.83	186.42	187.31		187.35	0.001756	0.98	27.42	63.64	0.41

HEC-RAS Plan: WC 16 - EX (4hr CH) River: Rouge Reach: WC16 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC16	400	50-yr	28.14	186.42	187.34		187.39	0.001803	1.03	29.38	64.39	0.42
WC16	400	100-yr	31.57	186.42	187.38		187.44	0.001695	1.04	32.17	65.43	0.41
WC16	400	Check Flow	41.04	186.42	187.49		187.55	0.001500	1.08	39.38	68.13	0.39
WC16	400	Regional	22.45	186.42	187.27		187.31	0.001958	0.99	24.83	62.41	0.42
WC16	300	2-yr	9.39	186.33	186.94		186.96	0.000801	0.52	18.47	47.24	0.26
WC16	300	5-yr	16.92	186.33	187.14		187.16	0.000657	0.61	29.52	63.76	0.25
WC16	300	10-yr	20.34	186.33	187.21		187.23	0.000614	0.63	34.13	65.76	0.25
WC16	300	25-yr	24.83	186.33	187.29		187.31	0.000573	0.66	39.57	67.95	0.24
WC16	300	50-yr	28.14	186.33	187.32		187.35	0.000629	0.71	41.59	68.74	0.26
WC16	300	100-yr	31.57	186.33	187.37		187.39	0.000635	0.74	44.61	69.92	0.26
WC16	300	Check Flow	41.04	186.33	187.48		187.51	0.000648	0.81	52.45	72.88	0.27
WC16	300	Regional	22.45	186.33	187.25		187.27	0.000594	0.65	36.71	66.80	0.24
WC16	200	2-yr	9.39	186.00	186.92		186.94	0.000761	0.68	22.51	50.85	0.27
WC16	200	5-yr	16.92	186.00	187.12		187.14	0.000823	0.83	34.39	68.03	0.29
WC16	200	10-yr	20.34	186.00	187.19		187.22	0.000801	0.87	39.42	70.08	0.29
WC16	200	25-yr	24.83	186.00	187.27		187.30	0.000786	0.91	45.32	72.49	0.29
WC16	200	50-yr	28.14	186.00	187.30		187.33	0.000886	0.98	47.33	73.30	0.31
WC16	200	100-yr	31.57	186.00	187.35		187.38	0.000913	1.02	50.56	74.59	0.31
WC16	200	Check Flow	41.04	186.00	187.46		187.50	0.000966	1.12	58.99	77.85	0.33
WC16	200	Regional	22.45	186.00	187.23		187.26	0.000796	0.89	42.21	71.21	0.29
WC16	100	2-yr	9.39	186.18	186.69	186.69	186.84	0.010239	1.32	5.50	18.27	0.84
WC16	100	5-yr	16.92	186.18	186.85	186.85	187.03	0.010185	1.61	9.08	24.57	0.88
WC16	100	10-yr	20.34	186.18	186.90	186.90	187.10	0.010805	1.81	10.32	26.40	0.92
WC16	100	25-yr	24.83	186.18	186.97	186.97	187.18	0.010941	2.02	12.14	28.87	0.96
WC16	100	50-yr	28.14	186.18	187.05	187.05	187.23	0.008627	2.01	15.36	46.17	0.87
WC16	100	100-yr	31.57	186.18	187.08	187.08	187.27	0.008886	2.11	16.77	47.48	0.89
WC16	100	Check Flow	41.04	186.18	187.15	187.15	187.37	0.009418	2.35	20.23	50.55	0.94
WC16	100	Regional	22.45	186.18	186.94	186.94	187.14	0.010778	1.91	11.22	27.65	0.94

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
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PROJECT DATA
Project Title: HEC-RAS ROUGE
Project File : HEC.prj
Run Date and Time: 21/01/2016 2:06:25 PM

Project in SI units

Project Description:
HEC-RAS model for creek crossings along the proposed 407 TWY Ph 2 started
from scratch

PLAN DATA

Plan Title: Plan 31
Plan File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.p31

Geometry Title: WC16 - EX
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g08

Flow Title   : WC#16-Chicago4hr (PARSONS)
Flow File   : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f15

Plan Summary Information:
Number of: Cross Sections =   8   Multiple Openings =   0
            Culverts   =   0   Inline Structures =   0
            Bridges   =   0   Lateral Structures =   0

Computational Information
    Water surface calculation tolerance = 0.01
    Critical depth calculation tolerance = 0.01
    Maximum number of iterations   = 20
    Maximum difference tolerance   = 0.3
    Flow tolerance factor   = 0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method: Average Conveyance
    Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: WC#16-Chicago4hr (PARSONS)
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f15

Flow Data (m3/s)

River	Reach	RS	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Check Flow	Regional
Trib B	Reach 1	800	9.39	16.92	20.34	24.83	28.14	31.57	41.04	22.45
Rouge	WC16	800	9.39	16.92	20.34	24.83	28.14	31.57	41.04	22.45
Rouge	WC16	800	9.39	16.92	20.34	24.83	28.14	31.57	41.04	22.45

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Rouge	WC16	2-yr		Critical
Rouge	WC16	5-yr		Critical
Rouge	WC16	10-yr		Critical
Rouge	WC16	25-yr		Critical
Rouge	WC16	50-yr		Critical
Rouge	WC16	100-yr		Critical
Rouge	WC16	Check Flow		Critical
Rouge	WC16	Regional		Critical

GEOMETRY DATA

Geometry Title: WC16 - EX
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g08

CROSS SECTION

RIVER: Rouge
REACH: WC16 RS: 800

INPUT
Description: ST800
Station Elevation Data num= 131

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	194.284	.574	194	1.062	193.809	1.735	193.5	2.212	193.324
3.069	193	3.79	192.734	4.322	192.5	4.548	192.422	5.665	192
6.517	191.696	7.063	191.5	7.634	191.279	8.355	191	8.664	190.875
9.586	190.5	10.484	190.245	11.124	190	12.742	189.518	12.811	189.5
14.81	189.033	14.931	189	15.064	188.964	15.207	188.928	16.683	188.5
18.922	188.485	19.313	188.484	19.585	188.487	22.674	188.473	22.69	188.473
22.715	188.473	25.641	188.486	27.919	188.485	29.385	188.487	29.923	188.487
30.778	188.49	31.877	188.429	35.321	188.403	38.53	188.399	39.014	188.389
39.679	188.362	40.923	188.225	41.049	188.216	41.519	188.173	41.563	188.166
41.785	188.145	43.122	188	45.445	187.755	48.166	187.5	50.329	187.5
51.317	187.5	52.405	187.5	53.743	187.5	54.569	187.5	55.414	187.628
57.818	188	63.338	188.36	63.625	188.37	66.691	188.5	69.28	188.628
70.26	188.673	74.292	188.88	74.872	188.922	75.032	188.928	75.071	188.929
75.309	188.936	75.339	188.931	76.079	188.964	77.026	189	77.054	189.001
80.009	189.072	80.737	189.132	80.992	189.147	81.09	189.15	82.953	189.234
83.247	189.228	84.223	189.332	84.486	189.391	86.673	189.5	88.281	189.817
88.294	189.82	89.093	190	89.339	190.038	90.706	190.279	92.864	190.317
92.893	190.319	93.041	190.328	94.031	190.334	95.448	190.254	95.886	190.199
96.059	190.184	97.624	190	98.831	189.739	99.121	189.683	100.075	189.5
100.674	189.373	102.138	189	102.81	188.841	103.513	188.69	104.063	188.587
104.258	188.556	104.623	188.5	105.116	188.491	105.304	188.493	105.661	188.469
105.702	188.467	106.788	188.425	109.86	188.322	111.771	188.278	111.812	188.276
112.514	188.263	112.638	188.259	112.714	188.262	115.779	188.216	115.883	188.212
120.976	188.19	133.337	188.455	136.228	188.488	143.181	188.5	144.076	188.683
145.723	189	147.212	189.334	147.935	189.5	148.801	189.714	150.064	190
151.348	190.259	152.549	190.5	154.821	190.779	155.349	190.813	156.422	191
157.949	191.032								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	39.679	.03	63.338	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
39.679	63.338	44.5	44.5	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	188.16	Element	Left OB	Channel	Right OB
Vel Head (m)	0.18	Wt. n-Val.		0.030	
W.S. Elev (m)	187.98	Reach Len. (m)	44.50	44.50	44.50
Crit W.S. (m)	187.98	Flow Area (m2)		5.06	
E.G. Slope (m/m)	0.012580	Area (m2)		5.06	
Q Total (m3/s)	9.39	Flow (m3/s)		9.39	
Top Width (m)	14.42	Top Width (m)		14.42	
Vel Total (m/s)	1.86	Avg. Vel. (m/s)		1.86	
Max Chl Dpth (m)	0.48	Hydr. Depth (m)		0.35	
Conv. Total (m3/s)	83.7	Conv. (m3/s)		83.7	
Length Wtd. (m)	44.50	Wetted Per. (m)		14.48	
Min Ch El (m)	187.50	Shear (N/m2)		43.13	
Alpha	1.00	Stream Power (N/m s)	7562.26	0.00	0.00
Frctn Loss (m)	0.32	Cum Volume (1000 m3)	0.74	2.10	0.01
C & E Loss (m)	0.04	Cum SA (1000 m2)	2.47	6.43	0.11

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	188.39	Element	Left OB	Channel	Right OB
Vel Head (m)	0.22	Wt. n-Val.		0.030	
W.S. Elev (m)	188.17	Reach Len. (m)	44.50	44.50	44.50
Crit W.S. (m)	188.17	Flow Area (m2)		8.13	
E.G. Slope (m/m)	0.012034	Area (m2)		8.13	
Q Total (m3/s)	16.92	Flow (m3/s)		16.92	
Top Width (m)	18.84	Top Width (m)		18.84	
Vel Total (m/s)	2.08	Avg. Vel. (m/s)		2.08	
Max Chl Dpth (m)	0.67	Hydr. Depth (m)		0.43	
Conv. Total (m3/s)	154.2	Conv. (m3/s)		154.2	
Length Wtd. (m)	44.50	Wetted Per. (m)		18.91	
Min Ch El (m)	187.50	Shear (N/m2)		50.70	
Alpha	1.00	Stream Power (N/m s)	7562.26	0.00	0.00
Frctn Loss (m)	0.34	Cum Volume (1000 m3)	1.32	3.13	0.05
C & E Loss (m)	0.04	Cum SA (1000 m2)	3.71	7.40	0.34

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	188.47	Element	Left OB	Channel	Right OB
Vel Head (m)	0.22	Wt. n-Val.		0.030	0.070

W.S. Elev (m)	188.25	Reach Len. (m)	44.50	44.50	44.50
Crit W.S. (m)	188.25	Flow Area (m2)		9.78	0.39
E.G. Slope (m/m)	0.010744	Area (m2)		9.78	0.39
Q Total (m3/s)	20.34	Flow (m3/s)		20.28	0.06
Top Width (m)	31.35	Top Width (m)		20.98	10.38
Vel Total (m/s)	2.00	Avg. Vel. (m/s)		2.07	0.17
Max Chl Dpth (m)	0.75	Hydr. Depth (m)		0.47	0.04
Conv. Total (m3/s)	196.2	Conv. (m3/s)		195.6	0.6
Length Wtd. (m)	44.50	Wetted Per. (m)		21.06	10.38
Min Ch El (m)	187.50	Shear (N/m2)		48.94	3.92
Alpha	1.07	Stream Power (N/m s)	7562.26	0.00	0.00
Frctn Loss (m)	0.34	Cum Volume (1000 m3)	1.57	3.52	0.09
C & E Loss (m)	0.03	Cum SA (1000 m2)	3.94	7.57	0.71

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	188.55	Element	Left OB	Channel	Right OB
Vel Head (m)	0.22	Wt. n-Val.		0.030	0.070
W.S. Elev (m)	188.34	Reach Len. (m)	44.50	44.50	44.50
Crit W.S. (m)	188.34	Flow Area (m2)		11.71	1.67
E.G. Slope (m/m)	0.009688	Area (m2)		11.71	1.67
Q Total (m3/s)	24.83	Flow (m3/s)		24.36	0.47
Top Width (m)	41.64	Top Width (m)		23.11	18.52
Vel Total (m/s)	1.86	Avg. Vel. (m/s)		2.08	0.28
Max Chl Dpth (m)	0.84	Hydr. Depth (m)		0.51	0.09
Conv. Total (m3/s)	252.3	Conv. (m3/s)		247.4	4.8
Length Wtd. (m)	44.50	Wetted Per. (m)		23.20	18.53
Min Ch El (m)	187.50	Shear (N/m2)		47.95	8.59
Alpha	1.23	Stream Power (N/m s)	7562.26	0.00	0.00
Frctn Loss (m)	0.33	Cum Volume (1000 m3)	1.88	4.01	0.16
C & E Loss (m)	0.03	Cum SA (1000 m2)	4.09	7.75	1.06

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	188.61	Element	Left OB	Channel	Right OB
Vel Head (m)	0.23	Wt. n-Val.	0.070	0.030	0.070
W.S. Elev (m)	188.38	Reach Len. (m)	44.50	44.50	44.50
Crit W.S. (m)	188.38	Flow Area (m2)	0.01	12.75	2.58
E.G. Slope (m/m)	0.009439	Area (m2)	0.01	12.75	2.58
Q Total (m3/s)	28.14	Flow (m3/s)	0.00	27.28	0.86
Top Width (m)	46.67	Top Width (m)	0.51	23.66	22.50
Vel Total (m/s)	1.83	Avg. Vel. (m/s)	0.07	2.14	0.33
Max Chl Dpth (m)	0.88	Hydr. Depth (m)	0.01	0.54	0.11
Conv. Total (m3/s)	289.6	Conv. (m3/s)	0.0	280.8	8.8
Length Wtd. (m)	44.50	Wetted Per. (m)	0.51	23.75	22.50
Min Ch El (m)	187.50	Shear (N/m2)	0.95	49.70	10.60
Alpha	1.32	Stream Power (N/m s)	7562.26	0.00	0.00
Frctn Loss (m)	0.33	Cum Volume (1000 m3)	2.06	4.31	0.21
C & E Loss (m)	0.03	Cum SA (1000 m2)	4.40	7.86	1.26

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	188.66	Element	Left OB	Channel	Right OB
Vel Head (m)	0.23	Wt. n-Val.	0.070	0.030	0.070
W.S. Elev (m)	188.43	Reach Len. (m)	44.50	44.50	44.50
Crit W.S. (m)	188.43	Flow Area (m2)	0.18	13.82	3.70
E.G. Slope (m/m)	0.008839	Area (m2)	0.18	13.82	3.70
Q Total (m3/s)	31.57	Flow (m3/s)	0.02	30.20	1.35
Top Width (m)	58.35	Top Width (m)	7.68	23.66	27.02
Vel Total (m/s)	1.78	Avg. Vel. (m/s)	0.11	2.18	0.36
Max Chl Dpth (m)	0.93	Hydr. Depth (m)	0.02	0.58	0.14
Conv. Total (m3/s)	335.8	Conv. (m3/s)	0.2	321.2	14.4
Length Wtd. (m)	44.50	Wetted Per. (m)	7.68	23.75	27.02
Min Ch El (m)	187.50	Shear (N/m2)	2.02	50.45	11.87
Alpha	1.44	Stream Power (N/m s)	7562.26	0.00	0.00
Frctn Loss (m)	0.32	Cum Volume (1000 m3)	2.24	4.62	0.27
C & E Loss (m)	0.02	Cum SA (1000 m2)	4.63	7.94	1.46

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	188.78	Element	Left OB	Channel	Right OB
Vel Head (m)	0.22	Wt. n-Val.	0.070	0.030	0.070
W.S. Elev (m)	188.56	Reach Len. (m)	44.50	44.50	44.50
Crit W.S. (m)	188.56	Flow Area (m2)	2.48	17.04	8.70
E.G. Slope (m/m)	0.006583	Area (m2)	2.48	17.04	8.70
Q Total (m3/s)	41.04	Flow (m3/s)	0.65	36.92	3.48
Top Width (m)	90.80	Top Width (m)	23.22	23.66	43.93
Vel Total (m/s)	1.45	Avg. Vel. (m/s)	0.26	2.17	0.40
Max Chl Dpth (m)	1.06	Hydr. Depth (m)	0.11	0.72	0.20
Conv. Total (m3/s)	505.8	Conv. (m3/s)	8.0	455.0	42.9
Length Wtd. (m)	44.50	Wetted Per. (m)	23.23	23.75	43.95
Min Ch El (m)	187.50	Shear (N/m2)	6.88	46.30	12.78
Alpha	2.00	Stream Power (N/m s)	7562.26	0.00	0.00
Frctn Loss (m)	0.29	Cum Volume (1000 m3)	2.74	5.38	0.47
C & E Loss (m)	0.01	Cum SA (1000 m2)	5.18	8.05	2.16

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	188.51	Element	Left OB	Channel	Right OB
Vel Head (m)	0.22	Wt. n-Val.		0.030	0.070
W.S. Elev (m)	188.30	Reach Len. (m)	44.50	44.50	44.50
Crit W.S. (m)	188.30	Flow Area (m2)		10.76	0.97
E.G. Slope (m/m)	0.010074	Area (m2)		10.76	0.97
Q Total (m3/s)	22.45	Flow (m3/s)		22.23	0.22
Top Width (m)	37.03	Top Width (m)		22.08	14.95
Vel Total (m/s)	1.91	Avg. Vel. (m/s)		2.07	0.23
Max Chl Dpth (m)	0.80	Hydr. Depth (m)		0.49	0.06
Conv. Total (m3/s)	223.7	Conv. (m3/s)		221.4	2.2
Length Wtd. (m)	44.50	Wetted Per. (m)		22.17	14.95
Min Ch El (m)	187.50	Shear (N/m2)		47.94	6.39
Alpha	1.15	Stream Power (N/m s)	7562.26	0.00	0.00
Frctn Loss (m)	0.33	Cum Volume (1000 m3)	1.72	3.76	0.12
C & E Loss (m)	0.03	Cum SA (1000 m2)	4.01	7.66	0.90

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Rouge
REACH: WC16 RS: 700

INPUT
Description: ST 700
Station Elevation Data num= 95

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	188.728	1.142	188.78	7.257	189	8.108	189.004	10.16	189.014
11.464	189.008	13.125	189.002	13.398	189	14.489	188.949	14.63	188.946
15.501	188.988	15.603	189	16.731	189.014	18.711	189.028	20.916	189.046
21.943	189.045	26.598	189.006	27.175	189	28.157	188.993	31.135	188.944
34.613	188.929	35.12	188.923	35.801	188.905	37.801	188.867	37.932	188.877
39.623	188.776	42.024	188.686	42.913	188.672	42.994	188.666	43.066	188.665
45.744	188.603	46.856	188.573	48.509	188.5	54.138	188.249	55.744	188.147
57.585	188	57.703	187.99	59.82	187.761	62.236	187.5	66.426	187.135
67.382	187.076	68.496	187	68.543	187	68.588	187	68.682	187
68.826	187	69.226	187.035	69.997	187.117	71.933	187.12	74.637	187.164
75.761	187.197	86.273	187.5	86.569	187.51	87.057	187.53	92.556	187.752
98.012	188	101.446	188.241	103.413	188.373	104.228	188.423	105.339	188.5
111.633	188.95	112.425	188.994	113.078	189	113.418	189.019	113.422	189.019
113.604	189.033	113.871	189.057	114.308	189.093	116.759	189.315	117.521	189.374
119.277	189.5	120.431	189.545	120.883	189.56	121.019	189.565	123.265	189.636
125.348	189.719	125.698	189.721	126.485	189.743	128.389	189.802	129.15	189.814
129.94	189.829	132.483	189.89	134.026	189.946	135.308	190	135.507	190.002
140.457	190.252	145.499	190.5	146.445	190.526	149.891	190.583	153.081	190.603
154.748	190.624	159.239	190.724	161.957	190.772	165.235	190.786	166	190.785

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	59.82	.03	92.556	.07

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

Left	Right	Left	Channel	Right	Coeff Contr.	Expan.
59.82	92.556	51.6	51.6	51.6	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	187.67	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.030	
W.S. Elev (m)	187.61	Reach Len. (m)	51.60	51.60	51.60
Crit W.S. (m)		Flow Area (m2)		8.82	
E.G. Slope (m/m)	0.004717	Area (m2)		8.82	
Q Total (m3/s)	9.39	Flow (m3/s)		9.39	
Top Width (m)	27.78	Top Width (m)		27.78	
Vel Total (m/s)	1.06	Avg. Vel. (m/s)		1.06	
Max Chl Dpth (m)	0.61	Hydr. Depth (m)		0.32	

Conv. Total (m3/s)	136.7	Conv. (m3/s)		136.7	
Length Wtd. (m)	51.60	Wetted Per. (m)		27.82	
Min Ch El (m)	187.00	Shear (N/m2)		14.67	
Alpha	1.00	Stream Power (N/m s)	7947.72	0.00	0.00
Frctn Loss (m)	0.24	Cum Volume (1000 m3)	0.74	1.79	0.01
C & E Loss (m)	0.00	Cum SA (1000 m2)	2.47	5.49	0.11

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	187.83	Element	Left OB	Channel	Right OB
Vel Head (m)	0.09	Wt. n-Val.		0.030	
W.S. Elev (m)	187.74	Reach Len. (m)	51.60	51.60	51.60
Crit W.S. (m)		Flow Area (m2)		12.86	
E.G. Slope (m/m)	0.005341	Area (m2)		12.86	
Q Total (m3/s)	16.92	Flow (m3/s)		16.92	
Top Width (m)	32.35	Top Width (m)		32.35	
Vel Total (m/s)	1.32	Avg. Vel. (m/s)		1.32	
Max Chl Dpth (m)	0.74	Hydr. Depth (m)		0.40	
Conv. Total (m3/s)	231.5	Conv. (m3/s)		231.5	
Length Wtd. (m)	51.60	Wetted Per. (m)		32.40	
Min Ch El (m)	187.00	Shear (N/m2)		20.79	
Alpha	1.00	Stream Power (N/m s)	7947.72	0.00	0.00
Frctn Loss (m)	0.23	Cum Volume (1000 m3)	1.32	2.66	0.05
C & E Loss (m)	0.01	Cum SA (1000 m2)	3.71	6.26	0.34

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	187.89	Element	Left OB	Channel	Right OB
Vel Head (m)	0.10	Wt. n-Val.	0.070	0.030	0.070
W.S. Elev (m)	187.78	Reach Len. (m)	51.60	51.60	51.60
Crit W.S. (m)		Flow Area (m2)	0.00	14.21	0.01
E.G. Slope (m/m)	0.005619	Area (m2)	0.00	14.21	0.01
Q Total (m3/s)	20.34	Flow (m3/s)	0.00	20.34	0.00
Top Width (m)	33.67	Top Width (m)	0.22	32.74	0.72
Vel Total (m/s)	1.43	Avg. Vel. (m/s)	0.05	1.43	0.07
Max Chl Dpth (m)	0.78	Hydr. Depth (m)	0.01	0.43	0.02
Conv. Total (m3/s)	271.4	Conv. (m3/s)	0.0	271.3	0.0
Length Wtd. (m)	51.60	Wetted Per. (m)	0.22	32.79	0.72
Min Ch El (m)	187.00	Shear (N/m2)	0.64	23.88	0.90
Alpha	1.00	Stream Power (N/m s)	7947.72	0.00	0.00
Frctn Loss (m)	0.23	Cum Volume (1000 m3)	1.57	2.99	0.08
C & E Loss (m)	0.01	Cum SA (1000 m2)	3.94	6.37	0.46

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	187.96	Element	Left OB	Channel	Right OB
Vel Head (m)	0.13	Wt. n-Val.	0.070	0.030	0.070
W.S. Elev (m)	187.83	Reach Len. (m)	51.60	51.60	51.60
Crit W.S. (m)		Flow Area (m2)	0.02	15.78	0.07
E.G. Slope (m/m)	0.005907	Area (m2)	0.02	15.78	0.07
Q Total (m3/s)	24.83	Flow (m3/s)	0.00	24.82	0.01
Top Width (m)	35.16	Top Width (m)	0.66	32.74	1.77
Vel Total (m/s)	1.56	Avg. Vel. (m/s)	0.12	1.57	0.13
Max Chl Dpth (m)	0.83	Hydr. Depth (m)	0.04	0.48	0.04
Conv. Total (m3/s)	323.1	Conv. (m3/s)	0.0	322.9	0.1
Length Wtd. (m)	51.60	Wetted Per. (m)	0.66	32.79	1.77
Min Ch El (m)	187.00	Shear (N/m2)	2.05	27.87	2.32
Alpha	1.01	Stream Power (N/m s)	7947.72	0.00	0.00
Frctn Loss (m)	0.22	Cum Volume (1000 m3)	1.88	3.40	0.12
C & E Loss (m)	0.02	Cum SA (1000 m2)	4.07	6.51	0.61

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	188.01	Element	Left OB	Channel	Right OB
Vel Head (m)	0.14	Wt. n-Val.	0.070	0.030	0.070
W.S. Elev (m)	187.87	Reach Len. (m)	51.60	51.60	51.60
Crit W.S. (m)		Flow Area (m2)	0.05	16.95	0.15
E.G. Slope (m/m)	0.005965	Area (m2)	0.05	16.95	0.15
Q Total (m3/s)	28.14	Flow (m3/s)	0.01	28.11	0.02
Top Width (m)	36.28	Top Width (m)	0.99	32.74	2.55
Vel Total (m/s)	1.64	Avg. Vel. (m/s)	0.16	1.66	0.17
Max Chl Dpth (m)	0.87	Hydr. Depth (m)	0.05	0.52	0.06
Conv. Total (m3/s)	364.3	Conv. (m3/s)	0.1	363.9	0.3
Length Wtd. (m)	51.60	Wetted Per. (m)	1.00	32.79	2.56
Min Ch El (m)	187.00	Shear (N/m2)	3.11	30.24	3.39
Alpha	1.02	Stream Power (N/m s)	7947.72	0.00	0.00
Frctn Loss (m)	0.22	Cum Volume (1000 m3)	2.06	3.65	0.15
C & E Loss (m)	0.02	Cum SA (1000 m2)	4.37	6.60	0.70

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	188.06	Element	Left OB	Channel	Right OB
Vel Head (m)	0.15	Wt. n-Val.	0.070	0.030	0.070
W.S. Elev (m)	187.90	Reach Len. (m)	51.60	51.60	51.60
Crit W.S. (m)		Flow Area (m2)	0.09	18.06	0.25
E.G. Slope (m/m)	0.006068	Area (m2)	0.09	18.06	0.25
Q Total (m3/s)	31.57	Flow (m3/s)	0.02	31.50	0.05
Top Width (m)	37.34	Top Width (m)	1.30	32.74	3.30
Vel Total (m/s)	1.72	Avg. Vel. (m/s)	0.19	1.74	0.20
Max Chl Dpth (m)	0.90	Hydr. Depth (m)	0.07	0.55	0.08
Conv. Total (m3/s)	405.3	Conv. (m3/s)	0.2	404.4	0.6
Length Wtd. (m)	51.60	Wetted Per. (m)	1.31	32.79	3.30
Min Ch El (m)	187.00	Shear (N/m2)	4.17	32.77	4.46
Alpha	1.03	Stream Power (N/m s)	7947.72	0.00	0.00
Frctn Loss (m)	0.21	Cum Volume (1000 m3)	2.23	3.91	0.18
C & E Loss (m)	0.03	Cum SA (1000 m2)	4.43	6.69	0.79

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	188.18	Element	Left OB	Channel	Right OB
Vel Head (m)	0.20	Wt. n-Val.	0.070	0.030	0.070
W.S. Elev (m)	187.98	Reach Len. (m)	51.60	51.60	51.60
Crit W.S. (m)	187.89	Flow Area (m2)	0.23	20.67	0.58
E.G. Slope (m/m)	0.006491	Area (m2)	0.23	20.67	0.58
Q Total (m3/s)	41.04	Flow (m3/s)	0.06	40.82	0.16
Top Width (m)	39.83	Top Width (m)	2.04	32.74	5.06
Vel Total (m/s)	1.91	Avg. Vel. (m/s)	0.26	1.97	0.27
Max Chl Dpth (m)	0.98	Hydr. Depth (m)	0.11	0.63	0.11
Conv. Total (m3/s)	509.4	Conv. (m3/s)	0.7	506.7	2.0
Length Wtd. (m)	51.60	Wetted Per. (m)	2.05	32.79	5.06
Min Ch El (m)	187.00	Shear (N/m2)	6.99	40.13	7.31
Alpha	1.06	Stream Power (N/m s)	7947.72	0.00	0.00
Frctn Loss (m)	0.21	Cum Volume (1000 m3)	2.68	4.54	0.27
C & E Loss (m)	0.04	Cum SA (1000 m2)	4.62	6.80	1.07

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This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	187.92	Element	Left OB	Channel	Right OB
Vel Head (m)	0.11	Wt. n-Val.	0.070	0.030	0.070
W.S. Elev (m)	187.81	Reach Len. (m)	51.60	51.60	51.60
Crit W.S. (m)		Flow Area (m2)	0.01	14.95	0.03
E.G. Slope (m/m)	0.005780	Area (m2)	0.01	14.95	0.03
Q Total (m3/s)	22.45	Flow (m3/s)	0.00	22.45	0.00
Top Width (m)	34.37	Top Width (m)	0.42	32.74	1.21
Vel Total (m/s)	1.50	Avg. Vel. (m/s)	0.09	1.50	0.10
Max Chl Dpth (m)	0.81	Hydr. Depth (m)	0.02	0.46	0.03
Conv. Total (m3/s)	295.3	Conv. (m3/s)	0.0	295.2	0.0
Length Wtd. (m)	51.60	Wetted Per. (m)	0.43	32.79	1.21
Min Ch El (m)	187.00	Shear (N/m2)	1.29	25.85	1.56
Alpha	1.01	Stream Power (N/m s)	7947.72	0.00	0.00
Frctn Loss (m)	0.22	Cum Volume (1000 m3)	1.72	3.19	0.10
C & E Loss (m)	0.02	Cum SA (1000 m2)	4.00	6.44	0.54

CROSS SECTION

RIVER: Rouge
REACH: WC16 RS: 600

INPUT
Description: ST 600
Station Elevation Data num= 45

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	188.584	5.453	188.665	14.598	188.554	17.97	188.5	18.586	188.488
19.79	188.468	20.105	188.47	21.987	188.5	22.02	188.503	22.273	188.503
22.728	188.503	24.45	188.51	26.753	188.522	29.638	188.5	32.002	188.253
32.384	188.241	32.516	188.226	33.471	188	35.659	187.775	37.975	187.5
38.781	187.491	39.879	187.449	44.662	187.264	49.036	187.099	51.71	186.8
57.409	186.8	58.561	187.023	62.272	187.076	65.342	187.105	65.824	187.113
66.638	187.124	67.891	187.152	83.297	187.5	88.2	187.783	91.351	187.965
91.661	187.982	92.022	188	99.628	188.427	100.817	188.5	109.153	188.959
109.356	188.969	109.894	189	120.265	189.454	121.278	189.5	127.304	189.719

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.07	17.97	.03	22.273	.013	29.638	.07	35.659	.03
88.2	.07								

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
35.659	88.2	45.3	45.3	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	187.43	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.030	
W.S. Elev (m)	187.38	Reach Len. (m)	45.30	45.30	45.30
Crit W.S. (m)		Flow Area (m2)		10.00	
E.G. Slope (m/m)	0.004458	Area (m2)		10.00	
Q Total (m3/s)	9.39	Flow (m3/s)		9.39	
Top Width (m)	36.42	Top Width (m)		36.42	
Vel Total (m/s)	0.94	Avg. Vel. (m/s)		0.94	
Max Chl Dpth (m)	0.58	Hydr. Depth (m)		0.27	
Conv. Total (m3/s)	140.6	Conv. (m3/s)		140.6	
Length Wtd. (m)	45.30	Wetted Per. (m)		36.46	
Min Ch El (m)	186.80	Shear (N/m2)		11.99	
Alpha	1.00	Stream Power (N/m s)	6095.04	0.00	0.00
Frctn Loss (m)	0.18	Cum Volume (1000 m3)	0.74	1.30	0.01
C & E Loss (m)	0.00	Cum SA (1000 m2)	2.47	3.83	0.11

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	187.59	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.030	
W.S. Elev (m)	187.53	Reach Len. (m)	45.30	45.30	45.30
Crit W.S. (m)		Flow Area (m2)		16.36	
E.G. Slope (m/m)	0.003847	Area (m2)		16.36	
Q Total (m3/s)	16.92	Flow (m3/s)		16.92	
Top Width (m)	46.19	Top Width (m)		46.19	
Vel Total (m/s)	1.03	Avg. Vel. (m/s)		1.03	
Max Chl Dpth (m)	0.73	Hydr. Depth (m)		0.35	
Conv. Total (m3/s)	272.8	Conv. (m3/s)		272.8	
Length Wtd. (m)	45.30	Wetted Per. (m)		46.25	
Min Ch El (m)	186.80	Shear (N/m2)		13.35	
Alpha	1.00	Stream Power (N/m s)	6095.04	0.00	0.00
Frctn Loss (m)	0.20	Cum Volume (1000 m3)	1.32	1.91	0.05
C & E Loss (m)	0.00	Cum SA (1000 m2)	3.71	4.23	0.34

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	187.65	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.030	
W.S. Elev (m)	187.59	Reach Len. (m)	45.30	45.30	45.30
Crit W.S. (m)		Flow Area (m2)		18.92	
E.G. Slope (m/m)	0.003565	Area (m2)		18.92	
Q Total (m3/s)	20.34	Flow (m3/s)		20.34	
Top Width (m)	47.60	Top Width (m)		47.60	
Vel Total (m/s)	1.08	Avg. Vel. (m/s)		1.08	
Max Chl Dpth (m)	0.79	Hydr. Depth (m)		0.40	
Conv. Total (m3/s)	340.6	Conv. (m3/s)		340.6	
Length Wtd. (m)	45.30	Wetted Per. (m)		47.66	
Min Ch El (m)	186.80	Shear (N/m2)		13.88	
Alpha	1.00	Stream Power (N/m s)	6095.04	0.00	0.00
Frctn Loss (m)	0.20	Cum Volume (1000 m3)	1.57	2.13	0.08
C & E Loss (m)	0.00	Cum SA (1000 m2)	3.93	4.30	0.45

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	187.72	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.030	
W.S. Elev (m)	187.66	Reach Len. (m)	45.30	45.30	45.30
Crit W.S. (m)		Flow Area (m2)		22.29	
E.G. Slope (m/m)	0.003229	Area (m2)		22.29	
Q Total (m3/s)	24.83	Flow (m3/s)		24.83	
Top Width (m)	49.39	Top Width (m)		49.39	
Vel Total (m/s)	1.11	Avg. Vel. (m/s)		1.11	
Max Chl Dpth (m)	0.86	Hydr. Depth (m)		0.45	
Conv. Total (m3/s)	436.9	Conv. (m3/s)		436.9	
Length Wtd. (m)	45.30	Wetted Per. (m)		49.45	
Min Ch El (m)	186.80	Shear (N/m2)		14.28	
Alpha	1.00	Stream Power (N/m s)	6095.04	0.00	0.00
Frctn Loss (m)	0.20	Cum Volume (1000 m3)	1.88	2.41	0.12
C & E Loss (m)	0.01	Cum SA (1000 m2)	4.06	4.39	0.56

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	187.77	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.030	
W.S. Elev (m)	187.70	Reach Len. (m)	45.30	45.30	45.30
Crit W.S. (m)		Flow Area (m2)		24.58	
E.G. Slope (m/m)	0.003090	Area (m2)		24.58	
Q Total (m3/s)	28.14	Flow (m3/s)		28.14	
Top Width (m)	50.57	Top Width (m)		50.57	
Vel Total (m/s)	1.14	Avg. Vel. (m/s)		1.14	
Max Chl Dpth (m)	0.90	Hydr. Depth (m)		0.49	
Conv. Total (m3/s)	506.2	Conv. (m3/s)		506.2	
Length Wtd. (m)	45.30	Wetted Per. (m)		50.64	
Min Ch El (m)	186.80	Shear (N/m2)		14.71	
Alpha	1.00	Stream Power (N/m s)	6095.04	0.00	0.00
Frctn Loss (m)	0.20	Cum Volume (1000 m3)	2.05	2.58	0.14
C & E Loss (m)	0.01	Cum SA (1000 m2)	4.34	4.45	0.63

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	187.82	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.030	
W.S. Elev (m)	187.75	Reach Len. (m)	45.30	45.30	45.30
Crit W.S. (m)		Flow Area (m2)		26.90	
E.G. Slope (m/m)	0.002971	Area (m2)		26.90	
Q Total (m3/s)	31.57	Flow (m3/s)		31.57	
Top Width (m)	51.73	Top Width (m)		51.73	
Vel Total (m/s)	1.17	Avg. Vel. (m/s)		1.17	
Max Chl Dpth (m)	0.95	Hydr. Depth (m)		0.52	
Conv. Total (m3/s)	579.2	Conv. (m3/s)		579.2	
Length Wtd. (m)	45.30	Wetted Per. (m)		51.80	
Min Ch El (m)	186.80	Shear (N/m2)		15.13	
Alpha	1.00	Stream Power (N/m s)	6095.04	0.00	0.00
Frctn Loss (m)	0.20	Cum Volume (1000 m3)	2.23	2.75	0.17
C & E Loss (m)	0.01	Cum SA (1000 m2)	4.40	4.51	0.70

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	187.94	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.	0.070	0.030	0.070
W.S. Elev (m)	187.86	Reach Len. (m)	45.30	45.30	45.30
Crit W.S. (m)		Flow Area (m2)	0.03	32.61	0.05
E.G. Slope (m/m)	0.002696	Area (m2)	0.03	32.61	0.05
Q Total (m3/s)	41.04	Flow (m3/s)	0.00	41.03	0.00
Top Width (m)	54.64	Top Width (m)	0.81	52.54	1.30
Vel Total (m/s)	1.26	Avg. Vel. (m/s)	0.09	1.26	0.08
Max Chl Dpth (m)	1.06	Hydr. Depth (m)	0.04	0.62	0.04
Conv. Total (m3/s)	790.3	Conv. (m3/s)	0.1	790.2	0.1
Length Wtd. (m)	45.30	Wetted Per. (m)	0.81	52.62	1.30
Min Ch El (m)	186.80	Shear (N/m2)	1.09	16.39	0.99
Alpha	1.00	Stream Power (N/m s)	6095.04	0.00	0.00
Frctn Loss (m)	0.20	Cum Volume (1000 m3)	2.67	3.17	0.25
C & E Loss (m)	0.01	Cum SA (1000 m2)	4.54	4.60	0.91

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.

This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	187.68	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.030	
W.S. Elev (m)	187.62	Reach Len. (m)	45.30	45.30	45.30
Crit W.S. (m)		Flow Area (m2)		20.60	
E.G. Slope (m/m)	0.003353	Area (m2)		20.60	
Q Total (m3/s)	22.45	Flow (m3/s)		22.45	
Top Width (m)	48.50	Top Width (m)		48.50	
Vel Total (m/s)	1.09	Avg. Vel. (m/s)		1.09	
Max Chl Dpth (m)	0.82	Hydr. Depth (m)		0.42	
Conv. Total (m3/s)	387.7	Conv. (m3/s)		387.7	
Length Wtd. (m)	45.30	Wetted Per. (m)		48.56	
Min Ch El (m)	186.80	Shear (N/m2)		13.95	
Alpha	1.00	Stream Power (N/m s)	6095.04	0.00	0.00
Frctn Loss (m)	0.20	Cum Volume (1000 m3)	1.72	2.27	0.10
C & E Loss (m)	0.01	Cum SA (1000 m2)	3.99	4.35	0.50

CROSS SECTION

RIVER: Rouge
REACH: WC16 RS: 500

INPUT
Description: ST 500
Station Elevation Data num= 90

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	188.202	5.115	188.012	6.277	188.012	7.165	188.011	8.253	188.01
11.393	188.005	12.267	188.005	12.788	188.004	16.022	188	16.049	188
23.15	187.837	23.912	187.804	30.903	187.763	35.957	187.566	37.607	187.601
38.861	187.5	40.503	187.023	40.588	187	40.605	186.994	40.772	186.982
41.027	186.956	41.334	186.941	41.585	186.926	42.238	186.851	42.501	186.834
44.328	186.846	46.297	186.86	46.297	186.861	46.326	186.865	46.411	186.862
47.782	186.81	48.816	186.773	50.168	186.742	50.979	186.725	51.687	186.712
52.042	186.708	52.337	186.708	53.521	186.7	55.665	186.727	57.21	186.768
61.314	186.904	61.523	186.916	63.895	186.962	64.199	186.973	65.967	187
68.833	187.182	69.753	187.226	71.66	187.335	72.085	187.352	75.192	187.5
79.45	187.908	80.531	188	81.54	188.012	82.63	188.022	82.751	188.023
82.918	188.023	89.602	188.422	90.748	188.5	91.141	188.504	91.639	188.507
95.678	188.706	98.461	188.834	99.367	188.858	101.485	189	105.523	189.016
106.512	189.019	106.608	189.019	106.63	189.02	113.489	189.243	114.379	189.255
114.943	189.268	116.089	189.286	116.134	189.287	116.156	189.287	116.232	189.288
120.929	189.453	121.043	189.459	121.159	189.465	121.955	189.5	121.99	189.5
122.368	189.501	122.415	189.501	122.658	189.528	125.971	189.723	129.539	189.738
129.713	189.756	132.463	189.809	133.407	189.814	134.553	189.817	135.001	189.832

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.013	38.861	.03	75.192	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
38.861	75.192	44.2	44.2	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	187.25	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.030	
W.S. Elev (m)	187.20	Reach Len. (m)	44.20	44.20	44.20
Crit W.S. (m)		Flow Area (m2)		9.90	
E.G. Slope (m/m)	0.003464	Area (m2)		9.90	
Q Total (m3/s)	9.39	Flow (m3/s)		9.39	
Top Width (m)	29.38	Top Width (m)		29.38	
Vel Total (m/s)	0.95	Avg. Vel. (m/s)		0.95	
Max Chl Dpth (m)	0.50	Hydr. Depth (m)		0.34	
Conv. Total (m3/s)	159.5	Conv. (m3/s)		159.5	
Length Wtd. (m)	44.20	Wetted Per. (m)		29.44	
Min Ch El (m)	186.70	Shear (N/m2)		11.42	
Alpha	1.00	Stream Power (N/m s)	6463.57	0.00	0.00
Frctn Loss (m)	0.22	Cum Volume (1000 m3)	0.74	0.85	0.01
C & E Loss (m)	0.00	Cum SA (1000 m2)	2.47	2.34	0.11

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	187.39	Element	Left OB	Channel	Right OB
Vel Head (m)	0.09	Wt. n-Val.		0.030	
W.S. Elev (m)	187.30	Reach Len. (m)	44.20	44.20	44.20
Crit W.S. (m)		Flow Area (m2)		12.80	
E.G. Slope (m/m)	0.005233	Area (m2)		12.80	
Q Total (m3/s)	16.92	Flow (m3/s)		16.92	
Top Width (m)	31.46	Top Width (m)		31.46	
Vel Total (m/s)	1.32	Avg. Vel. (m/s)		1.32	
Max Chl Dpth (m)	0.60	Hydr. Depth (m)		0.41	
Conv. Total (m3/s)	233.9	Conv. (m3/s)		233.9	
Length Wtd. (m)	44.20	Wetted Per. (m)		31.53	
Min Ch El (m)	186.70	Shear (N/m2)		20.83	
Alpha	1.00	Stream Power (N/m s)	6463.57	0.00	0.00
Frctn Loss (m)	0.18	Cum Volume (1000 m3)	1.32	1.25	0.05
C & E Loss (m)	0.01	Cum SA (1000 m2)	3.71	2.48	0.34

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	187.44	Element	Left OB	Channel	Right OB
Vel Head (m)	0.11	Wt. n-Val.		0.030	
W.S. Elev (m)	187.33	Reach Len. (m)	44.20	44.20	44.20
Crit W.S. (m)		Flow Area (m2)		13.96	
E.G. Slope (m/m)	0.005852	Area (m2)		13.96	
Q Total (m3/s)	20.34	Flow (m3/s)		20.34	

Top Width (m)	32.22	Top Width (m)		32.22	
Vel Total (m/s)	1.46	Avg. Vel. (m/s)		1.46	
Max Chl Dpth (m)	0.63	Hydr. Depth (m)		0.43	
Conv. Total (m3/s)	265.9	Conv. (m3/s)		265.9	
Length Wtd. (m)	44.20	Wetted Per. (m)		32.29	
Min Ch El (m)	186.70	Shear (N/m2)		24.80	
Alpha	1.00	Stream Power (N/m s)	6463.57	0.00	0.00
Frctn Loss (m)	0.17	Cum Volume (1000 m3)	1.57	1.39	0.08
C & E Loss (m)	0.02	Cum SA (1000 m2)	3.93	2.49	0.45

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	187.51	Element	Left OB	Channel	Right OB
Vel Head (m)	0.13	Wt. n-Val.		0.030	
W.S. Elev (m)	187.38	Reach Len. (m)	44.20	44.20	44.20
Crit W.S. (m)		Flow Area (m2)		15.41	
E.G. Slope (m/m)	0.006566	Area (m2)		15.41	
Q Total (m3/s)	24.83	Flow (m3/s)		24.83	
Top Width (m)	33.37	Top Width (m)		33.37	
Vel Total (m/s)	1.61	Avg. Vel. (m/s)		1.61	
Max Chl Dpth (m)	0.68	Hydr. Depth (m)		0.46	
Conv. Total (m3/s)	306.4	Conv. (m3/s)		306.4	
Length Wtd. (m)	44.20	Wetted Per. (m)		33.45	
Min Ch El (m)	186.70	Shear (N/m2)		29.67	
Alpha	1.00	Stream Power (N/m s)	6463.57	0.00	0.00
Frctn Loss (m)	0.15	Cum Volume (1000 m3)	1.88	1.56	0.12
C & E Loss (m)	0.02	Cum SA (1000 m2)	4.06	2.52	0.56

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	187.56	Element	Left OB	Channel	Right OB
Vel Head (m)	0.15	Wt. n-Val.		0.030	
W.S. Elev (m)	187.41	Reach Len. (m)	44.20	44.20	44.20
Crit W.S. (m)		Flow Area (m2)		16.41	
E.G. Slope (m/m)	0.007042	Area (m2)		16.41	
Q Total (m3/s)	28.14	Flow (m3/s)		28.14	
Top Width (m)	34.09	Top Width (m)		34.09	
Vel Total (m/s)	1.71	Avg. Vel. (m/s)		1.71	
Max Chl Dpth (m)	0.71	Hydr. Depth (m)		0.48	
Conv. Total (m3/s)	335.3	Conv. (m3/s)		335.3	
Length Wtd. (m)	44.20	Wetted Per. (m)		34.18	
Min Ch El (m)	186.70	Shear (N/m2)		33.15	
Alpha	1.00	Stream Power (N/m s)	6463.57	0.00	0.00
Frctn Loss (m)	0.15	Cum Volume (1000 m3)	2.05	1.65	0.14
C & E Loss (m)	0.03	Cum SA (1000 m2)	4.34	2.53	0.63

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	187.60	Element	Left OB	Channel	Right OB
Vel Head (m)	0.17	Wt. n-Val.		0.030	
W.S. Elev (m)	187.44	Reach Len. (m)	44.20	44.20	44.20
Crit W.S. (m)		Flow Area (m2)		17.39	
E.G. Slope (m/m)	0.007504	Area (m2)		17.39	
Q Total (m3/s)	31.57	Flow (m3/s)		31.57	
Top Width (m)	34.79	Top Width (m)		34.79	
Vel Total (m/s)	1.82	Avg. Vel. (m/s)		1.82	
Max Chl Dpth (m)	0.74	Hydr. Depth (m)		0.50	
Conv. Total (m3/s)	364.4	Conv. (m3/s)		364.4	
Length Wtd. (m)	44.20	Wetted Per. (m)		34.88	
Min Ch El (m)	186.70	Shear (N/m2)		36.69	
Alpha	1.00	Stream Power (N/m s)	6463.57	0.00	0.00
Frctn Loss (m)	0.15	Cum Volume (1000 m3)	2.23	1.75	0.17
C & E Loss (m)	0.03	Cum SA (1000 m2)	4.40	2.55	0.70

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	187.72	Element	Left OB	Channel	Right OB
Vel Head (m)	0.22	Wt. n-Val.	0.013	0.030	0.000
W.S. Elev (m)	187.51	Reach Len. (m)	44.20	44.20	44.20
Crit W.S. (m)	187.46	Flow Area (m2)	0.00	19.87	0.00
E.G. Slope (m/m)	0.008618	Area (m2)	0.00	19.87	0.00
Q Total (m3/s)	41.04	Flow (m3/s)	0.00	41.04	0.00
Top Width (m)	36.48	Top Width (m)	0.08	36.33	0.07
Vel Total (m/s)	2.07	Avg. Vel. (m/s)	0.16	2.07	0.03
Max Chl Dpth (m)	0.81	Hydr. Depth (m)	0.00	0.55	0.00
Conv. Total (m3/s)	442.1	Conv. (m3/s)	0.0	442.1	0.0
Length Wtd. (m)	44.20	Wetted Per. (m)	0.08	36.43	0.07
Min Ch El (m)	186.70	Shear (N/m2)	0.28	46.09	
Alpha	1.00	Stream Power (N/m s)	6463.57	0.00	0.00
Frctn Loss (m)	0.15	Cum Volume (1000 m3)	2.67	1.98	0.25
C & E Loss (m)	0.05	Cum SA (1000 m2)	4.52	2.58	0.88

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	187.48	Element	Left OB	Channel	Right OB
Vel Head (m)	0.12	Wt. n-Val.		0.030	

W.S. Elev (m)	187.36	Reach Len. (m)	44.20	44.20	44.20
Crit W.S. (m)		Flow Area (m2)		14.64	
E.G. Slope (m/m)	0.006223	Area (m2)		14.64	
Q Total (m3/s)	22.45	Flow (m3/s)		22.45	
Top Width (m)	32.80	Top Width (m)		32.80	
Vel Total (m/s)	1.53	Avg. Vel. (m/s)		1.53	
Max Chl Dpth (m)	0.66	Hydr. Depth (m)		0.45	
Conv. Total (m3/s)	284.6	Conv. (m3/s)		284.6	
Length Wtd. (m)	44.20	Wetted Per. (m)		32.88	
Min Ch El (m)	186.70	Shear (N/m2)		27.17	
Alpha	1.00	Stream Power (N/m s)	6463.57	0.00	0.00
Frctn Loss (m)	0.16	Cum Volume (1000 m3)	1.72	1.47	0.10
C & E Loss (m)	0.02	Cum SA (1000 m2)	3.99	2.51	0.50

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Rouge
REACH: WC16 RS: 400

INPUT
Description: ST 400
Station Elevation Data num= 70

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	188.02	1.482	188.021	2.255	188.02	2.502	188.019	10.948	188
10.982	187.999	11.722	187.966	19.896	187.5	21.565	187.305	22.845	187.217
25.504	187	31.45	186.819	32.268	186.792	32.345	186.79	34.253	186.745
35.58	186.706	35.774	186.705	36.667	186.673	37.159	186.666	37.916	186.649
38.044	186.637	38.048	186.637	38.57	186.655	39.147	186.682	39.34	186.687
40.455	186.742	43.508	186.873	43.728	186.879	43.879	186.872	44.412	186.872
46.179	187	49.895	187.128	50.763	187.154	51.167	187.167	51.322	187.173
51.393	187.176	51.924	187.174	52.548	187.173	52.669	187.17	52.754	187.167
53.045	187.156	53.691	187.134	55.13	187.089	57.726	187	58.551	186.626
59.033	186.5	59.942	186.434	60.181	186.419	60.994	186.476	61.241	186.492
61.353	186.5	61.483	186.502	63.233	186.552	64.151	186.575	80.252	187
86.345	187.384	88.243	187.5	97.387	187.926	98.951	188	99.235	188.011
111.316	188.5	113.295	188.79	114.326	189	115.145	189.164	116.932	189.5
117.908	189.698	119.766	190	121.863	190.154	125.531	190.3	130.099	190.49

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.07	21.565	.03	46.179	.013	57.726	.03	80.252	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
57.726	80.252	34.2	34.2	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	187.02	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.	0.030	0.030	
W.S. Elev (m)	186.96	Reach Len. (m)	34.20	34.20	34.20
Crit W.S. (m)		Flow Area (m2)	3.09	5.44	
E.G. Slope (m/m)	0.008046	Area (m2)	3.09	5.44	
Q Total (m3/s)	9.39	Flow (m3/s)	2.77	6.62	
Top Width (m)	39.64	Top Width (m)	18.76	20.88	
Vel Total (m/s)	1.10	Avg. Vel. (m/s)	0.90	1.22	
Max Chl Dpth (m)	0.54	Hydr. Depth (m)	0.16	0.26	
Conv. Total (m3/s)	104.7	Conv. (m3/s)	30.9	73.8	
Length Wtd. (m)	34.20	Wetted Per. (m)	18.77	20.98	
Min Ch El (m)	186.42	Shear (N/m2)	12.97	20.47	
Alpha	1.06	Stream Power (N/m s)	6228.86	0.00	0.00
Frctn Loss (m)	0.07	Cum Volume (1000 m3)	0.68	0.52	0.01
C & E Loss (m)	0.02	Cum SA (1000 m2)	2.05	1.23	0.11

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	187.19	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.	0.029	0.030	0.070
W.S. Elev (m)	187.14	Reach Len. (m)	34.20	34.20	34.20
Crit W.S. (m)		Flow Area (m2)	7.58	9.55	0.16
E.G. Slope (m/m)	0.003310	Area (m2)	7.58	9.55	0.16
Q Total (m3/s)	16.92	Flow (m3/s)	6.59	10.31	0.02
Top Width (m)	55.73	Top Width (m)	30.94	22.53	2.27
Vel Total (m/s)	0.98	Avg. Vel. (m/s)	0.87	1.08	0.14
Max Chl Dpth (m)	0.72	Hydr. Depth (m)	0.24	0.42	0.07
Conv. Total (m3/s)	294.1	Conv. (m3/s)	114.5	179.2	0.4
Length Wtd. (m)	34.20	Wetted Per. (m)	30.96	22.64	2.27
Min Ch El (m)	186.42	Shear (N/m2)	7.94	13.70	2.31
Alpha	1.05	Stream Power (N/m s)	6228.86	0.00	0.00
Frctn Loss (m)	0.05	Cum Volume (1000 m3)	1.15	0.76	0.05
C & E Loss (m)	0.01	Cum SA (1000 m2)	3.03	1.28	0.29

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	187.26	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.	0.028	0.030	0.070
W.S. Elev (m)	187.21	Reach Len. (m)	34.20	34.20	34.20
Crit W.S. (m)		Flow Area (m2)	9.70	10.99	0.34
E.G. Slope (m/m)	0.002682	Area (m2)	9.70	10.99	0.34
Q Total (m3/s)	20.34	Flow (m3/s)	8.57	11.72	0.06
Top Width (m)	60.56	Top Width (m)	34.75	22.53	3.28
Vel Total (m/s)	0.97	Avg. Vel. (m/s)	0.88	1.07	0.16

Max Chl Dpth (m)	0.79	Hydr. Depth (m)	0.28	0.49	0.10
Conv. Total (m3/s)	392.8	Conv. (m3/s)	165.4	226.3	1.1
Length Wtd. (m)	34.20	Wetted Per. (m)	34.78	22.64	3.29
Min Ch El (m)	186.42	Shear (N/m2)	7.33	12.77	2.71
Alpha	1.05	Stream Power (N/m s)	6228.86	0.00	0.00
Frctn Loss (m)	0.04	Cum Volume (1000 m3)	1.35	0.84	0.07
C & E Loss (m)	0.01	Cum SA (1000 m2)	3.16	1.28	0.37

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	187.33	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.	0.026	0.030	0.070
W.S. Elev (m)	187.28	Reach Len. (m)	34.20	34.20	34.20
Crit W.S. (m)		Flow Area (m2)	12.35	12.68	0.63
E.G. Slope (m/m)	0.002163	Area (m2)	12.35	12.68	0.63
Q Total (m3/s)	24.83	Flow (m3/s)	11.36	13.36	0.11
Top Width (m)	62.82	Top Width (m)	35.82	22.53	4.47
Vel Total (m/s)	0.97	Avg. Vel. (m/s)	0.92	1.05	0.18
Max Chl Dpth (m)	0.86	Hydr. Depth (m)	0.34	0.56	0.14
Conv. Total (m3/s)	533.9	Conv. (m3/s)	244.3	287.2	2.4
Length Wtd. (m)	34.20	Wetted Per. (m)	35.85	22.64	4.48
Min Ch El (m)	186.42	Shear (N/m2)	7.30	11.88	2.98
Alpha	1.05	Stream Power (N/m s)	6228.86	0.00	0.00
Frctn Loss (m)	0.04	Cum Volume (1000 m3)	1.60	0.94	0.11
C & E Loss (m)	0.01	Cum SA (1000 m2)	3.26	1.28	0.47

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	187.38	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.	0.026	0.030	0.070
W.S. Elev (m)	187.32	Reach Len. (m)	34.20	34.20	34.20
Crit W.S. (m)		Flow Area (m2)	13.79	13.58	0.82
E.G. Slope (m/m)	0.002060	Area (m2)	13.79	13.58	0.82
Q Total (m3/s)	28.14	Flow (m3/s)	13.36	14.62	0.16
Top Width (m)	63.94	Top Width (m)	36.30	22.53	5.11
Vel Total (m/s)	1.00	Avg. Vel. (m/s)	0.97	1.08	0.19
Max Chl Dpth (m)	0.90	Hydr. Depth (m)	0.38	0.60	0.16
Conv. Total (m3/s)	620.0	Conv. (m3/s)	294.4	322.1	3.5
Length Wtd. (m)	34.20	Wetted Per. (m)	36.34	22.64	5.12
Min Ch El (m)	186.42	Shear (N/m2)	7.67	12.12	3.24
Alpha	1.05	Stream Power (N/m s)	6228.86	0.00	0.00
Frctn Loss (m)	0.04	Cum Volume (1000 m3)	1.75	0.99	0.13
C & E Loss (m)	0.01	Cum SA (1000 m2)	3.54	1.28	0.52

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	187.42	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.	0.025	0.030	0.070
W.S. Elev (m)	187.36	Reach Len. (m)	34.20	34.20	34.20
Crit W.S. (m)		Flow Area (m2)	15.29	14.51	1.04
E.G. Slope (m/m)	0.001941	Area (m2)	15.29	14.51	1.04
Q Total (m3/s)	31.57	Flow (m3/s)	15.52	15.83	0.21
Top Width (m)	64.94	Top Width (m)	36.66	22.53	5.76
Vel Total (m/s)	1.02	Avg. Vel. (m/s)	1.02	1.09	0.20
Max Chl Dpth (m)	0.94	Hydr. Depth (m)	0.42	0.64	0.18
Conv. Total (m3/s)	716.6	Conv. (m3/s)	352.4	359.4	4.8
Length Wtd. (m)	34.20	Wetted Per. (m)	36.69	22.64	5.77
Min Ch El (m)	186.42	Shear (N/m2)	7.93	12.20	3.45
Alpha	1.05	Stream Power (N/m s)	6228.86	0.00	0.00
Frctn Loss (m)	0.04	Cum Volume (1000 m3)	1.89	1.04	0.15
C & E Loss (m)	0.01	Cum SA (1000 m2)	3.59	1.28	0.58

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	187.53	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.	0.025	0.030	0.070
W.S. Elev (m)	187.46	Reach Len. (m)	34.20	34.20	34.20
Crit W.S. (m)		Flow Area (m2)	19.01	16.77	1.70
E.G. Slope (m/m)	0.001754	Area (m2)	19.01	16.77	1.70
Q Total (m3/s)	41.04	Flow (m3/s)	21.49	19.16	0.38
Top Width (m)	67.43	Top Width (m)	37.52	22.53	7.39
Vel Total (m/s)	1.09	Avg. Vel. (m/s)	1.13	1.14	0.22
Max Chl Dpth (m)	1.04	Hydr. Depth (m)	0.51	0.74	0.23
Conv. Total (m3/s)	979.9	Conv. (m3/s)	513.2	457.6	9.1
Length Wtd. (m)	34.20	Wetted Per. (m)	37.56	22.64	7.40
Min Ch El (m)	186.42	Shear (N/m2)	8.71	12.74	3.96
Alpha	1.07	Stream Power (N/m s)	6228.86	0.00	0.00
Frctn Loss (m)	0.04	Cum Volume (1000 m3)	2.25	1.17	0.21
C & E Loss (m)	0.01	Cum SA (1000 m2)	3.69	1.28	0.71

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	187.29	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.	0.027	0.030	0.070
W.S. Elev (m)	187.24	Reach Len. (m)	34.20	34.20	34.20
Crit W.S. (m)		Flow Area (m2)	11.04	11.85	0.48

E.G. Slope (m/m)	0.002363	Area (m2)	11.04	11.85	0.48
Q Total (m3/s)	22.45	Flow (m3/s)	9.89	12.47	0.08
Top Width (m)	61.70	Top Width (m)	35.29	22.53	3.89
Vel Total (m/s)	0.96	Avg. Vel. (m/s)	0.90	1.05	0.17
Max Chl Dpth (m)	0.83	Hydr. Depth (m)	0.31	0.53	0.12
Conv. Total (m3/s)	461.8	Conv. (m3/s)	203.6	256.6	1.7
Length Wtd. (m)	34.20	Wetted Per. (m)	35.32	22.64	3.89
Min Ch El (m)	186.42	Shear (N/m2)	7.24	12.13	2.83
Alpha	1.05	Stream Power (N/m s)	6228.86	0.00	0.00
Frctn Loss (m)	0.04	Cum Volume (1000 m3)	1.47	0.89	0.09
C & E Loss (m)	0.01	Cum SA (1000 m2)	3.21	1.28	0.42

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Rouge
REACH: WC16 RS: 300

INPUT
Description: ST 300
Station Elevation Data num= 69

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	187.527	7.69	187.507	9.589	187.506	10.009	187.506	15.762	187.5
18.945	187.2	20.102	187.102	21.244	187	23.446	186.81	24.424	186.742
27.336	186.5	27.476	186.5	30.044	186.5	33.75	186.5	45.643	186.5
48.13	186.5	50.134	186.5	50.744	186.734	51.426	187	52.426	187.034
52.93	187.058	56.717	187.047	61.167	187.034	62.028	187.013	62.431	187
62.614	186.886	63.224	186.5	66.239	186.381	67.82	186.329	70.511	186.394
72.38	186.478	72.616	186.5	77.486	186.785	79.563	186.891	81.304	187
82.355	187.077	82.813	187.105	89.259	187.5	97.07	187.894	97.122	187.897
98.899	188	101.917	188.099	103.584	188.138	103.635	188.14	103.744	188.143
103.884	188.147	104.238	188.156	112.464	188.342	115.831	188.5	117.839	188.989
117.887	189	118.051	189.034	118.079	189.042	118.186	189.076	119.824	189.5
121.733	189.687	122.727	189.77	123.042	189.798	125.463	189.86	129.349	189.978
129.526	189.987	130.113	189.998	130.479	190	132.893	190.034	132.958	190.035
134.917	190.123	135.006	190.114	136.658	190.211	142.898	190.158		

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.07	18.945	.03	51.426	.013	62.614	.03	79.563	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
62.614	79.563	17.15	17.15	17.15	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	186.94	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.	0.030	0.030	0.070
W.S. Elev (m)	186.92	Reach Len. (m)	17.15	17.15	17.15
Crit W.S. (m)		Flow Area (m2)	10.94	6.54	0.01
E.G. Slope (m/m)	0.000950	Area (m2)	10.94	6.54	0.01
Q Total (m3/s)	9.39	Flow (m3/s)	5.85	3.54	0.00
Top Width (m)	46.58	Top Width (m)	29.13	16.95	0.50
Vel Total (m/s)	0.54	Avg. Vel. (m/s)	0.53	0.54	0.03
Max Chl Dpth (m)	0.59	Hydr. Depth (m)	0.38	0.39	0.02
Conv. Total (m3/s)	304.6	Conv. (m3/s)	189.6	115.0	0.0
Length Wtd. (m)	17.15	Wetted Per. (m)	29.24	17.08	0.50
Min Ch El (m)	186.33	Shear (N/m2)	3.49	3.57	0.14
Alpha	1.00	Stream Power (N/m s)	6841.65	0.00	0.00
Frctn Loss (m)	0.02	Cum Volume (1000 m3)	0.44	0.31	0.01
C & E Loss (m)	0.00	Cum SA (1000 m2)	1.23	0.59	0.10

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	187.14	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.	0.029	0.030	0.070
W.S. Elev (m)	187.12	Reach Len. (m)	17.15	17.15	17.15
Crit W.S. (m)		Flow Area (m2)	17.76	9.86	0.40
E.G. Slope (m/m)	0.000765	Area (m2)	17.76	9.86	0.40
Q Total (m3/s)	16.92	Flow (m3/s)	10.58	6.30	0.04
Top Width (m)	63.10	Top Width (m)	42.70	16.95	3.45
Vel Total (m/s)	0.60	Avg. Vel. (m/s)	0.60	0.64	0.09
Max Chl Dpth (m)	0.79	Hydr. Depth (m)	0.42	0.58	0.11
Conv. Total (m3/s)	611.8	Conv. (m3/s)	382.7	227.8	1.3
Length Wtd. (m)	17.15	Wetted Per. (m)	42.85	17.08	3.46
Min Ch El (m)	186.33	Shear (N/m2)	3.11	4.33	0.86
Alpha	1.03	Stream Power (N/m s)	6841.65	0.00	0.00
Frctn Loss (m)	0.01	Cum Volume (1000 m3)	0.72	0.42	0.04
C & E Loss (m)	0.00	Cum SA (1000 m2)	1.77	0.61	0.20

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	187.20	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.	0.029	0.030	0.070
W.S. Elev (m)	187.18	Reach Len. (m)	17.15	17.15	17.15
Crit W.S. (m)		Flow Area (m2)	20.62	10.98	0.66
E.G. Slope (m/m)	0.000729	Area (m2)	20.62	10.98	0.66
Q Total (m3/s)	20.34	Flow (m3/s)	12.91	7.36	0.07
Top Width (m)	64.97	Top Width (m)	43.48	16.95	4.54
Vel Total (m/s)	0.63	Avg. Vel. (m/s)	0.63	0.67	0.11
Max Chl Dpth (m)	0.85	Hydr. Depth (m)	0.47	0.65	0.15
Conv. Total (m3/s)	753.3	Conv. (m3/s)	478.0	272.7	2.6
Length Wtd. (m)	17.15	Wetted Per. (m)	43.64	17.08	4.55
Min Ch El (m)	186.33	Shear (N/m2)	3.38	4.60	1.04
Alpha	1.04	Stream Power (N/m s)	6841.65	0.00	0.00
Frctn Loss (m)	0.01	Cum Volume (1000 m3)	0.83	0.46	0.06
C & E Loss (m)	0.00	Cum SA (1000 m2)	1.83	0.61	0.24

CROSS SECTION OUTPUT Profile #25-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	187.29	Element			
Vel Head (m)	0.02	Wt. n-Val.	0.028	0.030	0.070
W.S. Elev (m)	187.26	Reach Len. (m)	17.15	17.15	17.15
Crit W.S. (m)		Flow Area (m2)	24.05	12.30	1.07
E.G. Slope (m/m)	0.000684	Area (m2)	24.05	12.30	1.07
Q Total (m3/s)	24.83	Flow (m3/s)	16.08	8.62	0.13
Top Width (m)	67.09	Top Width (m)	44.33	16.95	5.81
Vel Total (m/s)	0.66	Avg. Vel. (m/s)	0.67	0.70	0.12
Max Chl Dpth (m)	0.93	Hydr. Depth (m)	0.54	0.73	0.18
Conv. Total (m3/s)	949.4	Conv. (m3/s)	614.9	329.6	4.9
Length Wtd. (m)	17.15	Wetted Per. (m)	44.49	17.08	5.82
Min Ch El (m)	186.33	Shear (N/m2)	3.63	4.83	1.23
Alpha	1.04	Stream Power (N/m s)	6841.65	0.00	0.00
Frctn Loss (m)	0.01	Cum Volume (1000 m3)	0.98	0.51	0.08
C & E Loss (m)	0.00	Cum SA (1000 m2)	1.89	0.61	0.29

CROSS SECTION OUTPUT Profile #50-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	187.33	Element			
Vel Head (m)	0.03	Wt. n-Val.	0.028	0.030	0.070
W.S. Elev (m)	187.30	Reach Len. (m)	17.15	17.15	17.15
Crit W.S. (m)		Flow Area (m2)	25.85	12.99	1.31
E.G. Slope (m/m)	0.000703	Area (m2)	25.85	12.99	1.31
Q Total (m3/s)	28.14	Flow (m3/s)	18.40	9.57	0.17
Top Width (m)	68.18	Top Width (m)	44.76	16.95	6.47
Vel Total (m/s)	0.70	Avg. Vel. (m/s)	0.71	0.74	0.13
Max Chl Dpth (m)	0.97	Hydr. Depth (m)	0.58	0.77	0.20
Conv. Total (m3/s)	1061.1	Conv. (m3/s)	693.9	360.7	6.5
Length Wtd. (m)	17.15	Wetted Per. (m)	44.92	17.08	6.48
Min Ch El (m)	186.33	Shear (N/m2)	3.97	5.25	1.40
Alpha	1.05	Stream Power (N/m s)	6841.65	0.00	0.00
Frctn Loss (m)	0.01	Cum Volume (1000 m3)	1.07	0.54	0.09
C & E Loss (m)	0.00	Cum SA (1000 m2)	2.16	0.61	0.32

CROSS SECTION OUTPUT Profile #100-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	187.37	Element			
Vel Head (m)	0.03	Wt. n-Val.	0.027	0.030	0.070
W.S. Elev (m)	187.34	Reach Len. (m)	17.15	17.15	17.15
Crit W.S. (m)		Flow Area (m2)	27.72	13.70	1.60
E.G. Slope (m/m)	0.000712	Area (m2)	27.72	13.70	1.60
Q Total (m3/s)	31.57	Flow (m3/s)	20.83	10.52	0.22
Top Width (m)	69.30	Top Width (m)	45.20	16.95	7.15
Vel Total (m/s)	0.73	Avg. Vel. (m/s)	0.75	0.77	0.14
Max Chl Dpth (m)	1.01	Hydr. Depth (m)	0.61	0.81	0.22
Conv. Total (m3/s)	1182.8	Conv. (m3/s)	780.4	394.0	8.4
Length Wtd. (m)	17.15	Wetted Per. (m)	45.36	17.08	7.17
Min Ch El (m)	186.33	Shear (N/m2)	4.27	5.60	1.56
Alpha	1.06	Stream Power (N/m s)	6841.65	0.00	0.00
Frctn Loss (m)	0.01	Cum Volume (1000 m3)	1.16	0.56	0.10
C & E Loss (m)	0.00	Cum SA (1000 m2)	2.19	0.61	0.36

CROSS SECTION OUTPUT Profile #Check Flow

			Left OB	Channel	Right OB
E.G. Elev (m)	187.48	Element			
Vel Head (m)	0.04	Wt. n-Val.	0.027	0.030	0.070
W.S. Elev (m)	187.45	Reach Len. (m)	17.15	17.15	17.15
Crit W.S. (m)		Flow Area (m2)	32.38	15.42	2.41
E.G. Slope (m/m)	0.000742	Area (m2)	32.38	15.42	2.41
Q Total (m3/s)	41.04	Flow (m3/s)	27.56	13.08	0.39
Top Width (m)	72.05	Top Width (m)	46.28	16.95	8.82
Vel Total (m/s)	0.82	Avg. Vel. (m/s)	0.85	0.85	0.16
Max Chl Dpth (m)	1.12	Hydr. Depth (m)	0.70	0.91	0.27
Conv. Total (m3/s)	1506.8	Conv. (m3/s)	1012.0	480.3	14.5
Length Wtd. (m)	17.15	Wetted Per. (m)	46.45	17.08	8.83
Min Ch El (m)	186.33	Shear (N/m2)	5.07	6.57	1.99
Alpha	1.07	Stream Power (N/m s)	6841.65	0.00	0.00
Frctn Loss (m)	0.02	Cum Volume (1000 m3)	1.37	0.62	0.14
C & E Loss (m)	0.00	Cum SA (1000 m2)	2.26	0.61	0.44

CROSS SECTION OUTPUT Profile #Regional

			Left OB	Channel	Right OB
E.G. Elev (m)	187.25	Element			
Vel Head (m)	0.02	Wt. n-Val.	0.028	0.030	0.070
W.S. Elev (m)	187.22	Reach Len. (m)	17.15	17.15	17.15
Crit W.S. (m)		Flow Area (m2)	22.37	11.66	0.86
E.G. Slope (m/m)	0.000697	Area (m2)	22.37	11.66	0.86
Q Total (m3/s)	22.45	Flow (m3/s)	14.39	7.96	0.10
Top Width (m)	66.07	Top Width (m)	43.92	16.95	5.19
Vel Total (m/s)	0.64	Avg. Vel. (m/s)	0.64	0.68	0.11
Max Chl Dpth (m)	0.89	Hydr. Depth (m)	0.51	0.69	0.16
Conv. Total (m3/s)	850.1	Conv. (m3/s)	545.1	301.4	3.7
Length Wtd. (m)	17.15	Wetted Per. (m)	44.08	17.08	5.20
Min Ch El (m)	186.33	Shear (N/m2)	3.47	4.67	1.13
Alpha	1.04	Stream Power (N/m s)	6841.65	0.00	0.00
Frctn Loss (m)	0.01	Cum Volume (1000 m3)	0.90	0.49	0.07
C & E Loss (m)	0.00	Cum SA (1000 m2)	1.85	0.61	0.26

CROSS SECTION

RIVER: Rouge
REACH: WC16 RS: 200

INPUT
Description: ST 200
Station Elevation Data num= 49

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

```
      0 187.512    .822 187.513  13.166 187.501  14.307   187.5  17.848 187.215
 20.239     187  23.765 186.697  24.532  186.64    26.6   186.5  26.604   186.5
 26.614   186.5  26.887   186.5  28.857   186.5  40.141   186.5  47.456   186.5
 50.973   186.5  51.295 186.612   52.27     187  52.536 187.012  55.749     187
 55.806     187  55.871     187  57.928     187  59.302     187  63.836     187
 64.407 186.621  64.683   186.5  64.896  186.41  65.745     186  65.937     186
 66.129     186  66.494     186  67.623  186.07   68.61 186.114  69.096 186.119
 70.387 186.157  74.397 186.307  74.845 186.324  76.272 186.401  77.634 186.473
 78.133   186.5    79.7 186.616  84.084  186.94  84.869 186.998    84.9     187
 84.934 187.002  84.946 187.002  93.428   187.5 100.098 187.746

Manning's n Values        num=       4
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
       0     .07   52.27    .013  64.407     .03  78.133     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
       64.407    79.7             31.8    31.8    31.8             .1       .3

CROSS SECTION OUTPUT  Profile #2-yr

  E.G. Elev (m)           186.92    Element                Left OB    Channel   Right OB
  Vel Head (m)              0.02    Wt. n-Val.               0.069      0.031      0.070
  W.S. Elev (m)           186.90    Reach Len. (m)           31.80      31.80      31.80
  Crit W.S. (m)                     Flow Area (m2)           11.14       9.68       0.55
  E.G. Slope (m/m)      0.000872    Area (m2)                11.14       9.68       0.55
  Q Total (m3/s)            9.39    Flow (m3/s)               2.40       6.93       0.06
  Top Width (m)            50.19    Top Width (m)            31.05      15.29       3.85
  Vel Total (m/s)           0.44    Avg. Vel. (m/s)           0.22       0.72       0.11
  Max Chl Dpth (m)          0.90    Hydr. Depth (m)           0.36       0.63       0.14
  Conv. Total (m3/s)       318.0    Conv. (m3/s)             81.3      234.6        2.1
  Length Wtd. (m)          31.80    Wetted Per. (m)          31.22      15.45       3.86
  Min Ch El (m)           186.00    Shear (N/m2)              3.05       5.36       1.21
  Alpha                     2.02    Stream Power (N/m s)   4792.49       0.00       0.00
  Frctn Loss (m)            0.07    Cum Volume (1000 m3)      0.25       0.17       0.01
  C & E Loss (m)            0.01    Cum SA (1000 m2)          0.72       0.31       0.06


Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
         This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT  Profile #5-yr

  E.G. Elev (m)           187.12    Element                Left OB    Channel   Right OB
  Vel Head (m)              0.03    Wt. n-Val.               0.064      0.031      0.070
  W.S. Elev (m)           187.09    Reach Len. (m)           31.80      31.80      31.80
  Crit W.S. (m)                     Flow Area (m2)           18.47      12.63       1.56
  E.G. Slope (m/m)      0.000952    Area (m2)                18.47      12.63       1.56
  Q Total (m3/s)           16.92    Flow (m3/s)               5.54      11.13       0.26
  Top Width (m)            67.31    Top Width (m)            45.21      15.29       6.81
  Vel Total (m/s)           0.52    Avg. Vel. (m/s)           0.30       0.88       0.16
  Max Chl Dpth (m)          1.09    Hydr. Depth (m)           0.41       0.83       0.23
  Conv. Total (m3/s)       548.5    Conv. (m3/s)            179.4      360.7        8.3
  Length Wtd. (m)          31.80    Wetted Per. (m)          45.44      15.45       6.82
  Min Ch El (m)           186.00    Shear (N/m2)              3.79       7.63       2.13
  Alpha                     2.01    Stream Power (N/m s)   4792.49       0.00       0.00
  Frctn Loss (m)            0.07    Cum Volume (1000 m3)      0.41       0.23       0.02
  C & E Loss (m)            0.02    Cum SA (1000 m2)          1.02       0.33       0.11


Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
         This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT  Profile #10-yr

  E.G. Elev (m)           187.19    Element                Left OB    Channel   Right OB
  Vel Head (m)              0.03    Wt. n-Val.               0.059      0.031      0.070
  W.S. Elev (m)           187.16    Reach Len. (m)           31.80      31.80      31.80
  Crit W.S. (m)                     Flow Area (m2)           21.53      13.66       2.06
  E.G. Slope (m/m)      0.000946    Area (m2)                21.53      13.66       2.06
  Q Total (m3/s)           20.34    Flow (m3/s)               7.38      12.60       0.37
  Top Width (m)            69.20    Top Width (m)            45.96      15.29       7.95
  Vel Total (m/s)           0.55    Avg. Vel. (m/s)           0.34       0.92       0.18
  Max Chl Dpth (m)          1.16    Hydr. Depth (m)           0.47       0.89       0.26
  Conv. Total (m3/s)       661.3    Conv. (m3/s)            239.8      409.6       11.9
  Length Wtd. (m)          31.80    Wetted Per. (m)          46.19      15.45       7.97
  Min Ch El (m)           186.00    Shear (N/m2)              4.32       8.21       2.39
  Alpha                     1.91    Stream Power (N/m s)   4792.49       0.00       0.00
  Frctn Loss (m)            0.07    Cum Volume (1000 m3)      0.47       0.25       0.03
  C & E Loss (m)            0.02    Cum SA (1000 m2)          1.06       0.33       0.13


Warning: The velocity head has changed by more than 0.5 ft (0.15 m).  This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
         This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT  Profile #25-yr

  E.G. Elev (m)           187.27    Element                Left OB    Channel   Right OB
  Vel Head (m)              0.03    Wt. n-Val.               0.054      0.031      0.070
  W.S. Elev (m)           187.24    Reach Len. (m)           31.80      31.80      31.80
  Crit W.S. (m)                     Flow Area (m2)           25.22      14.88       2.74
  E.G. Slope (m/m)      0.000932    Area (m2)                25.22      14.88       2.74
  Q Total (m3/s)           24.83    Flow (m3/s)               9.94      14.36       0.53
  Top Width (m)            71.47    Top Width (m)            46.88      15.29       9.31
  Vel Total (m/s)           0.58    Avg. Vel. (m/s)           0.39       0.97       0.19
  Max Chl Dpth (m)          1.24    Hydr. Depth (m)           0.54       0.97       0.29
  Conv. Total (m3/s)       813.4    Conv. (m3/s)            325.5      470.6       17.3
  Length Wtd. (m)          31.80    Wetted Per. (m)          47.11      15.45       9.33
  Min Ch El (m)           186.00    Shear (N/m2)              4.89       8.80       2.69
  Alpha                     1.79    Stream Power (N/m s)   4792.49       0.00       0.00
  Frctn Loss (m)            0.07    Cum Volume (1000 m3)      0.56       0.28       0.04
  C & E Loss (m)            0.02    Cum SA (1000 m2)          1.11       0.33       0.16
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Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	187.31	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.	0.052	0.031	0.070
W.S. Elev (m)	187.28	Reach Len. (m)	31.80	31.80	31.80
Crit W.S. (m)		Flow Area (m2)	27.09	15.48	3.13
E.G. Slope (m/m)	0.000985	Area (m2)	27.09	15.48	3.13
Q Total (m3/s)	28.14	Flow (m3/s)	11.73	15.77	0.65
Top Width (m)	72.64	Top Width (m)	47.37	15.29	9.98
Vel Total (m/s)	0.62	Avg. Vel. (m/s)	0.43	1.02	0.21
Max Chl Dpth (m)	1.28	Hydr. Depth (m)	0.57	1.01	0.31
Conv. Total (m3/s)	896.4	Conv. (m3/s)	373.6	502.3	20.6
Length Wtd. (m)	31.80	Wetted Per. (m)	47.61	15.45	10.00
Min Ch El (m)	186.00	Shear (N/m2)	5.50	9.69	3.02
Alpha	1.74	Stream Power (N/m s)	4792.49	0.00	0.00
Frctn Loss (m)	0.07	Cum Volume (1000 m3)	0.62	0.29	0.05
C & E Loss (m)	0.02	Cum SA (1000 m2)	1.37	0.33	0.18

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	187.36	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.	0.051	0.031	0.070
W.S. Elev (m)	187.32	Reach Len. (m)	31.80	31.80	31.80
Crit W.S. (m)		Flow Area (m2)	29.07	16.12	3.55
E.G. Slope (m/m)	0.001021	Area (m2)	29.07	16.12	3.55
Q Total (m3/s)	31.57	Flow (m3/s)	13.66	17.14	0.78
Top Width (m)	73.87	Top Width (m)	47.88	15.29	10.69
Vel Total (m/s)	0.65	Avg. Vel. (m/s)	0.47	1.06	0.22
Max Chl Dpth (m)	1.32	Hydr. Depth (m)	0.61	1.05	0.33
Conv. Total (m3/s)	988.2	Conv. (m3/s)	427.5	536.4	24.3
Length Wtd. (m)	31.80	Wetted Per. (m)	48.13	15.45	10.71
Min Ch El (m)	186.00	Shear (N/m2)	6.04	10.44	3.32
Alpha	1.69	Stream Power (N/m s)	4792.49	0.00	0.00
Frctn Loss (m)	0.07	Cum Volume (1000 m3)	0.67	0.31	0.06
C & E Loss (m)	0.02	Cum SA (1000 m2)	1.39	0.33	0.20

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	187.47	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.	0.047	0.031	0.070
W.S. Elev (m)	187.42	Reach Len. (m)	31.80	31.80	31.80
Crit W.S. (m)		Flow Area (m2)	33.99	17.67	4.73
E.G. Slope (m/m)	0.001108	Area (m2)	33.99	17.67	4.73
Q Total (m3/s)	41.04	Flow (m3/s)	19.11	20.75	1.18
Top Width (m)	76.86	Top Width (m)	49.15	15.29	12.42
Vel Total (m/s)	0.73	Avg. Vel. (m/s)	0.56	1.17	0.25
Max Chl Dpth (m)	1.42	Hydr. Depth (m)	0.69	1.16	0.38
Conv. Total (m3/s)	1233.2	Conv. (m3/s)	574.3	623.5	35.4
Length Wtd. (m)	31.80	Wetted Per. (m)	49.39	15.45	12.45
Min Ch El (m)	186.00	Shear (N/m2)	7.47	12.43	4.13
Alpha	1.60	Stream Power (N/m s)	4792.49	0.00	0.00
Frctn Loss (m)	0.08	Cum Volume (1000 m3)	0.80	0.34	0.08
C & E Loss (m)	0.02	Cum SA (1000 m2)	1.44	0.33	0.25

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	187.23	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.	0.056	0.031	0.070
W.S. Elev (m)	187.20	Reach Len. (m)	31.80	31.80	31.80
Crit W.S. (m)		Flow Area (m2)	23.43	14.29	2.40
E.G. Slope (m/m)	0.000926	Area (m2)	23.43	14.29	2.40
Q Total (m3/s)	22.45	Flow (m3/s)	8.59	13.41	0.44
Top Width (m)	70.36	Top Width (m)	46.42	15.29	8.65
Vel Total (m/s)	0.56	Avg. Vel. (m/s)	0.37	0.94	0.18
Max Chl Dpth (m)	1.20	Hydr. Depth (m)	0.50	0.93	0.28
Conv. Total (m3/s)	737.6	Conv. (m3/s)	282.3	440.7	14.5
Length Wtd. (m)	31.80	Wetted Per. (m)	46.65	15.45	8.67
Min Ch El (m)	186.00	Shear (N/m2)	4.56	8.41	2.51
Alpha	1.85	Stream Power (N/m s)	4792.49	0.00	0.00
Frctn Loss (m)	0.07	Cum Volume (1000 m3)	0.51	0.26	0.04
C & E Loss (m)	0.02	Cum SA (1000 m2)	1.08	0.33	0.14

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Rouge
REACH: WC16 RS: 100

INPUT
Description: ST 100
Station Elevation Data num= 60

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

0	188	1.28	188	1.584	188	1.609	188	1.611	188
2.923	187.938	3.272	187.922	4.685	187.857	12.022	187.5	13.697	187.438
13.81	187.44	16.68	187.329	20.629	187.172	25.033	187	33.167	186.684
33.855	186.659	34.402	186.635	36.149	186.57	37.904	186.5	39.29	186.412
43.908	186	44.29	185.983	44.475	185.982	45.021	186	45.03	186
45.107	186.028	46.367	186.5	47.354	186.744	48.275	187	51.613	187
55.146	187.001	56.077	187.001	61.03	187	61.804	187	61.839	187
62.185	187	62.617	186.848	63.593	186.5	63.756	186.375	64.517	186.184
64.62	186.247	64.825	186.267	64.915	186.281	65.016	186.287	66.259	186.5
68.145	186.841	68.987	187	74.195	187.292	79.642	187.5	84.27	187.649
85.089	187.695	85.622	187.705	86.648	187.733	89.357	187.823	90.772	187.86
94.52	187.919	94.761	187.925	94.837	187.927	95.003	187.923	96.429	187.942

Manning's n Values num= 7

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.07	37.904	.03	46.367	.07	48.275	.013	62.185	.07
62.617	.03	68.145	.07						

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
62.617	68.145	0	0	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	186.84	Element			
Vel Head (m)	0.15	Wt. n-Val.	0.031	0.030	
W.S. Elev (m)	186.69	Reach Len. (m)			
Crit W.S. (m)	186.69	Flow Area (m2)	4.43	1.08	
E.G. Slope (m/m)	0.010239	Area (m2)	4.43	1.08	
Q Total (m3/s)	9.39	Flow (m3/s)	7.97	1.42	
Top Width (m)	18.27	Top Width (m)	14.04	4.23	
Vel Total (m/s)	1.71	Avg. Vel. (m/s)	1.80	1.32	
Max Chl Dpth (m)	0.71	Hydr. Depth (m)	0.32	0.25	
Conv. Total (m3/s)	92.8	Conv. (m3/s)	78.7	14.1	
Length Wtd. (m)		Wetted Per. (m)	14.18	4.38	
Min Ch El (m)	186.18	Shear (N/m2)	31.36	24.68	
Alpha	1.03	Stream Power (N/m s)	4616.81	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #5-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	187.03	Element			
Vel Head (m)	0.18	Wt. n-Val.	0.032	0.030	0.000
W.S. Elev (m)	186.85	Reach Len. (m)			
Crit W.S. (m)	186.85	Flow Area (m2)	7.10	1.87	0.00
E.G. Slope (m/m)	0.010491	Area (m2)	7.10	1.87	0.00
Q Total (m3/s)	16.92	Flow (m3/s)	13.89	3.03	0.00
Top Width (m)	24.40	Top Width (m)	18.83	5.53	0.05
Vel Total (m/s)	1.89	Avg. Vel. (m/s)	1.96	1.62	0.04
Max Chl Dpth (m)	0.87	Hydr. Depth (m)	0.38	0.34	0.00
Conv. Total (m3/s)	165.2	Conv. (m3/s)	135.6	29.6	0.0
Length Wtd. (m)		Wetted Per. (m)	18.99	5.72	0.05
Min Ch El (m)	186.18	Shear (N/m2)	38.44	33.65	
Alpha	1.02	Stream Power (N/m s)	4616.81	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #10-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	187.10	Element			
Vel Head (m)	0.19	Wt. n-Val.	0.033	0.030	0.070
W.S. Elev (m)	186.91	Reach Len. (m)			
Crit W.S. (m)	186.91	Flow Area (m2)	8.24	2.19	0.01
E.G. Slope (m/m)	0.010507	Area (m2)	8.24	2.19	0.01
Q Total (m3/s)	20.34	Flow (m3/s)	16.39	3.95	0.00
Top Width (m)	26.57	Top Width (m)	20.69	5.53	0.35
Vel Total (m/s)	1.95	Avg. Vel. (m/s)	1.99	1.80	0.15
Max Chl Dpth (m)	0.93	Hydr. Depth (m)	0.40	0.40	0.03
Conv. Total (m3/s)	198.4	Conv. (m3/s)	159.9	38.5	0.0
Length Wtd. (m)		Wetted Per. (m)	20.87	5.72	0.36
Min Ch El (m)	186.18	Shear (N/m2)	40.67	39.45	3.36
Alpha	1.01	Stream Power (N/m s)	4616.81	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #25-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	187.18	Element			
Vel Head (m)	0.20	Wt. n-Val.	0.034	0.030	0.070
W.S. Elev (m)	186.98	Reach Len. (m)			
Crit W.S. (m)	186.98	Flow Area (m2)	9.84	2.60	0.05
E.G. Slope (m/m)	0.010252	Area (m2)	9.84	2.60	0.05
Q Total (m3/s)	24.83	Flow (m3/s)	19.65	5.17	0.01
Top Width (m)	29.31	Top Width (m)	23.04	5.53	0.74
Vel Total (m/s)	1.99	Avg. Vel. (m/s)	2.00	1.99	0.24
Max Chl Dpth (m)	1.00	Hydr. Depth (m)	0.43	0.47	0.07
Conv. Total (m3/s)	245.2	Conv. (m3/s)	194.0	51.1	0.1
Length Wtd. (m)		Wetted Per. (m)	23.25	5.72	0.75
Min Ch El (m)	186.18	Shear (N/m2)	42.54	45.60	6.89
Alpha	1.01	Stream Power (N/m s)	4616.81	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	187.23	Element	Left OB	Channel	Right OB
Vel Head (m)	0.19	Wt. n-Val.	0.034	0.030	0.070
W.S. Elev (m)	187.04	Reach Len. (m)			
Crit W.S. (m)	187.04	Flow Area (m2)	11.74	2.91	0.11
E.G. Slope (m/m)	0.009384	Area (m2)	11.74	2.91	0.11
Q Total (m3/s)	28.14	Flow (m3/s)	22.11	6.00	0.03
Top Width (m)	45.60	Top Width (m)	38.56	5.53	1.52
Vel Total (m/s)	1.91	Avg. Vel. (m/s)	1.88	2.06	0.24
Max Chl Dpth (m)	1.06	Hydr. Depth (m)	0.30	0.53	0.07
Conv. Total (m3/s)	290.5	Conv. (m3/s)	228.3	61.9	0.3
Length Wtd. (m)		Wetted Per. (m)	38.77	5.72	1.54
Min Ch El (m)	186.18	Shear (N/m2)	27.86	46.86	6.70
Alpha	1.02	Stream Power (N/m s)	4616.81	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	187.27	Element	Left OB	Channel	Right OB
Vel Head (m)	0.20	Wt. n-Val.	0.034	0.030	0.070
W.S. Elev (m)	187.07	Reach Len. (m)			
Crit W.S. (m)	187.07	Flow Area (m2)	12.95	3.09	0.17
E.G. Slope (m/m)	0.009622	Area (m2)	12.95	3.09	0.17
Q Total (m3/s)	31.57	Flow (m3/s)	24.84	6.69	0.04
Top Width (m)	46.96	Top Width (m)	39.36	5.53	2.08
Vel Total (m/s)	1.95	Avg. Vel. (m/s)	1.92	2.17	0.26
Max Chl Dpth (m)	1.09	Hydr. Depth (m)	0.33	0.56	0.08
Conv. Total (m3/s)	321.8	Conv. (m3/s)	253.2	68.2	0.4
Length Wtd. (m)		Wetted Per. (m)	39.57	5.72	2.09
Min Ch El (m)	186.18	Shear (N/m2)	30.89	50.89	7.57
Alpha	1.02	Stream Power (N/m s)	4616.81	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	187.37	Element	Left OB	Channel	Right OB
Vel Head (m)	0.22	Wt. n-Val.	0.033	0.030	0.070
W.S. Elev (m)	187.16	Reach Len. (m)			
Crit W.S. (m)	187.16	Flow Area (m2)	16.44	3.56	0.41
E.G. Slope (m/m)	0.009205	Area (m2)	16.44	3.56	0.41
Q Total (m3/s)	41.04	Flow (m3/s)	32.60	8.31	0.13
Top Width (m)	50.70	Top Width (m)	41.56	5.53	3.61
Vel Total (m/s)	2.01	Avg. Vel. (m/s)	1.98	2.33	0.32
Max Chl Dpth (m)	1.17	Hydr. Depth (m)	0.40	0.64	0.11
Conv. Total (m3/s)	427.8	Conv. (m3/s)	339.8	86.6	1.4
Length Wtd. (m)		Wetted Per. (m)	41.78	5.72	3.63
Min Ch El (m)	186.18	Shear (N/m2)	35.52	56.19	10.26
Alpha	1.05	Stream Power (N/m s)	4616.81	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	187.14	Element	Left OB	Channel	Right OB
Vel Head (m)	0.22	Wt. n-Val.	0.033	0.030	0.070
W.S. Elev (m)	186.93	Reach Len. (m)			
Crit W.S. (m)	186.93	Flow Area (m2)	8.64	2.30	0.02
E.G. Slope (m/m)	0.011414	Area (m2)	8.64	2.30	0.02
Q Total (m3/s)	22.45	Flow (m3/s)	18.00	4.45	0.00
Top Width (m)	27.28	Top Width (m)	21.30	5.53	0.45
Vel Total (m/s)	2.05	Avg. Vel. (m/s)	2.08	1.94	0.18
Max Chl Dpth (m)	0.94	Hydr. Depth (m)	0.41	0.42	0.04
Conv. Total (m3/s)	210.1	Conv. (m3/s)	168.5	41.6	0.0
Length Wtd. (m)		Wetted Per. (m)	21.49	5.72	0.46
Min Ch El (m)	186.18	Shear (N/m2)	44.99	44.91	4.70
Alpha	1.01	Stream Power (N/m s)	4616.81	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

Warning: Divided flow computed for this cross-section.

SUMMARY OF MANNING'S N VALUES

River:Rouge

Reach	River Sta.	n1	n2	n3	n4	n5	n6	n7
WC16	800	.07	.03	.07				
WC16	700	.07	.03	.07				
WC16	600	.07	.03	.013	.07	.03	.07	
WC16	500	.013	.03	.07				
WC16	400	.07	.03	.013	.03	.07		
WC16	300	.07	.03	.013	.03	.07		
WC16	200	.07	.013	.03	.07			
WC16	100	.07	.03	.07	.013	.07	.03	.07

SUMMARY OF REACH LENGTHS

River: Rouge

Reach	River Sta.	Left	Channel	Right
WC16	800	44.5	44.5	44.5
WC16	700	51.6	51.6	51.6
WC16	600	45.3	45.3	45.3

WC16	500	44.2	44.2	44.2
WC16	400	34.2	34.2	34.2
WC16	300	17.15	17.15	17.15
WC16	200	31.8	31.8	31.8
WC16	100	0	0	0

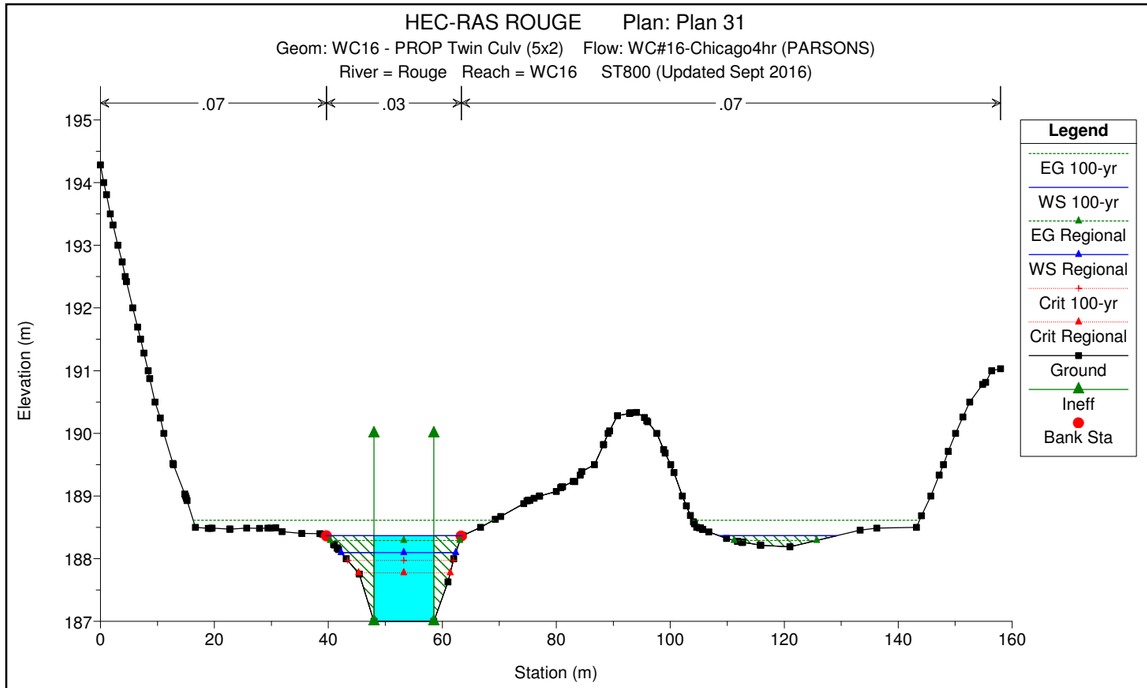
SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Rouge

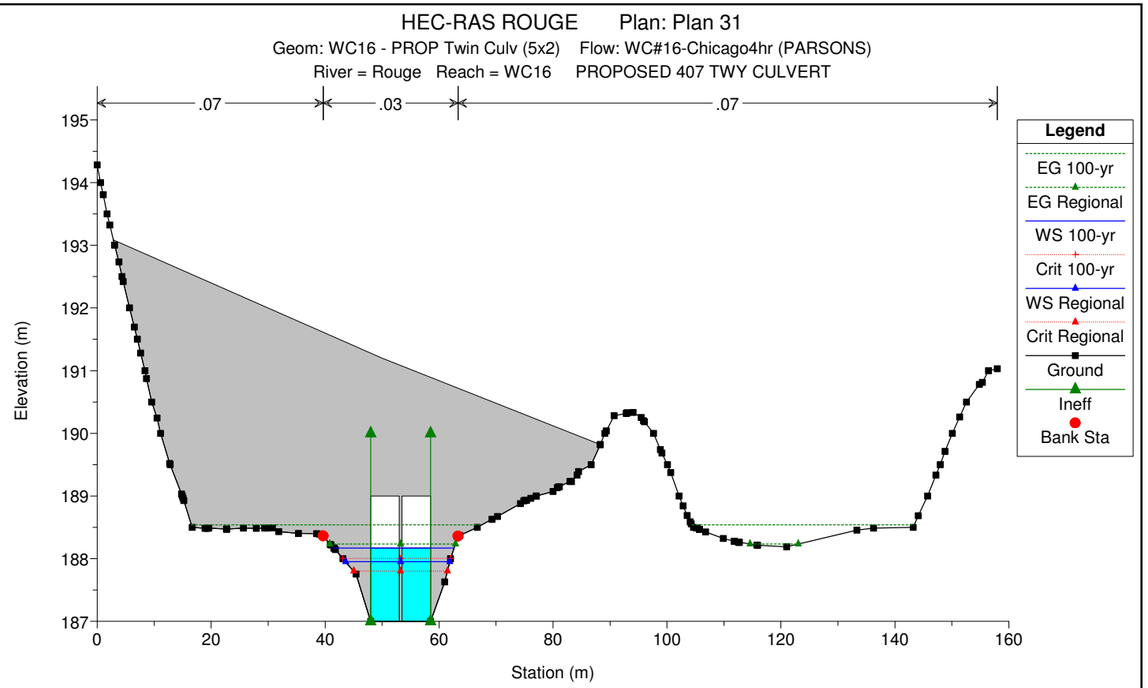
Reach	River Sta.	Contr.	Expan.
WC16	800	.1	.3
WC16	700	.1	.3
WC16	600	.1	.3
WC16	500	.1	.3
WC16	400	.1	.3
WC16	300	.1	.3
WC16	200	.1	.3
WC16	100	.1	.3

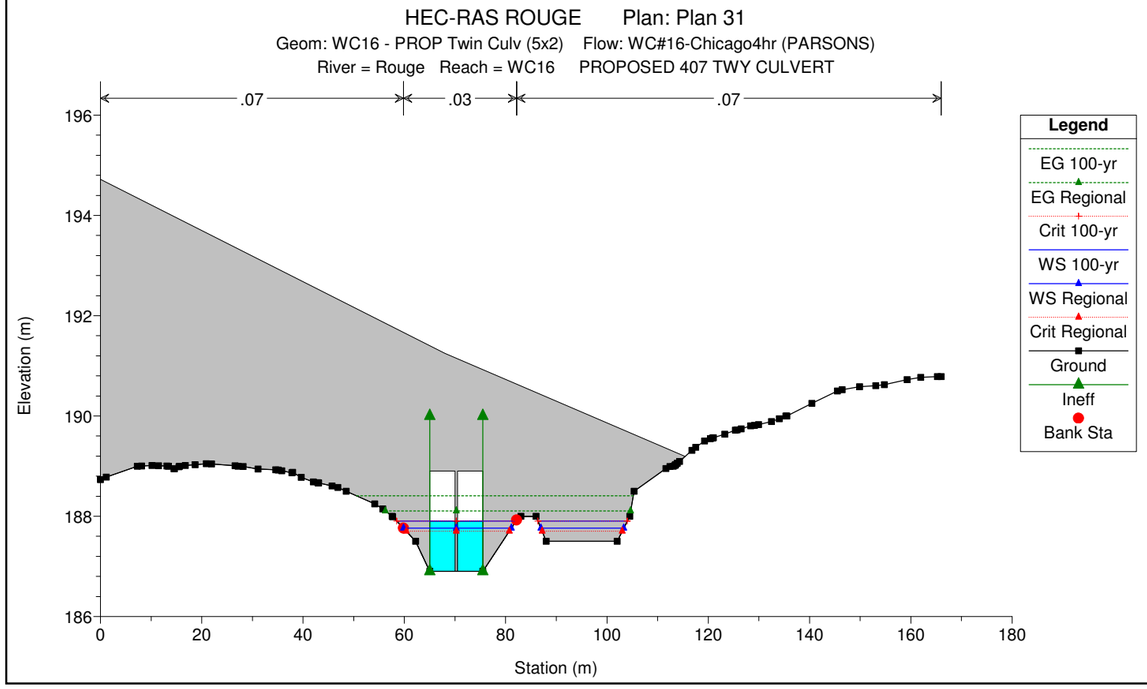
Profile Output Table - Standard Table 1

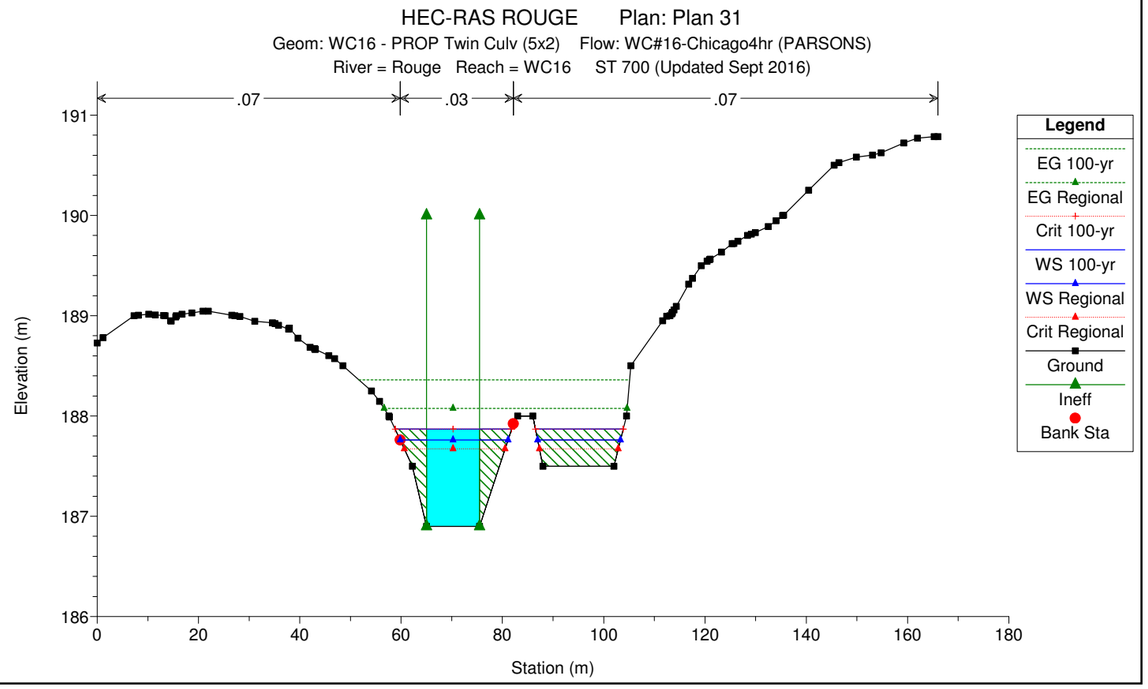
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC16	800	2-yr	9.39	187.50	187.98	187.98	188.16	0.012580	1.86	5.06	14.42	1.00
WC16	800	5-yr	16.92	187.50	188.17	188.17	188.39	0.012034	2.08	8.13	18.84	1.01
WC16	800	10-yr	20.34	187.50	188.25	188.25	188.47	0.010744	2.07	10.17	31.35	0.97
WC16	800	25-yr	24.83	187.50	188.34	188.34	188.55	0.009688	2.08	13.39	41.64	0.93
WC16	800	50-yr	28.14	187.50	188.38	188.38	188.61	0.009439	2.14	15.34	46.67	0.93
WC16	800	100-yr	31.57	187.50	188.43	188.43	188.66	0.008839	2.18	17.70	58.35	0.91
WC16	800	Check Flow	41.04	187.50	188.56	188.56	188.78	0.006583	2.17	28.22	90.80	0.82
WC16	800	Regional	22.45	187.50	188.30	188.30	188.51	0.010074	2.07	11.72	37.03	0.94
WC16	700	2-yr	9.39	187.00	187.61		187.67	0.004717	1.06	8.82	27.78	0.60
WC16	700	5-yr	16.92	187.00	187.74		187.83	0.005341	1.32	12.86	32.35	0.67
WC16	700	10-yr	20.34	187.00	187.78		187.89	0.005619	1.43	14.23	33.67	0.69
WC16	700	25-yr	24.83	187.00	187.83		187.96	0.005907	1.57	15.87	35.16	0.72
WC16	700	50-yr	28.14	187.00	187.87		188.01	0.005965	1.66	17.15	36.28	0.74
WC16	700	100-yr	31.57	187.00	187.90		188.06	0.006068	1.74	18.40	37.34	0.75
WC16	700	Check Flow	41.04	187.00	187.98	187.89	188.18	0.006491	1.97	21.48	39.83	0.79
WC16	700	Regional	22.45	187.00	187.81		187.92	0.005780	1.50	14.99	34.37	0.71
WC16	600	2-yr	9.39	186.80	187.38		187.43	0.004458	0.94	10.00	36.42	0.57
WC16	600	5-yr	16.92	186.80	187.53		187.59	0.003847	1.03	16.36	46.19	0.55
WC16	600	10-yr	20.34	186.80	187.59		187.65	0.003565	1.08	18.92	47.60	0.54
WC16	600	25-yr	24.83	186.80	187.66		187.72	0.003229	1.11	22.29	49.39	0.53
WC16	600	50-yr	28.14	186.80	187.70		187.77	0.003090	1.14	24.58	50.57	0.52
WC16	600	100-yr	31.57	186.80	187.75		187.82	0.002971	1.17	26.90	51.73	0.52
WC16	600	Check Flow	41.04	186.80	187.86		187.94	0.002696	1.26	32.69	54.64	0.51
WC16	600	Regional	22.45	186.80	187.62		187.68	0.003353	1.09	20.60	48.50	0.53
WC16	500	2-yr	9.39	186.70	187.20		187.25	0.003464	0.95	9.90	29.38	0.52
WC16	500	5-yr	16.92	186.70	187.30		187.39	0.005233	1.32	12.80	31.46	0.66
WC16	500	10-yr	20.34	186.70	187.33		187.44	0.005852	1.46	13.96	32.22	0.71
WC16	500	25-yr	24.83	186.70	187.38		187.51	0.006566	1.61	15.41	33.37	0.76
WC16	500	50-yr	28.14	186.70	187.41		187.56	0.007042	1.71	16.41	34.09	0.79
WC16	500	100-yr	31.57	186.70	187.44		187.60	0.007504	1.82	17.39	34.79	0.82
WC16	500	Check Flow	41.04	186.70	187.51	187.46	187.72	0.008618	2.07	19.87	36.48	0.89
WC16	500	Regional	22.45	186.70	187.36		187.48	0.006223	1.53	14.64	32.80	0.73

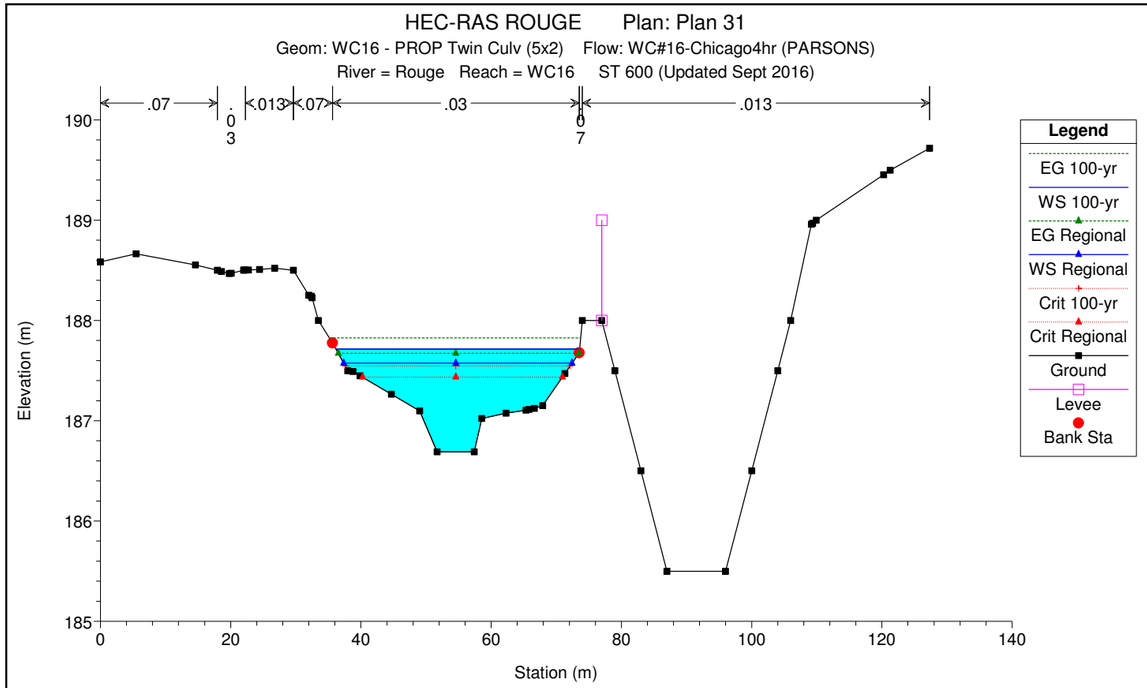
WC16	400	2-yr	9.39	186.42	186.96		187.02	0.008046	1.22	8.53
39.64	0.76									
WC16	400	5-yr	16.92	186.42	187.14		187.19	0.003310	1.08	17.29
55.73	0.53									
WC16	400	10-yr	20.34	186.42	187.21		187.26	0.002682	1.07	21.03
60.56	0.49									
WC16	400	25-yr	24.83	186.42	187.28		187.33	0.002163	1.05	25.66
62.82	0.45									
WC16	400	50-yr	28.14	186.42	187.32		187.38	0.002060	1.08	28.20
63.94	0.44									
WC16	400	100-yr	31.57	186.42	187.36		187.42	0.001941	1.09	30.84
64.94	0.43									
WC16	400	Check Flow	41.04	186.42	187.46		187.53	0.001754	1.14	37.48
67.43	0.42									
WC16	400	Regional	22.45	186.42	187.24		187.29	0.002363	1.05	23.37
61.70	0.46									
WC16	300	2-yr	9.39	186.33	186.92		186.94	0.000950	0.54	17.49
46.58	0.28									
WC16	300	5-yr	16.92	186.33	187.12		187.14	0.000765	0.64	28.02
63.10	0.27									
WC16	300	10-yr	20.34	186.33	187.18		187.20	0.000729	0.67	32.27
64.97	0.27									
WC16	300	25-yr	24.83	186.33	187.26		187.29	0.000684	0.70	37.42
67.09	0.26									
WC16	300	50-yr	28.14	186.33	187.30		187.33	0.000703	0.74	40.15
68.18	0.27									
WC16	300	100-yr	31.57	186.33	187.34		187.37	0.000712	0.77	43.02
69.30	0.27									
WC16	300	Check Flow	41.04	186.33	187.45		187.48	0.000742	0.85	50.22
72.05	0.28									
WC16	300	Regional	22.45	186.33	187.22		187.25	0.000697	0.68	34.89
66.07	0.26									
WC16	200	2-yr	9.39	186.00	186.90		186.92	0.000872	0.72	21.37
50.19	0.29									
WC16	200	5-yr	16.92	186.00	187.09		187.12	0.000952	0.88	32.66
67.31	0.31									
WC16	200	10-yr	20.34	186.00	187.16		187.19	0.000946	0.92	37.25
69.20	0.31									
WC16	200	25-yr	24.83	186.00	187.24		187.27	0.000932	0.97	42.84
71.47	0.31									
WC16	200	50-yr	28.14	186.00	187.28		187.31	0.000985	1.02	45.70
72.64	0.32									
WC16	200	100-yr	31.57	186.00	187.32		187.36	0.001021	1.06	48.74
73.87	0.33									
WC16	200	Check Flow	41.04	186.00	187.42		187.47	0.001108	1.17	56.39
76.86	0.35									
WC16	200	Regional	22.45	186.00	187.20		187.23	0.000926	0.94	40.11
70.36	0.31									
WC16	100	2-yr	9.39	186.18	186.69	186.69	186.84	0.010239	1.32	5.50
18.27	0.84									
WC16	100	5-yr	16.92	186.18	186.85	186.85	187.03	0.010491	1.62	8.97
24.40	0.89									
WC16	100	10-yr	20.34	186.18	186.91	186.91	187.10	0.010507	1.80	10.44
26.57	0.91									
WC16	100	25-yr	24.83	186.18	186.98	186.98	187.18	0.010252	1.99	12.48
29.31	0.93									
WC16	100	50-yr	28.14	186.18	187.04	187.04	187.23	0.009384	2.06	14.76
45.60	0.91									
WC16	100	100-yr	31.57	186.18	187.07	187.07	187.27	0.009622	2.17	16.21
46.96	0.93									
WC16	100	Check Flow	41.04	186.18	187.16	187.16	187.37	0.009205	2.33	20.41
50.70	0.93									
WC16	100	Regional	22.45	186.18	186.93	186.93	187.14	0.011414	1.94	10.95
27.28	0.96									

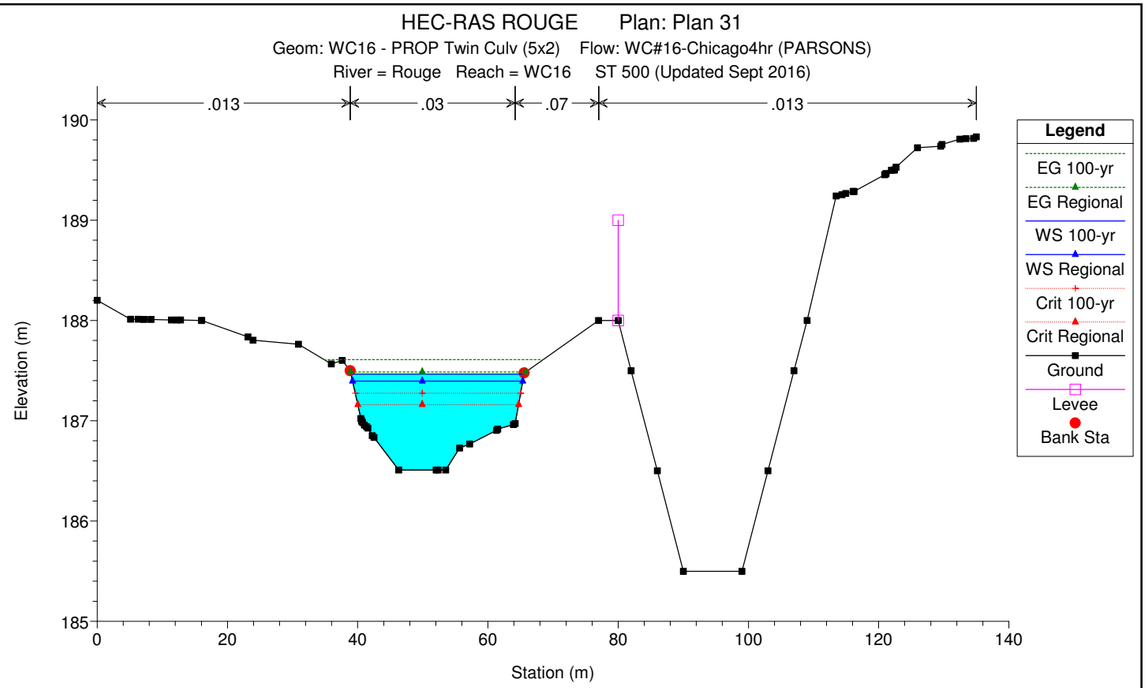

HEC-RAS ROUGE Plan: Plan 31
Geom: WC16 - PROP Twin Culv (5x2) Flow: WC#16-Chicago4hr (PARSONS)
River = Rouge Reach = WC16 ST800 (Updated Sept 2016)
.07
.03
.07
Elevation (m)
Station (m)
Legend
EG 100-yr
WS 100-yr
EG Regional
WS Regional
Crit 100-yr
Crit Regional
Ground
Ineff
Bank Sta

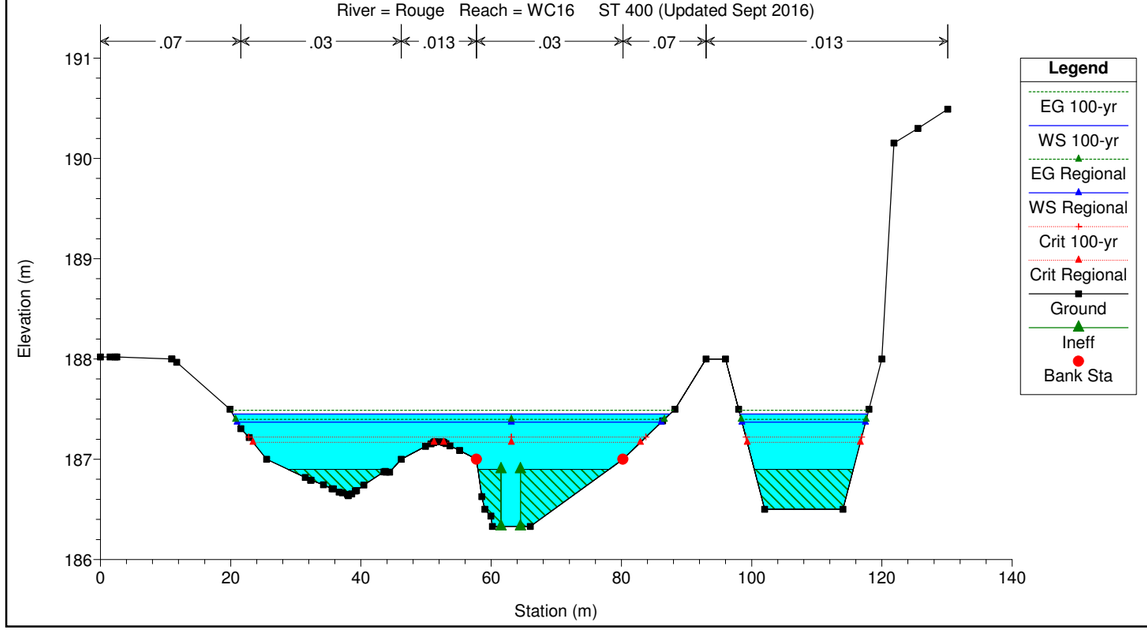

HEC-RAS ROUGE Plan: Plan 31
Geom: WC16 - PROP Twin Culv (5x2) Flow: WC#16-Chicago4hr (PARSONS)
River = Rouge Reach = WC16 PROPOSED 407 TWY CULVERT
.07
.03
.07
Elevation (m)
Station (m)
Legend
EG 100-yr
EG Regional
WS 100-yr
Crit 100-yr
WS Regional
Crit Regional
Ground
Ineff
Bank Sta

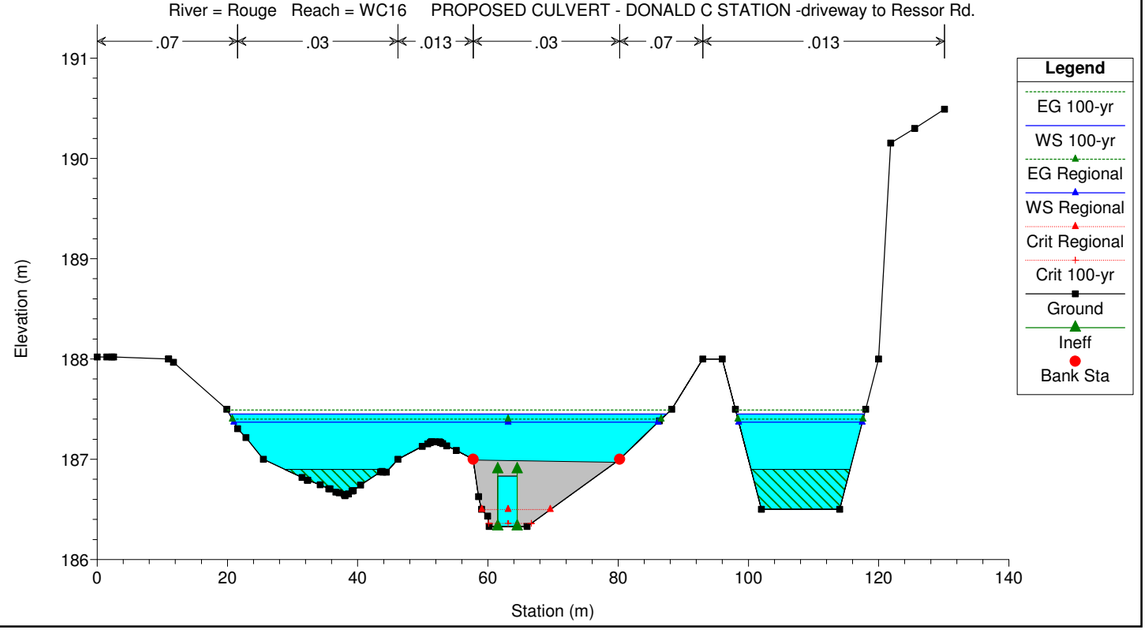

HEC-RAS ROUGE Plan: Plan 31
Geom: WC16 - PROP Twin Culv (5x2) Flow: WC#16-Chicago4hr (PARSONS)
River = Rouge Reach = WC16 PROPOSED 407 TWY CULVERT
.07
.03
.07
Elevation (m)
Station (m)
Legend
EG 100-yr
EG Regional
Crit 100-yr
WS 100-yr
WS Regional
Crit Regional
Ground
Ineff
Bank Sta

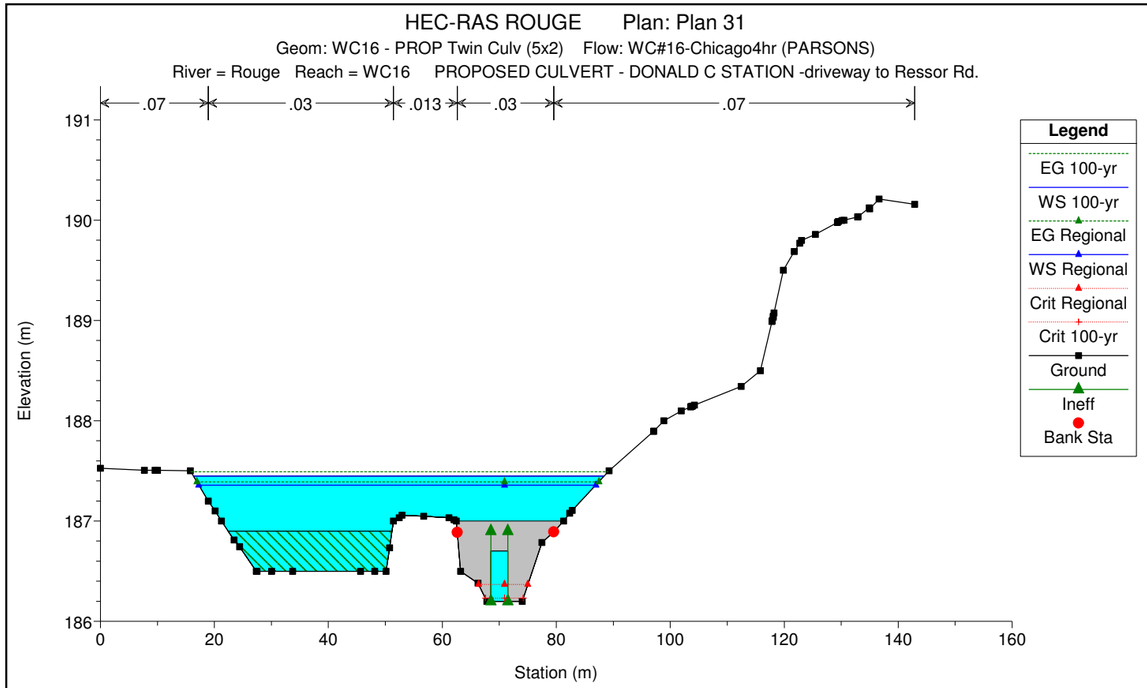

HEC-RAS ROUGE Plan: Plan 31
Geom: WC16 - PROP Twin Culv (5x2) Flow: WC#16-Chicago4hr (PARSONS)
River = Rouge Reach = WC16 ST 700 (Updated Sept 2016)
.07
.03
.07
Elevation (m)
Station (m)
Legend
EG 100-yr
EG Regional
Crit 100-yr
WS 100-yr
WS Regional
Crit Regional
Ground
Ineff
Bank Sta

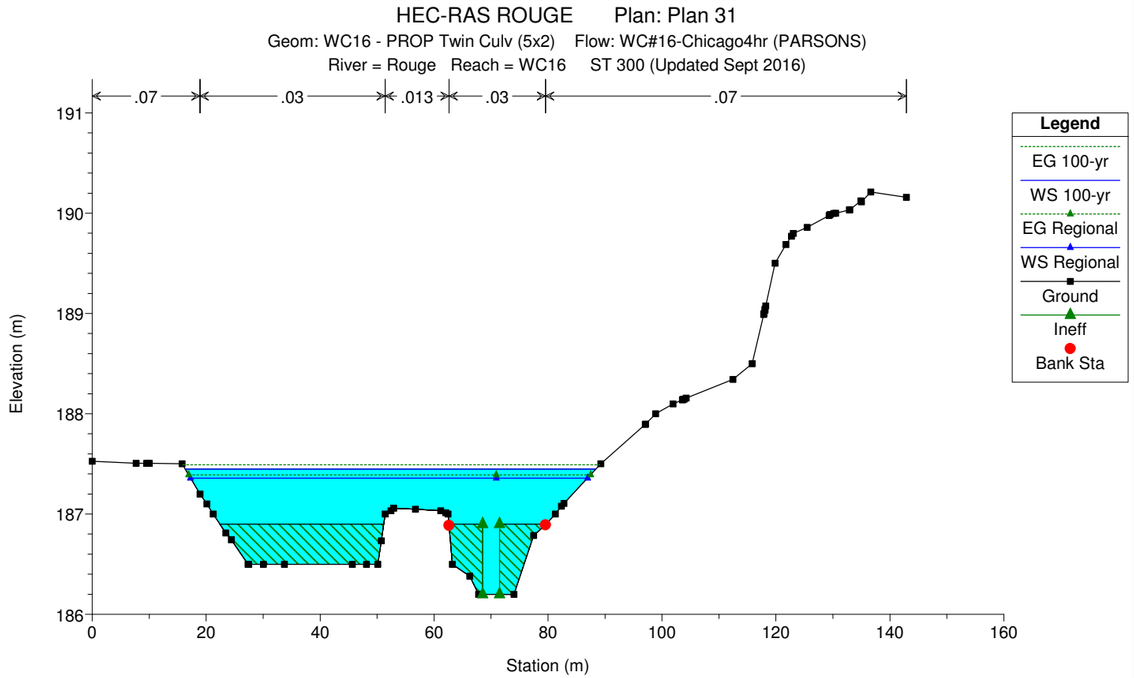

HEC-RAS ROUGE Plan: Plan 31
Geom: WC16 - PROP Twin Culv (5x2) Flow: WC#16-Chicago4hr (PARSONS)
River = Rouge Reach = WC16 ST 600 (Updated Sept 2016)
.07
.03
.013
.07
.03
.013
Elevation (m)
Station (m)
Legend
EG 100-yr
WS 100-yr
EG Regional
WS Regional
Crit 100-yr
Crit Regional
Ground
Levee
Bank Sta

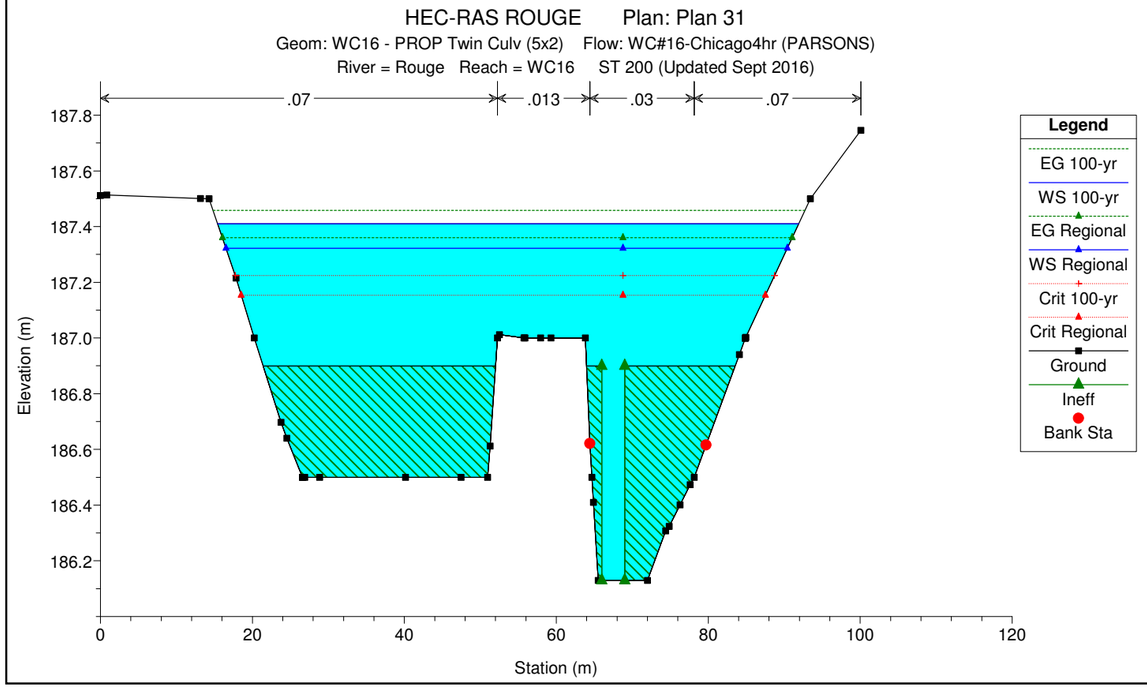

HEC-RAS ROUGE Plan: Plan 31
Geom: WC16 - PROP Twin Culv (5x2) Flow: WC#16-Chicago4hr (PARSONS)
River = Rouge Reach = WC16 ST 500 (Updated Sept 2016)
.013
.03
.07
.013
Elevation (m)
Station (m)
Legend
EG 100-yr
EG Regional
WS 100-yr
WS Regional
Crit 100-yr
Crit Regional
Ground
Levee
Bank Sta

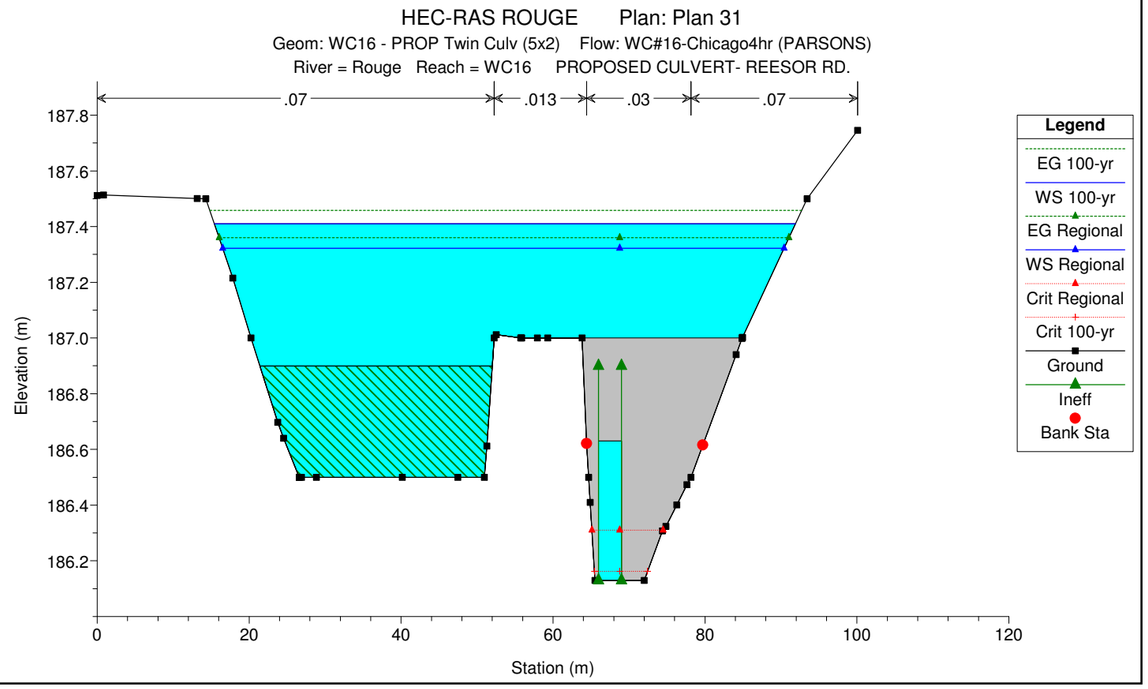

HEC-RAS ROUGE Plan: Plan 31
Geom: WC16 - PROP Twin Culv (5x2) Flow: WC#16-Chicago4hr (PARSONS)
River = Rouge Reach = WC16 ST 400 (Updated Sept 2016)
.07
.03
.013
.03
.07
.013
Elevation (m)
Station (m)
Legend
EG 100-yr
WS 100-yr
EG Regional
WS Regional
Crit 100-yr
Crit Regional
Ground
Ineff
Bank Sta

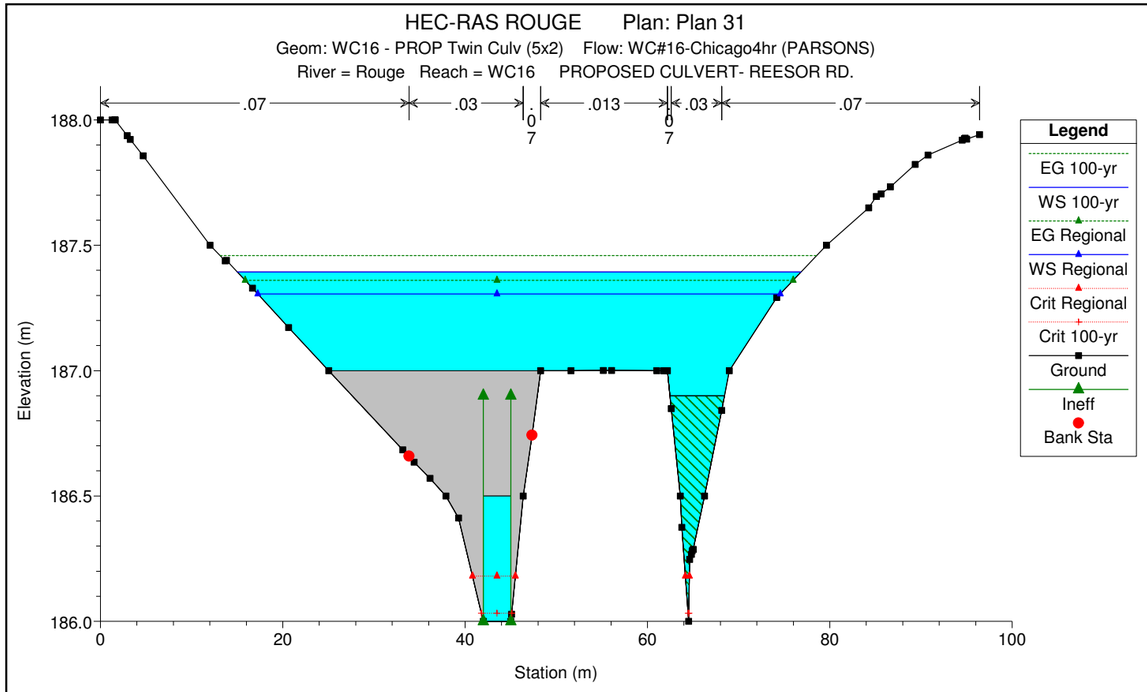

HEC-RAS ROUGE Plan: Plan 31
Geom: WC16 - PROP Twin Culv (5x2) Flow: WC#16-Chicago4hr (PARSONS)
River = Rouge Reach = WC16 PROPOSED CULVERT - DONALD C STATION -driveway to Ressor Rd.
.07
.03
.013
.03
.07
.013
Elevation (m)
Station (m)
Legend
EG 100-yr
WS 100-yr
EG Regional
WS Regional
Crit Regional
Crit 100-yr
Ground
Ineff
Bank Sta

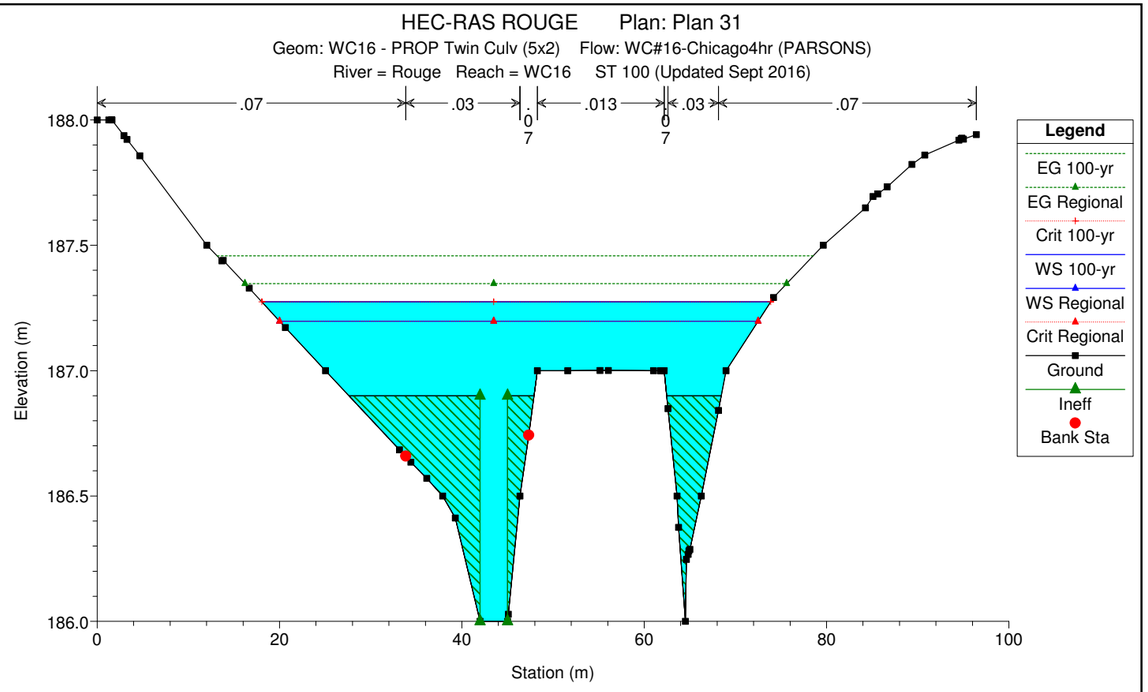

HEC-RAS ROUGE Plan: Plan 31
Geom: WC16 - PROP Twin Culv (5x2) Flow: WC#16-Chicago4hr (PARSONS)
River = Rouge Reach = WC16 PROPOSED CULVERT - DONALD C STATION -driveway to Ressor Rd.
.07
.03
.013
.03
.07
Elevation (m)
Station (m)
Legend
EG 100-yr
WS 100-yr
EG Regional
WS Regional
Crit Regional
Crit 100-yr
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 31
Geom: WC16 - PROP Twin Culv (5x2) Flow: WC#16-Chicago4hr (PARSONS)
River = Rouge Reach = WC16 ST 300 (Updated Sept 2016)
.07
.03
.013
.03
.07
Elevation (m)
Station (m)
Legend
EG 100-yr
WS 100-yr
EG Regional
WS Regional
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 31
Geom: WC16 - PROP Twin Culv (5x2) Flow: WC#16-Chicago4hr (PARSONS)
River = Rouge Reach = WC16 ST 200 (Updated Sept 2016)
.07
.013
.03
.07
Elevation (m)
Station (m)
Legend
EG 100-yr
WS 100-yr
EG Regional
WS Regional
Crit 100-yr
Crit Regional
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 31
Geom: WC16 - PROP Twin Culv (5x2) Flow: WC#16-Chicago4hr (PARSONS)
River = Rouge Reach = WC16 PROPOSED CULVERT- REESOR RD.
.07
.013
.03
.07
Elevation (m)
Station (m)
Legend
EG 100-yr
WS 100-yr
EG Regional
WS Regional
Crit Regional
Crit 100-yr
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 31
Geom: WC16 - PROP Twin Culv (5x2) Flow: WC#16-Chicago4hr (PARSONS)
River = Rouge Reach = WC16 PROPOSED CULVERT- REESOR RD.
.07
.03
.013
.03
.07
Elevation (m)
Station (m)
Legend
EG 100-yr
WS 100-yr
EG Regional
WS Regional
Crit Regional
Crit 100-yr
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 31
Geom: WC16 - PROP Twin Culv (5x2) Flow: WC#16-Chicago4hr (PARSONS)
River = Rouge Reach = WC16 ST 100 (Updated Sept 2016)
.07
.03
.013
.03
.07
Elevation (m)
Station (m)
Legend
EG 100-yr
EG Regional
Crit 100-yr
WS 100-yr
WS Regional
Crit Regional
Ground
Ineff
Bank Sta

HEC-RAS Plan: WC - 16 PROP 4hr CH River: Rouge Reach: WC16

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC16	800	2-yr	9.39	187.00	187.65	187.43	187.75	0.003011	1.37	6.83	15.26	0.54
WC16	800	5-yr	16.92	187.00	187.92	187.64	188.08	0.003075	1.75	9.67	17.92	0.58
WC16	800	10-yr	20.34	187.00	188.03	187.73	188.21	0.003047	1.88	10.83	19.28	0.59
WC16	800	25-yr	24.83	187.00	188.17	187.83	188.38	0.002981	2.02	12.29	21.09	0.60
WC16	800	50-yr	28.14	187.00	188.27	187.90	188.50	0.002922	2.11	13.32	34.94	0.60
WC16	800	100-yr	31.57	187.00	188.37	187.97	188.61	0.002865	2.20	14.36	44.79	0.60
WC16	800	Check Flow	41.04	187.00	188.64	188.16	188.93	0.002656	2.39	17.19	93.34	0.60
WC16	800	Regional	22.45	187.00	188.10	187.77	188.29	0.003021	1.95	11.52	20.13	0.59
WC16	750		Culvert									
WC16	700	2-yr	9.39	186.90	187.52		187.63	0.003499	1.44	6.53	31.72	0.58
WC16	700	5-yr	16.92	186.90	187.69		187.90	0.005221	2.05	8.25	35.77	0.74
WC16	700	10-yr	20.34	186.90	187.74		188.01	0.006122	2.32	8.78	37.03	0.81
WC16	700	25-yr	24.83	186.90	187.79	187.73	188.15	0.007545	2.67	9.30	38.24	0.91
WC16	700	50-yr	28.14	186.90	187.81	187.80	188.25	0.008799	2.94	9.57	38.89	0.98
WC16	700	100-yr	31.57	186.90	187.87	187.87	188.36	0.009017	3.10	10.18	40.32	1.01
WC16	700	Check Flow	41.04	186.90	188.06	188.06	188.64	0.008496	3.38	12.13	47.70	1.01
WC16	700	Regional	22.45	186.90	187.76	187.67	188.08	0.006774	2.48	9.04	37.63	0.85
WC16	600	2-yr	9.39	186.69	187.32	187.23	187.38	0.005648	1.15	8.19	26.39	0.66
WC16	600	5-yr	16.92	186.69	187.48	187.36	187.57	0.005140	1.30	13.03	32.42	0.65
WC16	600	10-yr	20.34	186.69	187.54	187.41	187.63	0.005064	1.36	14.97	34.41	0.66
WC16	600	25-yr	24.83	186.69	187.61	187.47	187.71	0.004802	1.43	17.40	35.74	0.65
WC16	600	50-yr	28.14	186.69	187.66	187.52	187.77	0.004479	1.45	19.38	36.79	0.64
WC16	600	100-yr	31.57	186.69	187.71	187.55	187.83	0.004211	1.48	21.29	37.42	0.63
WC16	600	Check Flow	41.04	186.69	187.85	187.63	187.97	0.003619	1.57	26.26	38.80	0.60
WC16	600	Regional	22.45	186.69	187.57	187.44	187.67	0.004899	1.39	16.16	35.07	0.65
WC16	500	2-yr	9.39	186.51	187.22	186.95	187.25	0.001485	0.76	12.32	25.04	0.35
WC16	500	5-yr	16.92	186.51	187.33	187.08	187.40	0.002549	1.11	15.27	25.75	0.46
WC16	500	10-yr	20.34	186.51	187.37	187.13	187.45	0.003114	1.26	16.17	25.97	0.51
WC16	500	25-yr	24.83	186.51	187.42	187.19	187.52	0.003695	1.42	17.48	26.28	0.56
WC16	500	50-yr	28.14	186.51	187.45	187.23	187.57	0.004083	1.53	18.41	26.49	0.59
WC16	500	100-yr	31.57	186.51	187.47	187.27	187.61	0.004921	1.69	18.68	26.56	0.64
WC16	500	Check Flow	41.04	186.51	187.57	187.38	187.76	0.005283	1.91	21.59	29.84	0.68
WC16	500	Regional	22.45	186.51	187.40	187.16	187.49	0.003350	1.33	16.87	26.13	0.53
WC16	400	2-yr	9.39	186.33	187.18	187.03	187.20	0.000811	0.44	18.35	77.15	0.25
WC16	400	5-yr	16.92	186.33	187.30	187.11	187.33	0.000688	0.51	28.12	81.83	0.24

HEC-RAS Plan: WC - 16 PROP 4hr CH River: Rouge Reach: WC16 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC16	400	10-yr	20.34	186.33	187.34	187.15	187.37	0.000720	0.55	31.11	83.04	0.25
WC16	400	25-yr	24.83	186.33	187.40	187.18	187.43	0.000667	0.57	36.11	85.00	0.25
WC16	400	50-yr	28.14	186.33	187.44	187.20	187.47	0.000630	0.58	39.79	86.42	0.24
WC16	400	100-yr	31.57	186.33	187.45	187.22	187.49	0.000742	0.64	40.65	86.75	0.26
WC16	400	Check Flow	41.04	186.33	187.59	187.28	187.62	0.000550	0.63	52.86	91.47	0.24
WC16	400	Regional	22.45	186.33	187.37	187.17	187.40	0.000670	0.55	33.84	84.11	0.25
WC16	350		Culvert									
WC16	300	2-yr	9.39	186.20	187.18		187.19	0.001198	0.62	17.41	64.77	0.31
WC16	300	5-yr	16.92	186.20	187.28		187.31	0.001292	0.76	24.44	67.65	0.34
WC16	300	10-yr	20.34	186.20	187.33		187.36	0.001299	0.80	27.33	68.80	0.34
WC16	300	25-yr	24.83	186.20	187.38		187.41	0.001296	0.85	30.97	70.21	0.35
WC16	300	50-yr	28.14	186.20	187.42		187.46	0.001255	0.87	33.84	71.30	0.35
WC16	300	100-yr	31.57	186.20	187.45		187.49	0.001309	0.92	35.91	72.08	0.36
WC16	300	Check Flow	41.04	186.20	187.56		187.61	0.001128	0.95	45.35	90.53	0.34
WC16	300	Regional	22.45	186.20	187.36		187.39	0.001220	0.81	29.64	69.70	0.34
WC16	200	2-yr	9.39	186.13	187.13	187.06	187.16	0.002806	0.91	16.17	68.39	0.47
WC16	200	5-yr	16.92	186.13	187.24	187.13	187.27	0.002763	1.06	23.66	71.44	0.48
WC16	200	10-yr	20.34	186.13	187.28	187.15	187.32	0.002671	1.10	26.88	72.75	0.48
WC16	200	25-yr	24.83	186.13	187.34	187.18	187.38	0.002562	1.14	30.92	74.37	0.48
WC16	200	50-yr	28.14	186.13	187.38	187.20	187.43	0.002395	1.16	34.21	75.66	0.46
WC16	200	100-yr	31.57	186.13	187.41	187.22	187.46	0.002505	1.22	36.30	76.47	0.48
WC16	200	Check Flow	41.04	186.13	187.53	187.27	187.58	0.002252	1.28	46.03	94.25	0.46
WC16	200	Regional	22.45	186.13	187.32	187.15	187.36	0.002372	1.08	29.72	73.89	0.46
WC16	150		Culvert									
WC16	100	2-yr	9.39	186.00	187.07	187.07	187.15	0.007383	1.45	8.44	46.79	0.77
WC16	100	5-yr	16.92	186.00	187.15	187.15	187.27	0.007682	1.70	12.51	50.43	0.81
WC16	100	10-yr	20.34	186.00	187.18	187.18	187.32	0.007930	1.80	14.00	51.69	0.83
WC16	100	25-yr	24.83	186.00	187.22	187.22	187.38	0.007416	1.85	16.34	53.61	0.82
WC16	100	50-yr	28.14	186.00	187.24	187.24	187.42	0.008167	1.98	17.20	54.29	0.86
WC16	100	100-yr	31.57	186.00	187.27	187.27	187.46	0.007433	1.97	19.17	55.83	0.83
WC16	100	Check Flow	41.04	186.00	187.35	187.35	187.56	0.006856	2.06	23.52	59.57	0.81
WC16	100	Regional	22.45	186.00	187.20	187.20	187.35	0.007850	1.84	15.00	52.52	0.83

HEC-RAS HEC-RAS 5.0.1 April 2016
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: HEC-RAS ROUGE
Project File : HEC.prj
Run Date and Time: 9/13/2016 3:16:54 PM

Project in SI units

Project Description:
HEC-RAS model for creek crossings along the proposed 407 TWY Ph 2 started
from scratch

PLAN DATA

Plan Title: Plan 31
Plan File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.p31

Geometry Title: WC16 - PROP Twin Culv (5x2)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g04

Flow Title : WC#16-Chicago4hr (PARSONS)
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f15

Plan Summary Information:
Number of: Cross Sections = 8 Multiple Openings = 0
Culverts = 3 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: WC#16-Chicago4hr (PARSONS)
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f15

Flow Data (m3/s)

River	Reach	RS	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Check Flow	Regional
Trib B	Reach 1	800	9.39	16.92	20.34	24.83	28.14	31.57	41.04	22.45
Rouge	WC16	800	9.39	16.92	20.34	24.83	28.14	31.57	41.04	22.45
Rouge	WC16	800	9.39	16.92	20.34	24.83	28.14	31.57	41.04	22.45

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Rouge	WC16	2-yr		Critical
Rouge	WC16	5-yr		Critical
Rouge	WC16	10-yr		Critical
Rouge	WC16	25-yr		Critical
Rouge	WC16	50-yr		Critical
Rouge	WC16	100-yr		Critical
Rouge	WC16	Check Flow		Critical
Rouge	WC16	Regional		Critical

GEOMETRY DATA

Geometry Title: WC16 - PROP Twin Culv (5x2)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g04

CROSS SECTION

RIVER: Rouge
REACH: WC16 RS: 800

INPUT
Description: ST800 (Updated Sept 2016)
Station Elevation Data num= 127

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	194.284	.574	194	1.062	193.809	1.735	193.5	2.212	193.324
3.069	193	3.79	192.734	4.322	192.5	4.548	192.422	5.665	192
6.517	191.696	7.063	191.5	7.634	191.279	8.355	191	8.664	190.875
9.586	190.5	10.484	190.245	11.124	190	12.742	189.518	12.811	189.5
14.81	189.033	14.931	189	15.064	188.964	15.207	188.928	16.683	188.5
18.922	188.485	19.313	188.484	19.585	188.487	22.674	188.473	22.69	188.473
22.715	188.473	25.641	188.486	27.919	188.485	29.385	188.487	29.923	188.487
30.778	188.49	31.877	188.429	35.321	188.403	38.53	188.399	39.014	188.389
39.679	188.362	40.923	188.225	41.049	188.216	41.519	188.173	41.563	188.166
41.785	188.145	43.122	188	45.445	187.755	48	187	58.5	187
61	187.628	62	188	63.338	188.36	63.625	188.37	66.691	188.5
69.28	188.628	70.26	188.673	74.292	188.88	74.872	188.922	75.032	188.928
75.071	188.929	75.309	188.936	75.339	188.931	76.079	188.964	77.026	189
77.054	189.001	80.009	189.072	80.737	189.132	80.992	189.147	81.09	189.15
82.953	189.234	83.247	189.228	84.223	189.332	84.486	189.391	86.673	189.5
88.281	189.817	88.294	189.82	89.093	190	89.339	190.038	90.706	190.279
92.864	190.317	92.893	190.319	93.041	190.328	94.031	190.334	95.448	190.254
95.886	190.199	96.059	190.184	97.624	190	98.831	189.739	99.121	189.683
100.075	189.5	100.674	189.373	102.138	189	102.81	188.841	103.513	188.69
104.063	188.587	104.258	188.556	104.623	188.5	105.116	188.491	105.304	188.493
105.661	188.469	105.702	188.467	106.788	188.425	109.86	188.322	111.771	188.278
111.812	188.276	112.514	188.263	112.638	188.259	112.714	188.262	115.779	188.216
115.883	188.212	120.976	188.19	133.337	188.455	136.228	188.488	143.181	188.5
144.076	188.683	145.723	189	147.212	189.334	147.935	189.5	148.801	189.714
150.064	190	151.348	190.259	152.549	190.5	154.821	190.779	155.349	190.813
156.422	191	157.949	191.032						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	39.679	.03	63.338	.07

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
39.679 63.338 44.5 44.5 44.5 .3 .5
Ineffective Flow num= 2
Sta L Sta R Elev Permanent

```
      0      48     190       T
   58.5 157.949     190       T

CROSS SECTION OUTPUT  Profile #100-yr

  E.G. Elev (m)           188.61    Element                Left OB    Channel   Right OB
  Vel Head (m)              0.25    Wt. n-Val.                        0.030
  W.S. Elev (m)           188.37    Reach Len. (m)           44.50     44.50      44.50
  Crit W.S. (m)           187.97    Flow Area (m2)                     14.36
  E.G. Slope (m/m)      0.002865    Area (m2)                 0.00     22.11       2.25
  Q Total (m3/s)            31.57   Flow (m3/s)                        31.57
  Top Width (m)             44.79   Top Width (m)             0.14     23.66      20.99
  Vel Total (m/s)            2.20   Avg. Vel. (m/s)                     2.20
  Max Chl Dpth (m)           1.37   Hydr. Depth (m)                     1.37
  Conv. Total (m3/s)       589.8    Conv. (m3/s)                       589.8
  Length Wtd. (m)           44.50   Wetted Per. (m)                    10.50
  Min Ch El (m)           187.00    Shear (N/m2)                       38.42
  Alpha                     1.00    Stream Power (N/m s)               84.47
  Frctn Loss (m)                    Cum Volume (1000 m3)      0.98      6.26       0.58
  C & E Loss (m)                    Cum SA (1000 m2)          4.16      6.49       3.30


CROSS SECTION OUTPUT  Profile #Regional

  E.G. Elev (m)           188.29    Element                Left OB    Channel   Right OB
  Vel Head (m)              0.19    Wt. n-Val.                        0.030
  W.S. Elev (m)           188.10    Reach Len. (m)           44.50     44.50      44.50
  Crit W.S. (m)           187.77    Flow Area (m2)                     11.52
  E.G. Slope (m/m)      0.003021    Area (m2)                          16.17
  Q Total (m3/s)            22.45   Flow (m3/s)                        22.45
  Top Width (m)             20.13   Top Width (m)                      20.13
  Vel Total (m/s)            1.95   Avg. Vel. (m/s)                     1.95
  Max Chl Dpth (m)           1.10   Hydr. Depth (m)                     1.10
  Conv. Total (m3/s)       408.5    Conv. (m3/s)                       408.5
  Length Wtd. (m)           44.50   Wetted Per. (m)                    10.50
  Min Ch El (m)           187.00    Shear (N/m2)                       32.50
  Alpha                     1.00    Stream Power (N/m s)               63.33
  Frctn Loss (m)                    Cum Volume (1000 m3)      0.84      5.15       0.47
  C & E Loss (m)                    Cum SA (1000 m2)          4.00      6.25       2.61


CULVERT


RIVER: Rouge
REACH: WC16               RS: 750

INPUT
Description: PROPOSED 407 TWY CULVERT
Distance from Upstream XS =      19
Deck/Roadway Width        =      14
Weir Coefficient          =     1.4
Upstream  Deck/Roadway Coordinates
    num=         3
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0   193.2              50   191.2           88.28  189.82

Upstream Bridge Cross Section Data
Station Elevation Data    num=     127
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 194.284    .574     194   1.062 193.809   1.735   193.5   2.212 193.324
   3.069     193    3.79 192.734   4.322   192.5   4.548 192.422   5.665     192
   6.517 191.696   7.063   191.5   7.634 191.279   8.355     191   8.664 190.875
   9.586   190.5  10.484 190.245  11.124     190  12.742 189.518  12.811   189.5
   14.81 189.033  14.931     189  15.064 188.964  15.207 188.928  16.683   188.5
  18.922 188.485  19.313 188.484  19.585 188.487  22.674 188.473   22.69 188.473
  22.715 188.473  25.641 188.486  27.919 188.485  29.385 188.487  29.923 188.487
  30.778  188.49  31.877 188.429  35.321 188.403   38.53 188.399  39.014 188.389
  39.679 188.362  40.923 188.225  41.049 188.216  41.519 188.173  41.563 188.166
  41.785 188.145  43.122     188  45.445 187.755      48     187    58.5     187
      61 187.628      62     188  63.338  188.36  63.625  188.37  66.691   188.5
   69.28 188.628   70.26 188.673  74.292  188.88  74.872 188.922  75.032 188.928
  75.071 188.929  75.309 188.936  75.339 188.931  76.079 188.964  77.026     189
  77.054 189.001  80.009 189.072  80.737 189.132  80.992 189.147   81.09  189.15
  82.953 189.234  83.247 189.228  84.223 189.332  84.486 189.391  86.673   189.5
  88.281 189.817  88.294  189.82  89.093     190  89.339 190.038  90.706 190.279
  92.864 190.317  92.893 190.319  93.041 190.328  94.031 190.334  95.448 190.254
  95.886 190.199  96.059 190.184  97.624     190  98.831 189.739  99.121 189.683
 100.075   189.5 100.674 189.373 102.138     189  102.81 188.841 103.513  188.69
 104.063 188.587 104.258 188.556 104.623   188.5 105.116 188.491 105.304 188.493
 105.661 188.469 105.702 188.467 106.788 188.425  109.86 188.322 111.771 188.278
 111.812 188.276 112.514 188.263 112.638 188.259 112.714 188.262 115.779 188.216
 115.883 188.212 120.976  188.19 133.337 188.455 136.228 188.488 143.181   188.5
 144.076 188.683 145.723     189 147.212 189.334 147.935   189.5 148.801 189.714
 150.064     190 151.348 190.259 152.549   190.5 154.821 190.779 155.349 190.813
 156.422     191 157.949 191.032

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .07  39.679     .03  63.338     .07

Bank Sta: Left   Right    Coeff Contr.   Expan.
        39.679  63.338          .3         .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0      48     190       T
    58.5 157.949     190       T

Downstream  Deck/Roadway Coordinates
    num=         3
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0  194.72              68  191.25              166     187

Downstream Bridge Cross Section Data
Station Elevation Data    num=      83
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 188.728   1.142  188.78   7.257     189   8.108 189.004   10.16 189.014
  11.464 189.008  13.125 189.002  13.398     189  14.489 188.949   14.63 188.946
  15.501 188.988  15.603     189  16.731 189.014  18.711 189.028  20.916 189.046
  21.943 189.045  26.598 189.006  27.175     189  28.157 188.993  31.135 188.944
  34.613 188.929   35.12 188.923  35.801 188.905  37.801 188.867  37.932 188.877
  39.623 188.776  42.024 188.686  42.913 188.672  42.994 188.666  43.066 188.665
  45.744 188.603  46.856 188.573  48.509   188.5  54.138 188.249  55.744 188.147
  57.585     188  57.703  187.99   59.82 187.761  62.236   187.5      65   186.9
    75.5   186.9   82.15 187.922      83     188      86     188      88   187.5
     102   187.5   104.5     188 105.339   188.5 111.633   188.95 112.425 188.994
 113.078     189 113.418 189.019 113.422 189.019 113.604 189.033 113.871 189.057
 114.308 189.093 116.759 189.315 117.521 189.374 119.277   189.5 120.431 189.545
 120.883  189.56 121.019 189.565 123.265 189.636 125.348 189.719 125.698 189.721
 126.485 189.743 128.389 189.802  129.15 189.814  129.94 189.829 132.483  189.89
 134.026 189.946 135.308     190 135.507 190.002 140.457 190.252 145.499   190.5
 146.445 190.526 149.891 190.583 153.081 190.603 154.748 190.624 159.239 190.724
 161.957 190.772 165.235 190.786     166 190.785

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .07   59.82     .03   82.15     .07

Bank Sta: Left   Right    Coeff Contr.   Expan.
         59.82   82.15          .3         .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0      65     190       T
    75.5     166     190       T

Upstream Embankment side slope              =       2 horiz. to 1.0 vertical
Downstream Embankment side slope            =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  2
```

```
Culvert Name     Shape      Rise    Span
Culvert #1         Box         2       5
FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                 7    25.5     .013     .025        0                  .2               1
Upstream   Elevation =  187
           Centerline Station =  50.5
Downstream Elevation =  186.9
           Centerline Station =  67.5

Culvert Name     Shape      Rise    Span
Culvert #2         Box         2       5
FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                 7    25.5     .013     .025        0                  .2               1
Upstream   Elevation =  187
           Centerline Station =  56
Downstream Elevation =  186.9
           Centerline Station =  73

CULVERT OUTPUT  Profile #100-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)      15.79    Culv Full Len (m)
  # Barrels                   1    Culv Vel US (m/s)         2.70
  Q Barrel (m3/s)          15.79    Culv Vel DS (m/s)         3.14
  E.G. US. (m)            188.62    Culv Inv El Up (m)      187.00
  W.S. US. (m)            188.37    Culv Inv El Dn (m)      186.90
  E.G. DS (m)             188.36    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             187.87    Culv Exit Loss (m)        0.05
  Delta EG (m)              0.26    Culv Entr Loss (m)        0.07
  Delta WS (m)              0.50    Q Weir (m3/s)
  E.G. IC (m)             188.61    Weir Sta Lft (m)
  E.G. OC (m)             188.62    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       188.17    Weir Max Depth (m)
  Culv WS Outlet (m)      187.91    Weir Avg Depth (m)
  Culv Nml Depth (m)        1.23    Weir Flow Area (m2)
  Culv Crt Depth (m)        1.01    Min El Weir Flow (m)    190.00


CULVERT OUTPUT  Profile #Regional  Culv Group:  Culvert #1

  Q Culv Group (m3/s)      11.23    Culv Full Len (m)
  # Barrels                   1    Culv Vel US (m/s)         2.36
  Q Barrel (m3/s)          11.23    Culv Vel DS (m/s)         2.61
  E.G. US. (m)            188.29    Culv Inv El Up (m)      187.00
  W.S. US. (m)            188.10    Culv Inv El Dn (m)      186.90
  E.G. DS (m)             188.08    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             187.76    Culv Exit Loss (m)        0.03
  Delta EG (m)              0.22    Culv Entr Loss (m)        0.06
  Delta WS (m)              0.34    Q Weir (m3/s)
  E.G. IC (m)             188.27    Weir Sta Lft (m)
  E.G. OC (m)             188.29    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       187.95    Weir Max Depth (m)
  Culv WS Outlet (m)      187.76    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.99    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.80    Min El Weir Flow (m)    190.00


CULVERT OUTPUT  Profile #100-yr  Culv Group:  Culvert #2

  Q Culv Group (m3/s)      15.79    Culv Full Len (m)
  # Barrels                   1    Culv Vel US (m/s)         2.70
  Q Barrel (m3/s)          15.79    Culv Vel DS (m/s)         3.14
  E.G. US. (m)            188.62    Culv Inv El Up (m)      187.00
  W.S. US. (m)            188.37    Culv Inv El Dn (m)      186.90
  E.G. DS (m)             188.36    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             187.87    Culv Exit Loss (m)        0.05
  Delta EG (m)              0.26    Culv Entr Loss (m)        0.07
  Delta WS (m)              0.50    Q Weir (m3/s)
  E.G. IC (m)             188.61    Weir Sta Lft (m)
  E.G. OC (m)             188.62    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       188.17    Weir Max Depth (m)
  Culv WS Outlet (m)      187.91    Weir Avg Depth (m)
  Culv Nml Depth (m)        1.23    Weir Flow Area (m2)
  Culv Crt Depth (m)        1.01    Min El Weir Flow (m)    190.00


CULVERT OUTPUT  Profile #Regional  Culv Group:  Culvert #2

  Q Culv Group (m3/s)      11.23    Culv Full Len (m)
  # Barrels                   1    Culv Vel US (m/s)         2.36
  Q Barrel (m3/s)          11.23    Culv Vel DS (m/s)         2.61
  E.G. US. (m)            188.29    Culv Inv El Up (m)      187.00
  W.S. US. (m)            188.10    Culv Inv El Dn (m)      186.90
  E.G. DS (m)             188.08    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             187.76    Culv Exit Loss (m)        0.03
  Delta EG (m)              0.22    Culv Entr Loss (m)        0.06
  Delta WS (m)              0.34    Q Weir (m3/s)
  E.G. IC (m)             188.27    Weir Sta Lft (m)
  E.G. OC (m)             188.29    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       187.95    Weir Max Depth (m)
  Culv WS Outlet (m)      187.76    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.99    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.80    Min El Weir Flow (m)    190.00


CROSS SECTION


RIVER: Rouge
REACH: WC16              RS: 700

INPUT
Description: ST 700 (Updated Sept 2016)
Station Elevation Data    num=       83
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 188.728   1.142  188.78   7.257     189   8.108 189.004   10.16 189.014
  11.464 189.008  13.125 189.002  13.398     189  14.489 188.949   14.63 188.946
  15.501 188.988  15.603     189  16.731 189.014  18.711 189.028  20.916 189.046
  21.943 189.045  26.598 189.006  27.175     189  28.157 188.993  31.135 188.944
  34.613 188.929   35.12 188.923  35.801 188.905  37.801 188.867  37.932 188.877
  39.623 188.776  42.024 188.686  42.913 188.672  42.994 188.666  43.066 188.665
  45.744 188.603  46.856 188.573  48.509   188.5  54.138 188.249  55.744 188.147
  57.585     188  57.703  187.99   59.82 187.761  62.236   187.5      65   186.9
    75.5   186.9   82.15 187.922      83     188      86     188      88   187.5
     102   187.5   104.5     188 105.339   188.5 111.633  188.95 112.425 188.994
 113.078     189 113.418 189.019 113.422 189.019 113.604 189.033 113.871 189.057
 114.308 189.093 116.759 189.315 117.521 189.374 119.277   189.5 120.431 189.545
 120.883  189.56 121.019 189.565 123.265 189.636 125.348 189.719 125.698 189.721
 126.485 189.743 128.389 189.802  129.15 189.814  129.94 189.829 132.483  189.89
 134.026 189.946 135.308     190 135.507 190.002 140.457 190.252 145.499   190.5
 146.445 190.526 149.891 190.583 153.081 190.603 154.748 190.624 159.239 190.724
 161.957 190.772 165.235 190.786     166 190.785

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .07   59.82     .03   82.15     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        59.82   82.15             51.6    51.6    51.6             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0      65     190        T
    75.5     166     190        T
```

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	188.36	Element	Left OB	Channel	Right OB
Vel Head (m)	0.49	Wt. n-Val.		0.030	
W.S. Elev (m)	187.87	Reach Len. (m)	51.60	51.60	51.60
Crit W.S. (m)	187.87	Flow Area (m2)		10.18	
E.G. Slope (m/m)	0.009017	Area (m2)	0.05	15.67	5.79
Q Total (m3/s)	31.57	Flow (m3/s)		31.57	
Top Width (m)	40.32	Top Width (m)	1.00	21.99	17.33
Vel Total (m/s)	3.10	Avg. Vel. (m/s)		3.10	
Max Chl Dpth (m)	0.97	Hydr. Depth (m)		0.97	
Conv. Total (m3/s)	332.5	Conv. (m3/s)		332.5	
Length Wtd. (m)	51.60	Wetted Per. (m)		10.50	
Min Ch El (m)	186.90	Shear (N/m2)		85.74	
Alpha	1.00	Stream Power (N/m s)		265.86	
Frctn Loss (m)	0.31	Cum Volume (1000 m3)	0.98	5.72	0.58
C & E Loss (m)	0.19	Cum SA (1000 m2)	4.13	5.47	2.45

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	188.08	Element	Left OB	Channel	Right OB
Vel Head (m)	0.31	Wt. n-Val.		0.030	
W.S. Elev (m)	187.76	Reach Len. (m)	51.60	51.60	51.60
Crit W.S. (m)	187.67	Flow Area (m2)		9.04	
E.G. Slope (m/m)	0.006774	Area (m2)	0.00	13.32	3.96
Q Total (m3/s)	22.45	Flow (m3/s)		22.45	
Top Width (m)	37.63	Top Width (m)		21.28	16.35
Vel Total (m/s)	2.48	Avg. Vel. (m/s)		2.48	
Max Chl Dpth (m)	0.86	Hydr. Depth (m)		0.86	
Conv. Total (m3/s)	272.8	Conv. (m3/s)		272.8	
Length Wtd. (m)	51.60	Wetted Per. (m)		10.50	
Min Ch El (m)	186.90	Shear (N/m2)		57.20	
Alpha	1.00	Stream Power (N/m s)		142.03	
Frctn Loss (m)	0.30	Cum Volume (1000 m3)	0.84	4.73	0.47
C & E Loss (m)	0.11	Cum SA (1000 m2)	4.00	5.32	2.25

Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Rouge
REACH: WC16 RS: 600

INPUT
Description: ST 600 (Updated Sept 2016)
Station Elevation Data num= 49

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	188.584	5.453	188.665	14.598	188.554	17.97	188.5	18.586	188.488
19.79	188.468	20.105	188.47	21.987	188.5	22.02	188.503	22.273	188.503
22.728	188.503	24.45	188.51	26.753	188.522	29.638	188.5	32.002	188.253
32.384	188.241	32.516	188.226	33.471	188	35.659	187.775	37.975	187.5
38.781	187.491	39.879	187.449	44.662	187.264	49.036	187.099	51.71	186.69
57.409	186.69	58.561	187.023	62.272	187.076	65.342	187.105	65.824	187.113
66.638	187.124	67.891	187.152	71.31	187.47	73.53	187.677	74	188
77	188	79	187.5	83	186.5	87	185.5	96	185.5
100	186.5	104	187.5	106	188	109.153	188.959	109.356	188.969
109.894	189	120.265	189.454	121.278	189.5	127.304	189.719		

Manning's n Values num= 7

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.07	17.97	.03	22.273	.013	29.638	.07	35.659	.03
73.53	.07	74	.013						

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
35.659 73.53 45.3 45.3 45.3 .3 .5
Right Levee Station= 77 Elevation= 189

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	187.83	Element	Left OB	Channel	Right OB
Vel Head (m)	0.11	Wt. n-Val.		0.030	0.070
W.S. Elev (m)	187.71	Reach Len. (m)	45.30	45.30	45.30
Crit W.S. (m)	187.55	Flow Area (m2)		21.29	0.00
E.G. Slope (m/m)	0.004211	Area (m2)		21.29	0.00
Q Total (m3/s)	31.57	Flow (m3/s)		31.57	0.00
Top Width (m)	37.42	Top Width (m)		37.36	0.05
Vel Total (m/s)	1.48	Avg. Vel. (m/s)		1.48	0.06
Max Chl Dpth (m)	2.21	Hydr. Depth (m)		0.57	0.02
Conv. Total (m3/s)	486.5	Conv. (m3/s)		486.5	0.0
Length Wtd. (m)	45.30	Wetted Per. (m)		37.49	0.07
Min Ch El (m)	186.69	Shear (N/m2)		23.45	0.64
Alpha	1.00	Stream Power (N/m s)		34.78	0.04
Frctn Loss (m)	0.21	Cum Volume (1000 m3)	0.97	4.77	0.43
C & E Loss (m)	0.01	Cum SA (1000 m2)	4.11	3.94	2.00

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	187.67	Element	Left OB	Channel	Right OB
Vel Head (m)	0.10	Wt. n-Val.		0.030	
W.S. Elev (m)	187.57	Reach Len. (m)	45.30	45.30	45.30
Crit W.S. (m)	187.44	Flow Area (m2)		16.16	
E.G. Slope (m/m)	0.004899	Area (m2)		16.16	
Q Total (m3/s)	22.45	Flow (m3/s)		22.45	
Top Width (m)	35.07	Top Width (m)		35.07	
Vel Total (m/s)	1.39	Avg. Vel. (m/s)		1.39	
Max Chl Dpth (m)	2.07	Hydr. Depth (m)		0.46	
Conv. Total (m3/s)	320.7	Conv. (m3/s)		320.7	
Length Wtd. (m)	45.30	Wetted Per. (m)		35.18	
Min Ch El (m)	186.69	Shear (N/m2)		22.07	
Alpha	1.00	Stream Power (N/m s)		30.66	
Frctn Loss (m)	0.18	Cum Volume (1000 m3)	0.84	3.97	0.37
C & E Loss (m)	0.00	Cum SA (1000 m2)	4.00	3.87	1.83

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, energy was used.

CROSS SECTION

RIVER: Rouge
REACH: WC16 RS: 500

INPUT
Description: ST 500 (Updated Sept 2016)
Station Elevation Data num= 67

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	188.202	5.115	188.012	6.277	188.012	7.165	188.011	8.253	188.01
11.393	188.005	12.267	188.005	12.788	188.004	16.022	188	16.049	188
23.15	187.837	23.912	187.804	30.903	187.763	35.957	187.566	37.607	187.601
38.861	187.5	40.503	187.023	40.588	187	40.605	186.994	40.772	186.982
41.027	186.956	41.334	186.941	41.585	186.926	42.238	186.851	42.501	186.834

```
    46.3  186.51  52.042  186.51  52.337  186.51  53.521  186.51  55.665 186.727
   57.21 186.768  61.314 186.904  61.523 186.916  63.895 186.962  64.199 186.973
   65.57 187.476      77     188      80     188      82   187.5      86   186.5
      90   185.5      99   185.5     103    186.5     107   187.5     109     188
 113.489 189.243 114.379 189.255 114.943 189.268 116.089 189.286 116.134 189.287
 116.156 189.287 116.232 189.288 120.929 189.453 121.043 189.459 121.159 189.465
 121.955   189.5  121.99   189.5 122.368 189.501 122.415 189.501 122.658 189.528
 125.971 189.723 129.539 189.738 129.713 189.756 132.463 189.809 133.407 189.814
 134.553 189.817 135.001 189.832

Manning's n Values         num=       4
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
       0    .013  38.861     .03  64.199     .07      77    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        38.861   65.57             44.2    44.2    44.2             .3      .5
Right Levee     Station=      80      Elevation=     189

CROSS SECTION OUTPUT  Profile #100-yr

  E.G. Elev (m)           187.61    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.15    Wt. n-Val.                0.033
  W.S. Elev (m)           187.47    Reach Len. (m)            44.20      44.20      44.20
  Crit W.S. (m)           187.27    Flow Area (m2)                       18.68
  E.G. Slope (m/m)      0.004921    Area (m2)                            18.68
  Q Total (m3/s)            31.57   Flow (m3/s)                          31.57
  Top Width (m)             26.56   Top Width (m)                        26.56
  Vel Total (m/s)            1.69   Avg. Vel. (m/s)                       1.69
  Max Chl Dpth (m)           1.96   Hydr. Depth (m)                       0.70
  Conv. Total (m3/s)       450.1    Conv. (m3/s)                         450.1
  Length Wtd. (m)           44.20   Wetted Per. (m)                      26.75
  Min Ch El (m)           186.51    Shear (N/m2)                         33.70
  Alpha                      1.00   Stream Power (N/m s)                 56.95
  Frctn Loss (m)             0.07   Cum Volume (1000 m3)      0.97       3.86       0.43
  C & E Loss (m)             0.05   Cum SA (1000 m2)          4.11       2.49       2.00


Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
         1.4.  This may indicate the need for additional cross sections.
Note:    Manning's n values were composited to a single value in the main channel.
Note:    Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.

CROSS SECTION OUTPUT  Profile #Regional

  E.G. Elev (m)           187.49    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.09    Wt. n-Val.                0.032
  W.S. Elev (m)           187.40    Reach Len. (m)            44.20      44.20      44.20
  Crit W.S. (m)           187.16    Flow Area (m2)                       16.87
  E.G. Slope (m/m)      0.003350    Area (m2)                            16.87
  Q Total (m3/s)            22.45   Flow (m3/s)                          22.45
  Top Width (m)             26.13   Top Width (m)                        26.13
  Vel Total (m/s)            1.33   Avg. Vel. (m/s)                       1.33
  Max Chl Dpth (m)           1.90   Hydr. Depth (m)                       0.65
  Conv. Total (m3/s)       387.9    Conv. (m3/s)                         387.9
  Length Wtd. (m)           44.20   Wetted Per. (m)                      26.30
  Min Ch El (m)           186.51    Shear (N/m2)                         21.07
  Alpha                      1.00   Stream Power (N/m s)                 28.04
  Frctn Loss (m)             0.06   Cum Volume (1000 m3)      0.84       3.22       0.37
  C & E Loss (m)             0.03   Cum SA (1000 m2)          4.00       2.48       1.83


Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
         1.4.  This may indicate the need for additional cross sections.
Note:    Manning's n values were composited to a single value in the main channel.
Note:    Multiple critical depths were found at this location.  The critical depth with the lowest, valid, energy was used.

CROSS SECTION


RIVER: Rouge
REACH: WC16               RS: 400

INPUT
Description: ST 400 (Updated Sept 2016)
Station Elevation Data    num=      62
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  188.02   1.482 188.021   2.255  188.02   2.502 188.019  10.948     188
  10.982 187.999  11.722 187.966  19.896   187.5  21.565 187.305  22.845 187.217
  25.504     187   31.45 186.819  32.268 186.792  32.345  186.79  34.253 186.745
   35.58 186.706  35.774 186.705  36.667 186.673  37.159 186.666  37.916 186.649
  38.044 186.637  38.048 186.637   38.57 186.655  39.147 186.682   39.34 186.687
  40.455 186.742  43.508 186.873  43.728 186.879  43.879 186.872  44.412 186.872
  46.179     187  49.895 187.128  50.763 187.154  51.167 187.167  51.322 187.173
  51.393 187.176  51.924 187.174  52.548 187.173  52.669  187.17  52.754 187.167
  53.045 187.156  53.691 187.134   55.13 187.089  57.726     187  58.551 186.626
  59.033   186.5  59.942 186.434  60.181  186.33      66  186.33  80.252     187
  86.345 187.384  88.243   187.5     93     188      96     188      98   187.5
     102   186.5     114   186.5     118   187.5     120     188 121.863 190.154
 125.531   190.3 130.099  190.49

Manning's n Values         num=       6
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
       0     .07  21.565     .03  46.179    .013  57.726     .03  80.252     .07
      93    .013

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        57.726  80.252            34.2    34.2    34.2             .3      .5
Ineffective Flow     num=       2
   Sta L    Sta R    Elev  Permanent
       0     61.5   186.9       T
    64.5 130.099   186.9       T

CROSS SECTION OUTPUT  Profile #100-yr

  E.G. Elev (m)           187.49    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.04    Wt. n-Val.                0.024      0.030      0.014
  W.S. Elev (m)           187.45    Reach Len. (m)            34.20      34.20      34.20
  Crit W.S. (m)           187.22    Flow Area (m2)            16.49      13.38      10.78
  E.G. Slope (m/m)      0.000742    Area (m2)                 18.58      19.84      16.66
  Q Total (m3/s)            31.57   Flow (m3/s)               11.34       8.55      11.69
  Top Width (m)             86.75   Top Width (m)             37.42      22.53      26.81
  Vel Total (m/s)            0.78   Avg. Vel. (m/s)            0.69       0.64       1.08
  Max Chl Dpth (m)           1.12   Hydr. Depth (m)            0.44       0.59       0.40
  Conv. Total (m3/s)       1159.3   Conv. (m3/s)              416.3      313.8      429.2
  Length Wtd. (m)           34.20   Wetted Per. (m)           37.46      22.66      27.06
  Min Ch El (m)           186.33    Shear (N/m2)               3.20       4.29       2.90
  Alpha                      1.19   Stream Power (N/m s)       2.20       2.74       3.14
  Frctn Loss (m)                    Cum Volume (1000 m3)       0.56       3.01       0.06
  C & E Loss (m)                    Cum SA (1000 m2)           3.28       1.41       1.41


CROSS SECTION OUTPUT  Profile #Regional

  E.G. Elev (m)           187.40    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.03    Wt. n-Val.                0.024      0.030      0.014
  W.S. Elev (m)           187.37    Reach Len. (m)            34.20      34.20      34.20
  Crit W.S. (m)           187.17    Flow Area (m2)            13.51      11.57       8.76
  E.G. Slope (m/m)      0.000670    Area (m2)                 15.59      18.03      14.58
  Q Total (m3/s)            22.45   Flow (m3/s)                7.65       6.38       8.42
  Top Width (m)             84.11   Top Width (m)             36.73      22.53      24.86
  Vel Total (m/s)            0.66   Avg. Vel. (m/s)            0.57       0.55       0.96
  Max Chl Dpth (m)           1.04   Hydr. Depth (m)            0.37       0.51       0.35
  Conv. Total (m3/s)       867.0    Conv. (m3/s)              295.6      246.2      325.3
  Length Wtd. (m)           34.20   Wetted Per. (m)           36.76      22.66      25.08
  Min Ch El (m)           186.33    Shear (N/m2)               2.42       3.36       2.30
  Alpha                      1.23   Stream Power (N/m s)       1.37       1.85       2.21
  Frctn Loss (m)                    Cum Volume (1000 m3)       0.49       2.45       0.05
  C & E Loss (m)                    Cum SA (1000 m2)           3.19       1.41       1.28


CULVERT


RIVER: Rouge
```

REACH: WC16 RS: 350

INPUT
Description: PROPOSED CULVERT - DONALD C STATION -driveway to Ressor Rd.

Distance from Upstream XS = 10
Deck/Roadway Width = 11
Weir Coefficient = 1.4
Upstream Deck/Roadway Coordinates
num= 2

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
50	187	100	186.95

Upstream Bridge Cross Section Data
Station Elevation Data num= 62

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	188.02	1.482	188.021	2.255	188.02	2.502	188.019	10.948	188
10.982	187.999	11.722	187.966	19.896	187.5	21.565	187.305	22.845	187.217
25.504	187	31.45	186.819	32.268	186.792	32.345	186.79	34.253	186.745
35.58	186.706	35.774	186.705	36.667	186.673	37.159	186.666	37.916	186.649
38.044	186.637	38.048	186.637	38.57	186.655	39.147	186.682	39.34	186.687
40.455	186.742	43.508	186.873	43.728	186.879	43.879	186.872	44.412	186.872
46.179	187	49.895	187.128	50.763	187.154	51.167	187.167	51.322	187.173
51.393	187.176	51.924	187.174	52.548	187.173	52.669	187.17	52.754	187.167
53.045	187.156	53.691	187.134	55.13	187.089	57.726	187	58.551	186.626
59.033	186.5	59.942	186.434	60.181	186.33	66	186.33	80.252	187
86.345	187.384	88.243	187.5	93	188	96	188	98	187.5
102	186.5	114	186.5	118	187.5	120	188	121.863	190.154
125.531	190.3	130.099	190.49						

Manning's n Values num= 6

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.07	21.565	.03	46.179	.013	57.726	.03	80.252	.07
93	.013								

Bank Sta: Left Right Coeff Contr. Expan.
57.726 80.252 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	61.5	186.9	T
64.5	130.099	186.9	T

Downstream Deck/Roadway Coordinates
num= 2

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
60	187	130	187

Downstream Bridge Cross Section Data
Station Elevation Data num= 67

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	187.527	7.69	187.507	9.589	187.506	10.009	187.506	15.762	187.5
18.945	187.2	20.102	187.102	21.244	187	23.446	186.81	24.424	186.742
27.336	186.5	27.476	186.5	30.044	186.5	33.75	186.5	45.643	186.5
48.13	186.5	50.134	186.5	50.744	186.734	51.426	187	52.426	187.034
52.93	187.058	56.717	187.047	61.167	187.034	62.028	187.013	62.431	187
62.614	186.886	63.224	186.5	66.239	186.381	67.82	186.2	74	186.2
77.486	186.785	79.563	186.891	81.304	187	82.355	187.077	82.813	187.105
89.259	187.5	97.07	187.894	97.122	187.897	98.899	188	101.917	188.099
103.584	188.138	103.635	188.14	103.744	188.143	103.884	188.147	104.238	188.156
112.464	188.342	115.831	188.5	117.839	188.989	117.887	189	118.051	189.034
118.079	189.042	118.186	189.076	119.824	189.5	121.733	189.687	122.727	189.77
123.042	189.798	125.463	189.86	129.349	189.978	129.526	189.987	130.113	189.998
130.479	190	132.893	190.034	132.958	190.035	134.917	190.123	135.006	190.114
136.658	190.211	142.898	190.158						

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.07	18.945	.03	51.426	.013	62.614	.03	79.563	.07

Bank Sta: Left Right Coeff Contr. Expan.
62.614 79.563 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	68.5	186.9	T
71.5	142.898	186.9	T

Upstream Embankment side slope = 2 horiz. to 1.0 vertical
Downstream Embankment side slope = 2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .98
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name	Shape	Rise	Span
Culvert #1	Box	.5	3

FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG

Culvert Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
5	20	.013	.013	0	.5	1

Upstream Elevation = 186.33
Centerline Station = 63
Downstream Elevation = 186.2
Centerline Station = 70

CULVERT OUTPUT Profile #100-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.05	Culv Full Len (m)	20.00
# Barrels	1	Culv Vel US (m/s)	0.03
Q Barrel (m3/s)	0.05	Culv Vel DS (m/s)	0.03
E.G. US. (m)	187.49	Culv Inv El Up (m)	186.33
W.S. US. (m)	187.45	Culv Inv El Dn (m)	186.20
E.G. DS (m)	187.49	Culv Frctn Ls (m)	0.00
W.S. DS (m)	187.45	Culv Exit Loss (m)	0.00
Delta EG (m)	0.00	Culv Entr Loss (m)	0.00
Delta WS (m)	0.00	Q Weir (m3/s)	31.52
E.G. IC (m)	187.50	Weir Sta Lft (m)	19.87
E.G. OC (m)	187.49	Weir Sta Rgt (m)	118.00
Culvert Control	Outlet	Weir Submerg	0.95
Culv WS Inlet (m)	186.83	Weir Max Depth (m)	0.60
Culv WS Outlet (m)	186.70	Weir Avg Depth (m)	0.48
Culv Nml Depth (m)		Weir Flow Area (m2)	42.66
Culv Crt Depth (m)	0.03	Min El Weir Flow (m)	186.90

CULVERT OUTPUT Profile #Regional Culv Group: Culvert #1

Q Culv Group (m3/s)	0.65	Culv Full Len (m)	20.00
# Barrels	1	Culv Vel US (m/s)	0.43
Q Barrel (m3/s)	0.65	Culv Vel DS (m/s)	0.43
E.G. US. (m)	187.40	Culv Inv El Up (m)	186.33
W.S. US. (m)	187.37	Culv Inv El Dn (m)	186.20
E.G. DS (m)	187.39	Culv Frctn Ls (m)	0.00
W.S. DS (m)	187.36	Culv Exit Loss (m)	0.00
Delta EG (m)	0.01	Culv Entr Loss (m)	0.00
Delta WS (m)	0.01	Q Weir (m3/s)	21.80
E.G. IC (m)	187.40	Weir Sta Lft (m)	20.76
E.G. OC (m)	187.40	Weir Sta Rgt (m)	117.60
Culvert Control	Outlet	Weir Submerg	0.95
Culv WS Inlet (m)	186.83	Weir Max Depth (m)	0.50
Culv WS Outlet (m)	186.70	Weir Avg Depth (m)	0.40
Culv Nml Depth (m)		Weir Flow Area (m2)	33.79
Culv Crt Depth (m)	0.17	Min El Weir Flow (m)	186.90

CROSS SECTION

RIVER: Rouge
REACH: WC16 RS: 300

INPUT
Description: ST 300 (Updated Sept 2016)
Station Elevation Data num= 67

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	187.527	7.69	187.507	9.589	187.506	10.009	187.506	15.762	187.5
18.945	187.2	20.102	187.102	21.244	187	23.446	186.81	24.424	186.742
27.336	186.5	27.476	186.5	30.044	186.5	33.75	186.5	45.643	186.5
48.13	186.5	50.134	186.5	50.744	186.734	51.426	187	52.426	187.034
52.93	187.058	56.717	187.047	61.167	187.034	62.028	187.013	62.431	187
62.614	186.886	63.224	186.5	66.239	186.381	67.82	186.2	74	186.2
77.486	186.785	79.563	186.891	81.304	187	82.355	187.077	82.813	187.105
89.259	187.5	97.07	187.894	97.122	187.897	98.899	188	101.917	188.099
103.584	188.138	103.635	188.14	103.744	188.143	103.884	188.147	104.238	188.156
112.464	188.342	115.831	188.5	117.839	188.989	117.887	189	118.051	189.034
118.079	189.042	118.186	189.076	119.824	189.5	121.733	189.687	122.727	189.77
123.042	189.798	125.463	189.86	129.349	189.978	129.526	189.987	130.113	189.998
130.479	190	132.893	190.034	132.958	190.035	134.917	190.123	135.006	190.114
136.658	190.211	142.898	190.158						

Manning's n Values num= 5

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.07	18.945	.03	51.426	.013	62.614	.03	79.563	.07

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
62.614 79.563 17.15 17.15 17.15 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	68.5	186.9	T
71.5	142.898	186.9	T

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	187.49	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.	0.024	0.030	0.070
W.S. Elev (m)	187.45	Reach Len. (m)	17.15	17.15	17.15
Crit W.S. (m)		Flow Area (m2)	22.12	11.38	2.42
E.G. Slope (m/m)	0.001309	Area (m2)	32.44	17.63	2.42
Q Total (m3/s)	31.57	Flow (m3/s)	20.60	10.44	0.53
Top Width (m)	72.08	Top Width (m)	46.29	16.95	8.84
Vel Total (m/s)	0.88	Avg. Vel. (m/s)	0.93	0.92	0.22
Max Chl Dpth (m)	1.25	Hydr. Depth (m)	0.48	0.67	0.27
Conv. Total (m3/s)	872.7	Conv. (m3/s)	569.4	288.7	14.6
Length Wtd. (m)	17.15	Wetted Per. (m)	46.46	17.12	8.85
Min Ch El (m)	186.20	Shear (N/m2)	6.11	8.53	3.51
Alpha	1.09	Stream Power (N/m s)	5.69	7.83	0.76
Frctn Loss (m)	0.03	Cum Volume (1000 m3)	0.56	1.63	0.06
C & E Loss (m)	0.00	Cum SA (1000 m2)	1.85	0.73	0.80

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	187.39	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.	0.025	0.030	0.070
W.S. Elev (m)	187.36	Reach Len. (m)	17.15	17.15	17.15
Crit W.S. (m)		Flow Area (m2)	18.06	9.88	1.70
E.G. Slope (m/m)	0.001220	Area (m2)	28.39	16.13	1.70
Q Total (m3/s)	22.45	Flow (m3/s)	14.17	7.97	0.32
Top Width (m)	69.70	Top Width (m)	45.35	16.95	7.39
Vel Total (m/s)	0.76	Avg. Vel. (m/s)	0.78	0.81	0.19
Max Chl Dpth (m)	1.16	Hydr. Depth (m)	0.40	0.58	0.23
Conv. Total (m3/s)	642.8	Conv. (m3/s)	405.6	228.1	9.1
Length Wtd. (m)	17.15	Wetted Per. (m)	45.52	17.12	7.41
Min Ch El (m)	186.20	Shear (N/m2)	4.75	6.90	2.75
Alpha	1.08	Stream Power (N/m s)	3.72	5.56	0.52
Frctn Loss (m)	0.03	Cum Volume (1000 m3)	0.49	1.33	0.05
C & E Loss (m)	0.00	Cum SA (1000 m2)	1.78	0.73	0.73

CROSS SECTION

RIVER: Rouge
REACH: WC16 RS: 200

INPUT
Description: ST 200 (Updated Sept 2016)
Station Elevation Data num= 43

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	187.512	.822	187.513	13.166	187.501	14.307	187.5	17.848	187.215
20.239	187	23.765	186.697	24.532	186.64	26.6	186.5	26.604	186.5
26.614	186.5	26.887	186.5	28.857	186.5	40.141	186.5	47.456	186.5
50.973	186.5	51.295	186.612	52.27	187	52.536	187.012	55.749	187
55.806	187	55.871	187	57.928	187	59.302	187	63.836	187
64.407	186.621	64.683	186.5	64.896	186.41	65.52	186.13	72	186.13
74.397	186.307	74.845	186.324	76.272	186.401	77.634	186.473	78.133	186.5
79.7	186.616	84.084	186.94	84.869	186.998	84.9	187	84.934	187.002
84.946	187.002	93.428	187.5	100.098	187.746				

Manning's n Values num= 4

Sta	n Val	Sta	n Val	Sta	n Val	Sta	n Val
0	.07	52.27	.013	64.407	.03	78.133	.07

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
64.407 79.7 31.8 31.8 31.8 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	66	186.9	T
69	100.098	186.9	T

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	187.46	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.	0.036	0.031	0.070
W.S. Elev (m)	187.41	Reach Len. (m)	31.80	31.80	31.80
Crit W.S. (m)	187.22	Flow Area (m2)	22.17	10.11	4.02
E.G. Slope (m/m)	0.002505	Area (m2)	33.35	17.41	4.57
Q Total (m3/s)	31.57	Flow (m3/s)	17.91	12.29	1.37
Top Width (m)	76.47	Top Width (m)	48.98	15.29	12.20
Vel Total (m/s)	0.87	Avg. Vel. (m/s)	0.81	1.22	0.34
Max Chl Dpth (m)	1.28	Hydr. Depth (m)	0.45	0.66	0.33
Conv. Total (m3/s)	630.8	Conv. (m3/s)	357.9	245.5	27.4
Length Wtd. (m)	31.80	Wetted Per. (m)	49.23	15.41	12.22
Min Ch El (m)	186.13	Shear (N/m2)	11.06	16.11	8.08
Alpha	1.26	Stream Power (N/m s)	8.94	19.59	2.75
Frctn Loss (m)		Cum Volume (1000 m3)		1.33	
C & E Loss (m)		Cum SA (1000 m2)	1.03	0.46	0.62

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	187.36	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.	0.038	0.031	0.070
W.S. Elev (m)	187.32	Reach Len. (m)	31.80	31.80	31.80
Crit W.S. (m)	187.15	Flow Area (m2)	17.93	8.77	3.02
E.G. Slope (m/m)	0.002372	Area (m2)	29.11	16.07	3.56
Q Total (m3/s)	22.45	Flow (m3/s)	12.08	9.47	0.90
Top Width (m)	73.89	Top Width (m)	47.90	15.29	10.70
Vel Total (m/s)	0.76	Avg. Vel. (m/s)	0.67	1.08	0.30
Max Chl Dpth (m)	1.19	Hydr. Depth (m)	0.37	0.57	0.28
Conv. Total (m3/s)	461.0	Conv. (m3/s)	248.0	194.5	18.5
Length Wtd. (m)	31.80	Wetted Per. (m)	48.14	15.41	10.73
Min Ch El (m)	186.13	Shear (N/m2)	8.66	13.23	6.54
Alpha	1.30	Stream Power (N/m s)	5.83	14.29	1.95
Frctn Loss (m)		Cum Volume (1000 m3)		1.05	
C & E Loss (m)		Cum SA (1000 m2)	0.98	0.46	0.57

CULVERT

RIVER: Rouge
REACH: WC16 RS: 150

INPUT

```
Description: PROPOSED CULVERT- REESOR RD.
Distance from Upstream XS =       4
Deck/Roadway Width        =      11
Weir Coefficient          =     1.4
Upstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
      60     187             100     187

Upstream Bridge Cross Section Data
Station Elevation Data    num=      43
      Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
        0 187.512    .822 187.513  13.166 187.501  14.307   187.5  17.848 187.215
   20.239     187  23.765 186.697  24.532  186.64    26.6   186.5  26.604   186.5
   26.614   186.5  26.887   186.5  28.857   186.5 40.141   186.5  47.456   186.5
   50.973   186.5  51.295 186.612   52.27     187  52.536 187.012  55.749     187
   55.806     187  55.871     187  57.928     187  59.302     187  63.836     187
   64.407 186.621  64.683   186.5  64.896  186.41   65.52  186.13     72  186.13
   74.397 186.307  74.845 186.324  76.272 186.401  77.634 186.473  78.133   186.5
     79.7 186.616  84.084  186.94  84.869 186.998    84.9     187  84.934 187.002
   84.946 187.002  93.428   187.5 100.098 187.746

Manning's n Values        num=       4
      Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
        0     .07   52.27    .013  64.407     .03  78.133     .07

Bank Sta: Left   Right    Coeff Contr.   Expan.
        64.407    79.7           .3        .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
        0      66   186.9       T
       69 100.098   186.9       T

Downstream  Deck/Roadway Coordinates
    num=       2
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
        0     187              50     187

Downstream Bridge Cross Section Data
Station Elevation Data    num=      58
      Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
        0     188    1.28     188   1.584     188   1.609     188   1.611     188
    2.923 187.938   3.272 187.922   4.685 187.857  12.022   187.5  13.697 187.438
    13.81  187.44   16.68 187.329  20.629 187.172  25.033     187  33.167 186.684
   33.855 186.659  34.402 186.635  36.149  186.57  37.904   186.5   39.29 186.412
       42     186      45     186  45.107 186.028  46.367   186.5   47.35 186.743
   47.354 186.744  48.275     187  51.613     187  55.146 187.001  56.077 187.001
    61.03     187  61.804     187  61.839     187  62.185     187  62.617 186.848
   63.593   186.5  63.756 186.375  64.517     186   64.62 186.247  64.825 186.267
   64.915 186.281  65.016 186.287  66.259   186.5  68.145 186.841  68.987     187
   74.195 187.292  79.642   187.5   84.27 187.649  85.089 187.695  85.622 187.705
   86.648 187.733  89.357 187.823  90.772  187.86   94.52 187.919  94.761 187.925
   94.837 187.927  95.003 187.923  96.429 187.942

Manning's n Values        num=       7
      Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
        0     .07  33.855     .03  46.367     .07  48.275    .013  62.185     .07
   62.617     .03  68.145     .07

Bank Sta: Left   Right    Coeff Contr.   Expan.
        33.855   47.35           .3        .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
        0      42   186.9       T
       45  96.429   186.9       T

Upstream Embankment side slope              =       2 horiz. to 1.0 vertical
Downstream Embankment side slope            =       2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1           Box      .5       3
FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                4.5      24     .013     .013        0                    .5               1
Upstream   Elevation =  186.13
           Centerline Station =  67.5
Downstream Elevation =  186
           Centerline Station =  43.5

CULVERT OUTPUT  Profile #100-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.06    Culv Full Len (m)        24.00
  # Barrels                    1    Culv Vel US (m/s)         0.04
  Q Barrel (m3/s)           0.06    Culv Vel DS (m/s)         0.04
  E.G. US. (m)            187.46    Culv Inv El Up (m)      186.13
  W.S. US. (m)            187.41    Culv Inv El Dn (m)      186.00
  E.G. DS (m)             187.46    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             187.27    Culv Exit Loss (m)        0.00
  Delta EG (m)              0.00    Culv Entr Loss (m)        0.00
  Delta WS (m)              0.14    Q Weir (m3/s)            31.51
  E.G. IC (m)             187.46    Weir Sta Lft (m)         14.72
  E.G. OC (m)             187.46    Weir Sta Rgt (m)         92.86
  Culvert Control         Outlet    Weir Submerg              0.89
  Culv WS Inlet (m)       186.63    Weir Max Depth (m)        0.57
  Culv WS Outlet (m)      186.50    Weir Avg Depth (m)        0.47
  Culv Nml Depth (m)                Weir Flow Area (m2)      36.41
  Culv Crt Depth (m)        0.03    Min El Weir Flow (m)    186.90


CULVERT OUTPUT  Profile #Regional  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.72    Culv Full Len (m)        24.00
  # Barrels                    1    Culv Vel US (m/s)         0.48
  Q Barrel (m3/s)           0.72    Culv Vel DS (m/s)         0.48
  E.G. US. (m)            187.36    Culv Inv El Up (m)      186.13
  W.S. US. (m)            187.32    Culv Inv El Dn (m)      186.00
  E.G. DS (m)             187.35    Culv Frctn Ls (m)         0.01
  W.S. DS (m)             187.20    Culv Exit Loss (m)        0.00
  Delta EG (m)              0.01    Culv Entr Loss (m)        0.01
  Delta WS (m)              0.13    Q Weir (m3/s)            21.73
  E.G. IC (m)             187.35    Weir Sta Lft (m)         16.12
  E.G. OC (m)             187.36    Weir Sta Rgt (m)         90.94
  Culvert Control         Outlet    Weir Submerg              0.88
  Culv WS Inlet (m)       186.63    Weir Max Depth (m)        0.45
  Culv WS Outlet (m)      186.50    Weir Avg Depth (m)        0.37
  Culv Nml Depth (m)                Weir Flow Area (m2)      27.77
  Culv Crt Depth (m)        0.18    Min El Weir Flow (m)    186.90


CROSS SECTION


RIVER: Rouge
REACH: WC16               RS: 100

INPUT
Description: ST 100 (Updated Sept 2016)
Station Elevation Data    num=      58
      Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
        0     188    1.28     188   1.584     188   1.609     188   1.611     188
    2.923 187.938   3.272 187.922   4.685 187.857  12.022   187.5  13.697 187.438
    13.81  187.44   16.68 187.329  20.629 187.172  25.033     187  33.167 186.684
   33.855 186.659  34.402 186.635  36.149  186.57  37.904   186.5   39.29 186.412
       42     186      45     186  45.107 186.028  46.367   186.5   47.35 186.743
   47.354 186.744  48.275     187  51.613     187  55.146 187.001  56.077 187.001
```

```
  61.03     187  61.804     187  61.839     187  62.185     187  62.617 186.848
 63.593   186.5  63.756 186.375  64.517     186   64.62 186.247  64.825 186.267
 64.915 186.281  65.016 186.287  66.259   186.5  68.145 186.841  68.987     187
 74.195 187.292  79.642   187.5   84.27 187.649  85.089 187.695  85.622 187.705
 86.648 187.733  89.357 187.823  90.772  187.86   94.52 187.919  94.761 187.925
 94.837 187.927  95.003 187.923  96.429 187.942

Manning's n Values         num=        7
     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val     Sta   n Val
       0     .07  33.855     .03  46.367     .07  48.275    .013  62.185     .07
  62.617     .03  68.145     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        33.855   47.35               0       0       0             .3       .5
Ineffective Flow     num=       2
   Sta L    Sta R    Elev  Permanent
       0       42   186.9       T
      45  96.429   186.9       T

CROSS SECTION OUTPUT  Profile #100-yr

  E.G. Elev (m)           187.46    Element                Left OB    Channel   Right OB
  Vel Head (m)              0.18    Wt. n-Val.               0.070      0.030      0.019
  W.S. Elev (m)           187.27    Reach Len. (m)
  Crit W.S. (m)           187.27    Flow Area (m2)            4.13       7.75       7.28
  E.G. Slope (m/m)      0.007433    Area (m2)                 4.89      12.72       9.60
  Q Total (m3/s)            31.57   Flow (m3/s)               2.08      15.27      14.21
  Top Width (m)             55.83   Top Width (m)            15.80      13.50      26.53
  Vel Total (m/s)            1.65   Avg. Vel. (m/s)           0.50       1.97       1.95
  Max Chl Dpth (m)           1.27   Hydr. Depth (m)           0.26       0.57       0.27
  Conv. Total (m3/s)       366.2    Conv. (m3/s)              24.2      177.2      164.9
  Length Wtd. (m)                   Wetted Per. (m)          15.81      13.65      27.02
  Min Ch El (m)           186.00    Shear (N/m2)             19.06      41.39      19.64
  Alpha                     1.33    Stream Power (N/m s)      9.60      81.56      38.34
  Frctn Loss (m)                    Cum Volume (1000 m3)
  C & E Loss (m)                    Cum SA (1000 m2)


Warning: When the Manning's n value for the channel was composited, the computed n value was larger [smaller] than the
         largest [smallest] user entered n value.  The n value has been set to the largest [smallest] entered value.  The user
         may wish to examine this cross section and enter a single n value for the entire channel.
Note:    Manning's n values were composited to a single value in the main channel.

CROSS SECTION OUTPUT  Profile #Regional

  E.G. Elev (m)           187.35    Element                Left OB    Channel   Right OB
  Vel Head (m)              0.15    Wt. n-Val.               0.070      0.030      0.019
  W.S. Elev (m)           187.20    Reach Len. (m)
  Crit W.S. (m)           187.20    Flow Area (m2)            2.99       6.71       5.29
  E.G. Slope (m/m)      0.007850    Area (m2)                 3.75      11.68       7.62
  Q Total (m3/s)            22.45   Flow (m3/s)               1.36      12.35       8.74
  Top Width (m)             52.52   Top Width (m)            13.87      13.50      25.16
  Vel Total (m/s)            1.50   Avg. Vel. (m/s)           0.46       1.84       1.65
  Max Chl Dpth (m)           1.20   Hydr. Depth (m)           0.22       0.50       0.21
  Conv. Total (m3/s)       253.4    Conv. (m3/s)              15.4      139.4       98.6
  Length Wtd. (m)                   Wetted Per. (m)          13.88      13.65      25.64
  Min Ch El (m)           186.00    Shear (N/m2)             16.60      37.85      15.88
  Alpha                     1.31    Stream Power (N/m s)      7.56      69.65      26.22
  Frctn Loss (m)                    Cum Volume (1000 m3)
  C & E Loss (m)                    Cum SA (1000 m2)


Warning: When the Manning's n value for the channel was composited, the computed n value was larger [smaller] than the
         largest [smallest] user entered n value.  The n value has been set to the largest [smallest] entered value.  The user
         may wish to examine this cross section and enter a single n value for the entire channel.
Note:    Manning's n values were composited to a single value in the main channel.


SUMMARY OF MANNING'S N VALUES

River:Rouge

      Reach          River Sta.       n1        n2        n3        n4        n5        n6        n7

 WC16                 800               .07       .03       .07
 WC16                 750          Culvert
 WC16                 700               .07       .03       .07
 WC16                 600               .07       .03      .013       .07       .03       .07      .013
 WC16                 500              .013       .03       .07      .013
 WC16                 400               .07       .03      .013       .03       .07      .013
 WC16                 350          Culvert
 WC16                 300               .07       .03      .013       .03       .07
 WC16                 200               .07      .013       .03       .07
 WC16                 150          Culvert
 WC16                 100               .07       .03       .07      .013       .07       .03       .07



SUMMARY OF REACH LENGTHS

River: Rouge

      Reach          River Sta.      Left     Channel    Right

 WC16                 800              44.5      44.5      44.5
 WC16                 750          Culvert
 WC16                 700              51.6      51.6      51.6
 WC16                 600              45.3      45.3      45.3
 WC16                 500              44.2      44.2      44.2
 WC16                 400              34.2      34.2      34.2
 WC16                 350          Culvert
 WC16                 300             17.15     17.15     17.15
 WC16                 200              31.8      31.8      31.8
 WC16                 150          Culvert
 WC16                 100                 0         0         0



SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Rouge


      Reach          River Sta.     Contr.    Expan.

 WC16                 800               .3        .5
 WC16                 750          Culvert
 WC16                 700               .3        .5
 WC16                 600               .3        .5
 WC16                 500               .3        .5
 WC16                 400               .3        .5
 WC16                 350          Culvert
 WC16                 300               .3        .5
 WC16                 200               .3        .5
 WC16                 150          Culvert
 WC16                 100               .3        .5

Profile Output Table - Standard Table 1

  Reach          River Sta      Profile    Q Total    Min Ch El   W.S. Elev   Crit W.S.   E.G. Elev   E.G. Slope   Vel Chnl   Flow Area   Top Width   Froude # Chl
                                           (m3/s)          (m)         (m)         (m)         (m)         (m/m)      (m/s)       (m2)        (m)

  WC16           800            100-yr       31.57      187.00      188.37      187.97      188.61     0.002865       2.20       14.36       44.79           0.60
  WC16           800            Regional     22.45      187.00      188.10      187.77      188.29     0.003021       1.95       11.52       20.13           0.59

  WC16           750                        Culvert

  WC16           700            100-yr       31.57      186.90      187.87      187.87      188.36     0.009017       3.10       10.18       40.32           1.01
  WC16           700            Regional     22.45      186.90      187.76      187.67      188.08     0.006774       2.48        9.04       37.63           0.85

  WC16           600            100-yr       31.57      186.69      187.71      187.55      187.83     0.004211       1.48       21.29       37.42           0.63
```

WC16	600	Regional	22.45	186.69	187.57	187.44	187.67	0.004899	1.39	16.16	35.07	0.65
WC16	500	100-yr	31.57	186.51	187.47	187.27	187.61	0.004921	1.69	18.68	26.56	0.64
WC16	500	Regional	22.45	186.51	187.40	187.16	187.49	0.003350	1.33	16.87	26.13	0.53
WC16	400	100-yr	31.57	186.33	187.45	187.22	187.49	0.000742	0.64	40.65	86.75	0.26
WC16	400	Regional	22.45	186.33	187.37	187.17	187.40	0.000670	0.55	33.84	84.11	0.25
WC16	350		Culvert									
WC16	300	100-yr	31.57	186.20	187.45		187.49	0.001309	0.92	35.91	72.08	0.36
WC16	300	Regional	22.45	186.20	187.36		187.39	0.001220	0.81	29.64	69.70	0.34
WC16	200	100-yr	31.57	186.13	187.41	187.22	187.46	0.002505	1.22	36.30	76.47	0.48
WC16	200	Regional	22.45	186.13	187.32	187.15	187.36	0.002372	1.08	29.72	73.89	0.46
WC16	150		Culvert									
WC16	100	100-yr	31.57	186.00	187.27	187.27	187.46	0.007433	1.97	19.17	55.83	0.83
WC16	100	Regional	22.45	186.00	187.20	187.20	187.35	0.007850	1.84	15.00	52.52	0.83

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (m)	W.S. Elev (m)	Vel Head (m)	Frctn Loss (m)	C & E Loss (m)	Q Left (m3/s)	Q Channel (m3/s)	Q Right (m3/s)	Top Width (m)
WC16	800	100-yr	188.61	188.37	0.25				31.57		44.79
WC16	800	Regional	188.29	188.10	0.19				22.45		20.13
WC16	750		Culvert								
WC16	700	100-yr	188.36	187.87	0.49	0.31	0.19		31.57		40.32
WC16	700	Regional	188.08	187.76	0.31	0.30	0.11		22.45		37.63
WC16	600	100-yr	187.83	187.71	0.11	0.21	0.01		31.57	0.00	37.42
WC16	600	Regional	187.67	187.57	0.10	0.18	0.00		22.45		35.07
WC16	500	100-yr	187.61	187.47	0.15	0.07	0.05		31.57		26.56
WC16	500	Regional	187.49	187.40	0.09	0.06	0.03		22.45		26.13
WC16	400	100-yr	187.49	187.45	0.04			11.34	8.55	11.69	86.75
WC16	400	Regional	187.40	187.37	0.03			7.65	6.38	8.42	84.11
WC16	350		Culvert								
WC16	300	100-yr	187.49	187.45	0.04	0.03	0.00	20.60	10.44	0.53	72.08
WC16	300	Regional	187.39	187.36	0.03	0.03	0.00	14.17	7.97	0.32	69.70
WC16	200	100-yr	187.46	187.41	0.05			17.91	12.29	1.37	76.47
WC16	200	Regional	187.36	187.32	0.04			12.08	9.47	0.90	73.89
WC16	150		Culvert								
WC16	100	100-yr	187.46	187.27	0.18			2.08	15.27	14.21	55.83
WC16	100	Regional	187.35	187.20	0.15			1.36	12.35	8.74	52.52

Profile Output Table - Culvert Only

Reach	River Sta		Profile	E.G. US. (m)	W.S. US. (m)	E.G. IC (m)	E.G. OC (m)	Min El Weir Flow (m)	Q Culv Group (m3/s)	Q Weir (m3/s)	Delta WS (m)	Culv Vel US (m/s)	Culv Vel DS (m/s)
WC16	750	Culvert #1	100-yr	188.62	188.37	188.61	188.62	190.00	15.79		0.50	2.70	3.14
WC16	750	Culvert #2	100-yr	188.62	188.37	188.61	188.62	190.00	15.79		0.50	2.70	3.14
WC16	750	Culvert #1	Regional	188.29	188.10	188.27	188.29	190.00	11.23		0.34	2.36	2.61
WC16	750	Culvert #2	Regional	188.29	188.10	188.27	188.29	190.00	11.23		0.34	2.36	2.61
WC16	350	Culvert #1	100-yr	187.49	187.45	187.50	187.49	186.90	0.05	31.52	0.00	0.03	0.03
WC16	350	Culvert #1	Regional	187.40	187.37	187.40	187.40	186.90	0.65	21.80	0.01	0.43	0.43
WC16	150	Culvert #1	100-yr	187.46	187.41	187.46	187.46	186.90	0.06	31.51	0.14	0.04	0.04
WC16	150	Culvert #1	Regional	187.36	187.32	187.35	187.36	186.90	0.72	21.73	0.13	0.48	0.48

ROUGE RIVER

HEC-RAS ANALYSIS WC#18

File: G:\TT4022\DRAWINGS\GENERAL\SHEETS\602282-S-HEC-ROU-1.DWG - Revised by <P006437C>: 9/29/2016 4:15 PM

EXISTING 407 ETR

PROPOSED 407 TWY

EX 407 ETR BRIDGE SPAN = 190m

EX 407 ETR BRIDGE SPAN = 190m

PROPOSED 407 TWY BRIDGE SPAN = 245m

184.90	184.90	ST 6513.21
183.42	183.42	
184.18	184.18	ST 6513.20
182.96	182.96	
184.22	184.21	ST 6513.197
182.72	182.72	
183.90	183.87	ST 6513.19
182.42	182.44	
183.34	183.47	ST 6513.18
182.17	182.27	
183.11	183.11	ST 6513.173
181.87	181.87	
182.86	182.86	ST 6513.17
181.48	181.48	
182.19	182.19	ST 6513.16
180.85	180.85	

LEGEND

- EXISTING 407 ETR
- PROPOSED 407 TWY
- CREEK FLOW DIRECTION
- EXISTING CULVERT
- PROPOSED CULVERT
- PROPOSED 407 TWY BRIDGE
- EXISTING TRCA FLOODLINE
- PROPOSED REGIONAL FLOODLINE

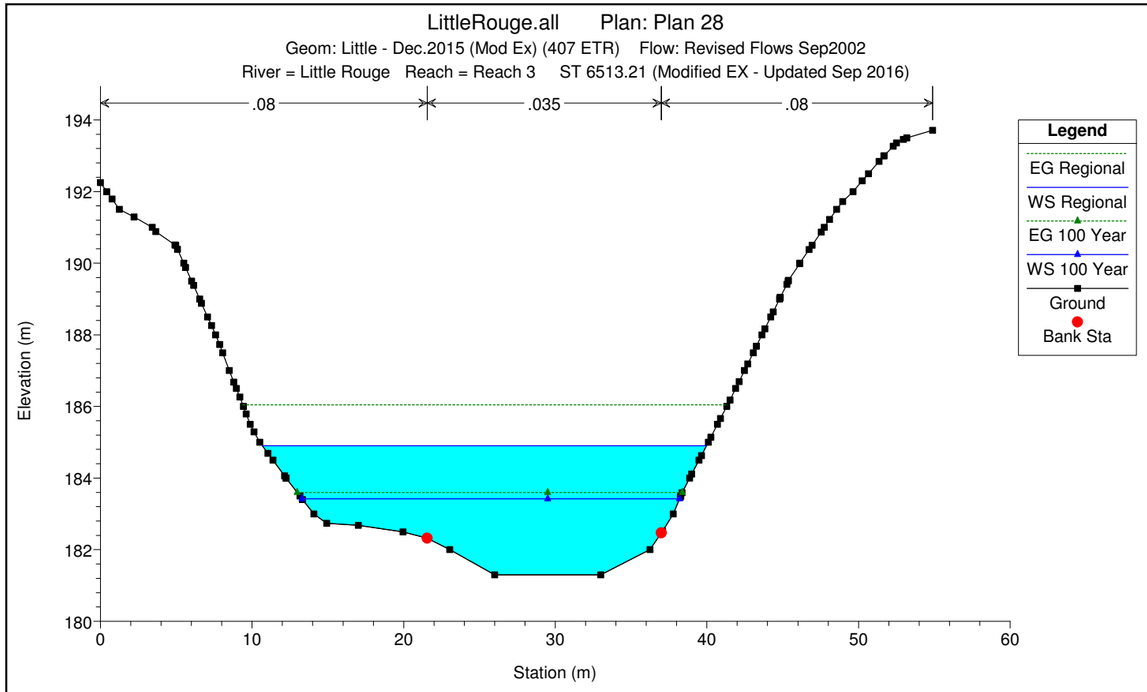
EX REG / EX 100 | PR REG / PR 100 | HEC ST — PARSONS HEC-RAS SECTION

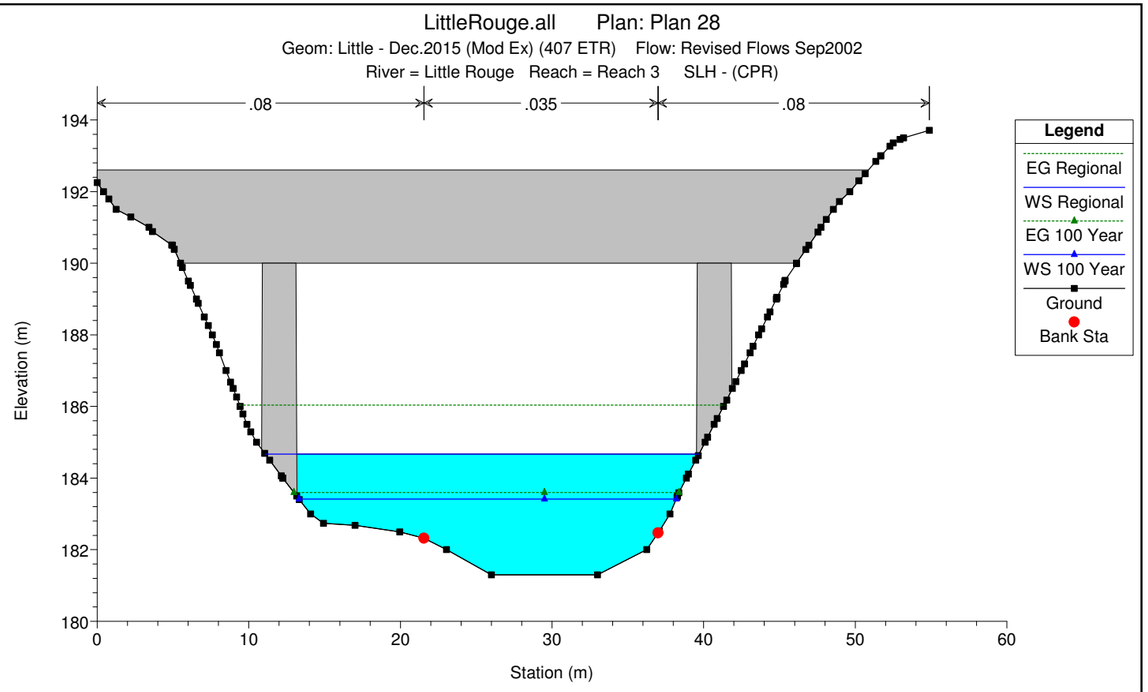
CROSS SECTION NUMBER

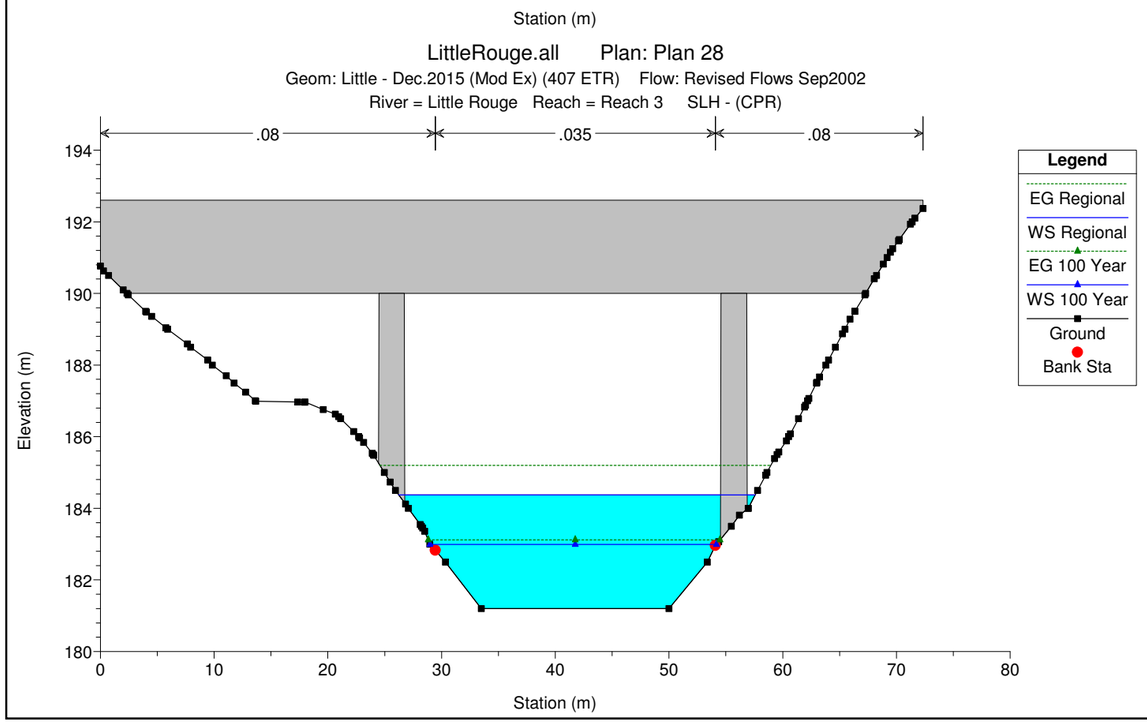
PROPOSED WL ELEVATION (m)

EXISTING UPDATED WL ELEVATION (m)

DATE: SEPTEMBER 2016	Ontario	PARSONS	625 COCHRANE DRIVE, SUITE 500 MARKHAM, ONTARIO L3R 9R9 TEL: 905-943-0500 FAX: 905-943-0400	407 TRANSITWAY FROM KENNEDY RD TO BROCK RD
SCALE: 1:1000				FIGURE 6.11 - PROPOSED FLOODPLAIN MAPPING - ROUGE RIVER (WC#18)


LittleRouge.all Plan: Plan 28
Geom: Little - Dec.2015 (Mod Ex) (407 ETR) Flow: Revised Flows Sep2002
River = Little Rouge Reach = Reach 3 ST 6513.21 (Modified EX - Updated Sep 2016)
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100 Year
WS 100 Year
Ground
Bank Sta


LittleRouge.all Plan: Plan 28
Geom: Little - Dec.2015 (Mod Ex) (407 ETR) Flow: Revised Flows Sep2002
River = Little Rouge Reach = Reach 3 SLH - (CPR)
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100 Year
WS 100 Year
Ground
Bank Sta


LittleRouge.all Plan: Plan 28
Geom: Little - Dec.2015 (Mod Ex) (407 ETR) Flow: Revised Flows Sep2002
River = Little Rouge Reach = Reach 3 SLH - (CPR)
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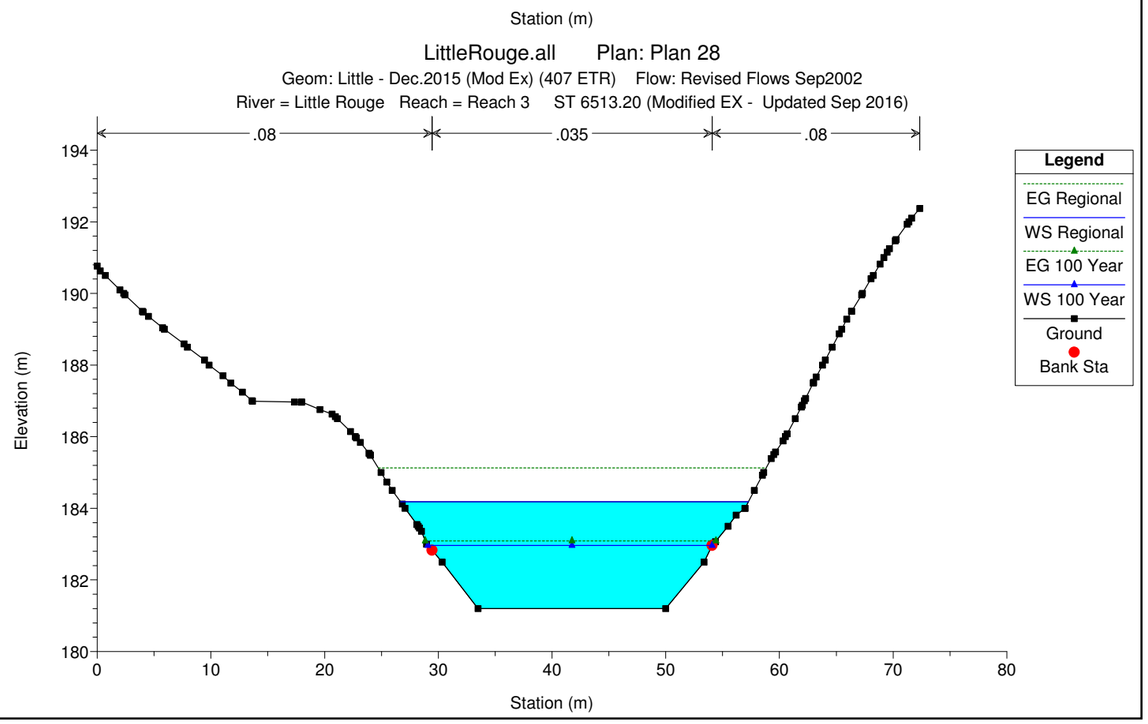
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100 Year
WS 100 Year
Ground
Bank Sta


LittleRouge.all Plan: Plan 28
Geom: Little - Dec.2015 (Mod Ex) (407 ETR) Flow: Revised Flows Sep2002
River = Little Rouge Reach = Reach 3 ST 6513.20 (Modified EX - Updated Sep 2016)
.08
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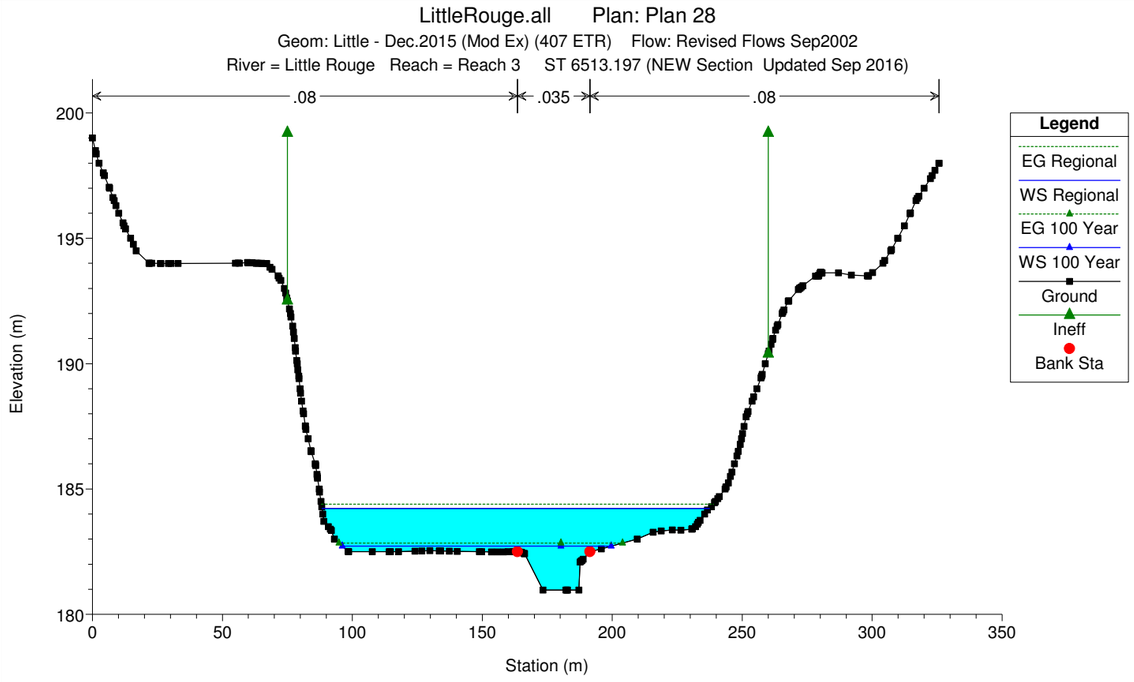
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100 Year
WS 100 Year
Ground
Bank Sta


LittleRouge.all Plan: Plan 28
Geom: Little - Dec.2015 (Mod Ex) (407 ETR) Flow: Revised Flows Sep2002
River = Little Rouge Reach = Reach 3 ST 6513.197 (NEW Section Updated Sep 2016)
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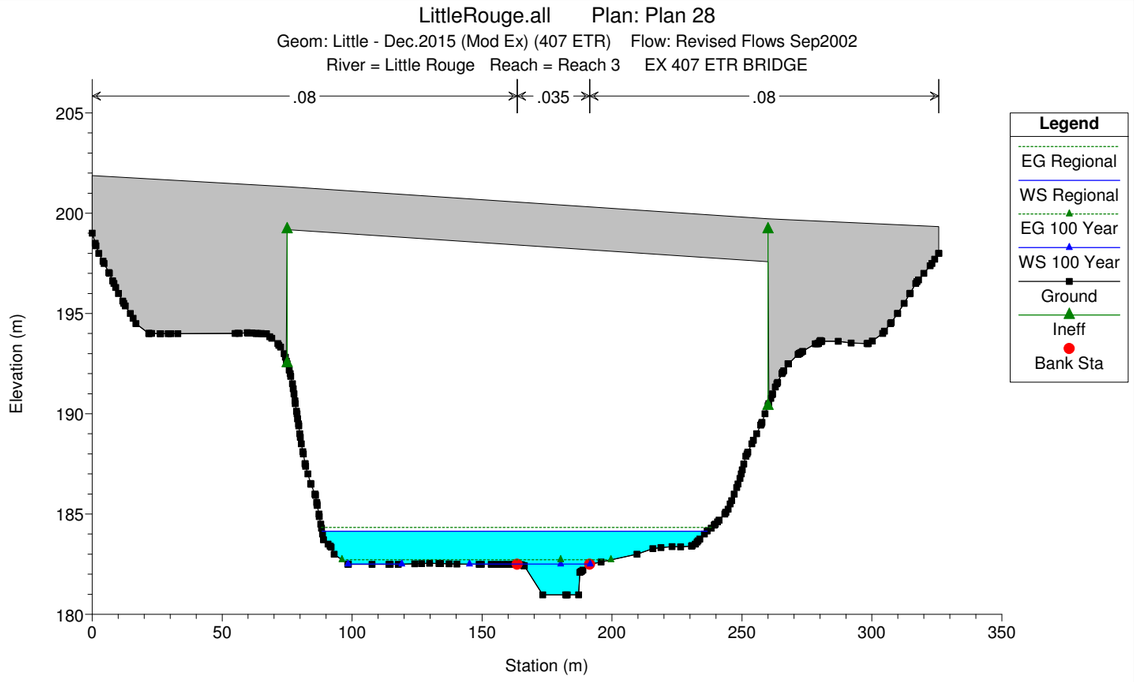
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100 Year
WS 100 Year
Ground
Ineff
Bank Sta


LittleRouge.all Plan: Plan 28
Geom: Little - Dec.2015 (Mod Ex) (407 ETR) Flow: Revised Flows Sep2002
River = Little Rouge Reach = Reach 3 EX 407 ETR BRIDGE
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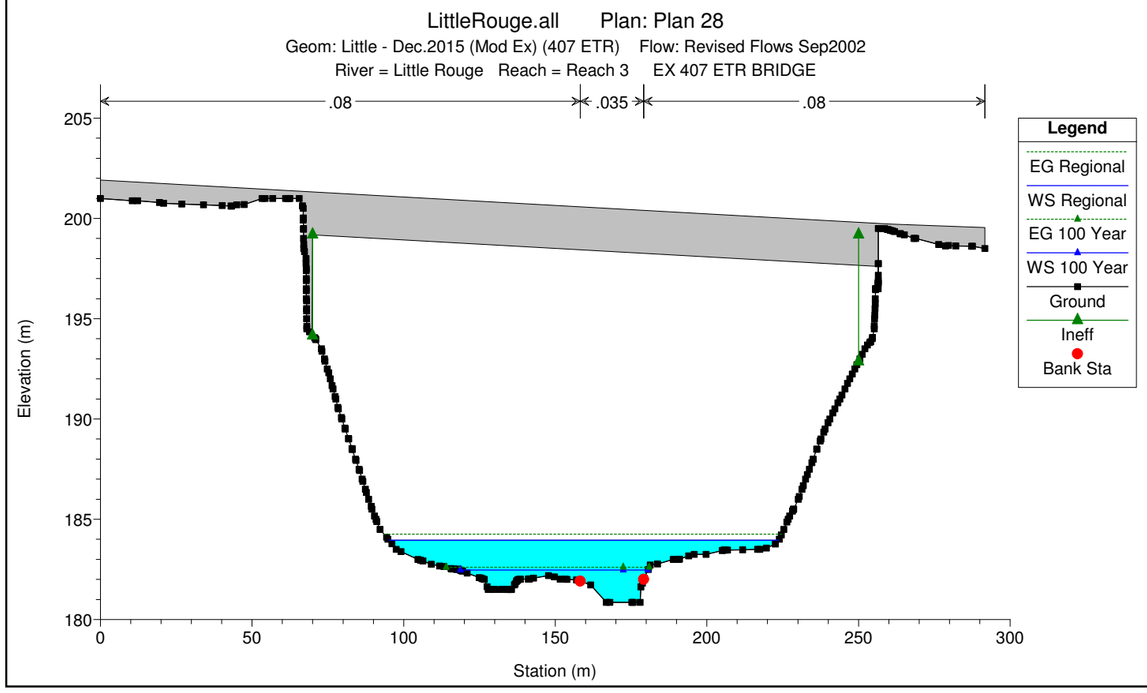
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100 Year
WS 100 Year
Ground
Ineff
Bank Sta


LittleRouge.all Plan: Plan 28
Geom: Little - Dec.2015 (Mod Ex) (407 ETR) Flow: Revised Flows Sep2002
River = Little Rouge Reach = Reach 3 EX 407 ETR BRIDGE
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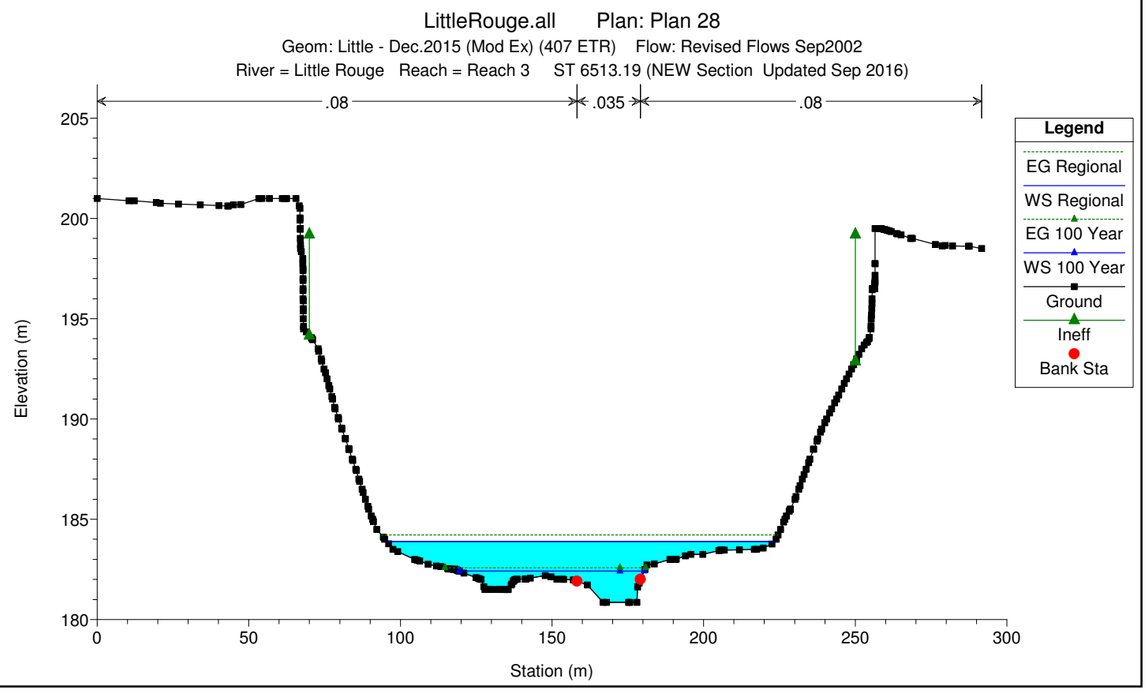
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100 Year
WS 100 Year
Ground
Ineff
Bank Sta


LittleRouge.all Plan: Plan 28
Geom: Little - Dec.2015 (Mod Ex) (407 ETR) Flow: Revised Flows Sep2002
River = Little Rouge Reach = Reach 3 ST 6513.19 (NEW Section Updated Sep 2016)
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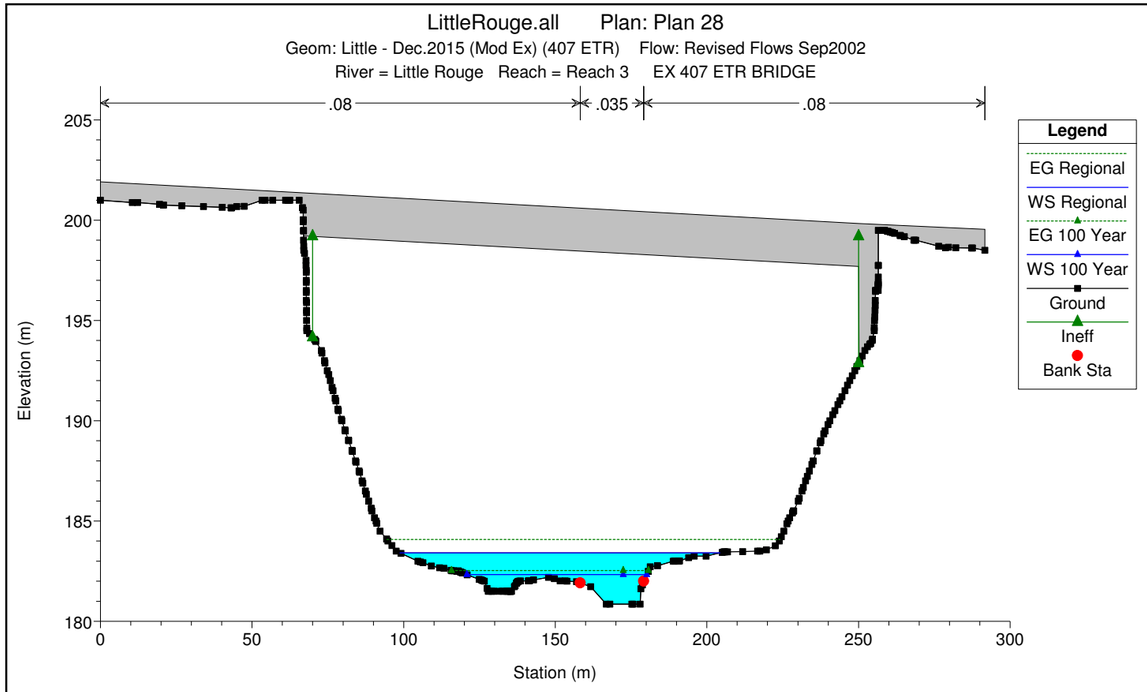
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100 Year
WS 100 Year
Ground
Ineff
Bank Sta


LittleRouge.all Plan: Plan 28
Geom: Little - Dec.2015 (Mod Ex) (407 ETR) Flow: Revised Flows Sep2002
River = Little Rouge Reach = Reach 3 EX 407 ETR BRIDGE
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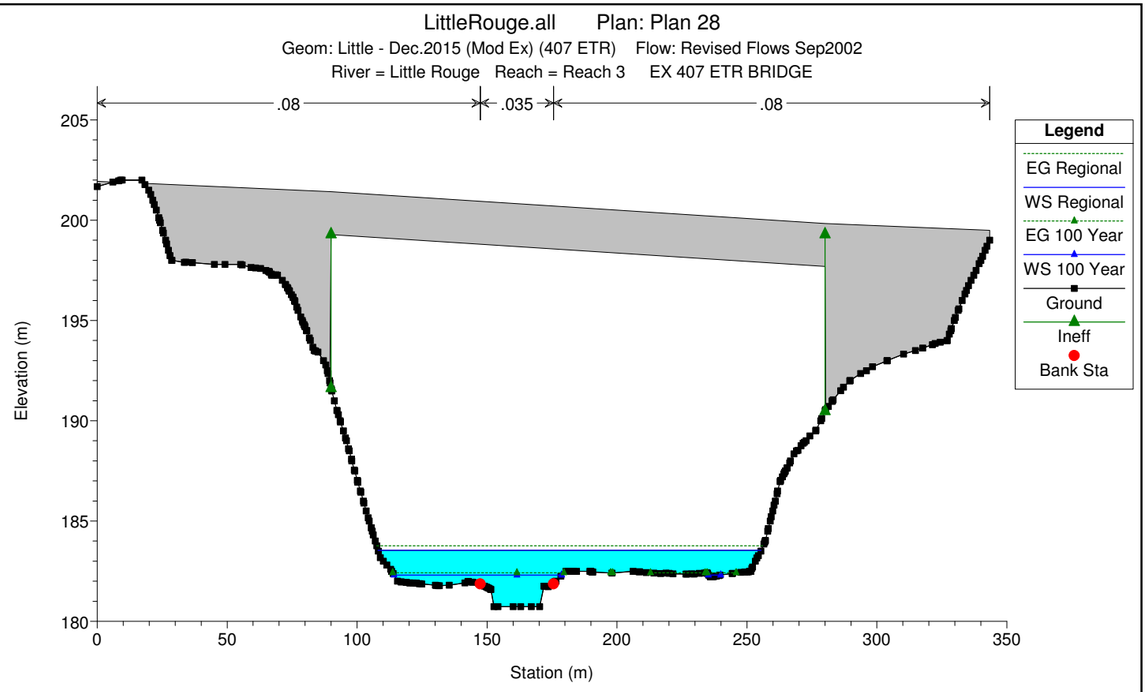
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100 Year
WS 100 Year
Ground
Ineff
Bank Sta


LittleRouge.all Plan: Plan 28
Geom: Little - Dec.2015 (Mod Ex) (407 ETR) Flow: Revised Flows Sep2002
River = Little Rouge Reach = Reach 3 EX 407 ETR BRIDGE
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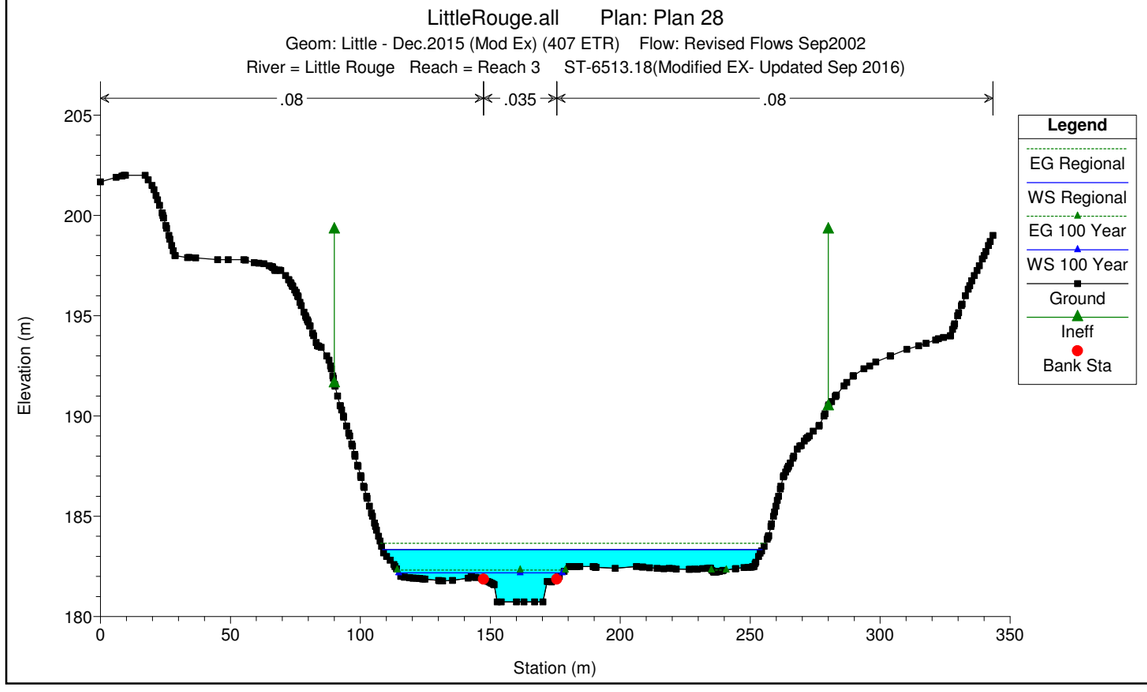
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100 Year
WS 100 Year
Ground
Ineff
Bank Sta


LittleRouge.all Plan: Plan 28
Geom: Little - Dec.2015 (Mod Ex) (407 ETR) Flow: Revised Flows Sep2002
River = Little Rouge Reach = Reach 3 ST-6513.18(Modified EX- Updated Sep 2016)
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.035
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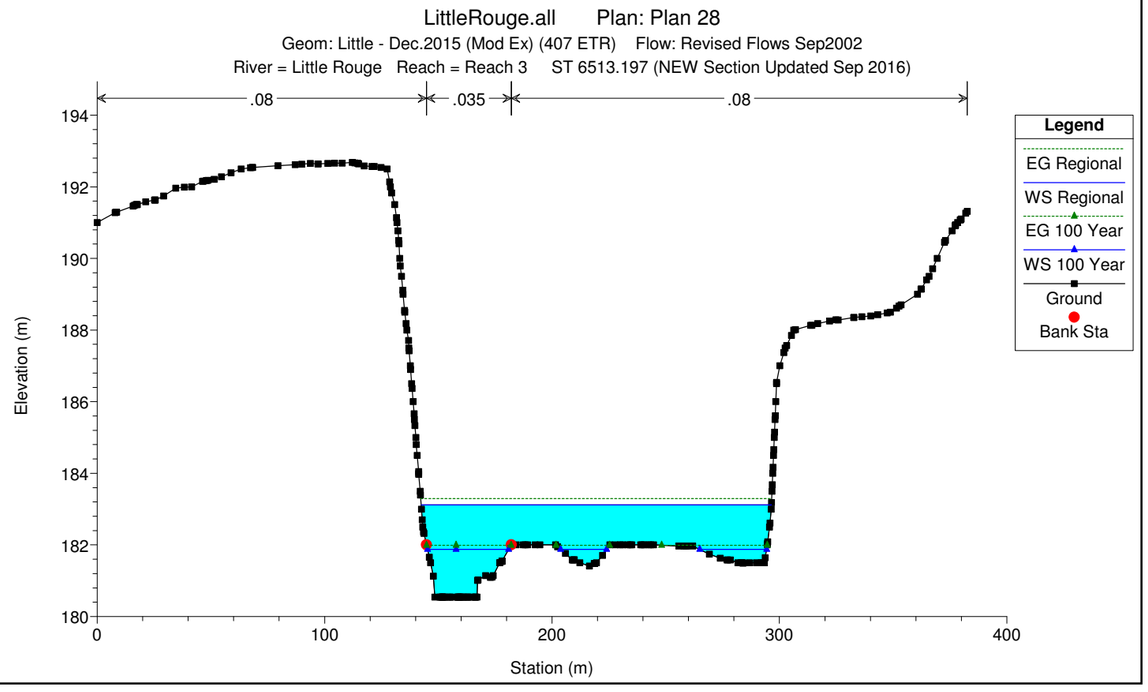
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100 Year
WS 100 Year
Ground
Ineff
Bank Sta


LittleRouge.all Plan: Plan 28
Geom: Little - Dec.2015 (Mod Ex) (407 ETR) Flow: Revised Flows Sep2002
River = Little Rouge Reach = Reach 3 ST 6513.197 (NEW Section Updated Sep 2016)
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.035
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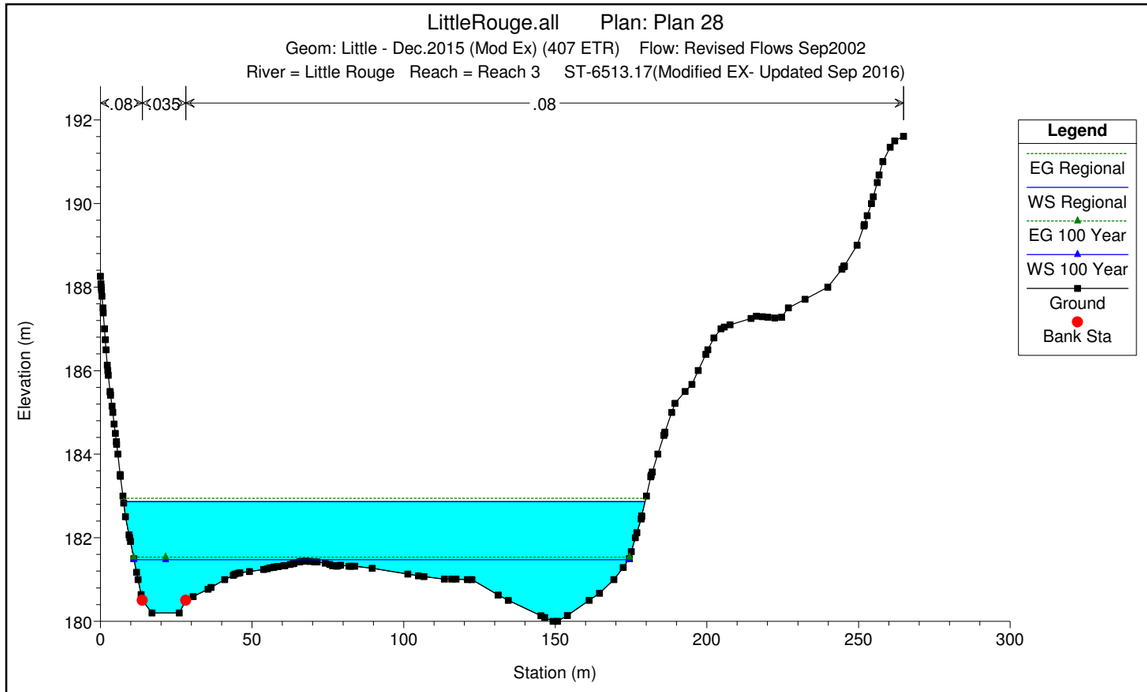
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100 Year
WS 100 Year
Ground
Bank Sta


LittleRouge.all Plan: Plan 28
Geom: Little - Dec.2015 (Mod Ex) (407 ETR) Flow: Revised Flows Sep2002
River = Little Rouge Reach = Reach 3 ST-6513.17(Modified EX- Updated Sep 2016)
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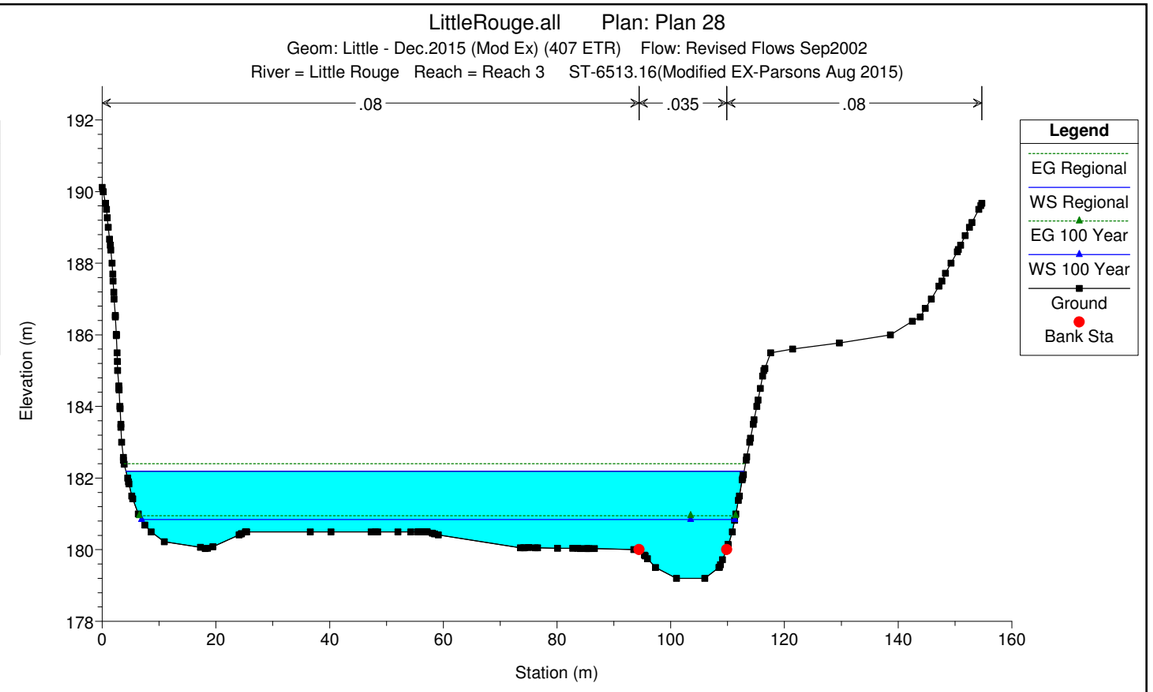
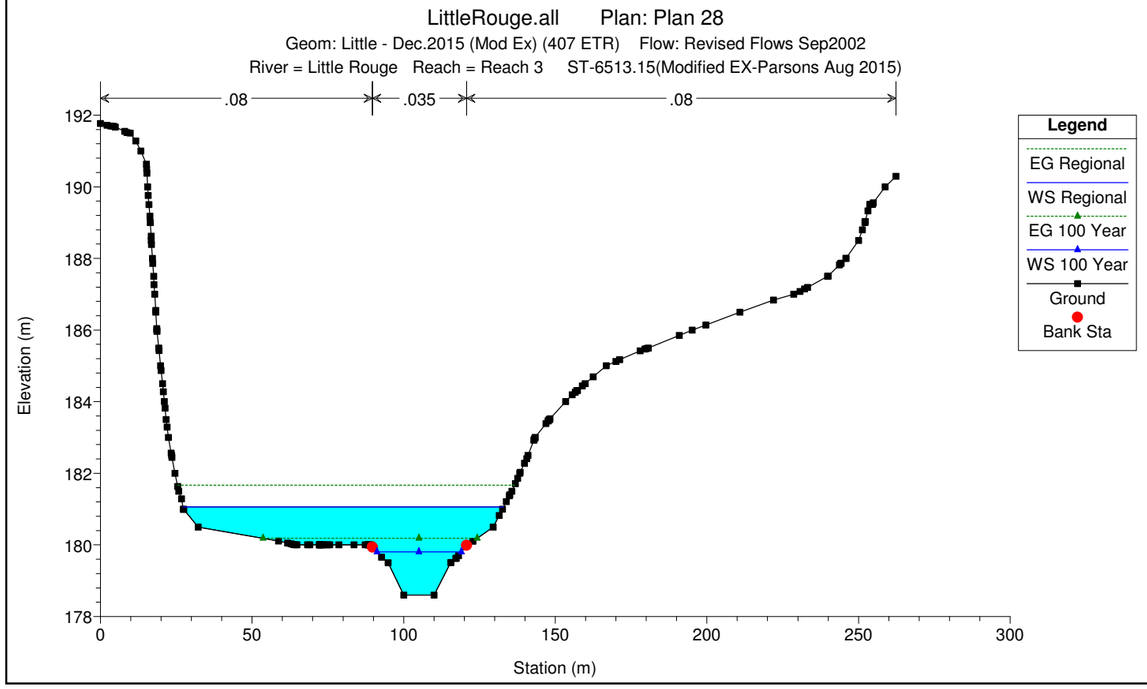
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100 Year
WS 100 Year
Ground
Bank Sta


LittleRouge.all Plan: Plan 28
Geom: Little - Dec.2015 (Mod Ex) (407 ETR) Flow: Revised Flows Sep2002
River = Little Rouge Reach = Reach 3 ST-6513.16(Modified EX-Parsons Aug 2015)
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100 Year
WS 100 Year
Ground
Bank Sta


LittleRouge.all Plan: Plan 28
Geom: Little - Dec.2015 (Mod Ex) (407 ETR) Flow: Revised Flows Sep2002
River = Little Rouge Reach = Reach 3 ST-6513.15(Modified EX-Parsons Aug 2015)
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100 Year
WS 100 Year
Ground
Bank Sta

HEC-RAS Plan: WC18-EX 4hr CH River: Little Rouge Reach: Reach 3

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Reach 3	6513.21	Regional	291.33	181.30	184.90	184.68	186.05	0.006362	5.01	75.48	29.28	0.88
Reach 3	6513.21	100 Year	57.95	181.30	183.42	182.72	183.60	0.002043	1.92	35.40	24.90	0.45
Reach 3	6513.21	50 Year	49.18	181.30	183.32	182.59	183.46	0.001807	1.74	32.83	24.61	0.42
Reach 3	6513.21	25 Year	41.08	181.30	183.18	182.47	183.30	0.001696	1.59	29.42	24.21	0.40
Reach 3	6513.21	10 Year	31.26	181.30	182.97	182.31	183.07	0.001615	1.42	24.40	23.55	0.38
Reach 3	6513.21	5 Year	24.42	181.30	182.78	182.18	182.87	0.001619	1.29	20.14	22.68	0.37
Reach 3	6513.21	2 Year	16.40	181.30	182.52	182.00	182.58	0.001682	1.12	14.85	17.43	0.37
Reach 3	6513.205		Bridge									
Reach 3	6513.2	Regional	291.33	181.20	184.18	183.90	185.13	0.006270	4.32	70.60	30.59	0.84
Reach 3	6513.2	100 Year	57.95	181.20	182.96		183.09	0.001857	1.58	36.76	25.01	0.41
Reach 3	6513.2	50 Year	49.18	181.20	182.86		182.96	0.001679	1.44	34.21	24.55	0.39
Reach 3	6513.2	25 Year	41.08	181.20	182.72		182.81	0.001598	1.33	30.89	23.97	0.37
Reach 3	6513.2	10 Year	31.26	181.20	182.52		182.59	0.001539	1.20	26.09	23.11	0.36
Reach 3	6513.2	5 Year	24.42	181.20	182.35		182.41	0.001517	1.10	22.25	22.27	0.35
Reach 3	6513.2	2 Year	16.40	181.20	182.11		182.16	0.001499	0.95	17.19	21.10	0.34
Reach 3	6513.197	Regional	291.33	180.97	184.22	183.49	184.39	0.001760	2.30	248.48	149.05	0.44
Reach 3	6513.197	100 Year	57.95	180.97	182.72	182.10	182.84	0.002480	1.60	49.10	103.47	0.46
Reach 3	6513.197	50 Year	49.18	180.97	182.58	181.98	182.71	0.002938	1.60	34.95	96.84	0.49
Reach 3	6513.197	25 Year	41.08	180.97	182.44	181.88	182.56	0.002807	1.54	26.70	25.21	0.48
Reach 3	6513.197	10 Year	31.26	180.97	182.26	181.73	182.36	0.002466	1.39	22.47	22.32	0.44
Reach 3	6513.197	5 Year	24.42	180.97	182.11	181.62	182.20	0.002195	1.27	19.28	20.15	0.41
Reach 3	6513.197	2 Year	16.40	180.97	181.90	181.48	181.96	0.002020	1.09	15.11	18.78	0.39
Reach 3	6513.195		Bridge									
Reach 3	6513.19	Regional	291.33	180.86	183.90	183.41	184.22	0.003335	3.15	184.58	127.85	0.61
Reach 3	6513.19	100 Year	57.95	180.86	182.42	181.99	182.58	0.003467	1.91	44.65	60.98	0.55
Reach 3	6513.19	50 Year	49.18	180.86	182.32	181.96	182.47	0.003428	1.80	38.98	59.21	0.54
Reach 3	6513.19	25 Year	41.08	180.86	182.21	181.89	182.35	0.003580	1.72	32.57	56.97	0.54
Reach 3	6513.19	10 Year	31.26	180.86	182.06	181.74	182.18	0.003675	1.57	24.71	45.38	0.53
Reach 3	6513.19	5 Year	24.42	180.86	181.93	181.61	182.03	0.003824	1.44	19.75	31.66	0.53
Reach 3	6513.19	2 Year	16.40	180.86	181.71	181.43	181.80	0.003848	1.36	13.42	25.77	0.52
Reach 3	6513.185		Bridge									
Reach 3	6513.18	Regional	291.33	180.73	183.34		183.65	0.003769	3.00	187.44	146.09	0.63

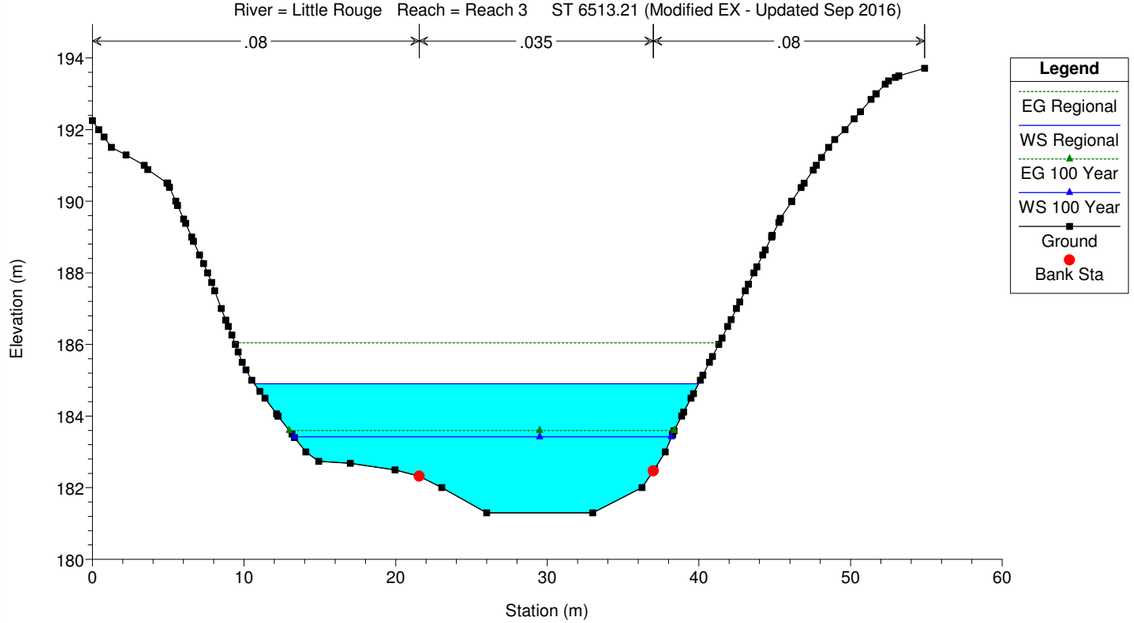
HEC-RAS Plan: WC18-EX 4hr CH River: Little Rouge Reach: Reach 3 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Reach 3	6513.18	100 Year	57.95	180.73	182.17		182.32	0.003320	1.75	41.25	62.97	0.53
Reach 3	6513.18	50 Year	49.18	180.73	182.08		182.22	0.003277	1.64	35.72	61.97	0.52
Reach 3	6513.18	25 Year	41.08	180.73	181.99		182.11	0.003269	1.54	29.97	60.26	0.51
Reach 3	6513.18	10 Year	31.26	180.73	181.86		181.96	0.003215	1.38	23.18	41.32	0.49
Reach 3	6513.18	5 Year	24.42	180.73	181.71		181.80	0.002653	1.30	18.81	22.13	0.45
Reach 3	6513.18	2 Year	16.40	180.73	181.53		181.59	0.002234	1.10	14.96	19.98	0.40
Reach 3	6513.173	Regional	291.33	180.54	183.11		183.29	0.002368	2.29	229.62	154.02	0.50
Reach 3	6513.173	100 Year	57.95	180.54	181.87		181.99	0.003223	1.56	48.23	85.33	0.51
Reach 3	6513.173	50 Year	49.18	180.54	181.79		181.90	0.003177	1.49	41.11	78.73	0.50
Reach 3	6513.173	25 Year	41.08	180.54	181.69		181.79	0.003156	1.41	34.13	71.27	0.49
Reach 3	6513.173	10 Year	31.26	180.54	181.56		181.65	0.003104	1.30	25.61	56.08	0.48
Reach 3	6513.173	5 Year	24.42	180.54	181.45		181.52	0.002979	1.19	20.50	32.97	0.46
Reach 3	6513.173	2 Year	16.40	180.54	181.28		181.34	0.003031	1.05	15.59	27.94	0.45
Reach 3	6513.17	Regional	291.33	180.20	182.86		182.94	0.001468	2.07	331.69	171.97	0.41
Reach 3	6513.17	100 Year	57.95	180.20	181.48		181.53	0.002166	1.52	98.57	163.11	0.44
Reach 3	6513.17	50 Year	49.18	180.20	181.39		181.44	0.002166	1.44	84.98	151.75	0.43
Reach 3	6513.17	25 Year	41.08	180.20	181.30		181.35	0.002114	1.35	72.29	132.66	0.42
Reach 3	6513.17	10 Year	31.26	180.20	181.18		181.23	0.002004	1.21	57.79	111.03	0.40
Reach 3	6513.17	5 Year	24.42	180.20	181.05		181.09	0.002177	1.15	44.83	91.83	0.41
Reach 3	6513.17	2 Year	16.40	180.20	180.88		180.91	0.002141	0.97	31.64	67.84	0.39
Reach 3	6513.16	Regional	291.33	179.20	182.19		182.40	0.002674	2.90	215.02	108.70	0.56
Reach 3	6513.16	100 Year	57.95	179.20	180.85		180.95	0.002290	1.73	71.30	104.33	0.46
Reach 3	6513.16	50 Year	49.18	179.20	180.75		180.85	0.002358	1.67	61.32	103.85	0.46
Reach 3	6513.16	25 Year	41.08	179.20	180.65		180.75	0.002479	1.63	50.89	103.26	0.47
Reach 3	6513.16	10 Year	31.26	179.20	180.51		180.62	0.002675	1.56	36.76	102.31	0.48
Reach 3	6513.16	5 Year	24.42	179.20	180.38		180.47	0.002635	1.42	27.35	64.22	0.46
Reach 3	6513.16	2 Year	16.40	179.20	180.21		180.29	0.002683	1.26	17.40	52.98	0.45
Reach 3	6513.15	Regional	291.33	178.60	181.06	181.06	181.67	0.007617	3.85	122.23	105.72	0.88
Reach 3	6513.15	100 Year	57.95	178.60	179.81	179.81	180.18	0.013191	2.73	21.26	27.89	1.00
Reach 3	6513.15	50 Year	49.18	178.60	179.70	179.70	180.06	0.013731	2.67	18.45	25.80	1.01
Reach 3	6513.15	25 Year	41.08	178.60	179.59	179.59	179.94	0.013850	2.59	15.84	23.21	1.00
Reach 3	6513.15	10 Year	31.26	178.60	179.44	179.44	179.76	0.014357	2.50	12.49	19.84	1.01
Reach 3	6513.15	5 Year	24.42	178.60	179.33	179.33	179.61	0.014895	2.36	10.36	18.54	1.01
Reach 3	6513.15	2 Year	16.40	178.60	179.17	179.17	179.41	0.015886	2.13	7.69	16.75	1.01

LittleRouge.all Plan: 1) WC18-EX 4hr CH

Geom: Little - Sep.2016 (PROP) (407 ETR) Flow: Revised Flows Sep2002

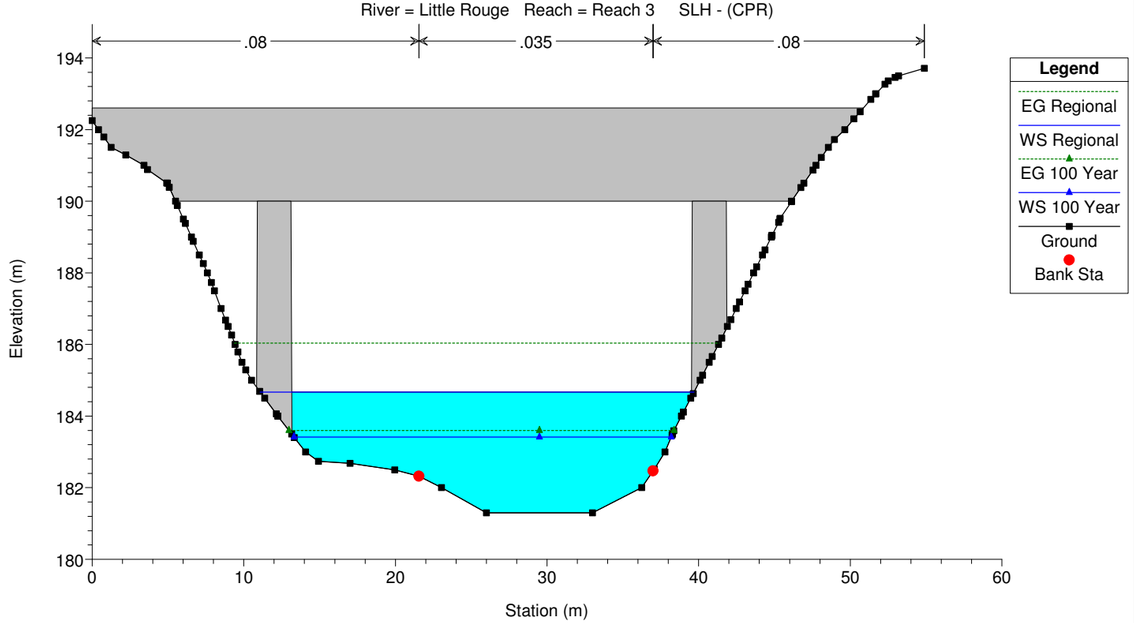
River = Little Rouge Reach = Reach 3 ST 6513.21 (Modified EX - Updated Sep 2016)



LittleRouge.all Plan: 1) WC18-EX 4hr CH

Geom: Little - Sep.2016 (PROP) (407 ETR) Flow: Revised Flows Sep2002

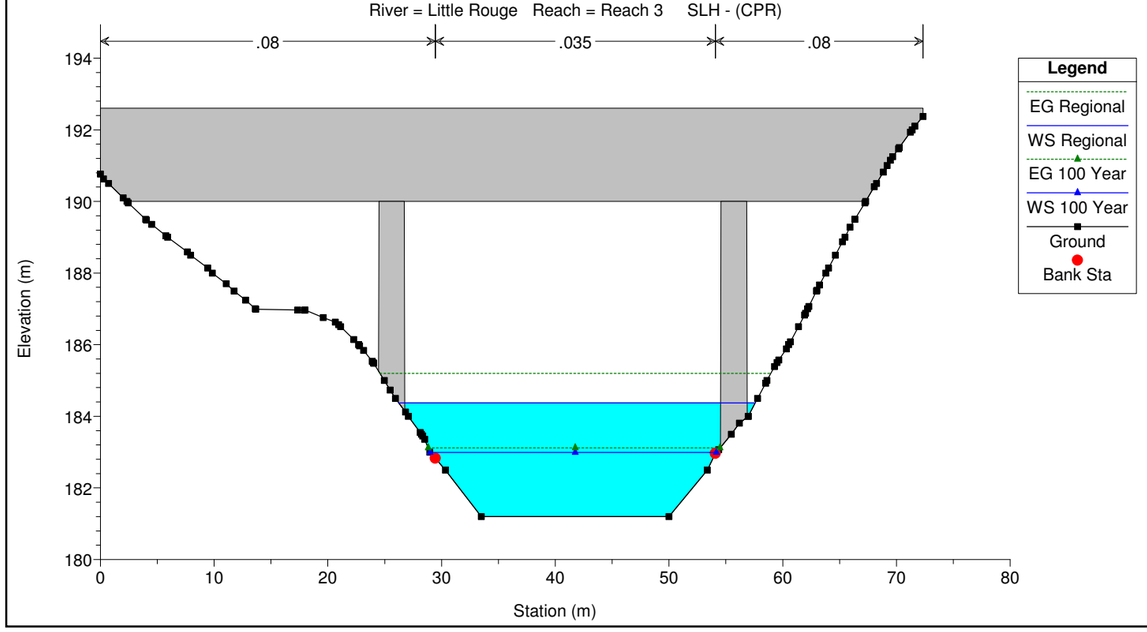
River = Little Rouge Reach = Reach 3 SLH - (CPR)



LittleRouge.all Plan: 1) WC18-EX 4hr CH

Geom: Little - Sep.2016 (PROP) (407 ETR) Flow: Revised Flows Sep2002

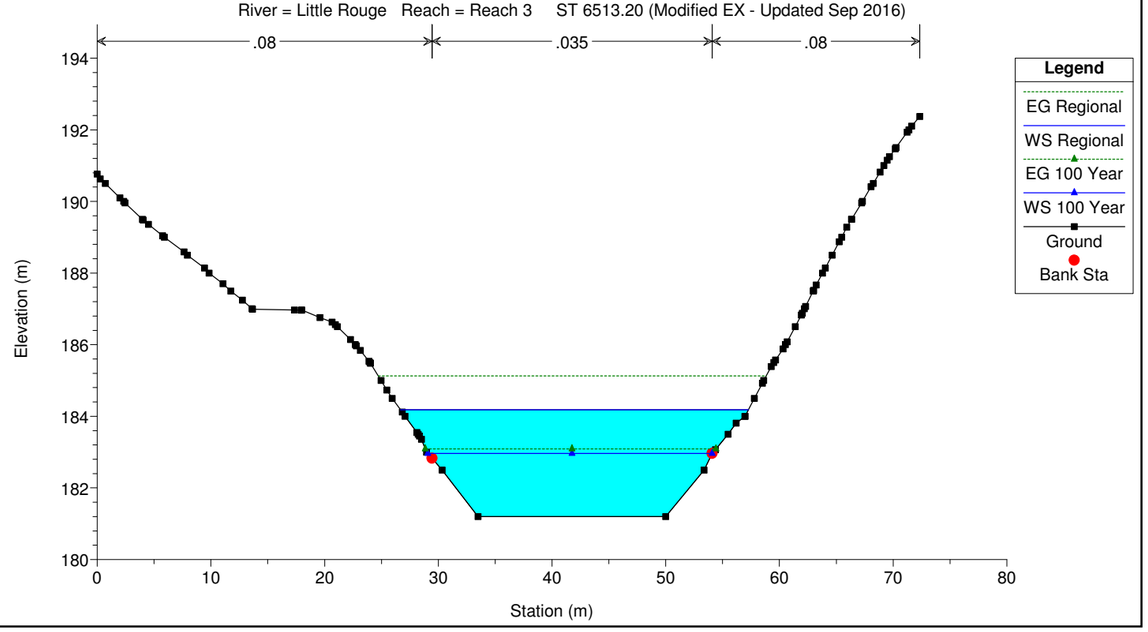
River = Little Rouge Reach = Reach 3 SLH - (CPR)



LittleRouge.all Plan: 1) WC18-EX 4hr CH

Geom: Little - Sep.2016 (PROP) (407 ETR) Flow: Revised Flows Sep2002

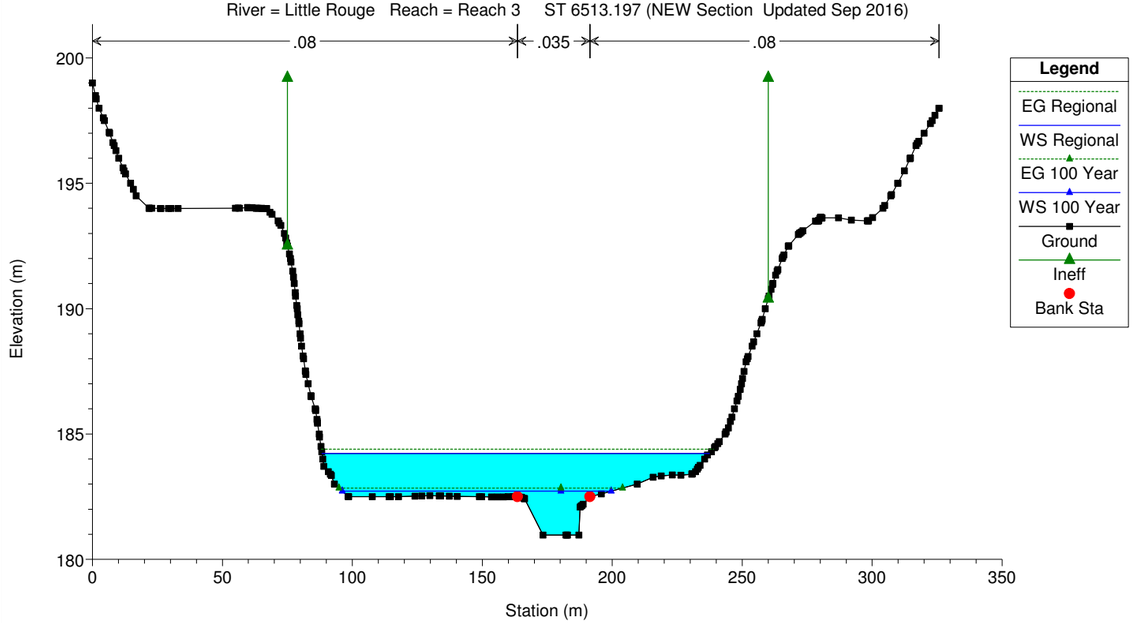
River = Little Rouge Reach = Reach 3 ST 6513.20 (Modified EX - Updated Sep 2016)



LittleRouge.all Plan: 1) WC18-EX 4hr CH

Geom: Little - Sep.2016 (PROP) (407 ETR) Flow: Revised Flows Sep2002

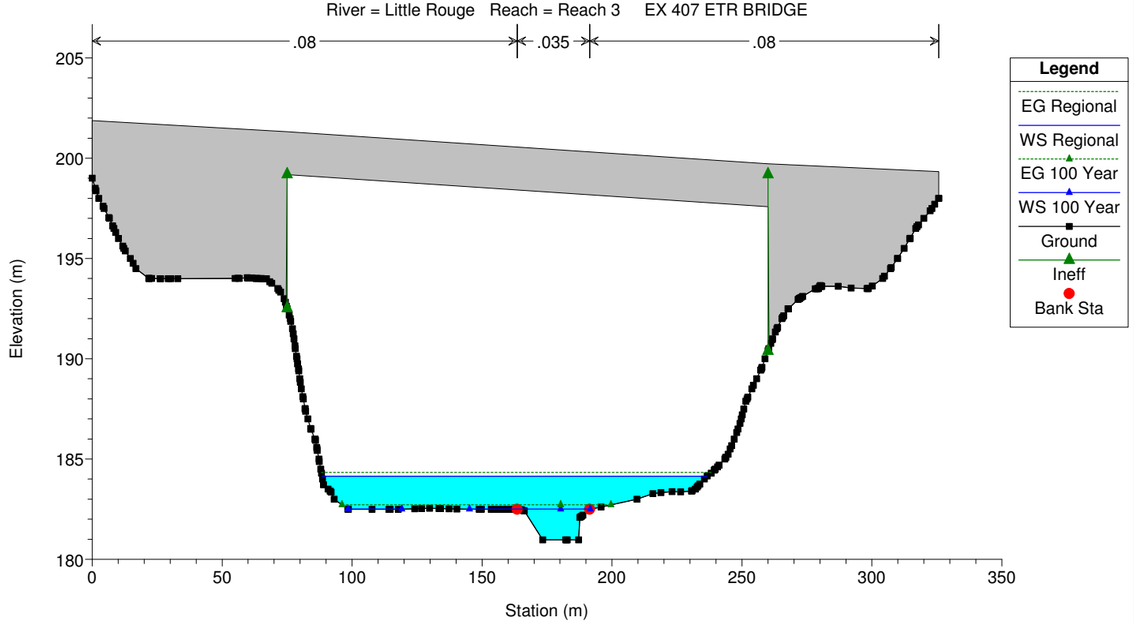
River = Little Rouge Reach = Reach 3 ST 6513.197 (NEW Section Updated Sep 2016)



LittleRouge.all Plan: 1) WC18-EX 4hr CH

Geom: Little - Sep.2016 (PROP) (407 ETR) Flow: Revised Flows Sep2002

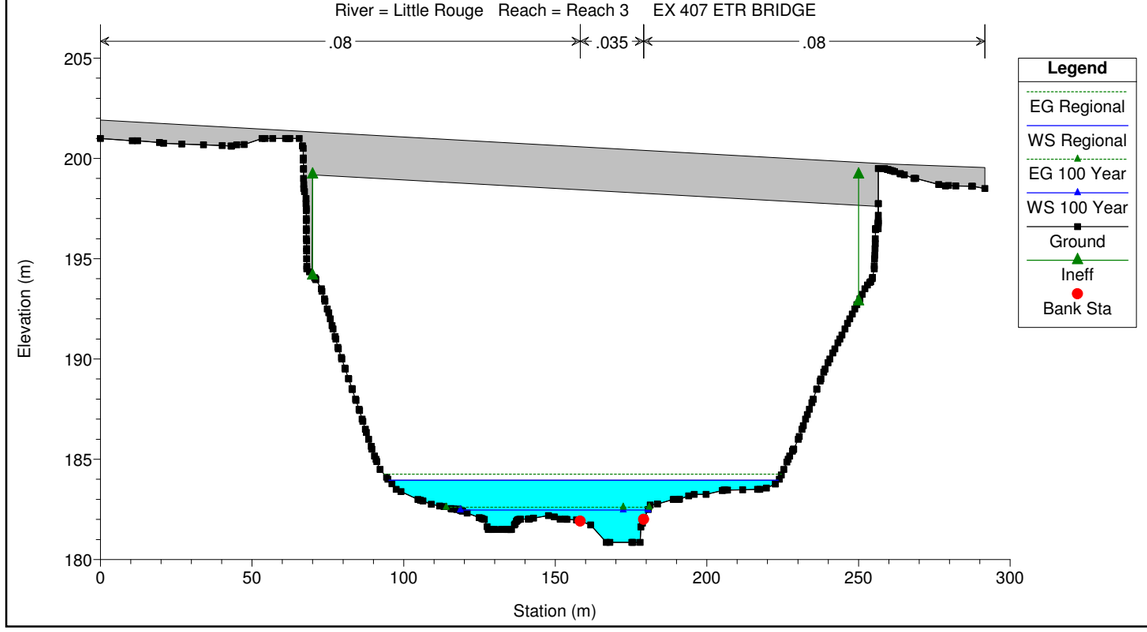
River = Little Rouge Reach = Reach 3 EX 407 ETR BRIDGE



LittleRouge.all Plan: 1) WC18-EX 4hr CH

Geom: Little - Sep.2016 (PROP) (407 ETR) Flow: Revised Flows Sep2002

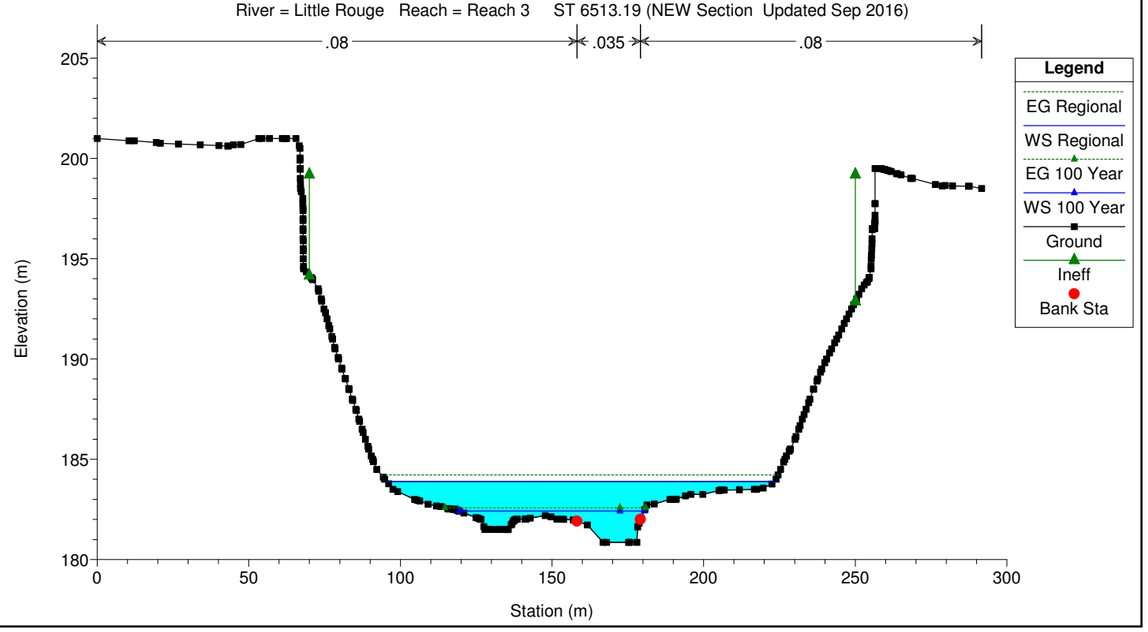
River = Little Rouge Reach = Reach 3 EX 407 ETR BRIDGE

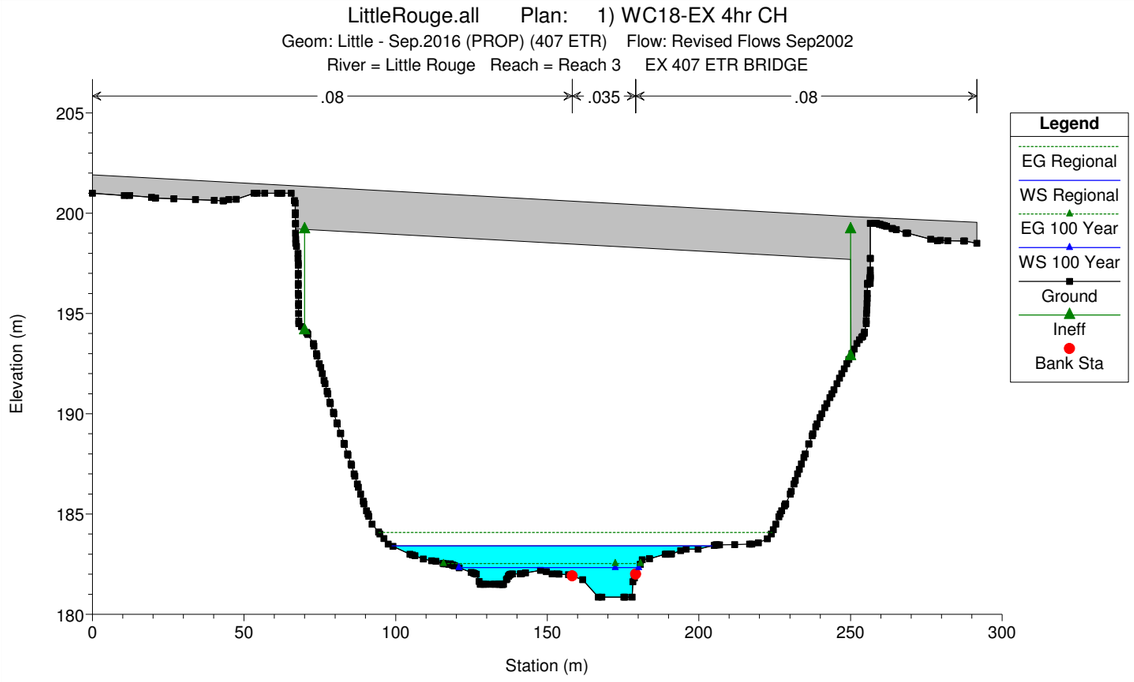


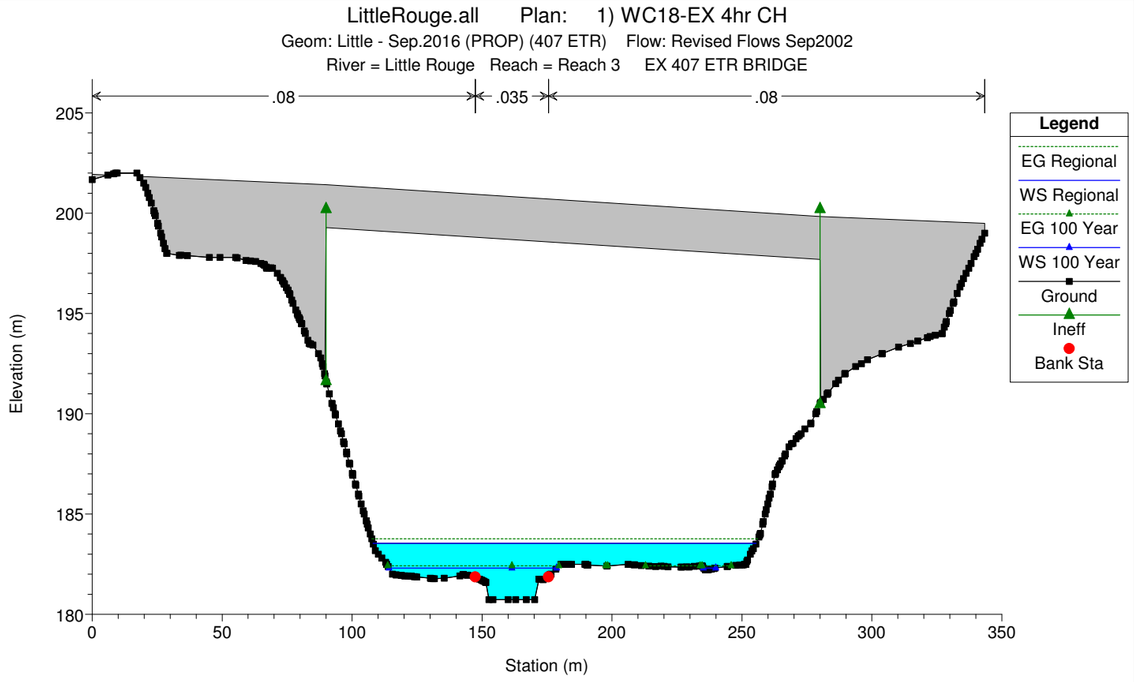
LittleRouge.all Plan: 1) WC18-EX 4hr CH

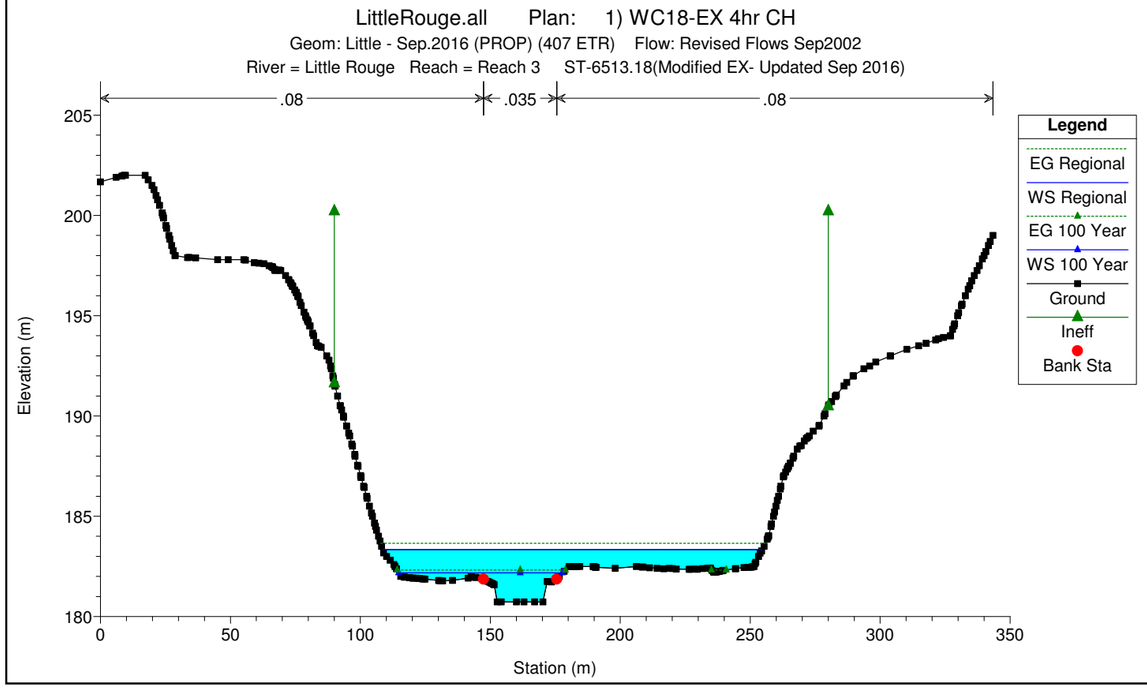
Geom: Little - Sep.2016 (PROP) (407 ETR) Flow: Revised Flows Sep2002

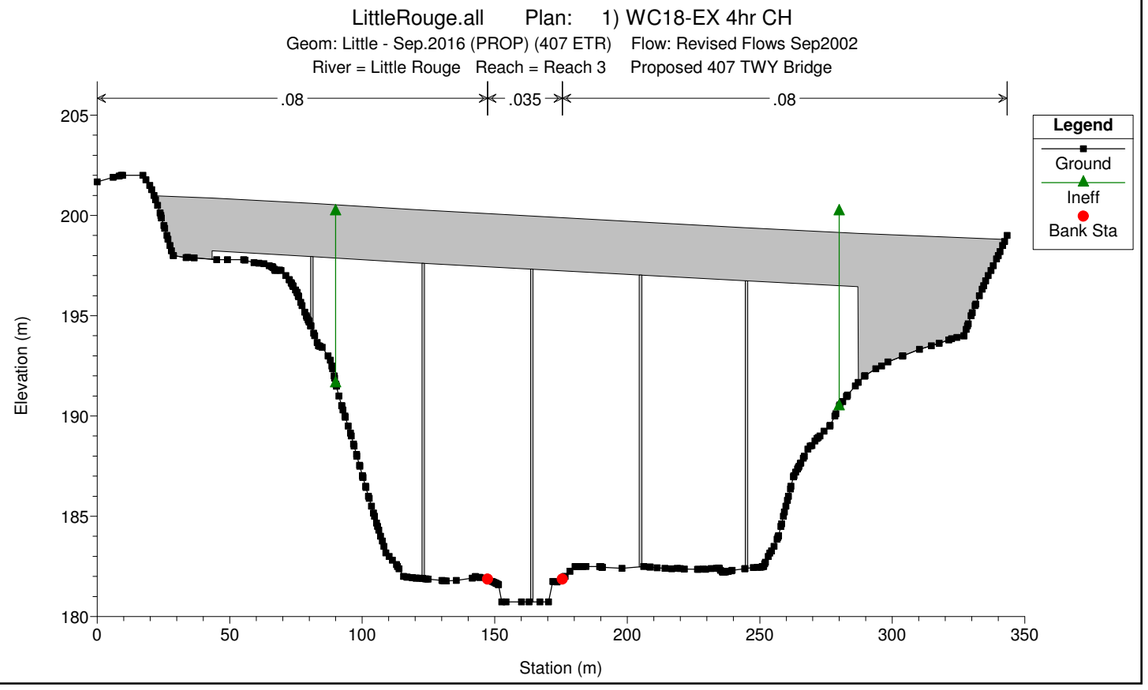
River = Little Rouge Reach = Reach 3 ST 6513.19 (NEW Section Updated Sep 2016)




LittleRouge.all Plan: 1) WC18-EX 4hr CH
Geom: Little - Sep.2016 (PROP) (407 ETR) Flow: Revised Flows Sep2002
River = Little Rouge Reach = Reach 3 EX 407 ETR BRIDGE
.08
.035
.08
Legend
EG Regional
WS Regional
EG 100 Year
WS 100 Year
Ground
Ineff
Bank Sta
Elevation (m)
Station (m)


LittleRouge.all Plan: 1) WC18-EX 4hr CH
Geom: Little - Sep.2016 (PROP) (407 ETR) Flow: Revised Flows Sep2002
River = Little Rouge Reach = Reach 3 EX 407 ETR BRIDGE
.08
.035
.08
Legend
EG Regional
WS Regional
EG 100 Year
WS 100 Year
Ground
Ineff
Bank Sta
Elevation (m)
Station (m)

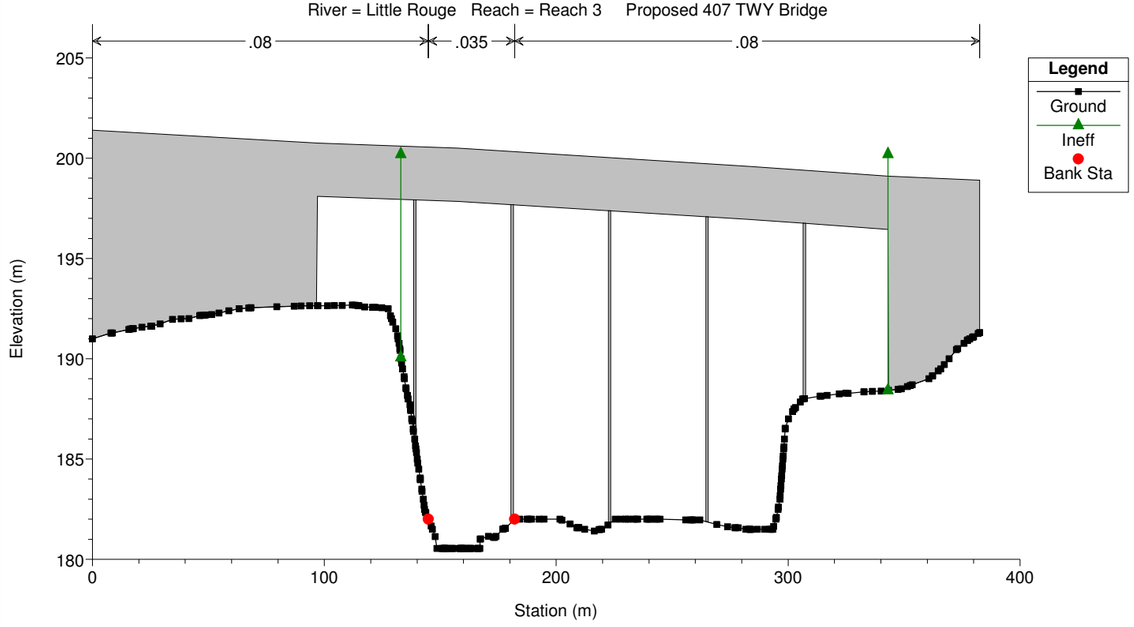

LittleRouge.all Plan: 1) WC18-EX 4hr CH
Geom: Little - Sep.2016 (PROP) (407 ETR) Flow: Revised Flows Sep2002
River = Little Rouge Reach = Reach 3 ST-6513.18(Modified EX- Updated Sep 2016)
.08
.035
.08
Legend
EG Regional
WS Regional
EG 100 Year
WS 100 Year
Ground
Ineff
Bank Sta
Elevation (m)
Station (m)


LittleRouge.all Plan: 1) WC18-EX 4hr CH
Geom: Little - Sep.2016 (PROP) (407 ETR) Flow: Revised Flows Sep2002
River = Little Rouge Reach = Reach 3 Proposed 407 TWY Bridge
.08
.035
.08
Legend
Ground
Ineff
Bank Sta
Elevation (m)
Station (m)

LittleRouge.all Plan: 1) WC18-EX 4hr CH

Geom: Little - Sep.2016 (PROP) (407 ETR) Flow: Revised Flows Sep2002

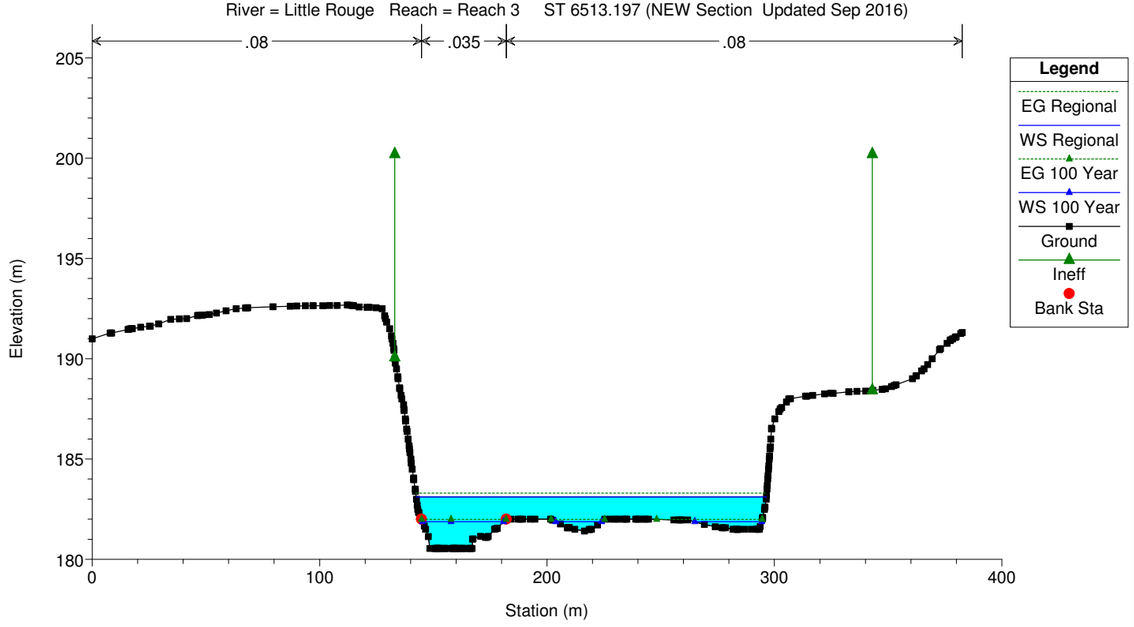
River = Little Rouge Reach = Reach 3 Proposed 407 TWY Bridge



LittleRouge.all Plan: 1) WC18-EX 4hr CH

Geom: Little - Sep.2016 (PROP) (407 ETR) Flow: Revised Flows Sep2002

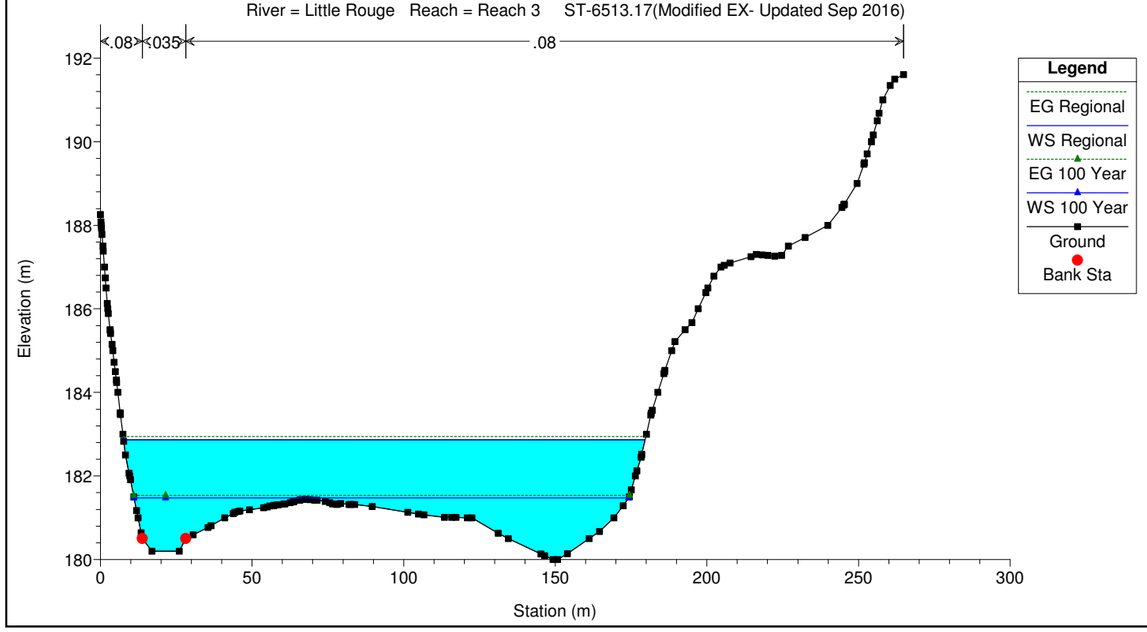
River = Little Rouge Reach = Reach 3 ST 6513.197 (NEW Section Updated Sep 2016)



LittleRouge.all Plan: 1) WC18-EX 4hr CH

Geom: Little - Sep.2016 (PROP) (407 ETR) Flow: Revised Flows Sep2002

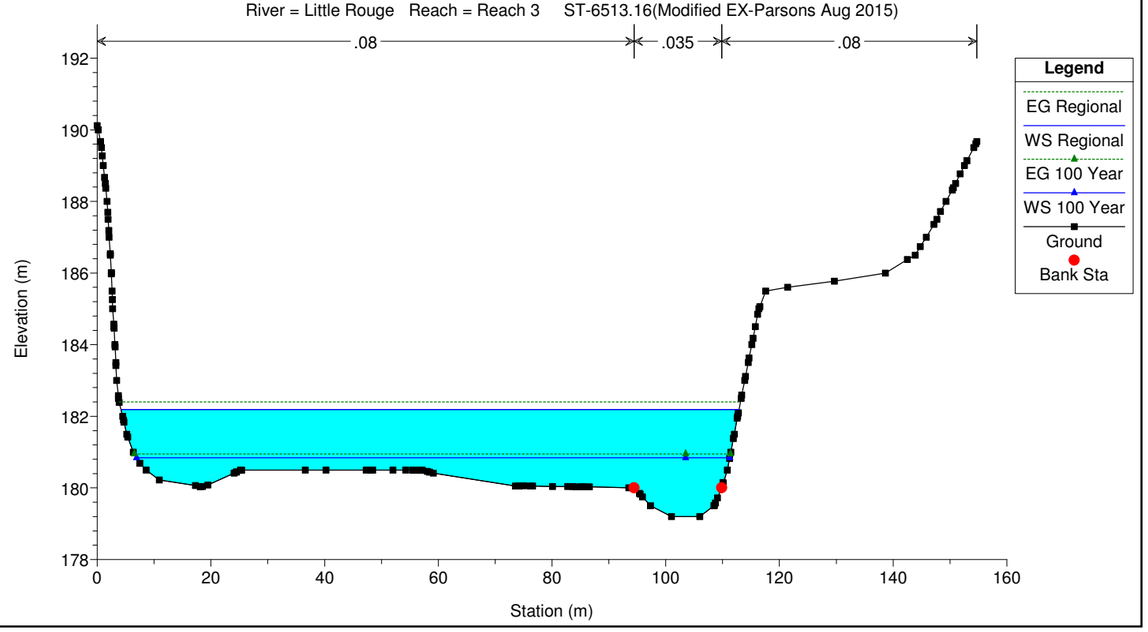
River = Little Rouge Reach = Reach 3 ST-6513.17(Modified EX- Updated Sep 2016)

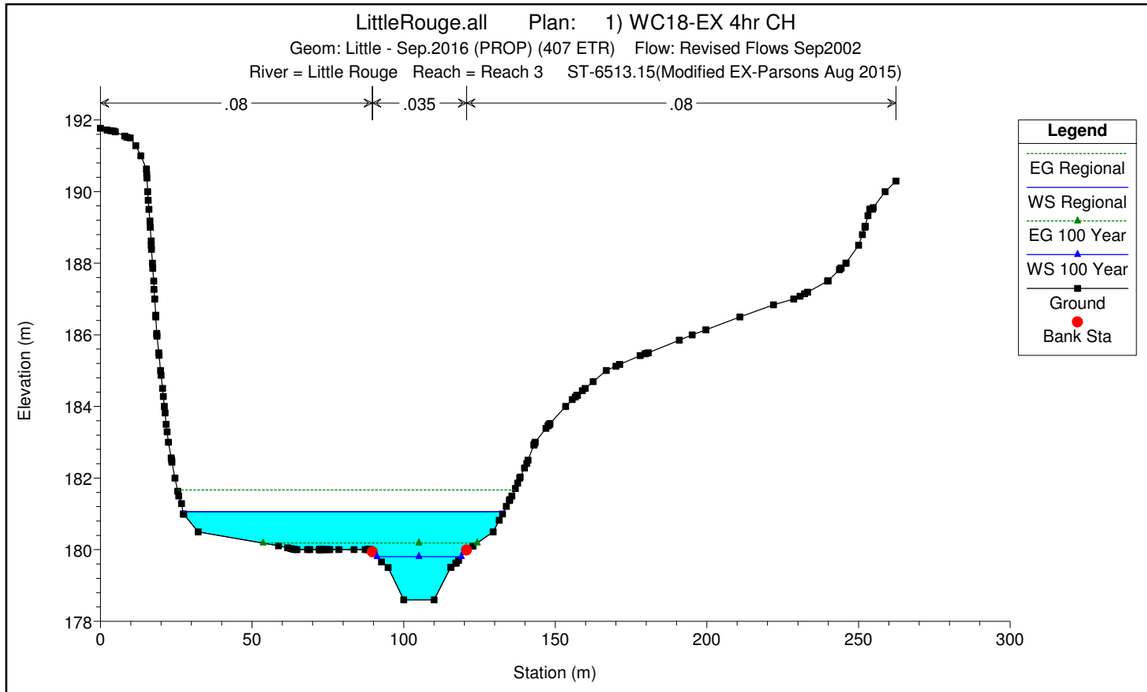


LittleRouge.all Plan: 1) WC18-EX 4hr CH

Geom: Little - Sep.2016 (PROP) (407 ETR) Flow: Revised Flows Sep2002

River = Little Rouge Reach = Reach 3 ST-6513.16(Modified EX-Parsons Aug 2015)




LittleRouge.all Plan: 1) WC18-EX 4hr CH
Geom: Little - Sep.2016 (PROP) (407 ETR) Flow: Revised Flows Sep2002
River = Little Rouge Reach = Reach 3 ST-6513.15(Modified EX-Parsons Aug 2015)
.08
.035
.08
Elevation (m)
192
190
188
186
184
182
180
178
0
50
100
150
200
250
300
Station (m)
Legend
EG Regional
WS Regional
EG 100 Year
WS 100 Year
Ground
Bank Sta

HEC-RAS Plan: WC18-PROP 4hr CH River: Little Rouge Reach: Reach 3

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Reach 3	6513.21	Regional	291.33	181.30	184.90	184.68	186.05	0.006362	5.01	75.48	29.28	0.88
Reach 3	6513.21	100 Year	57.95	181.30	183.42	182.72	183.60	0.002034	1.92	35.46	24.91	0.45
Reach 3	6513.21	50 Year	49.18	181.30	183.32	182.59	183.47	0.001801	1.74	32.87	24.62	0.42
Reach 3	6513.21	25 Year	41.08	181.30	183.18	182.47	183.31	0.001680	1.59	29.53	24.23	0.40
Reach 3	6513.21	10 Year	31.26	181.30	182.97	182.31	183.07	0.001602	1.41	24.47	23.57	0.38
Reach 3	6513.21	5 Year	24.42	181.30	182.79	182.18	182.87	0.001607	1.29	20.20	22.69	0.37
Reach 3	6513.21	2 Year	16.40	181.30	182.52	182.00	182.58	0.001678	1.12	14.86	17.45	0.37
Reach 3	6513.205		Bridge									
Reach 3	6513.2	Regional	291.33	181.20	184.18	183.90	185.12	0.006307	4.33	70.45	30.58	0.84
Reach 3	6513.2	100 Year	57.95	181.20	182.96		183.09	0.001847	1.58	36.82	25.02	0.41
Reach 3	6513.2	50 Year	49.18	181.20	182.86		182.96	0.001673	1.44	34.25	24.56	0.39
Reach 3	6513.2	25 Year	41.08	181.20	182.72		182.81	0.001582	1.33	30.99	23.99	0.37
Reach 3	6513.2	10 Year	31.26	181.20	182.52		182.59	0.001527	1.19	26.16	23.12	0.36
Reach 3	6513.2	5 Year	24.42	181.20	182.35		182.41	0.001506	1.09	22.30	22.29	0.35
Reach 3	6513.2	2 Year	16.40	181.20	182.11		182.16	0.001496	0.95	17.20	21.10	0.34
Reach 3	6513.197	Regional	291.33	180.97	184.21	183.49	184.39	0.001780	2.31	247.42	148.96	0.45
Reach 3	6513.197	100 Year	57.95	180.97	182.72	182.10	182.85	0.002426	1.59	49.76	103.76	0.46
Reach 3	6513.197	50 Year	49.18	180.97	182.58	181.98	182.71	0.002851	1.59	35.77	97.26	0.48
Reach 3	6513.197	25 Year	41.08	180.97	182.45	181.88	182.57	0.002772	1.53	26.92	25.50	0.47
Reach 3	6513.197	10 Year	31.26	180.97	182.27	181.73	182.37	0.002424	1.38	22.62	22.41	0.44
Reach 3	6513.197	5 Year	24.42	180.97	182.12	181.62	182.20	0.002165	1.26	19.39	20.23	0.41
Reach 3	6513.197	2 Year	16.40	180.97	181.90	181.48	181.96	0.002009	1.08	15.14	18.79	0.39
Reach 3	6513.195		Bridge									
Reach 3	6513.19	Regional	291.33	180.86	183.87	183.41	184.21	0.003463	3.19	181.74	127.59	0.62
Reach 3	6513.19	100 Year	57.95	180.86	182.44	181.99	182.59	0.003192	1.85	46.25	61.61	0.53
Reach 3	6513.19	50 Year	49.18	180.86	182.34	181.96	182.48	0.003183	1.75	40.25	59.61	0.52
Reach 3	6513.19	25 Year	41.08	180.86	182.24	181.89	182.37	0.003278	1.67	33.89	57.44	0.52
Reach 3	6513.19	10 Year	31.26	180.86	182.08	181.74	182.19	0.003449	1.54	25.46	46.69	0.52
Reach 3	6513.19	5 Year	24.42	180.86	181.94	181.61	182.04	0.003627	1.42	20.14	32.00	0.52
Reach 3	6513.19	2 Year	16.40	180.86	181.71	181.43	181.80	0.003773	1.35	13.54	25.84	0.52
Reach 3	6513.185		Bridge									
Reach 3	6513.18	Regional	291.33	180.73	183.47	183.05	183.73	0.002889	2.73	207.64	147.01	0.56

HEC-RAS Plan: WC18-PROP 4hr CH River: Little Rouge Reach: Reach 3 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Reach 3	6513.18	100 Year	57.95	180.73	182.27	181.80	182.38	0.002438	1.58	47.24	66.74	0.46
Reach 3	6513.18	50 Year	49.18	180.73	182.17	181.64	182.27	0.002444	1.49	40.85	62.90	0.45
Reach 3	6513.18	25 Year	41.08	180.73	182.06	181.53	182.16	0.002507	1.41	34.19	61.68	0.45
Reach 3	6513.18	10 Year	31.26	180.73	181.89	181.40	181.98	0.002823	1.33	24.62	45.56	0.46
Reach 3	6513.18	5 Year	24.42	180.73	181.74	181.30	181.82	0.002665	1.26	19.45	24.18	0.45
Reach 3	6513.18	2 Year	16.40	180.73	181.54	181.17	181.60	0.002108	1.08	15.24	20.02	0.39
Reach 3	6513.175		Bridge									
Reach 3	6513.173	Regional	291.33	180.54	183.11		183.29	0.002368	2.29	229.62	154.02	0.50
Reach 3	6513.173	100 Year	57.95	180.54	181.87		181.99	0.003223	1.56	48.23	85.33	0.51
Reach 3	6513.173	50 Year	49.18	180.54	181.79		181.90	0.003177	1.49	41.11	78.73	0.50
Reach 3	6513.173	25 Year	41.08	180.54	181.69		181.79	0.003156	1.41	34.13	71.27	0.49
Reach 3	6513.173	10 Year	31.26	180.54	181.56		181.65	0.003104	1.30	25.61	56.08	0.48
Reach 3	6513.173	5 Year	24.42	180.54	181.45		181.52	0.002979	1.19	20.50	32.97	0.46
Reach 3	6513.173	2 Year	16.40	180.54	181.28		181.34	0.003031	1.05	15.59	27.94	0.45
Reach 3	6513.17	Regional	291.33	180.20	182.86		182.94	0.001468	2.07	331.69	171.97	0.41
Reach 3	6513.17	100 Year	57.95	180.20	181.48		181.53	0.002166	1.52	98.57	163.11	0.44
Reach 3	6513.17	50 Year	49.18	180.20	181.39		181.44	0.002166	1.44	84.98	151.75	0.43
Reach 3	6513.17	25 Year	41.08	180.20	181.30		181.35	0.002114	1.35	72.29	132.66	0.42
Reach 3	6513.17	10 Year	31.26	180.20	181.18		181.23	0.002004	1.21	57.79	111.03	0.40
Reach 3	6513.17	5 Year	24.42	180.20	181.05		181.09	0.002177	1.15	44.83	91.83	0.41
Reach 3	6513.17	2 Year	16.40	180.20	180.88		180.91	0.002141	0.97	31.64	67.84	0.39
Reach 3	6513.16	Regional	291.33	179.20	182.19		182.40	0.002674	2.90	215.02	108.70	0.56
Reach 3	6513.16	100 Year	57.95	179.20	180.85		180.95	0.002290	1.73	71.30	104.33	0.46
Reach 3	6513.16	50 Year	49.18	179.20	180.75		180.85	0.002358	1.67	61.32	103.85	0.46
Reach 3	6513.16	25 Year	41.08	179.20	180.65		180.75	0.002479	1.63	50.89	103.26	0.47
Reach 3	6513.16	10 Year	31.26	179.20	180.51		180.62	0.002675	1.56	36.76	102.31	0.48
Reach 3	6513.16	5 Year	24.42	179.20	180.38		180.47	0.002635	1.42	27.35	64.22	0.46
Reach 3	6513.16	2 Year	16.40	179.20	180.21		180.29	0.002683	1.26	17.40	52.98	0.45
Reach 3	6513.15	Regional	291.33	178.60	181.06	181.06	181.67	0.007617	3.85	122.23	105.72	0.88
Reach 3	6513.15	100 Year	57.95	178.60	179.81	179.81	180.18	0.013191	2.73	21.26	27.89	1.00
Reach 3	6513.15	50 Year	49.18	178.60	179.70	179.70	180.06	0.013731	2.67	18.45	25.80	1.01
Reach 3	6513.15	25 Year	41.08	178.60	179.59	179.59	179.94	0.013850	2.59	15.84	23.21	1.00
Reach 3	6513.15	10 Year	31.26	178.60	179.44	179.44	179.76	0.014357	2.50	12.49	19.84	1.01
Reach 3	6513.15	5 Year	24.42	178.60	179.33	179.33	179.61	0.014895	2.36	10.36	18.54	1.01

HEC-RAS Plan: WC18-PROP 4hr CH River: Little Rouge Reach: Reach 3 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Reach 3	6513.15	2 Year	16.40	178.60	179.17	179.17	179.41	0.015886	2.13	7.69	16.75	1.01

PETTICOAT CREEK

HEC-RAS ANALYSIS WC#19

ST 300 | 196.04 | 196.06
196.02 | 196.03

ST 200 | 195.01 | 195.10
194.89 | 195.04

EXISTING 407 ETR

PROPOSED 407 TWY

PROP CULV WC#19
SPAN x RISE= (2.5 x 1.25)
L=38m, S=1.1%
U/S INV= 194.80
D/S INV= 194.40

194.55 | 194.55 | ST 100
194.52 | 194.45

194.27 | 194.27 | ST 10
194.25 | 194.25

LEGEND

- EXISTING 407 ETR
- PROPOSED 407 TWY
- CREEK FLOW DIRECTION
- EXISTING CULVERT
- PROPOSED CULVERT
- PROPOSED REGIONAL FLOODLINE

EX REG | PR REG | HEC ST — PARSONS HEC-RAS SECTION
EX 100 | PR 100

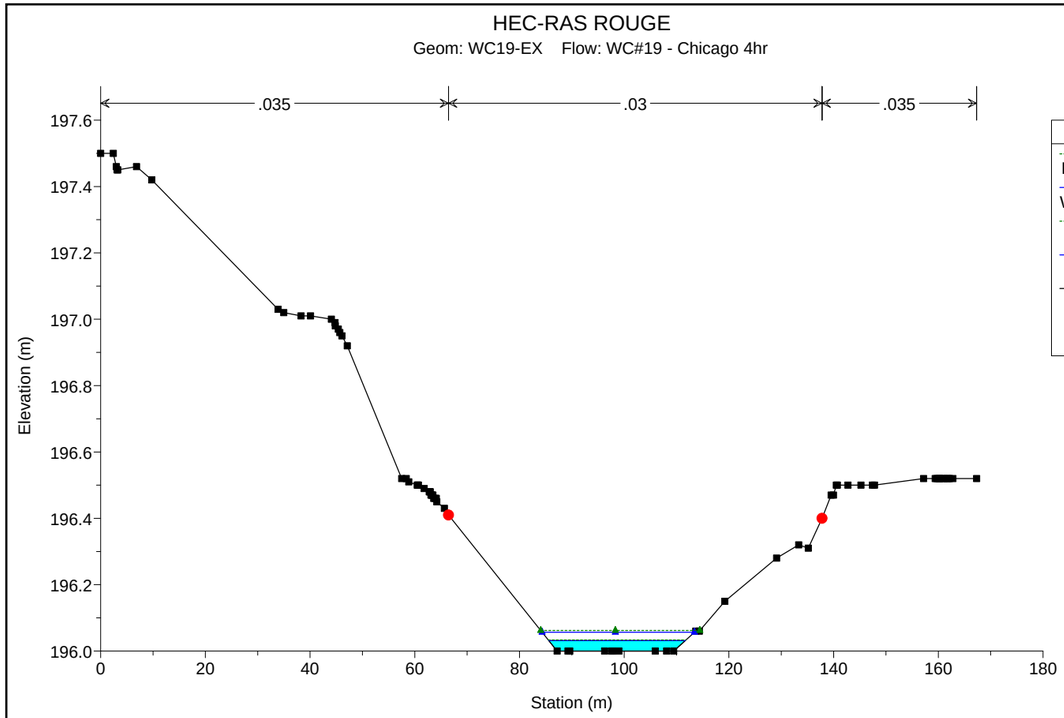
CROSS SECTION NUMBER

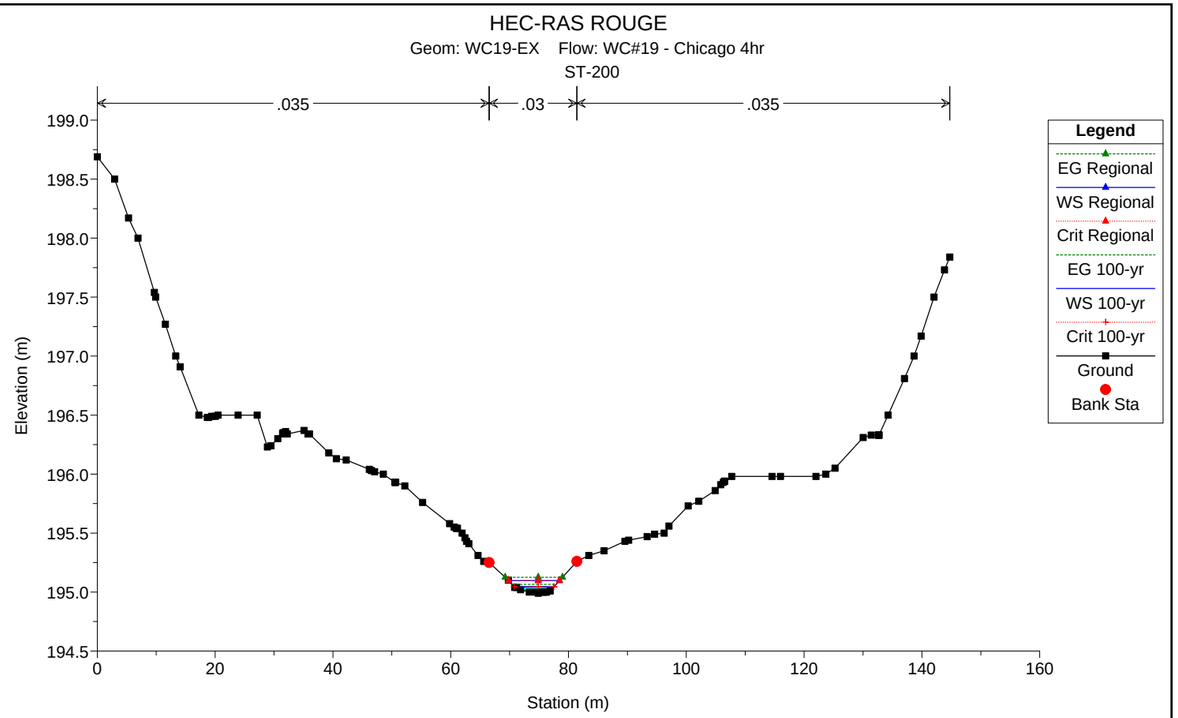
PROPOSED WL ELEVATION (m)

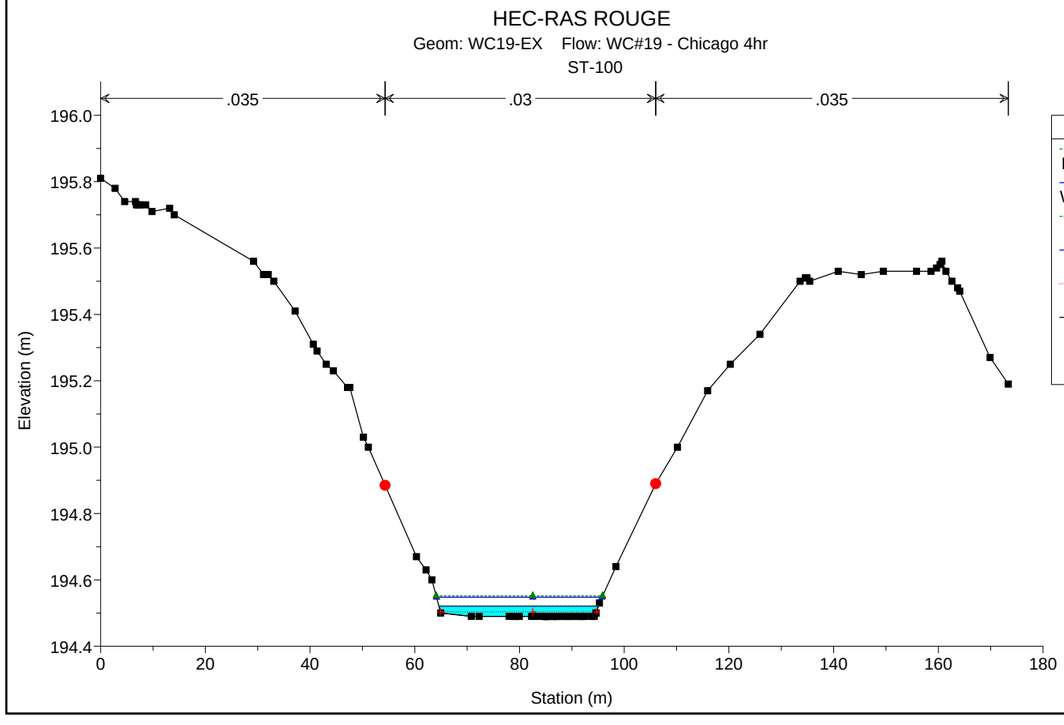
EXISTING UPDATED WL ELEVATION (m)

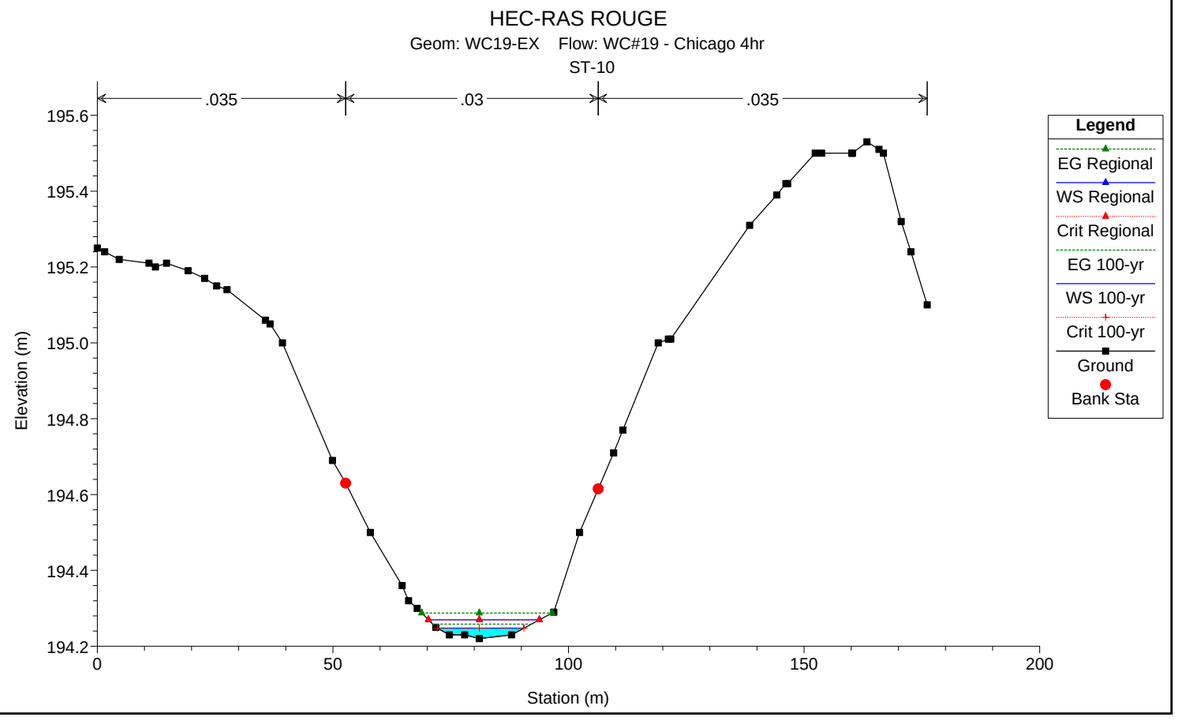
SCALE HORIZONTAL
5m 0m 10m 20m 30m
1:1000

DATE: SEPTEMBER 2016	Ontario	PARSONS 625 COCHRANE DRIVE, SUITE 500 MARKHAM, ONTARIO L3R 9R9 TEL: 905-943-0500 FAX: 905-943-0400	407 TRANSITWAY FROM KENNEDY RD TO BROCK RD
SCALE: 1:1000			FIGURE 6.12 - HEC-RAS ANALYSIS - PETTICOAT CREEK (WC#19)


HEC-RAS ROUGE
Geom: WC19-EX Flow: WC#19 - Chicago 4hr
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Bank Sta


HEC-RAS ROUGE
Geom: WC19-EX Flow: WC#19 - Chicago 4hr
ST-200
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta


HEC-RAS ROUGE
Geom: WC19-EX Flow: WC#19 - Chicago 4hr
ST-100
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta


HEC-RAS ROUGE
Geom: WC19-EX Flow: WC#19 - Chicago 4hr
ST-10
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta

HEC-RAS Plan: WC19-EX-4hr CH River: Rouge Reach: WC19

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC19	300	2-yr	0.03	196.00	196.01		196.01	0.003172	0.10	0.30	23.83	0.29
WC19	300	5-yr	0.06	196.00	196.02		196.02	0.003847	0.14	0.43	24.50	0.34
WC19	300	10-yr	0.08	196.00	196.02		196.02	0.006679	0.18	0.43	24.52	0.44
WC19	300	25-yr	0.10	196.00	196.02		196.02	0.004977	0.18	0.55	25.07	0.40
WC19	300	50-yr	0.12	196.00	196.03		196.03	0.003262	0.17	0.70	25.80	0.33
WC19	300	100-yr	0.15	196.00	196.03		196.03	0.003846	0.20	0.76	26.10	0.37
WC19	300	Check Flow	0.19	196.00	196.04		196.04	0.004253	0.22	0.86	26.55	0.39
WC19	300	Regional	0.47	196.00	196.06		196.06	0.005147	0.32	1.45	29.12	0.46
WC19	200	2-yr	0.03	194.99	195.01	195.01	195.03	0.078910	0.51	0.06	4.65	1.44
WC19	200	5-yr	0.06	194.99	195.03	195.03	195.04	0.035895	0.49	0.12	5.52	1.07
WC19	200	10-yr	0.08	194.99	195.04	195.04	195.05	0.011679	0.37	0.22	6.65	0.65
WC19	200	25-yr	0.10	194.99	195.04	195.04	195.05	0.018249	0.46	0.22	6.65	0.81
WC19	200	50-yr	0.12	194.99	195.03	195.03	195.06	0.060075	0.74	0.16	5.89	1.43
WC19	200	100-yr	0.15	194.99	195.04	195.04	195.07	0.033378	0.65	0.23	6.73	1.11
WC19	200	Check Flow	0.19	194.99	195.05	195.05	195.07	0.025147	0.64	0.30	7.07	0.99
WC19	200	Regional	0.47	194.99	195.10	195.10	195.12	0.015639	0.73	0.64	8.64	0.86
WC19	100	2-yr	0.03	194.49	194.50		194.50	0.002483	0.09	0.35	29.79	0.25
WC19	100	5-yr	0.06	194.49	194.51	194.50	194.51	0.002280	0.11	0.55	30.04	0.26
WC19	100	10-yr	0.08	194.49	194.51	194.50	194.51	0.002754	0.13	0.61	30.12	0.29
WC19	100	25-yr	0.10	194.49	194.51	194.50	194.52	0.002892	0.14	0.69	30.22	0.30
WC19	100	50-yr	0.12	194.49	194.52	194.50	194.52	0.002898	0.16	0.77	30.32	0.31
WC19	100	100-yr	0.15	194.49	194.52	194.50	194.52	0.002970	0.17	0.88	30.45	0.32
WC19	100	Check Flow	0.19	194.49	194.52		194.52	0.004266	0.21	0.91	30.49	0.39
WC19	100	Regional	0.47	194.49	194.55		194.55	0.003272	0.27	1.72	31.61	0.37
WC19	10	2-yr	0.03	194.22	194.23	194.23	194.24	0.073624	0.32	0.09	14.13	1.25
WC19	10	5-yr	0.06	194.22	194.24	194.24	194.25	0.139033	0.50	0.12	14.65	1.78
WC19	10	10-yr	0.08	194.22	194.24	194.24	194.25	0.058400	0.42	0.19	16.04	1.23
WC19	10	25-yr	0.10	194.22	194.24	194.24	194.25	0.035802	0.38	0.26	17.27	1.00
WC19	10	50-yr	0.12	194.22	194.25	194.25	194.25	0.035408	0.41	0.30	17.87	1.01
WC19	10	100-yr	0.15	194.22	194.25	194.25	194.26	0.041417	0.46	0.33	18.36	1.11
WC19	10	Check Flow	0.19	194.22	194.26	194.26	194.26	0.015819	0.36	0.53	20.87	0.72
WC19	10	Regional	0.47	194.22	194.27	194.27	194.29	0.029585	0.60	0.79	23.57	1.04

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X    X
X     X  X        X           X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X           X  X     X    X        X
X     X  X        X    X      X   X    X    X        X
X     X  XXXXXX    XXXX       X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: HEC-RAS ROUGE
Project File : HEC.prj
Run Date and Time: 1/20/2016 9:47:06 AM

Project in SI units

Project Description:
HEC-RAS model for creek crossings along the proposed 407 TWY Ph 2 started from
scratch

PLAN DATA

Plan Title: Plan 16
Plan File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.p16

Geometry Title: WC19-EX
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g15

Flow Title : WC#19 - Chicago 4hr
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f06

Plan Summary Information:
Number of: Cross Sections = 4 Multiple Openings = 0
Culverts = 0 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: WC#19 - Chicago 4hr
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f06

Flow Data (m3/s)

River	Reach	RS	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Check Flow	Regional
Rouge	WC19	300	.03	.06	.08	.1	.12	.15	.19	.47

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Rouge	WC19	2-yr		Critical
Rouge	WC19	5-yr		Critical
Rouge	WC19	10-yr		Critical
Rouge	WC19	25-yr		Critical
Rouge	WC19	50-yr		Critical
Rouge	WC19	100-yr		Critical
Rouge	WC19	Check Flow		Critical
Rouge	WC19	Regional		Critical

GEOMETRY DATA

Geometry Title: WC19-EX
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g15

CROSS SECTION

RIVER: Rouge
REACH: WC19 RS: 300

INPUT
Description:
Station Elevation Data num= 76

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	197.5	2.42	197.5	2.99	197.46	3.14	197.45	3.28	197.45
6.84	197.46	9.77	197.42	33.89	197.03	34.97	197.02	38.27	197.01
40.08	197.01	44.06	197	44.76	196.99	44.82	196.98	45.4	196.97
45.69	196.96	46.08	196.95	47.11	196.92	57.5	196.52	58.36	196.52
58.86	196.51	60.47	196.5	60.59	196.5	60.69	196.5	61.79	196.49
62.76	196.48	62.85	196.48	62.96	196.48	63.09	196.47	63.23	196.47
63.3	196.47	63.45	196.47	63.63	196.46	63.95	196.46	64.12	196.46
64.21	196.45	65.65	196.43	66.45	196.41	87.18	196	89.27	196
89.59	196	96.25	196	97.6	196	97.84	196	98.99	196
105.93	196	108.11	196	109.45	196	113.68	196.06	114.35	196.06
119.21	196.15	129.11	196.28	133.33	196.32	135.16	196.31	137.79	196.4
139.53	196.47	139.97	196.47	140.51	196.5	140.72	196.5	142.74	196.5
145.21	196.5	147.42	196.5	147.79	196.5	157.18	196.52	159.4	196.52
159.72	196.52	160.04	196.52	160.22	196.52	160.26	196.52	160.76	196.52
161.03	196.52	161.63	196.52	161.8	196.52	162.1	196.52	162.77	196.52
167.32	196.52								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	66.45	.03	137.79	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
66.45 137.79 112.4 112.4 112.4 .1 .3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	196.01	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	196.01	Reach Len. (m)	112.40	112.40	112.40
Crit W.S. (m)		Flow Area (m2)		0.30	
E.G. Slope (m/m)	0.003172	Area (m2)		0.30	
Q Total (m3/s)	0.03	Flow (m3/s)		0.03	
Top Width (m)	23.83	Top Width (m)		23.83	
Vel Total (m/s)	0.10	Avg. Vel. (m/s)		0.10	
Max Chl Dpth (m)	0.01	Hydr. Depth (m)		0.01	

Conv. Total (m3/s)	0.5	Conv. (m3/s)		0.5		
Length Wtd. (m)	112.40	Wetted Per. (m)		23.83		
Min Ch El (m)	196.00	Shear (N/m2)		0.39		
Alpha	1.00	Stream Power (N/m s)	8010.92	0.00	0.00	
Frctn Loss (m)	0.99	Cum Volume (1000 m3)		0.04		
C & E Loss (m)	0.00	Cum SA (1000 m2)		3.27		

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	196.02	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.00	Wt. n-Val.		0.030		
W.S. Elev (m)	196.02	Reach Len. (m)	112.40	112.40	112.40	
Crit W.S. (m)		Flow Area (m2)		0.43		
E.G. Slope (m/m)	0.003847	Area (m2)		0.43		
Q Total (m3/s)	0.06	Flow (m3/s)		0.06		
Top Width (m)	24.50	Top Width (m)		24.50		
Vel Total (m/s)	0.14	Avg. Vel. (m/s)		0.14		
Max Chl Dpth (m)	0.02	Hydr. Depth (m)		0.02		
Conv. Total (m3/s)	1.0	Conv. (m3/s)		1.0		
Length Wtd. (m)	112.40	Wetted Per. (m)		24.50		
Min Ch El (m)	196.00	Shear (N/m2)		0.66		
Alpha	1.00	Stream Power (N/m s)	8010.92	0.00	0.00	
Frctn Loss (m)	0.98	Cum Volume (1000 m3)		0.06		
C & E Loss (m)	0.00	Cum SA (1000 m2)		3.40		

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	196.02	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.00	Wt. n-Val.		0.030		
W.S. Elev (m)	196.02	Reach Len. (m)	112.40	112.40	112.40	
Crit W.S. (m)		Flow Area (m2)		0.43		
E.G. Slope (m/m)	0.006679	Area (m2)		0.43		
Q Total (m3/s)	0.08	Flow (m3/s)		0.08		
Top Width (m)	24.52	Top Width (m)		24.52		
Vel Total (m/s)	0.18	Avg. Vel. (m/s)		0.18		
Max Chl Dpth (m)	0.02	Hydr. Depth (m)		0.02		
Conv. Total (m3/s)	1.0	Conv. (m3/s)		1.0		
Length Wtd. (m)	112.40	Wetted Per. (m)		24.52		
Min Ch El (m)	196.00	Shear (N/m2)		1.16		
Alpha	1.00	Stream Power (N/m s)	8010.92	0.00	0.00	
Frctn Loss (m)	0.97	Cum Volume (1000 m3)		0.07		
C & E Loss (m)	0.00	Cum SA (1000 m2)		3.52		

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	196.02	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.00	Wt. n-Val.		0.030		
W.S. Elev (m)	196.02	Reach Len. (m)	112.40	112.40	112.40	
Crit W.S. (m)		Flow Area (m2)		0.55		
E.G. Slope (m/m)	0.004977	Area (m2)		0.55		
Q Total (m3/s)	0.10	Flow (m3/s)		0.10		
Top Width (m)	25.07	Top Width (m)		25.07		
Vel Total (m/s)	0.18	Avg. Vel. (m/s)		0.18		
Max Chl Dpth (m)	0.02	Hydr. Depth (m)		0.02		
Conv. Total (m3/s)	1.4	Conv. (m3/s)		1.4		
Length Wtd. (m)	112.40	Wetted Per. (m)		25.07		
Min Ch El (m)	196.00	Shear (N/m2)		1.06		
Alpha	1.00	Stream Power (N/m s)	8010.92	0.00	0.00	
Frctn Loss (m)	0.97	Cum Volume (1000 m3)		0.08		
C & E Loss (m)	0.00	Cum SA (1000 m2)		3.58		

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	196.03	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.00	Wt. n-Val.		0.030		
W.S. Elev (m)	196.03	Reach Len. (m)	112.40	112.40	112.40	
Crit W.S. (m)		Flow Area (m2)		0.70		
E.G. Slope (m/m)	0.003262	Area (m2)		0.70		
Q Total (m3/s)	0.12	Flow (m3/s)		0.12		
Top Width (m)	25.80	Top Width (m)		25.80		
Vel Total (m/s)	0.17	Avg. Vel. (m/s)		0.17		
Max Chl Dpth (m)	0.03	Hydr. Depth (m)		0.03		
Conv. Total (m3/s)	2.1	Conv. (m3/s)		2.1		
Length Wtd. (m)	112.40	Wetted Per. (m)		25.80		
Min Ch El (m)	196.00	Shear (N/m2)		0.87		
Alpha	1.00	Stream Power (N/m s)	8010.92	0.00	0.00	
Frctn Loss (m)	0.96	Cum Volume (1000 m3)		0.09		
C & E Loss (m)	0.00	Cum SA (1000 m2)		3.57		

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	196.03	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.00	Wt. n-Val.		0.030		
W.S. Elev (m)	196.03	Reach Len. (m)	112.40	112.40	112.40	
Crit W.S. (m)		Flow Area (m2)		0.76		
E.G. Slope (m/m)	0.003846	Area (m2)		0.76		
Q Total (m3/s)	0.15	Flow (m3/s)		0.15		
Top Width (m)	26.10	Top Width (m)		26.10		
Vel Total (m/s)	0.20	Avg. Vel. (m/s)		0.20		
Max Chl Dpth (m)	0.03	Hydr. Depth (m)		0.03		
Conv. Total (m3/s)	2.4	Conv. (m3/s)		2.4		
Length Wtd. (m)	112.40	Wetted Per. (m)		26.10		
Min Ch El (m)	196.00	Shear (N/m2)		1.10		
Alpha	1.00	Stream Power (N/m s)	8010.92	0.00	0.00	
Frctn Loss (m)	0.96	Cum Volume (1000 m3)		0.11		
C & E Loss (m)	0.00	Cum SA (1000 m2)		3.67		

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	196.04	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.00	Wt. n-Val.		0.030		
W.S. Elev (m)	196.04	Reach Len. (m)	112.40	112.40	112.40	
Crit W.S. (m)		Flow Area (m2)		0.86		
E.G. Slope (m/m)	0.004253	Area (m2)		0.86		
Q Total (m3/s)	0.19	Flow (m3/s)		0.19		
Top Width (m)	26.55	Top Width (m)		26.55		
Vel Total (m/s)	0.22	Avg. Vel. (m/s)		0.22		
Max Chl Dpth (m)	0.04	Hydr. Depth (m)		0.03		

Conv. Total (m3/s)	2.9	Conv. (m3/s)		2.9		
Length Wtd. (m)	112.40	Wetted Per. (m)		26.55		
Min Ch El (m)	196.00	Shear (N/m2)		1.35		
Alpha	1.00	Stream Power (N/m s)	8010.92	0.00	0.00	
Frctn Loss (m)	0.96	Cum Volume (1000 m3)		0.12		
C & E Loss (m)	0.00	Cum SA (1000 m2)		3.77		

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	196.06	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.01	Wt. n-Val.		0.030		
W.S. Elev (m)	196.06	Reach Len. (m)	112.40	112.40	112.40	
Crit W.S. (m)		Flow Area (m2)		1.45		
E.G. Slope (m/m)	0.005147	Area (m2)		1.45		
Q Total (m3/s)	0.47	Flow (m3/s)		0.47		
Top Width (m)	29.12	Top Width (m)		29.12		
Vel Total (m/s)	0.32	Avg. Vel. (m/s)		0.32		
Max Chl Dpth (m)	0.06	Hydr. Depth (m)		0.05		
Conv. Total (m3/s)	6.6	Conv. (m3/s)		6.6		
Length Wtd. (m)	112.40	Wetted Per. (m)		29.13		
Min Ch El (m)	196.00	Shear (N/m2)		2.52		
Alpha	1.00	Stream Power (N/m s)	8010.92	0.00	0.00	
Frctn Loss (m)	0.93	Cum Volume (1000 m3)		0.22		
C & E Loss (m)	0.00	Cum SA (1000 m2)		4.14		

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Rouge
REACH: WC19 RS: 200

INPUT
Description: ST-200
Station Elevation Data num= 101

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	198.69	2.94	198.5	5.29	198.17	6.91	198	9.69	197.54
9.9	197.5	11.55	197.27	13.32	197	14.06	196.91	17.23	196.5
18.68	196.48	18.88	196.48	19.42	196.49	20.05	196.49	20.49	196.5
23.91	196.5	27.15	196.5	28.88	196.23	29.48	196.24	30.64	196.3
31.46	196.34	31.52	196.35	31.59	196.35	31.96	196.36	32.25	196.34
35.1	196.37	35.76	196.34	36.01	196.34	39.29	196.18	40.58	196.13
42.25	196.12	46.19	196.04	46.54	196.03	47.07	196.02	48.55	196
50.5	195.93	50.55	195.93	50.61	195.93	50.66	195.93	52.2	195.9
55.22	195.76	59.81	195.58	60.58	195.55	60.94	195.54	61.04	195.54
61.14	195.54	61.93	195.5	62.41	195.46	62.69	195.43	63.08	195.41
64.63	195.31	65.61	195.26	66.52	195.25	69.78	195.1	70.86	195.04
71.18	195.04	71.87	195.02	73.35	195	74.44	195	74.87	194.99
75.48	195	75.68	195	76.08	195	76.28	195	76.89	195.01
81.42	195.26	83.45	195.31	86.04	195.35	89.57	195.43	90.21	195.44
93.34	195.47	94.62	195.49	96.23	195.5	97.06	195.56	100.32	195.73
102.11	195.77	104.91	195.86	105.84	195.91	106.29	195.93	106.48	195.94
106.5	195.94	107.72	195.98	114.55	195.98	115.98	195.98	122.01	195.98
123.69	196	125.24	196.05	130.02	196.31	131.4	196.33	132.64	196.33
132.65	196.33	132.66	196.33	132.7	196.33	132.71	196.33	134.26	196.5
137.03	196.81	138.67	197	139.87	197.17	142.05	197.5	143.84	197.73
144.73	197.84								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	66.52	.03	81.42	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
66.52	81.42	50.6	50.6	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	195.03	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.01	Wt. n-Val.		0.030		
W.S. Elev (m)	195.01	Reach Len. (m)	50.60	50.60	50.60	
Crit W.S. (m)	195.01	Flow Area (m2)		0.06		
E.G. Slope (m/m)	0.078910	Area (m2)		0.06		
Q Total (m3/s)	0.03	Flow (m3/s)		0.03		
Top Width (m)	4.65	Top Width (m)		4.65		
Vel Total (m/s)	0.51	Avg. Vel. (m/s)		0.51		
Max Chl Dpth (m)	0.02	Hydr. Depth (m)		0.01		
Conv. Total (m3/s)	0.1	Conv. (m3/s)		0.1		
Length Wtd. (m)	50.60	Wetted Per. (m)		4.65		
Min Ch El (m)	194.99	Shear (N/m2)		9.80		
Alpha	1.00	Stream Power (N/m s)	6929.37	0.00	0.00	
Frctn Loss (m)	0.36	Cum Volume (1000 m3)		0.02		
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.67		

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	195.04	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.01	Wt. n-Val.		0.030		
W.S. Elev (m)	195.03	Reach Len. (m)	50.60	50.60	50.60	
Crit W.S. (m)	195.03	Flow Area (m2)		0.12		
E.G. Slope (m/m)	0.035895	Area (m2)		0.12		
Q Total (m3/s)	0.06	Flow (m3/s)		0.06		
Top Width (m)	5.52	Top Width (m)		5.52		
Vel Total (m/s)	0.49	Avg. Vel. (m/s)		0.49		
Max Chl Dpth (m)	0.04	Hydr. Depth (m)		0.02		
Conv. Total (m3/s)	0.3	Conv. (m3/s)		0.3		
Length Wtd. (m)	50.60	Wetted Per. (m)		5.52		
Min Ch El (m)	194.99	Shear (N/m2)		7.72		
Alpha	1.00	Stream Power (N/m s)	6929.37	0.00	0.00	
Frctn Loss (m)	0.29	Cum Volume (1000 m3)		0.03		
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.71		

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	195.05	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.01	Wt. n-Val.		0.030		
W.S. Elev (m)	195.04	Reach Len. (m)	50.60	50.60	50.60	
Crit W.S. (m)	195.04	Flow Area (m2)		0.22		
E.G. Slope (m/m)	0.011679	Area (m2)		0.22		
Q Total (m3/s)	0.08	Flow (m3/s)		0.08		

Top Width (m)	6.65	Top Width (m)		6.65	
Vel Total (m/s)	0.37	Avg. Vel. (m/s)		0.37	
Max Chl Dpth (m)	0.05	Hydr. Depth (m)		0.03	
Conv. Total (m3/s)	0.7	Conv. (m3/s)		0.7	
Length Wtd. (m)	50.60	Wetted Per. (m)		6.65	
Min Ch El (m)	194.99	Shear (N/m2)		3.74	
Alpha	1.00	Stream Power (N/m s)	6929.37	0.00	0.00
Frctn Loss (m)	0.25	Cum Volume (1000 m3)		0.04	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.77	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	195.05	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	195.04	Reach Len. (m)	50.60	50.60	50.60
Crit W.S. (m)	195.04	Flow Area (m2)		0.22	
E.G. Slope (m/m)	0.018249	Area (m2)		0.22	
Q Total (m3/s)	0.10	Flow (m3/s)		0.10	
Top Width (m)	6.65	Top Width (m)		6.65	
Vel Total (m/s)	0.46	Avg. Vel. (m/s)		0.46	
Max Chl Dpth (m)	0.05	Hydr. Depth (m)		0.03	
Conv. Total (m3/s)	0.7	Conv. (m3/s)		0.7	
Length Wtd. (m)	50.60	Wetted Per. (m)		6.65	
Min Ch El (m)	194.99	Shear (N/m2)		5.85	
Alpha	1.00	Stream Power (N/m s)	6929.37	0.00	0.00
Frctn Loss (m)	0.30	Cum Volume (1000 m3)		0.04	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.79	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	195.06	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.030	
W.S. Elev (m)	195.03	Reach Len. (m)	50.60	50.60	50.60
Crit W.S. (m)	195.03	Flow Area (m2)		0.16	
E.G. Slope (m/m)	0.060075	Area (m2)		0.16	
Q Total (m3/s)	0.12	Flow (m3/s)		0.12	
Top Width (m)	5.89	Top Width (m)		5.89	
Vel Total (m/s)	0.74	Avg. Vel. (m/s)		0.74	
Max Chl Dpth (m)	0.04	Hydr. Depth (m)		0.03	
Conv. Total (m3/s)	0.5	Conv. (m3/s)		0.5	
Length Wtd. (m)	50.60	Wetted Per. (m)		5.90	
Min Ch El (m)	194.99	Shear (N/m2)		16.15	
Alpha	1.00	Stream Power (N/m s)	6929.37	0.00	0.00
Frctn Loss (m)	0.39	Cum Volume (1000 m3)		0.04	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.79	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	195.07	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	195.04	Reach Len. (m)	50.60	50.60	50.60
Crit W.S. (m)	195.04	Flow Area (m2)		0.23	
E.G. Slope (m/m)	0.033378	Area (m2)		0.23	
Q Total (m3/s)	0.15	Flow (m3/s)		0.15	
Top Width (m)	6.73	Top Width (m)		6.73	
Vel Total (m/s)	0.65	Avg. Vel. (m/s)		0.65	
Max Chl Dpth (m)	0.05	Hydr. Depth (m)		0.03	
Conv. Total (m3/s)	0.8	Conv. (m3/s)		0.8	
Length Wtd. (m)	50.60	Wetted Per. (m)		6.73	
Min Ch El (m)	194.99	Shear (N/m2)		11.30	
Alpha	1.00	Stream Power (N/m s)	6929.37	0.00	0.00
Frctn Loss (m)	0.36	Cum Volume (1000 m3)		0.05	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.83	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	195.07	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	195.05	Reach Len. (m)	50.60	50.60	50.60
Crit W.S. (m)	195.05	Flow Area (m2)		0.30	
E.G. Slope (m/m)	0.025147	Area (m2)		0.30	
Q Total (m3/s)	0.19	Flow (m3/s)		0.19	
Top Width (m)	7.07	Top Width (m)		7.07	
Vel Total (m/s)	0.64	Avg. Vel. (m/s)		0.64	
Max Chl Dpth (m)	0.06	Hydr. Depth (m)		0.04	
Conv. Total (m3/s)	1.2	Conv. (m3/s)		1.2	
Length Wtd. (m)	50.60	Wetted Per. (m)		7.07	
Min Ch El (m)	194.99	Shear (N/m2)		10.37	
Alpha	1.00	Stream Power (N/m s)	6929.37	0.00	0.00
Frctn Loss (m)	0.43	Cum Volume (1000 m3)		0.06	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.88	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	195.12	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.030	
W.S. Elev (m)	195.10	Reach Len. (m)	50.60	50.60	50.60

Crit W.S. (m)	195.10	Flow Area (m2)		0.64	
E.G. Slope (m/m)	0.015639	Area (m2)		0.64	
Q Total (m3/s)	0.47	Flow (m3/s)		0.47	
Top Width (m)	8.64	Top Width (m)		8.64	
Vel Total (m/s)	0.73	Avg. Vel. (m/s)		0.73	
Max Chl Dpth (m)	0.11	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	3.8	Conv. (m3/s)		3.8	
Length Wtd. (m)	50.60	Wetted Per. (m)		8.65	
Min Ch El (m)	194.99	Shear (N/m2)		11.34	
Alpha	1.00	Stream Power (N/m s)	6929.37	0.00	0.00
Frctn Loss (m)	0.31	Cum Volume (1000 m3)		0.11	
C & E Loss (m)	0.01	Cum SA (1000 m2)		2.02	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Rouge
REACH: WC19 RS: 100

INPUT
Description: ST-100
Station Elevation Data num= 93

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	195.81	2.75	195.78	4.58	195.74	6.65	195.74	6.83	195.73
7.16	195.73	7.49	195.73	8.6	195.73	9.81	195.71	13.17	195.72
14.06	195.7	29.22	195.56	31.11	195.52	31.16	195.52	31.46	195.52
31.88	195.52	32	195.52	33.06	195.5	37.14	195.41	40.61	195.31
41.34	195.29	43.08	195.25	44.45	195.23	47.15	195.18	47.58	195.18
50.19	195.03	51.14	195	54.35	194.885	60.32	194.67	62.16	194.63
63.27	194.6	64.96	194.5	70.79	194.49	72.29	194.49	78.03	194.49
79.05	194.49	79.25	194.49	79.96	194.49	82.33	194.49	82.96	194.49
83.86	194.49	84.88	194.49	84.89	194.49	84.97	194.49	85.06	194.49
85.25	194.49	85.34	194.49	85.41	194.49	86.46	194.49	86.52	194.49
86.59	194.49	87.1	194.49	87.17	194.49	88.21	194.49	88.55	194.49
89.34	194.49	89.66	194.49	90.16	194.49	90.91	194.49	91.58	194.49
91.65	194.49	92.21	194.49	92.44	194.49	93.77	194.49	94.28	194.49
94.6	194.5	94.64	194.5	95.26	194.53	98.42	194.64	106.03	194.89
110.17	195	115.95	195.17	120.26	195.25	125.92	195.34	133.59	195.5
134.61	195.51	134.74	195.51	134.92	195.51	135.42	195.5	140.88	195.53
145.28	195.52	149.48	195.53	155.83	195.53	158.6	195.53	159.67	195.54
160.31	195.55	160.69	195.56	161.46	195.53	162.58	195.5	163.7	195.48
164.08	195.47	169.89	195.27	173.37	195.19				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	54.35	.03	106.03	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
54.35	106.03	36.3	36.3	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	194.50	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	194.50	Reach Len. (m)	36.30	36.30	36.30
Crit W.S. (m)		Flow Area (m2)		0.35	
E.G. Slope (m/m)	0.002483	Area (m2)		0.35	
Q Total (m3/s)	0.03	Flow (m3/s)		0.03	
Top Width (m)	29.79	Top Width (m)		29.79	
Vel Total (m/s)	0.09	Avg. Vel. (m/s)		0.09	
Max Chl Dpth (m)	0.01	Hydr. Depth (m)		0.01	
Conv. Total (m3/s)	0.6	Conv. (m3/s)		0.6	
Length Wtd. (m)	36.30	Wetted Per. (m)		29.79	
Min Ch El (m)	194.49	Shear (N/m2)		0.29	
Alpha	1.00	Stream Power (N/m s)	8300.58	0.00	0.00
Frctn Loss (m)	0.26	Cum Volume (1000 m3)		0.01	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.80	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	194.51	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	194.51	Reach Len. (m)	36.30	36.30	36.30
Crit W.S. (m)	194.50	Flow Area (m2)		0.55	
E.G. Slope (m/m)	0.002280	Area (m2)		0.55	
Q Total (m3/s)	0.06	Flow (m3/s)		0.06	
Top Width (m)	30.04	Top Width (m)		30.04	
Vel Total (m/s)	0.11	Avg. Vel. (m/s)		0.11	
Max Chl Dpth (m)	0.02	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	1.3	Conv. (m3/s)		1.3	
Length Wtd. (m)	36.30	Wetted Per. (m)		30.04	
Min Ch El (m)	194.49	Shear (N/m2)		0.41	
Alpha	1.00	Stream Power (N/m s)	8300.58	0.00	0.00
Frctn Loss (m)	0.26	Cum Volume (1000 m3)		0.01	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.81	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	194.51	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	194.51	Reach Len. (m)	36.30	36.30	36.30
Crit W.S. (m)	194.50	Flow Area (m2)		0.61	
E.G. Slope (m/m)	0.002754	Area (m2)		0.61	
Q Total (m3/s)	0.08	Flow (m3/s)		0.08	
Top Width (m)	30.12	Top Width (m)		30.12	
Vel Total (m/s)	0.13	Avg. Vel. (m/s)		0.13	
Max Chl Dpth (m)	0.02	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	1.5	Conv. (m3/s)		1.5	
Length Wtd. (m)	36.30	Wetted Per. (m)		30.12	
Min Ch El (m)	194.49	Shear (N/m2)		0.55	
Alpha	1.00	Stream Power (N/m s)	8300.58	0.00	0.00
Frctn Loss (m)	0.27	Cum Volume (1000 m3)		0.01	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.84	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	194.52	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	194.51	Reach Len. (m)	36.30	36.30	36.30
Crit W.S. (m)	194.50	Flow Area (m2)		0.69	
E.G. Slope (m/m)	0.002892	Area (m2)		0.69	
Q Total (m3/s)	0.10	Flow (m3/s)		0.10	
Top Width (m)	30.22	Top Width (m)		30.22	
Vel Total (m/s)	0.14	Avg. Vel. (m/s)		0.14	
Max Chl Dpth (m)	0.02	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	1.9	Conv. (m3/s)		1.9	
Length Wtd. (m)	36.30	Wetted Per. (m)		30.22	
Min Ch El (m)	194.49	Shear (N/m2)		0.65	
Alpha	1.00	Stream Power (N/m s)	8300.58	0.00	0.00

Frctn Loss (m)	0.25	Cum Volume (1000 m3)	0.02
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.86

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	194.52	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	194.52	Reach Len. (m)	36.30	36.30	36.30
Crit W.S. (m)	194.50	Flow Area (m2)		0.77	
E.G. Slope (m/m)	0.002898	Area (m2)		0.77	
Q Total (m3/s)	0.12	Flow (m3/s)		0.12	
Top Width (m)	30.32	Top Width (m)		30.32	
Vel Total (m/s)	0.16	Avg. Vel. (m/s)		0.16	
Max Chl Dpth (m)	0.03	Hydr. Depth (m)		0.03	
Conv. Total (m3/s)	2.2	Conv. (m3/s)		2.2	
Length Wtd. (m)	36.30	Wetted Per. (m)		30.32	
Min Ch El (m)	194.49	Shear (N/m2)		0.72	
Alpha	1.00	Stream Power (N/m s)	8300.58	0.00	0.00
Frctn Loss (m)	0.25	Cum Volume (1000 m3)		0.02	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.87	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	194.52	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	194.52	Reach Len. (m)	36.30	36.30	36.30
Crit W.S. (m)	194.50	Flow Area (m2)		0.88	
E.G. Slope (m/m)	0.002970	Area (m2)		0.88	
Q Total (m3/s)	0.15	Flow (m3/s)		0.15	
Top Width (m)	30.45	Top Width (m)		30.45	
Vel Total (m/s)	0.17	Avg. Vel. (m/s)		0.17	
Max Chl Dpth (m)	0.03	Hydr. Depth (m)		0.03	
Conv. Total (m3/s)	2.8	Conv. (m3/s)		2.8	
Length Wtd. (m)	36.30	Wetted Per. (m)		30.45	
Min Ch El (m)	194.49	Shear (N/m2)		0.84	
Alpha	1.00	Stream Power (N/m s)	8300.58	0.00	0.00
Frctn Loss (m)	0.27	Cum Volume (1000 m3)		0.02	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.89	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	194.52	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	194.52	Reach Len. (m)	36.30	36.30	36.30
Crit W.S. (m)		Flow Area (m2)		0.91	
E.G. Slope (m/m)	0.004266	Area (m2)		0.91	
Q Total (m3/s)	0.19	Flow (m3/s)		0.19	
Top Width (m)	30.49	Top Width (m)		30.49	
Vel Total (m/s)	0.21	Avg. Vel. (m/s)		0.21	
Max Chl Dpth (m)	0.03	Hydr. Depth (m)		0.03	
Conv. Total (m3/s)	2.9	Conv. (m3/s)		2.9	
Length Wtd. (m)	36.30	Wetted Per. (m)		30.49	
Min Ch El (m)	194.49	Shear (N/m2)		1.25	
Alpha	1.00	Stream Power (N/m s)	8300.58	0.00	0.00
Frctn Loss (m)	0.27	Cum Volume (1000 m3)		0.03	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.93	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	194.55	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	194.55	Reach Len. (m)	36.30	36.30	36.30
Crit W.S. (m)		Flow Area (m2)		1.72	
E.G. Slope (m/m)	0.003272	Area (m2)		1.72	
Q Total (m3/s)	0.47	Flow (m3/s)		0.47	
Top Width (m)	31.61	Top Width (m)		31.61	
Vel Total (m/s)	0.27	Avg. Vel. (m/s)		0.27	
Max Chl Dpth (m)	0.06	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	8.2	Conv. (m3/s)		8.2	
Length Wtd. (m)	36.30	Wetted Per. (m)		31.61	
Min Ch El (m)	194.49	Shear (N/m2)		1.74	
Alpha	1.00	Stream Power (N/m s)	8300.58	0.00	0.00
Frctn Loss (m)	0.27	Cum Volume (1000 m3)		0.05	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.00	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Rouge
REACH: WC19 RS: 10

INPUT
Description: ST-10
Station Elevation Data num= 47

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	195.25	1.56	195.24	4.64	195.22	10.95	195.21	12.34	195.2		
14.68	195.21	19.26	195.19	22.79	195.17	25.33	195.15	27.53	195.14		
35.66	195.06	36.67	195.05	39.3	195	49.91	194.69	52.72	194.63		
57.93	194.5	64.7	194.36	66.07	194.32	67.88	194.3	71.81	194.25		
74.72	194.23	77.95	194.23	81.07	194.22	87.89	194.23	96.88	194.29		
102.35	194.5	106.3	194.615	109.59	194.71	111.53	194.77	119.04	195		
121.19	195.01	121.7	195.01	138.45	195.31	144.2	195.39	146.13	195.42		
146.5	195.42	152.34	195.5	153.72	195.5	160.13	195.5	160.18	195.5		
160.25	195.5	163.34	195.53	165.88	195.51	166.81	195.5	170.6	195.32		
172.66	195.24	176.11	195.1								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	52.72	.03	106.3	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
52.72	106.3	0	0	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	194.24	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	194.23	Reach Len. (m)			
Crit W.S. (m)	194.23	Flow Area (m2)		0.09	
E.G. Slope (m/m)	0.073624	Area (m2)		0.09	
Q Total (m3/s)	0.03	Flow (m3/s)		0.03	
Top Width (m)	14.13	Top Width (m)		14.13	
Vel Total (m/s)	0.32	Avg. Vel. (m/s)		0.32	
Max Chl Dpth (m)	0.01	Hydr. Depth (m)		0.01	
Conv. Total (m3/s)	0.1	Conv. (m3/s)		0.1	
Length Wtd. (m)		Wetted Per. (m)		14.13	
Min Ch El (m)	194.22	Shear (N/m2)		4.80	
Alpha	1.00	Stream Power (N/m s)	8431.78	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	194.25	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	194.24	Reach Len. (m)			
Crit W.S. (m)	194.24	Flow Area (m2)		0.12	
E.G. Slope (m/m)	0.139033	Area (m2)		0.12	
Q Total (m3/s)	0.06	Flow (m3/s)		0.06	
Top Width (m)	14.65	Top Width (m)		14.65	
Vel Total (m/s)	0.50	Avg. Vel. (m/s)		0.50	
Max Chl Dpth (m)	0.02	Hydr. Depth (m)		0.01	
Conv. Total (m3/s)	0.2	Conv. (m3/s)		0.2	
Length Wtd. (m)		Wetted Per. (m)		14.65	
Min Ch El (m)	194.22	Shear (N/m2)		11.10	
Alpha	1.00	Stream Power (N/m s)	8431.78	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	194.25	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	194.24	Reach Len. (m)			
Crit W.S. (m)	194.24	Flow Area (m2)		0.19	
E.G. Slope (m/m)	0.058400	Area (m2)		0.19	
Q Total (m3/s)	0.08	Flow (m3/s)		0.08	
Top Width (m)	16.04	Top Width (m)		16.04	
Vel Total (m/s)	0.42	Avg. Vel. (m/s)		0.42	
Max Chl Dpth (m)	0.02	Hydr. Depth (m)		0.01	
Conv. Total (m3/s)	0.3	Conv. (m3/s)		0.3	
Length Wtd. (m)		Wetted Per. (m)		16.04	
Min Ch El (m)	194.22	Shear (N/m2)		6.81	
Alpha	1.00	Stream Power (N/m s)	8431.78	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	194.25	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	194.24	Reach Len. (m)			
Crit W.S. (m)	194.24	Flow Area (m2)		0.26	
E.G. Slope (m/m)	0.035802	Area (m2)		0.26	
Q Total (m3/s)	0.10	Flow (m3/s)		0.10	
Top Width (m)	17.27	Top Width (m)		17.27	
Vel Total (m/s)	0.38	Avg. Vel. (m/s)		0.38	
Max Chl Dpth (m)	0.02	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	0.5	Conv. (m3/s)		0.5	
Length Wtd. (m)		Wetted Per. (m)		17.27	
Min Ch El (m)	194.22	Shear (N/m2)		5.29	
Alpha	1.00	Stream Power (N/m s)	8431.78	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	194.25	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	194.25	Reach Len. (m)			
Crit W.S. (m)	194.25	Flow Area (m2)		0.30	
E.G. Slope (m/m)	0.035408	Area (m2)		0.30	
Q Total (m3/s)	0.12	Flow (m3/s)		0.12	
Top Width (m)	17.87	Top Width (m)		17.87	
Vel Total (m/s)	0.41	Avg. Vel. (m/s)		0.41	
Max Chl Dpth (m)	0.03	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	0.6	Conv. (m3/s)		0.6	
Length Wtd. (m)		Wetted Per. (m)		17.87	
Min Ch El (m)	194.22	Shear (N/m2)		5.73	
Alpha	1.00	Stream Power (N/m s)	8431.78	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	194.26	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	194.25	Reach Len. (m)			
Crit W.S. (m)	194.25	Flow Area (m2)		0.33	
E.G. Slope (m/m)	0.041417	Area (m2)		0.33	
Q Total (m3/s)	0.15	Flow (m3/s)		0.15	
Top Width (m)	18.36	Top Width (m)		18.36	
Vel Total (m/s)	0.46	Avg. Vel. (m/s)		0.46	
Max Chl Dpth (m)	0.03	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	0.7	Conv. (m3/s)		0.7	
Length Wtd. (m)		Wetted Per. (m)		18.36	
Min Ch El (m)	194.22	Shear (N/m2)		7.20	
Alpha	1.00	Stream Power (N/m s)	8431.78	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	194.26	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	194.26	Reach Len. (m)			
Crit W.S. (m)	194.26	Flow Area (m2)		0.53	
E.G. Slope (m/m)	0.015819	Area (m2)		0.53	
Q Total (m3/s)	0.19	Flow (m3/s)		0.19	
Top Width (m)	20.87	Top Width (m)		20.87	
Vel Total (m/s)	0.36	Avg. Vel. (m/s)		0.36	
Max Chl Dpth (m)	0.04	Hydr. Depth (m)		0.03	
Conv. Total (m3/s)	1.5	Conv. (m3/s)		1.5	
Length Wtd. (m)		Wetted Per. (m)		20.87	
Min Ch El (m)	194.22	Shear (N/m2)		3.92	
Alpha	1.00	Stream Power (N/m s)	8431.78	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	194.29	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	194.27	Reach Len. (m)			
Crit W.S. (m)	194.27	Flow Area (m2)		0.79	
E.G. Slope (m/m)	0.029585	Area (m2)		0.79	
Q Total (m3/s)	0.47	Flow (m3/s)		0.47	
Top Width (m)	23.57	Top Width (m)		23.57	
Vel Total (m/s)	0.60	Avg. Vel. (m/s)		0.60	
Max Chl Dpth (m)	0.05	Hydr. Depth (m)		0.03	
Conv. Total (m3/s)	2.7	Conv. (m3/s)		2.7	
Length Wtd. (m)		Wetted Per. (m)		23.57	
Min Ch El (m)	194.22	Shear (N/m2)		9.71	
Alpha	1.00	Stream Power (N/m s)	8431.78	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

SUMMARY OF MANNING'S N VALUES

River:Rouge

Reach	River Sta.	n1	n2	n3
WC19	300	.035	.03	.035

WC19	200	.035	.03	.035
WC19	100	.035	.03	.035
WC19	10	.035	.03	.035

SUMMARY OF REACH LENGTHS

River: Rouge

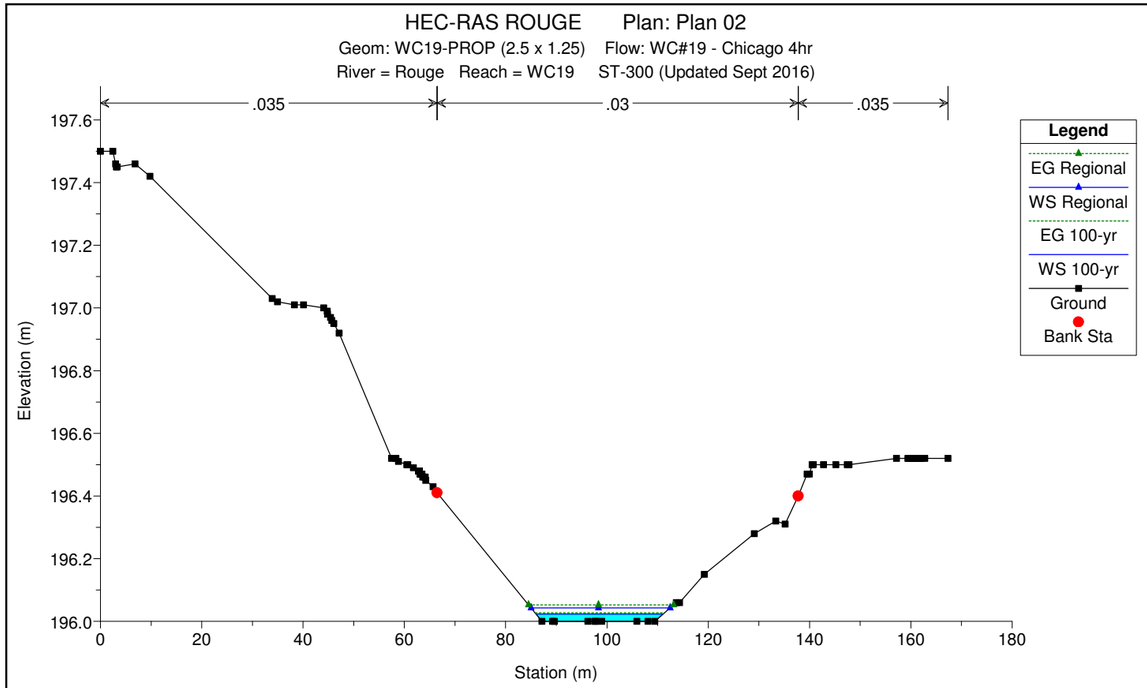
Reach	River Sta.	Left	Channel	Right
WC19	300	112.4	112.4	112.4
WC19	200	50.6	50.6	50.6
WC19	100	36.3	36.3	36.3
WC19	10	0	0	0

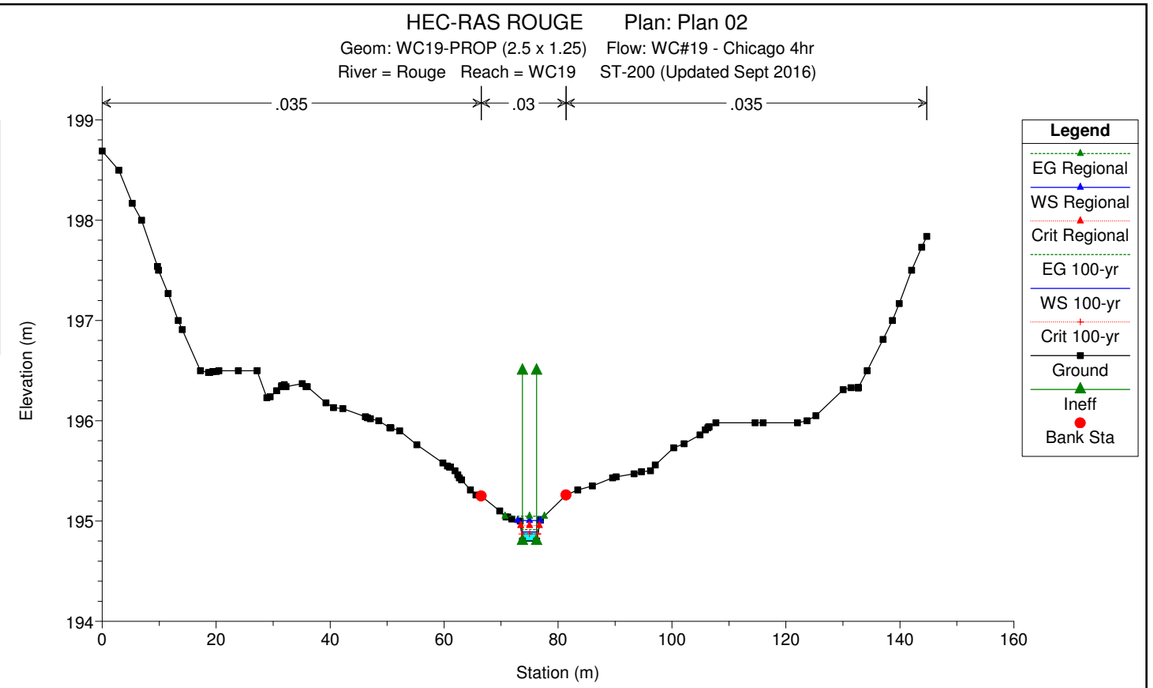
SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Rouge

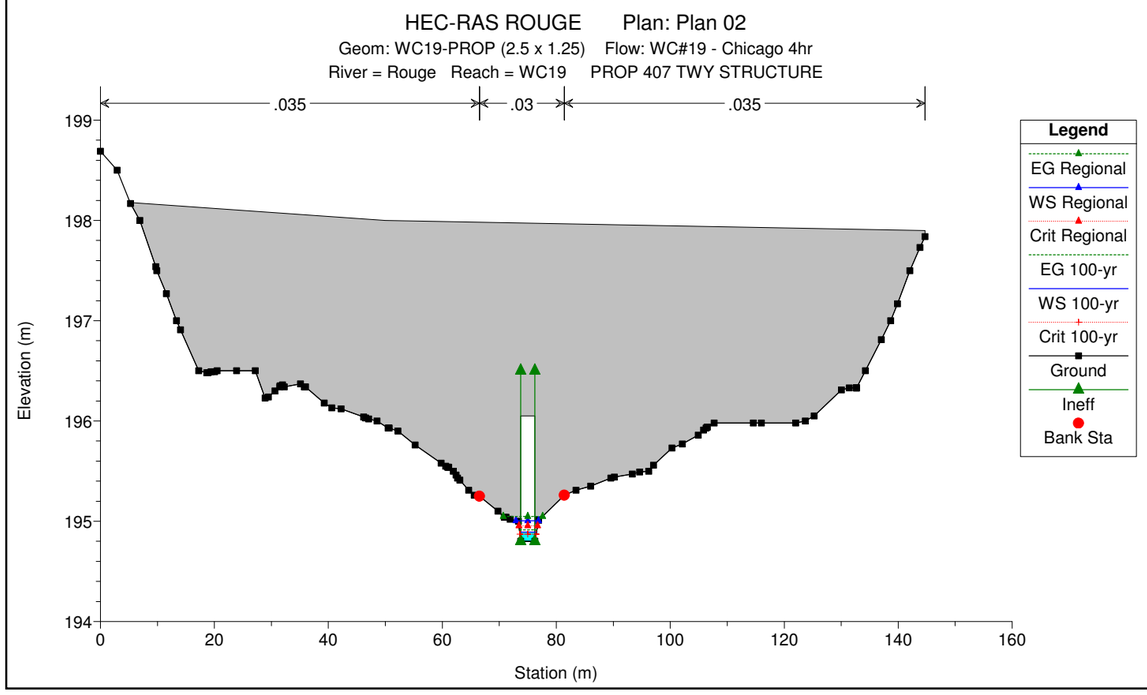
Reach	River Sta.	Contr.	Expan.
WC19	300	.1	.3
WC19	200	.1	.3
WC19	100	.1	.3
WC19	10	.1	.3

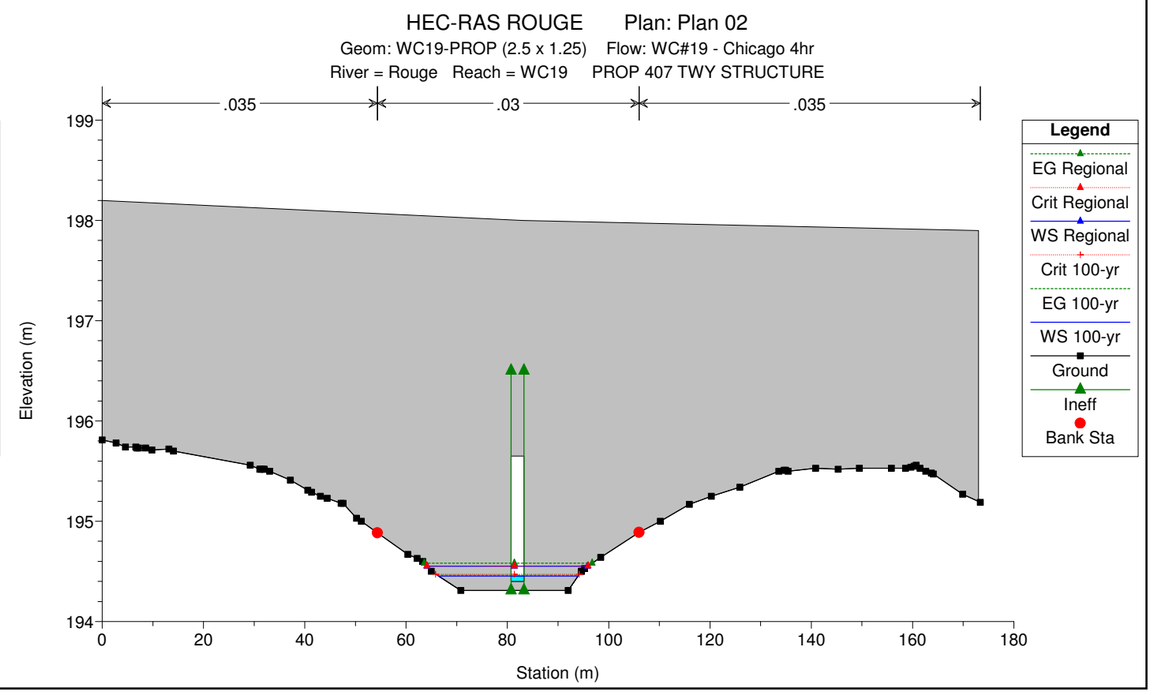
Profile Output Table - Standard Table 1

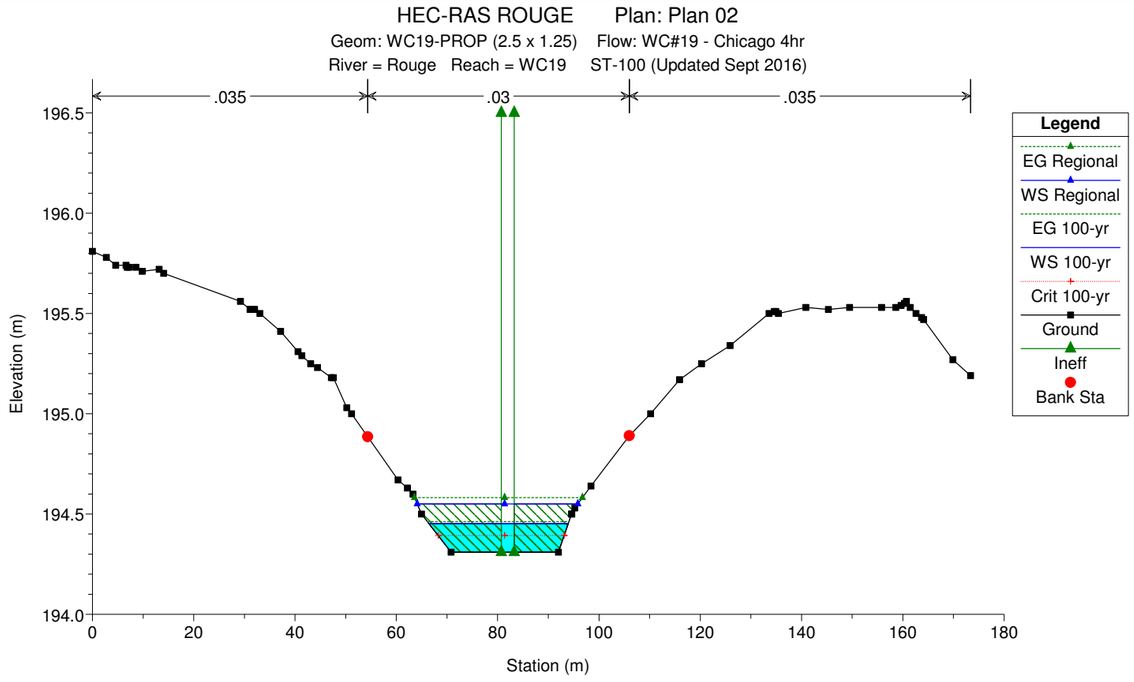
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
WC19	300	2-yr	0.03	196.00	196.01		196.01	0.003172	0.10	0.30	23.83	0.29
WC19	300	5-yr	0.06	196.00	196.02		196.02	0.003847	0.14	0.43	24.50	0.34
WC19	300	10-yr	0.08	196.00	196.02		196.02	0.006679	0.18	0.43	24.52	0.44
WC19	300	25-yr	0.10	196.00	196.02		196.02	0.004977	0.18	0.55	25.07	0.40
WC19	300	50-yr	0.12	196.00	196.03		196.03	0.003262	0.17	0.70	25.80	0.33
WC19	300	100-yr	0.15	196.00	196.03		196.03	0.003846	0.20	0.76	26.10	0.37
WC19	300	Check Flow	0.19	196.00	196.04		196.04	0.004253	0.22	0.86	26.55	0.39
WC19	300	Regional	0.47	196.00	196.06		196.06	0.005147	0.32	1.45	29.12	0.46
WC19	200	2-yr	0.03	194.99	195.01	195.01	195.03	0.078910	0.51	0.06	4.65	1.44
WC19	200	5-yr	0.06	194.99	195.03	195.03	195.04	0.035895	0.49	0.12	5.52	1.07
WC19	200	10-yr	0.08	194.99	195.04	195.04	195.05	0.011679	0.37	0.22	6.65	0.65
WC19	200	25-yr	0.10	194.99	195.04	195.04	195.05	0.018249	0.46	0.22	6.65	0.81
WC19	200	50-yr	0.12	194.99	195.03	195.03	195.06	0.060075	0.74	0.16	5.89	1.43
WC19	200	100-yr	0.15	194.99	195.04	195.04	195.07	0.033378	0.65	0.23	6.73	1.11
WC19	200	Check Flow	0.19	194.99	195.05	195.05	195.07	0.025147	0.64	0.30	7.07	0.99
WC19	200	Regional	0.47	194.99	195.10	195.10	195.12	0.015639	0.73	0.64	8.64	0.86
WC19	100	2-yr	0.03	194.49	194.50		194.50	0.002483	0.09	0.35	29.79	0.25
WC19	100	5-yr	0.06	194.49	194.51	194.50	194.51	0.002280	0.11	0.55	30.04	0.26
WC19	100	10-yr	0.08	194.49	194.51	194.50	194.51	0.002754	0.13	0.61	30.12	0.29
WC19	100	25-yr	0.10	194.49	194.51	194.50	194.52	0.002892	0.14	0.69	30.22	0.30
WC19	100	50-yr	0.12	194.49	194.52	194.50	194.52	0.002898	0.16	0.77	30.32	0.31
WC19	100	100-yr	0.15	194.49	194.52	194.50	194.52	0.002970	0.17	0.88	30.45	0.32
WC19	100	Check Flow	0.19	194.49	194.52		194.52	0.004266	0.21	0.91	30.49	0.39
WC19	100	Regional	0.47	194.49	194.55		194.55	0.003272	0.27	1.72	31.61	0.37
WC19	10	2-yr	0.03	194.22	194.23	194.23	194.24	0.073624	0.32	0.09	14.13	1.25
WC19	10	5-yr	0.06	194.22	194.24	194.24	194.25	0.139033	0.50	0.12	14.65	1.78
WC19	10	10-yr	0.08	194.22	194.24	194.24	194.25	0.058400	0.42	0.19	16.04	1.23
WC19	10	25-yr	0.10	194.22	194.24	194.24	194.25	0.035802	0.38	0.26	17.27	1.00
WC19	10	50-yr	0.12	194.22	194.25	194.25	194.25	0.035408	0.41	0.30	17.87	1.01
WC19	10	100-yr	0.15	194.22	194.25	194.25	194.26	0.041417	0.46	0.33	18.36	1.11
WC19	10	Check Flow	0.19	194.22	194.26	194.26	194.26	0.015819	0.36	0.53	20.87	0.72
WC19	10	Regional	0.47	194.22	194.27	194.27	194.29	0.029585	0.60	0.79	23.57	1.04

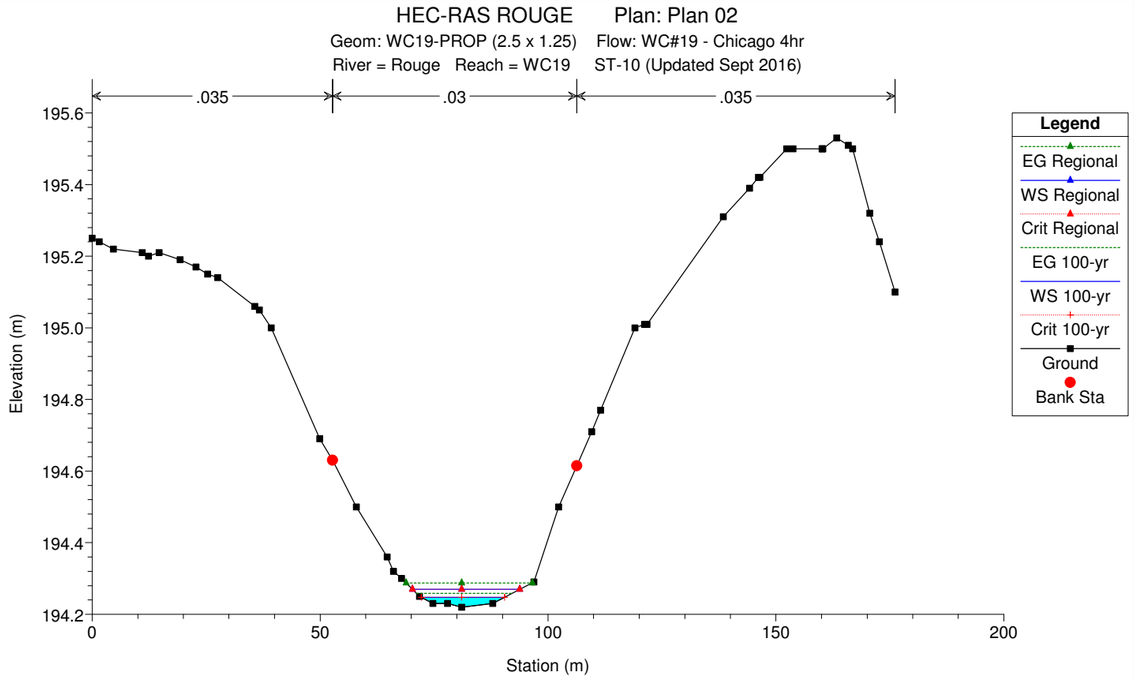

HEC-RAS ROUGE Plan: Plan 02
Geom: WC19-PROP (2.5 x 1.25) Flow: WC#19 - Chicago 4hr
River = Rouge Reach = WC19 ST-300 (Updated Sept 2016)
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Bank Sta


HEC-RAS ROUGE Plan: Plan 02
Geom: WC19-PROP (2.5 x 1.25) Flow: WC#19 - Chicago 4hr
River = Rouge Reach = WC19 ST-200 (Updated Sept 2016)
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 02
Geom: WC19-PROP (2.5 x 1.25) Flow: WC#19 - Chicago 4hr
River = Rouge Reach = WC19 PROP 407 TWY STRUCTURE
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 02
Geom: WC19-PROP (2.5 x 1.25) Flow: WC#19 - Chicago 4hr
River = Rouge Reach = WC19 PROP 407 TWY STRUCTURE
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG Regional
Crit Regional
WS Regional
Crit 100-yr
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 02
Geom: WC19-PROP (2.5 x 1.25) Flow: WC#19 - Chicago 4hr
River = Rouge Reach = WC19 ST-100 (Updated Sept 2016)
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 02
Geom: WC19-PROP (2.5 x 1.25) Flow: WC#19 - Chicago 4hr
River = Rouge Reach = WC19 ST-10 (Updated Sept 2016)
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta

HEC-RAS Plan: WC19-PROP-4hr CH River: Rouge Reach: WC19

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC19	300	2-yr	0.03	196.00	196.01		196.01	0.003833	0.11	0.28	23.75	0.31
WC19	300	5-yr	0.06	196.00	196.01		196.02	0.009387	0.18	0.33	23.98	0.50
WC19	300	10-yr	0.08	196.00	196.02		196.02	0.010871	0.21	0.37	24.21	0.55
WC19	300	25-yr	0.10	196.00	196.02		196.02	0.009317	0.22	0.45	24.59	0.53
WC19	300	50-yr	0.12	196.00	196.02		196.02	0.010486	0.25	0.48	24.77	0.57
WC19	300	100-yr	0.15	196.00	196.02		196.03	0.011076	0.27	0.55	25.08	0.59
WC19	300	Check Flow	0.19	196.00	196.03		196.03	0.012722	0.31	0.61	25.37	0.64
WC19	300	Regional	0.47	196.00	196.04		196.05	0.013578	0.44	1.06	27.44	0.72
WC19	200	2-yr	0.03	194.80	194.82	194.82	194.84	0.080985	0.66	0.05	2.59	1.55
WC19	200	5-yr	0.06	194.80	194.85	194.84	194.86	0.011156	0.48	0.13	2.75	0.68
WC19	200	10-yr	0.08	194.80	194.86	194.85	194.88	0.009490	0.51	0.16	2.82	0.65
WC19	200	25-yr	0.10	194.80	194.87	194.85	194.89	0.010921	0.58	0.17	2.85	0.71
WC19	200	50-yr	0.12	194.80	194.88	194.86	194.90	0.009467	0.60	0.20	2.90	0.68
WC19	200	100-yr	0.15	194.80	194.89	194.87	194.91	0.008975	0.65	0.23	2.97	0.68
WC19	200	Check Flow	0.19	194.80	194.91	194.88	194.94	0.007623	0.68	0.28	3.07	0.65
WC19	200	Regional	0.47	194.80	195.01	194.95	195.05	0.006186	0.91	0.51	3.96	0.64
WC19	150		Culvert									
WC19	100	2-yr	0.03	194.31	194.38	194.33	194.38	0.001156	0.18	0.16	24.11	0.23
WC19	100	5-yr	0.06	194.31	194.41		194.41	0.001322	0.25	0.24	25.43	0.26
WC19	100	10-yr	0.08	194.31	194.42		194.42	0.001664	0.30	0.26	25.89	0.30
WC19	100	25-yr	0.10	194.31	194.42		194.43	0.001974	0.35	0.29	26.29	0.33
WC19	100	50-yr	0.12	194.31	194.44	194.37	194.44	0.002062	0.38	0.32	26.81	0.34
WC19	100	100-yr	0.15	194.31	194.45	194.39	194.46	0.002139	0.42	0.36	27.54	0.36
WC19	100	Check Flow	0.19	194.31	194.46	194.39	194.47	0.002802	0.50	0.38	27.94	0.41
WC19	100	Regional	0.47	194.31	194.55		194.58	0.003677	0.78	0.60	31.74	0.51
WC19	10	2-yr	0.03	194.22	194.23	194.23	194.24	0.073624	0.32	0.09	14.13	1.25
WC19	10	5-yr	0.06	194.22	194.24	194.24	194.25	0.139033	0.50	0.12	14.65	1.78
WC19	10	10-yr	0.08	194.22	194.24	194.24	194.25	0.058399	0.42	0.19	16.04	1.23
WC19	10	25-yr	0.10	194.22	194.24	194.24	194.25	0.035802	0.38	0.26	17.27	1.00
WC19	10	50-yr	0.12	194.22	194.25	194.25	194.25	0.035886	0.41	0.29	17.84	1.02
WC19	10	100-yr	0.15	194.22	194.25	194.25	194.26	0.043536	0.47	0.32	18.28	1.13
WC19	10	Check Flow	0.19	194.22	194.26	194.26	194.26	0.015819	0.36	0.53	20.87	0.73
WC19	10	Regional	0.47	194.22	194.27	194.27	194.29	0.029824	0.60	0.79	23.55	1.04

HEC-RAS HEC-RAS 5.0.1 April 2016
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X     X
X     X  X        X           X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X           X  X     X    X        X
X     X  X        X    X      X   X    X    X        X
X     X  XXXXXX    XXXX       X    X   X    X   XXXXX
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PROJECT DATA
Project Title: HEC-RAS ROUGE
Project File : HEC.prj
Run Date and Time: 9/8/2016 9:55:47 AM

Project in SI units

Project Description:
HEC-RAS model for creek crossings along the proposed 407 TWY Ph 2 started
from scratch

PLAN DATA

Plan Title: Plan 02
Plan File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.p02

Geometry Title: WC19-PROP (2.5 x 1.25)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g28

Flow Title : WC#19 - Chicago 4hr
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f06

Plan Summary Information:
Number of: Cross Sections = 4 Multiple Openings = 0
Culverts = 1 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: WC#19 - Chicago 4hr
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f06

Flow Data (m3/s)

River	Reach	RS	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Check Flow	Regional
Rouge	WC19	300	.03	.06	.08	.1	.12	.15	.19	.47

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Rouge	WC19	2-yr		Critical
Rouge	WC19	5-yr		Critical
Rouge	WC19	10-yr		Critical
Rouge	WC19	25-yr		Critical
Rouge	WC19	50-yr		Critical
Rouge	WC19	100-yr		Critical
Rouge	WC19	Check Flow		Critical
Rouge	WC19	Regional		Critical

GEOMETRY DATA

Geometry Title: WC19-PROP (2.5 x 1.25)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g28

CROSS SECTION

RIVER: Rouge
REACH: WC19 RS: 300

INPUT
Description: ST-300 (Updated Sept 2016)
Station Elevation Data num= 76

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	197.5	2.42	197.5	2.99	197.46	3.14	197.45	3.28	197.45
6.84	197.46	9.77	197.42	33.89	197.03	34.97	197.02	38.27	197.01
40.08	197.01	44.06	197	44.76	196.99	44.82	196.98	45.4	196.97
45.69	196.96	46.08	196.95	47.11	196.92	57.5	196.52	58.36	196.52
58.86	196.51	60.47	196.5	60.59	196.5	60.69	196.5	61.79	196.49
62.76	196.48	62.85	196.48	62.96	196.48	63.09	196.47	63.23	196.47
63.3	196.47	63.45	196.47	63.63	196.46	63.95	196.46	64.12	196.46
64.21	196.45	65.65	196.43	66.45	196.41	87.18	196	89.27	196
89.59	196	96.25	196	97.6	196	97.84	196	98.99	196
105.93	196	108.11	196	109.45	196	113.68	196.06	114.35	196.06
119.21	196.15	129.11	196.28	133.33	196.32	135.16	196.31	137.79	196.4
139.53	196.47	139.97	196.47	140.51	196.5	140.72	196.5	142.74	196.5
145.21	196.5	147.42	196.5	147.79	196.5	157.18	196.52	159.4	196.52
159.72	196.52	160.04	196.52	160.22	196.52	160.26	196.52	160.76	196.52
161.03	196.52	161.63	196.52	161.8	196.52	162.1	196.52	162.77	196.52
167.32	196.52								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	66.45	.03	137.79	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
66.45 137.79 112.4 112.4 112.4 .3 .5

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	196.01	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	196.01	Reach Len. (m)	112.40	112.40	112.40
Crit W.S. (m)		Flow Area (m2)		0.28	
E.G. Slope (m/m)	0.003833	Area (m2)		0.28	
Q Total (m3/s)	0.03	Flow (m3/s)		0.03	
Top Width (m)	23.75	Top Width (m)		23.75	
Vel Total (m/s)	0.11	Avg. Vel. (m/s)		0.11	
Max Chl Dpth (m)	0.01	Hydr. Depth (m)		0.01	
Conv. Total (m3/s)	0.5	Conv. (m3/s)		0.5	
Length Wtd. (m)	112.40	Wetted Per. (m)		23.75	

Min Ch El (m)	196.00	Shear (N/m2)	0.44
Alpha	1.00	Stream Power (N/m s)	0.05
Frctn Loss (m)	1.16	Cum Volume (1000 m3)	0.05
C & E Loss (m)	0.01	Cum SA (1000 m2)	2.85

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	196.02	Element			
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	196.01	Reach Len. (m)	112.40	112.40	112.40
Crit W.S. (m)		Flow Area (m2)		0.33	
E.G. Slope (m/m)	0.009387	Area (m2)		0.33	
Q Total (m3/s)	0.06	Flow (m3/s)		0.06	
Top Width (m)	23.98	Top Width (m)		23.98	
Vel Total (m/s)	0.18	Avg. Vel. (m/s)		0.18	
Max Chl Dpth (m)	0.01	Hydr. Depth (m)		0.01	
Conv. Total (m3/s)	0.6	Conv. (m3/s)		0.6	
Length Wtd. (m)	112.40	Wetted Per. (m)		23.98	
Min Ch El (m)	196.00	Shear (N/m2)		1.25	
Alpha	1.00	Stream Power (N/m s)		0.23	
Frctn Loss (m)	1.15	Cum Volume (1000 m3)		0.07	
C & E Loss (m)	0.00	Cum SA (1000 m2)		2.94	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	196.02	Element			
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	196.02	Reach Len. (m)	112.40	112.40	112.40
Crit W.S. (m)		Flow Area (m2)		0.37	
E.G. Slope (m/m)	0.010871	Area (m2)		0.37	
Q Total (m3/s)	0.08	Flow (m3/s)		0.08	
Top Width (m)	24.21	Top Width (m)		24.21	
Vel Total (m/s)	0.21	Avg. Vel. (m/s)		0.21	
Max Chl Dpth (m)	0.02	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	0.8	Conv. (m3/s)		0.8	
Length Wtd. (m)	112.40	Wetted Per. (m)		24.21	
Min Ch El (m)	196.00	Shear (N/m2)		1.64	
Alpha	1.00	Stream Power (N/m s)		0.35	
Frctn Loss (m)	1.14	Cum Volume (1000 m3)		0.09	
C & E Loss (m)	0.00	Cum SA (1000 m2)		3.01	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	196.02	Element			
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	196.02	Reach Len. (m)	112.40	112.40	112.40
Crit W.S. (m)		Flow Area (m2)		0.45	
E.G. Slope (m/m)	0.009317	Area (m2)		0.45	
Q Total (m3/s)	0.10	Flow (m3/s)		0.10	
Top Width (m)	24.59	Top Width (m)		24.59	
Vel Total (m/s)	0.22	Avg. Vel. (m/s)		0.22	
Max Chl Dpth (m)	0.02	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	1.0	Conv. (m3/s)		1.0	
Length Wtd. (m)	112.40	Wetted Per. (m)		24.59	
Min Ch El (m)	196.00	Shear (N/m2)		1.67	
Alpha	1.00	Stream Power (N/m s)		0.37	
Frctn Loss (m)	1.13	Cum Volume (1000 m3)		0.10	
C & E Loss (m)	0.00	Cum SA (1000 m2)		3.07	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	196.02	Element			
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	196.02	Reach Len. (m)	112.40	112.40	112.40
Crit W.S. (m)		Flow Area (m2)		0.48	
E.G. Slope (m/m)	0.010486	Area (m2)		0.48	
Q Total (m3/s)	0.12	Flow (m3/s)		0.12	
Top Width (m)	24.77	Top Width (m)		24.77	
Vel Total (m/s)	0.25	Avg. Vel. (m/s)		0.25	
Max Chl Dpth (m)	0.02	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	1.2	Conv. (m3/s)		1.2	
Length Wtd. (m)	112.40	Wetted Per. (m)		24.77	
Min Ch El (m)	196.00	Shear (N/m2)		2.01	
Alpha	1.00	Stream Power (N/m s)		0.50	
Frctn Loss (m)	1.12	Cum Volume (1000 m3)		0.11	
C & E Loss (m)	0.00	Cum SA (1000 m2)		3.12	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	196.03	Element			
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	196.02	Reach Len. (m)	112.40	112.40	112.40
Crit W.S. (m)		Flow Area (m2)		0.55	
E.G. Slope (m/m)	0.011076	Area (m2)		0.55	
Q Total (m3/s)	0.15	Flow (m3/s)		0.15	
Top Width (m)	25.08	Top Width (m)		25.08	
Vel Total (m/s)	0.27	Avg. Vel. (m/s)		0.27	
Max Chl Dpth (m)	0.02	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	1.4	Conv. (m3/s)		1.4	
Length Wtd. (m)	112.40	Wetted Per. (m)		25.08	
Min Ch El (m)	196.00	Shear (N/m2)		2.37	
Alpha	1.00	Stream Power (N/m s)		0.65	
Frctn Loss (m)	1.12	Cum Volume (1000 m3)		0.12	
C & E Loss (m)	0.01	Cum SA (1000 m2)		3.18	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

			Left OB	Channel	Right OB
E.G. Elev (m)	196.03	Element			
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	196.03	Reach Len. (m)	112.40	112.40	112.40
Crit W.S. (m)		Flow Area (m2)		0.61	
E.G. Slope (m/m)	0.012722	Area (m2)		0.61	
Q Total (m3/s)	0.19	Flow (m3/s)		0.19	
Top Width (m)	25.37	Top Width (m)		25.37	
Vel Total (m/s)	0.31	Avg. Vel. (m/s)		0.31	
Max Chl Dpth (m)	0.03	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	1.7	Conv. (m3/s)		1.7	
Length Wtd. (m)	112.40	Wetted Per. (m)		25.37	
Min Ch El (m)	196.00	Shear (N/m2)		2.99	
Alpha	1.00	Stream Power (N/m s)		0.93	
Frctn Loss (m)	1.09	Cum Volume (1000 m3)		0.14	
C & E Loss (m)	0.01	Cum SA (1000 m2)		3.27	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	196.05	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	196.04	Reach Len. (m)	112.40	112.40	112.40
Crit W.S. (m)		Flow Area (m2)		1.06	
E.G. Slope (m/m)	0.013578	Area (m2)		1.06	
Q Total (m3/s)	0.47	Flow (m3/s)		0.47	
Top Width (m)	27.44	Top Width (m)		27.44	
Vel Total (m/s)	0.44	Avg. Vel. (m/s)		0.44	
Max Chl Dpth (m)	0.04	Hydr. Depth (m)		0.04	
Conv. Total (m3/s)	4.0	Conv. (m3/s)		4.0	
Length Wtd. (m)	112.40	Wetted Per. (m)		27.44	
Min Ch El (m)	196.00	Shear (N/m2)		5.14	
Alpha	1.00	Stream Power (N/m s)		2.28	
Frctn Loss (m)	0.99	Cum Volume (1000 m3)		0.25	
C & E Loss (m)	0.01	Cum SA (1000 m2)		3.67	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Rouge
REACH: WC19 RS: 200

INPUT
Description: ST-200 (Updated Sept 2016)
Station Elevation Data num= 97

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	198.69	2.94	198.5	5.29	198.17	6.91	198	9.69	197.54
9.9	197.5	11.55	197.27	13.32	197	14.06	196.91	17.23	196.5
18.68	196.48	18.88	196.48	19.42	196.49	20.05	196.49	20.49	196.5
23.91	196.5	27.15	196.5	28.88	196.23	29.48	196.24	30.64	196.3
31.46	196.34	31.52	196.35	31.59	196.35	31.96	196.36	32.25	196.34
35.1	196.37	35.76	196.34	36.01	196.34	39.29	196.18	40.58	196.13
42.25	196.12	46.19	196.04	46.54	196.03	47.07	196.02	48.55	196
50.5	195.93	50.55	195.93	50.61	195.93	50.66	195.93	52.2	195.9
55.22	195.76	59.81	195.58	60.58	195.55	60.94	195.54	61.04	195.54
61.14	195.54	61.93	195.5	62.41	195.46	62.69	195.43	63.08	195.41
64.63	195.31	65.61	195.26	66.52	195.25	69.78	195.1	70.86	195.04
71.18	195.04	71.87	195.02	73.35	195	73.75	194.8	76.25	194.8
76.89	195.01	81.42	195.26	83.45	195.31	86.04	195.35	89.57	195.43
90.21	195.44	93.34	195.47	94.62	195.49	96.23	195.5	97.06	195.56
100.32	195.73	102.11	195.77	104.91	195.86	105.84	195.91	106.29	195.93
106.48	195.94	106.5	195.94	107.72	195.98	114.55	195.98	115.98	195.98
122.01	195.98	123.69	196	125.24	196.05	130.02	196.31	131.4	196.33
132.64	196.33	132.65	196.33	132.66	196.33	132.7	196.33	132.71	196.33
134.26	196.5	137.03	196.81	138.67	197	139.87	197.17	142.05	197.5
143.84	197.73	144.73	197.84						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	66.52	.03	81.42	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
66.52	81.42	50.6	50.6	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	73.75	196.5	T
76.25	144.73	196.5	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	194.84	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	194.82	Reach Len. (m)	50.60	50.60	50.60
Crit W.S. (m)	194.82	Flow Area (m2)		0.05	
E.G. Slope (m/m)	0.080985	Area (m2)		0.05	
Q Total (m3/s)	0.03	Flow (m3/s)		0.03	
Top Width (m)	2.59	Top Width (m)		2.59	
Vel Total (m/s)	0.66	Avg. Vel. (m/s)		0.66	
Max Chl Dpth (m)	0.02	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	0.1	Conv. (m3/s)		0.1	
Length Wtd. (m)	50.60	Wetted Per. (m)		2.50	
Min Ch El (m)	194.80	Shear (N/m2)		14.49	
Alpha	1.00	Stream Power (N/m s)		9.53	
Frctn Loss (m)		Cum Volume (1000 m3)		0.03	
C & E Loss (m)		Cum SA (1000 m2)		1.37	

Warning: During subcritical analysis, the water surface upstream of culvert went to critical depth.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	194.86	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	194.85	Reach Len. (m)	50.60	50.60	50.60
Crit W.S. (m)	194.84	Flow Area (m2)		0.13	
E.G. Slope (m/m)	0.011156	Area (m2)		0.13	
Q Total (m3/s)	0.06	Flow (m3/s)		0.06	
Top Width (m)	2.75	Top Width (m)		2.75	
Vel Total (m/s)	0.48	Avg. Vel. (m/s)		0.48	
Max Chl Dpth (m)	0.05	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	0.6	Conv. (m3/s)		0.6	
Length Wtd. (m)	50.60	Wetted Per. (m)		2.50	
Min Ch El (m)	194.80	Shear (N/m2)		5.48	
Alpha	1.00	Stream Power (N/m s)		2.63	
Frctn Loss (m)		Cum Volume (1000 m3)		0.05	
C & E Loss (m)		Cum SA (1000 m2)		1.44	

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	194.88	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	194.86	Reach Len. (m)	50.60	50.60	50.60
Crit W.S. (m)	194.85	Flow Area (m2)		0.16	
E.G. Slope (m/m)	0.009490	Area (m2)		0.17	
Q Total (m3/s)	0.08	Flow (m3/s)		0.08	
Top Width (m)	2.82	Top Width (m)		2.82	
Vel Total (m/s)	0.51	Avg. Vel. (m/s)		0.51	
Max Chl Dpth (m)	0.06	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	0.8	Conv. (m3/s)		0.8	
Length Wtd. (m)	50.60	Wetted Per. (m)		2.50	
Min Ch El (m)	194.80	Shear (N/m2)		5.82	
Alpha	1.00	Stream Power (N/m s)		2.98	
Frctn Loss (m)		Cum Volume (1000 m3)		0.06	
C & E Loss (m)		Cum SA (1000 m2)		1.49	

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	194.89	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	194.87	Reach Len. (m)	50.60	50.60	50.60
Crit W.S. (m)	194.85	Flow Area (m2)		0.17	
E.G. Slope (m/m)	0.010921	Area (m2)		0.18	
Q Total (m3/s)	0.10	Flow (m3/s)		0.10	
Top Width (m)	2.85	Top Width (m)		2.85	
Vel Total (m/s)	0.58	Avg. Vel. (m/s)		0.58	
Max Chl Dpth (m)	0.07	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	1.0	Conv. (m3/s)		1.0	
Length Wtd. (m)	50.60	Wetted Per. (m)		2.50	
Min Ch El (m)	194.80	Shear (N/m2)		7.34	
Alpha	1.00	Stream Power (N/m s)		4.28	
Frctn Loss (m)		Cum Volume (1000 m3)		0.06	
C & E Loss (m)		Cum SA (1000 m2)		1.53	

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	194.90	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	194.88	Reach Len. (m)	50.60	50.60	50.60
Crit W.S. (m)	194.86	Flow Area (m2)		0.20	
E.G. Slope (m/m)	0.009467	Area (m2)		0.22	
Q Total (m3/s)	0.12	Flow (m3/s)		0.12	
Top Width (m)	2.90	Top Width (m)		2.90	
Vel Total (m/s)	0.60	Avg. Vel. (m/s)		0.60	
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	1.2	Conv. (m3/s)		1.2	
Length Wtd. (m)	50.60	Wetted Per. (m)		2.50	
Min Ch El (m)	194.80	Shear (N/m2)		7.41	
Alpha	1.00	Stream Power (N/m s)		4.46	
Frctn Loss (m)		Cum Volume (1000 m3)		0.07	
C & E Loss (m)		Cum SA (1000 m2)		1.56	

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	194.91	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	194.89	Reach Len. (m)	50.60	50.60	50.60
Crit W.S. (m)	194.87	Flow Area (m2)		0.23	
E.G. Slope (m/m)	0.008975	Area (m2)		0.25	
Q Total (m3/s)	0.15	Flow (m3/s)		0.15	
Top Width (m)	2.97	Top Width (m)		2.97	
Vel Total (m/s)	0.65	Avg. Vel. (m/s)		0.65	
Max Chl Dpth (m)	0.09	Hydr. Depth (m)		0.09	
Conv. Total (m3/s)	1.6	Conv. (m3/s)		1.6	
Length Wtd. (m)	50.60	Wetted Per. (m)		2.50	
Min Ch El (m)	194.80	Shear (N/m2)		8.16	
Alpha	1.00	Stream Power (N/m s)		5.28	
Frctn Loss (m)		Cum Volume (1000 m3)		0.08	
C & E Loss (m)		Cum SA (1000 m2)		1.60	

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	194.94	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	194.91	Reach Len. (m)	50.60	50.60	50.60
Crit W.S. (m)	194.88	Flow Area (m2)		0.28	
E.G. Slope (m/m)	0.007623	Area (m2)		0.31	
Q Total (m3/s)	0.19	Flow (m3/s)		0.19	
Top Width (m)	3.07	Top Width (m)		3.07	
Vel Total (m/s)	0.68	Avg. Vel. (m/s)		0.68	
Max Chl Dpth (m)	0.11	Hydr. Depth (m)		0.11	
Conv. Total (m3/s)	2.2	Conv. (m3/s)		2.2	
Length Wtd. (m)	50.60	Wetted Per. (m)		2.50	
Min Ch El (m)	194.80	Shear (N/m2)		8.39	
Alpha	1.00	Stream Power (N/m s)		5.68	
Frctn Loss (m)		Cum Volume (1000 m3)		0.09	
C & E Loss (m)		Cum SA (1000 m2)		1.67	

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	195.05	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.030	
W.S. Elev (m)	195.01	Reach Len. (m)	50.60	50.60	50.60
Crit W.S. (m)	194.95	Flow Area (m2)		0.51	
E.G. Slope (m/m)	0.006186	Area (m2)		0.62	
Q Total (m3/s)	0.47	Flow (m3/s)		0.47	
Top Width (m)	3.96	Top Width (m)		3.96	
Vel Total (m/s)	0.91	Avg. Vel. (m/s)		0.91	
Max Chl Dpth (m)	0.21	Hydr. Depth (m)		0.21	
Conv. Total (m3/s)	6.0	Conv. (m3/s)		6.0	
Length Wtd. (m)	50.60	Wetted Per. (m)		2.50	
Min Ch El (m)	194.80	Shear (N/m2)		12.48	
Alpha	1.00	Stream Power (N/m s)		11.40	
Frctn Loss (m)		Cum Volume (1000 m3)		0.15	
C & E Loss (m)		Cum SA (1000 m2)		1.91	

CULVERT

RIVER: Rouge
REACH: WC19 RS: 150

INPUT
Description: PROP 407 TWY STRUCTURE
Distance from Upstream XS = 18
Deck/Roadway Width = 13
Weir Coefficient = 1.4
Upstream Deck/Roadway Coordinates
num= 3

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0	198.2	50	198	145	197.9

Upstream Bridge Cross Section Data
Station Elevation Data num= 97

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	198.69	2.94	198.5	5.29	198.17	6.91	198	9.69	197.54
9.9	197.5	11.55	197.27	13.32	197	14.06	196.91	17.23	196.5
18.68	196.48	18.88	196.48	19.42	196.49	20.05	196.49	20.49	196.5
23.91	196.5	27.15	196.5	28.88	196.23	29.48	196.24	30.64	196.3
31.46	196.34	31.52	196.35	31.59	196.35	31.96	196.36	32.25	196.34
35.1	196.37	35.76	196.34	36.01	196.34	39.29	196.18	40.58	196.13
42.25	196.12	46.19	196.04	46.54	196.03	47.07	196.02	48.55	196
50.5	195.93	50.55	195.93	50.61	195.93	50.66	195.93	52.2	195.9
55.22	195.76	59.81	195.58	60.58	195.55	60.94	195.54	61.04	195.54
61.14	195.54	61.93	195.5	62.41	195.46	62.69	195.43	63.08	195.41
64.63	195.31	65.61	195.26	66.52	195.25	69.78	195.1	70.86	195.04
71.18	195.04	71.87	195.02	73.35	195	73.75	194.8	76.25	194.8
76.89	195.01	81.42	195.26	83.45	195.31	86.04	195.35	89.57	195.43
90.21	195.44	93.34	195.47	94.62	195.49	96.23	195.5	97.06	195.56
100.32	195.73	102.11	195.77	104.91	195.86	105.84	195.91	106.29	195.93
106.48	195.94	106.5	195.94	107.72	195.98	114.55	195.98	115.98	195.98
122.01	195.98	123.69	196	125.24	196.05	130.02	196.31	131.4	196.33
132.64	196.33	132.65	196.33	132.66	196.33	132.7	196.33	132.71	196.33
134.26	196.5	137.03	196.81	138.67	197	139.87	197.17	142.05	197.5
143.84	197.73	144.73	197.84						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	66.52	.03	81.42	.035

Bank Sta: Left Right Coeff Contr. Expan.
66.52 81.42 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	73.75	196.5	T
76.25	144.73	196.5	T

Downstream Deck/Roadway Coordinates
num= 3

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0	198.2	83	198	173	197.9

Downstream Bridge Cross Section Data
Station Elevation Data num= 60

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	195.81	2.75	195.78	4.58	195.74	6.65	195.74	6.83	195.73
7.16	195.73	8.6	195.73	9.81	195.71	13.17	195.72	14.06	195.7
29.22	195.56	31.11	195.52	31.16	195.52	31.46	195.52	31.88	195.52
32	195.52	33.06	195.5	37.14	195.41	40.61	195.31	41.34	195.29
43.08	195.25	44.45	195.23	47.15	195.18	47.58	195.18	50.19	195.03
51.14	195	54.35	194.885	60.32	194.67	62.16	194.63	63.27	194.6
64.96	194.5	70.79	194.31	92	194.31	94.6	194.5	94.64	194.5
95.26	194.53	98.42	194.64	106.03	194.89	110.17	195	115.95	195.17
120.26	195.25	125.92	195.34	133.59	195.5	134.61	195.51	134.92	195.51
135.42	195.5	140.88	195.53	145.28	195.52	149.48	195.53	155.83	195.53

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   158.6  195.53  159.67  195.54  160.31  195.55  160.69  195.56  161.46  195.53
  162.58   195.5   163.7  195.48  164.08  195.47  169.89  195.27  173.37  195.19

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .035   54.35     .03  106.03    .035

Bank Sta: Left   Right    Coeff Contr.   Expan.
         54.35  106.03          .3         .5
Ineffective Flow      num=       2
   Sta L   Sta R    Elev  Permanent
       0   80.75   196.5       T
   83.25  173.37   196.5       T

Upstream Embankment side slope             =       2 horiz. to 1.0 vertical
Downstream Embankment side slope           =       2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins        =
Energy head used in spillway design        =
Spillway height used in design             =
Weir crest shape                           = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1           Box    1.25     2.5
FHWA Chart # 9 - flared wingwalls and inlet top edge bevel
FHWA Scale # 1 - 45 deg Wingwall flare; inlet top edge bevel=0.043D
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                  6      38     .013     .025        0                  .2               1
Upstream   Elevation =  194.8
           Centerline Station =  75
Downstream Elevation =  194.4
           Centerline Station =  82

CULVERT OUTPUT  Profile #2-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.03    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         0.39
  Q Barrel (m3/s)           0.03    Culv Vel DS (m/s)         0.49
  E.G. US. (m)            194.84    Culv Inv El Up (m)      194.80
  W.S. US. (m)            194.82    Culv Inv El Dn (m)      194.40
  E.G. DS (m)             194.38    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             194.38    Culv Exit Loss (m)        0.06
  Delta EG (m)              0.46    Culv Entr Loss (m)        0.00
  Delta WS (m)              0.44    Q Weir (m3/s)
  E.G. IC (m)             194.84    Weir Sta Lft (m)
  E.G. OC (m)             194.84    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       194.83    Weir Max Depth (m)
  Culv WS Outlet (m)      194.42    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.03    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.02    Min El Weir Flow (m)    197.90


Warning: During subcritical analysis, the water surface upstream of culvert went to critical depth.
Note:    During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth.  Therefore, the
         inlet will be at normal depth.

CULVERT OUTPUT  Profile #5-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.06    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         0.53
  Q Barrel (m3/s)           0.06    Culv Vel DS (m/s)         0.62
  E.G. US. (m)            194.86    Culv Inv El Up (m)      194.80
  W.S. US. (m)            194.85    Culv Inv El Dn (m)      194.40
  E.G. DS (m)             194.41    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             194.41    Culv Exit Loss (m)        0.05
  Delta EG (m)              0.45    Culv Entr Loss (m)        0.00
  Delta WS (m)              0.45    Q Weir (m3/s)
  E.G. IC (m)             194.86    Weir Sta Lft (m)
  E.G. OC (m)             194.86    Weir Sta Rgt (m)
  Culvert Control          Inlet    Weir Submerg
  Culv WS Inlet (m)       194.85    Weir Max Depth (m)
  Culv WS Outlet (m)      194.44    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.05    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.04    Min El Weir Flow (m)    197.90


Note:    During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth.  Therefore, the
         inlet will be at normal depth.

CULVERT OUTPUT  Profile #10-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.08    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         0.58
  Q Barrel (m3/s)           0.08    Culv Vel DS (m/s)         0.68
  E.G. US. (m)            194.88    Culv Inv El Up (m)      194.80
  W.S. US. (m)            194.86    Culv Inv El Dn (m)      194.40
  E.G. DS (m)             194.42    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             194.42    Culv Exit Loss (m)        0.05
  Delta EG (m)              0.46    Culv Entr Loss (m)        0.00
  Delta WS (m)              0.45    Q Weir (m3/s)
  E.G. IC (m)             194.88    Weir Sta Lft (m)
  E.G. OC (m)             194.88    Weir Sta Rgt (m)
  Culvert Control          Inlet    Weir Submerg
  Culv WS Inlet (m)       194.85    Weir Max Depth (m)
  Culv WS Outlet (m)      194.45    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.05    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.05    Min El Weir Flow (m)    197.90


Note:    During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth.  Therefore, the
         inlet will be at normal depth.

CULVERT OUTPUT  Profile #25-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.10    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         0.64
  Q Barrel (m3/s)           0.10    Culv Vel DS (m/s)         0.73
  E.G. US. (m)            194.89    Culv Inv El Up (m)      194.80
  W.S. US. (m)            194.87    Culv Inv El Dn (m)      194.40
  E.G. DS (m)             194.43    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             194.42    Culv Exit Loss (m)        0.05
  Delta EG (m)              0.46    Culv Entr Loss (m)        0.01
  Delta WS (m)              0.44    Q Weir (m3/s)
  E.G. IC (m)             194.89    Weir Sta Lft (m)
  E.G. OC (m)             194.89    Weir Sta Rgt (m)
  Culvert Control          Inlet    Weir Submerg
  Culv WS Inlet (m)       194.86    Weir Max Depth (m)
  Culv WS Outlet (m)      194.45    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.06    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.05    Min El Weir Flow (m)    197.90


Note:    During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth.  Therefore, the
         inlet will be at normal depth.

CULVERT OUTPUT  Profile #50-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.12    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         0.69
  Q Barrel (m3/s)           0.12    Culv Vel DS (m/s)         0.78
  E.G. US. (m)            194.90    Culv Inv El Up (m)      194.80
  W.S. US. (m)            194.88    Culv Inv El Dn (m)      194.40
  E.G. DS (m)             194.44    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             194.44    Culv Exit Loss (m)        0.05
  Delta EG (m)              0.46    Culv Entr Loss (m)        0.01
  Delta WS (m)              0.44    Q Weir (m3/s)
  E.G. IC (m)             194.90    Weir Sta Lft (m)
  E.G. OC (m)             194.90    Weir Sta Rgt (m)
  Culvert Control          Inlet    Weir Submerg
  Culv WS Inlet (m)       194.87    Weir Max Depth (m)
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Culv WS Outlet (m)	194.46	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.07	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.06	Min El Weir Flow (m)	197.90

Note: During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth. Therefore, the inlet will be at normal depth.

CULVERT OUTPUT Profile #100-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.15	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	0.76
Q Barrel (m3/s)	0.15	Culv Vel DS (m/s)	0.84
E.G. US. (m)	194.92	Culv Inv El Up (m)	194.80
W.S. US. (m)	194.89	Culv Inv El Dn (m)	194.40
E.G. DS (m)	194.46	Culv Frctn Ls (m)	0.00
W.S. DS (m)	194.45	Culv Exit Loss (m)	0.05
Delta EG (m)	0.45	Culv Entr Loss (m)	0.01
Delta WS (m)	0.44	Q Weir (m3/s)	
E.G. IC (m)	194.92	Weir Sta Lft (m)	
E.G. OC (m)	194.91	Weir Sta Rgt (m)	
Culvert Control	Inlet	Weir Submerg	
Culv WS Inlet (m)	194.88	Weir Max Depth (m)	
Culv WS Outlet (m)	194.47	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.08	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.07	Min El Weir Flow (m)	197.90

Note: During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth. Therefore, the inlet will be at normal depth.

CULVERT OUTPUT Profile #Check Flow Culv Group: Culvert #1

Q Culv Group (m3/s)	0.19	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	0.83
Q Barrel (m3/s)	0.19	Culv Vel DS (m/s)	0.91
E.G. US. (m)	194.94	Culv Inv El Up (m)	194.80
W.S. US. (m)	194.91	Culv Inv El Dn (m)	194.40
E.G. DS (m)	194.47	Culv Frctn Ls (m)	0.00
W.S. DS (m)	194.46	Culv Exit Loss (m)	0.05
Delta EG (m)	0.46	Culv Entr Loss (m)	0.01
Delta WS (m)	0.45	Q Weir (m3/s)	
E.G. IC (m)	194.94	Weir Sta Lft (m)	
E.G. OC (m)	194.93	Weir Sta Rgt (m)	
Culvert Control	Inlet	Weir Submerg	
Culv WS Inlet (m)	194.89	Weir Max Depth (m)	
Culv WS Outlet (m)	194.48	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.09	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.08	Min El Weir Flow (m)	197.90

Note: During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth. Therefore, the inlet will be at normal depth.

CULVERT OUTPUT Profile #Regional Culv Group: Culvert #1

Q Culv Group (m3/s)	0.47	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.18
Q Barrel (m3/s)	0.47	Culv Vel DS (m/s)	1.23
E.G. US. (m)	195.05	Culv Inv El Up (m)	194.80
W.S. US. (m)	195.01	Culv Inv El Dn (m)	194.40
E.G. DS (m)	194.58	Culv Frctn Ls (m)	0.00
W.S. DS (m)	194.55	Culv Exit Loss (m)	0.05
Delta EG (m)	0.47	Culv Entr Loss (m)	0.02
Delta WS (m)	0.46	Q Weir (m3/s)	
E.G. IC (m)	195.05	Weir Sta Lft (m)	
E.G. OC (m)	195.04	Weir Sta Rgt (m)	
Culvert Control	Inlet	Weir Submerg	
Culv WS Inlet (m)	194.96	Weir Max Depth (m)	
Culv WS Outlet (m)	194.55	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.16	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.15	Min El Weir Flow (m)	197.90

Note: During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth. Therefore, the inlet will be at normal depth.

CROSS SECTION

RIVER: Rouge
REACH: WC19 RS: 100

INPUT
Description: ST-100 (Updated Sept 2016)
Station Elevation Data num= 60

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	195.81	2.75	195.78	4.58	195.74	6.65	195.74	6.83	195.73
7.16	195.73	8.6	195.73	9.81	195.71	13.17	195.72	14.06	195.7
29.22	195.56	31.11	195.52	31.16	195.52	31.46	195.52	31.88	195.52
32	195.52	33.06	195.5	37.14	195.41	40.61	195.31	41.34	195.29
43.08	195.25	44.45	195.23	47.15	195.18	47.58	195.18	50.19	195.03
51.14	195	54.35	194.885	60.32	194.67	62.16	194.63	63.27	194.6
64.96	194.5	70.79	194.31	92	194.31	94.6	194.5	94.64	194.5
95.26	194.53	98.42	194.64	106.03	194.89	110.17	195	115.95	195.17
120.26	195.25	125.92	195.34	133.59	195.5	134.61	195.51	134.92	195.51
135.42	195.5	140.88	195.53	145.28	195.52	149.48	195.53	155.83	195.53
158.6	195.53	159.67	195.54	160.31	195.55	160.69	195.56	161.46	195.53
162.58	195.5	163.7	195.48	164.08	195.47	169.89	195.27	173.37	195.19

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	54.35	.03	106.03	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
54.35	106.03	36.3	36.3	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	80.75	196.5	T
83.25	173.37	196.5	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	194.38	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	194.38	Reach Len. (m)	36.30	36.30	36.30
Crit W.S. (m)	194.33	Flow Area (m2)		0.16	
E.G. Slope (m/m)	0.001156	Area (m2)		1.48	
Q Total (m3/s)	0.03	Flow (m3/s)		0.03	
Top Width (m)	24.11	Top Width (m)		24.11	
Vel Total (m/s)	0.18	Avg. Vel. (m/s)		0.18	
Max Chl Dpth (m)	0.07	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	0.9	Conv. (m3/s)		0.9	
Length Wtd. (m)	36.30	Wetted Per. (m)		2.50	
Min Ch El (m)	194.31	Shear (N/m2)		0.74	
Alpha	1.00	Stream Power (N/m s)		0.14	
Frctn Loss (m)	0.13	Cum Volume (1000 m3)		0.03	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.69	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	194.41	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	194.41	Reach Len. (m)	36.30	36.30	36.30
Crit W.S. (m)		Flow Area (m2)		0.24	
E.G. Slope (m/m)	0.001322	Area (m2)		2.22	
Q Total (m3/s)	0.06	Flow (m3/s)		0.06	
Top Width (m)	25.43	Top Width (m)		25.43	
Vel Total (m/s)	0.25	Avg. Vel. (m/s)		0.25	
Max Chl Dpth (m)	0.10	Hydr. Depth (m)		0.10	

Conv. Total (m3/s)	1.7	Conv. (m3/s)	1.7
Length Wtd. (m)	36.30	Wetted Per. (m)	2.50
Min Ch El (m)	194.31	Shear (N/m2)	1.23
Alpha	1.00	Stream Power (N/m s)	0.31
Frctn Loss (m)	0.16	Cum Volume (1000 m3)	0.04
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.73

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	194.42	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	194.42	Reach Len. (m)	36.30	36.30	36.30
Crit W.S. (m)		Flow Area (m2)		0.26	
E.G. Slope (m/m)	0.001664	Area (m2)		2.48	
Q Total (m3/s)	0.08	Flow (m3/s)		0.08	
Top Width (m)	25.89	Top Width (m)		25.89	
Vel Total (m/s)	0.30	Avg. Vel. (m/s)		0.30	
Max Chl Dpth (m)	0.11	Hydr. Depth (m)		0.11	
Conv. Total (m3/s)	2.0	Conv. (m3/s)		2.0	
Length Wtd. (m)	36.30	Wetted Per. (m)		2.50	
Min Ch El (m)	194.31	Shear (N/m2)		1.72	
Alpha	1.00	Stream Power (N/m s)		0.52	
Frctn Loss (m)	0.18	Cum Volume (1000 m3)		0.05	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.76	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	194.43	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	194.42	Reach Len. (m)	36.30	36.30	36.30
Crit W.S. (m)		Flow Area (m2)		0.29	
E.G. Slope (m/m)	0.001974	Area (m2)		2.72	
Q Total (m3/s)	0.10	Flow (m3/s)		0.10	
Top Width (m)	26.29	Top Width (m)		26.29	
Vel Total (m/s)	0.35	Avg. Vel. (m/s)		0.35	
Max Chl Dpth (m)	0.11	Hydr. Depth (m)		0.11	
Conv. Total (m3/s)	2.3	Conv. (m3/s)		2.3	
Length Wtd. (m)	36.30	Wetted Per. (m)		2.50	
Min Ch El (m)	194.31	Shear (N/m2)		2.22	
Alpha	1.00	Stream Power (N/m s)		0.77	
Frctn Loss (m)	0.19	Cum Volume (1000 m3)		0.05	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.79	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	194.44	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	194.44	Reach Len. (m)	36.30	36.30	36.30
Crit W.S. (m)	194.37	Flow Area (m2)		0.32	
E.G. Slope (m/m)	0.002062	Area (m2)		3.03	
Q Total (m3/s)	0.12	Flow (m3/s)		0.12	
Top Width (m)	26.81	Top Width (m)		26.81	
Vel Total (m/s)	0.38	Avg. Vel. (m/s)		0.38	
Max Chl Dpth (m)	0.13	Hydr. Depth (m)		0.13	
Conv. Total (m3/s)	2.6	Conv. (m3/s)		2.6	
Length Wtd. (m)	36.30	Wetted Per. (m)		2.50	
Min Ch El (m)	194.31	Shear (N/m2)		2.55	
Alpha	1.00	Stream Power (N/m s)		0.97	
Frctn Loss (m)	0.19	Cum Volume (1000 m3)		0.06	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.81	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	194.46	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	194.45	Reach Len. (m)	36.30	36.30	36.30
Crit W.S. (m)	194.39	Flow Area (m2)		0.36	
E.G. Slope (m/m)	0.002139	Area (m2)		3.48	
Q Total (m3/s)	0.15	Flow (m3/s)		0.15	
Top Width (m)	27.54	Top Width (m)		27.54	
Vel Total (m/s)	0.42	Avg. Vel. (m/s)		0.42	
Max Chl Dpth (m)	0.14	Hydr. Depth (m)		0.14	
Conv. Total (m3/s)	3.2	Conv. (m3/s)		3.2	
Length Wtd. (m)	36.30	Wetted Per. (m)		2.50	
Min Ch El (m)	194.31	Shear (N/m2)		2.99	
Alpha	1.00	Stream Power (N/m s)		1.26	
Frctn Loss (m)	0.21	Cum Volume (1000 m3)		0.07	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.83	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	194.47	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	194.46	Reach Len. (m)	36.30	36.30	36.30
Crit W.S. (m)	194.39	Flow Area (m2)		0.38	
E.G. Slope (m/m)	0.002802	Area (m2)		3.72	
Q Total (m3/s)	0.19	Flow (m3/s)		0.19	
Top Width (m)	27.94	Top Width (m)		27.94	
Vel Total (m/s)	0.50	Avg. Vel. (m/s)		0.50	
Max Chl Dpth (m)	0.15	Hydr. Depth (m)		0.15	
Conv. Total (m3/s)	3.6	Conv. (m3/s)		3.6	
Length Wtd. (m)	36.30	Wetted Per. (m)		2.50	
Min Ch El (m)	194.31	Shear (N/m2)		4.16	
Alpha	1.00	Stream Power (N/m s)		2.09	
Frctn Loss (m)	0.20	Cum Volume (1000 m3)		0.08	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.89	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	194.58	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.030	
W.S. Elev (m)	194.55	Reach Len. (m)	36.30	36.30	36.30
Crit W.S. (m)		Flow Area (m2)		0.60	
E.G. Slope (m/m)	0.003677	Area (m2)		6.38	
Q Total (m3/s)	0.47	Flow (m3/s)		0.47	
Top Width (m)	31.74	Top Width (m)		31.74	
Vel Total (m/s)	0.78	Avg. Vel. (m/s)		0.78	
Max Chl Dpth (m)	0.24	Hydr. Depth (m)		0.24	
Conv. Total (m3/s)	7.8	Conv. (m3/s)		7.8	
Length Wtd. (m)	36.30	Wetted Per. (m)		2.50	
Min Ch El (m)	194.31	Shear (N/m2)		8.67	
Alpha	1.00	Stream Power (N/m s)		6.78	
Frctn Loss (m)	0.29	Cum Volume (1000 m3)		0.13	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.00	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Rouge
REACH: WC19 RS: 10

INPUT
Description: ST-10 (Updated Sept 2016)
Station Elevation Data num= 47

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	195.25	1.56	195.24	4.64	195.22	10.95	195.21	12.34	195.2
14.68	195.21	19.26	195.19	22.79	195.17	25.33	195.15	27.53	195.14
35.66	195.06	36.67	195.05	39.3	195	49.91	194.69	52.72	194.63
57.93	194.5	64.7	194.36	66.07	194.32	67.88	194.3	71.81	194.25
74.72	194.23	77.95	194.23	81.07	194.22	87.89	194.23	96.88	194.29
102.35	194.5	106.3	194.615	109.59	194.71	111.53	194.77	119.04	195
121.19	195.01	121.7	195.01	138.45	195.31	144.2	195.39	146.13	195.42
146.5	195.42	152.34	195.5	153.72	195.5	160.13	195.5	160.18	195.5
160.25	195.5	163.34	195.53	165.88	195.51	166.81	195.5	170.6	195.32
172.66	195.24	176.11	195.1						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	52.72	.03	106.3	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
52.72	106.3	0	0	0	.3	.5

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	194.24	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	194.23	Reach Len. (m)			
Crit W.S. (m)	194.23	Flow Area (m2)		0.09	
E.G. Slope (m/m)	0.073624	Area (m2)		0.09	
Q Total (m3/s)	0.03	Flow (m3/s)		0.03	
Top Width (m)	14.13	Top Width (m)		14.13	
Vel Total (m/s)	0.32	Avg. Vel. (m/s)		0.32	
Max Chl Dpth (m)	0.01	Hydr. Depth (m)		0.01	
Conv. Total (m3/s)	0.1	Conv. (m3/s)		0.1	
Length Wtd. (m)		Wetted Per. (m)		14.13	
Min Ch El (m)	194.22	Shear (N/m2)		4.80	
Alpha	1.00	Stream Power (N/m s)		1.53	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	194.25	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	194.24	Reach Len. (m)			
Crit W.S. (m)	194.24	Flow Area (m2)		0.12	
E.G. Slope (m/m)	0.139033	Area (m2)		0.12	
Q Total (m3/s)	0.06	Flow (m3/s)		0.06	
Top Width (m)	14.65	Top Width (m)		14.65	
Vel Total (m/s)	0.50	Avg. Vel. (m/s)		0.50	
Max Chl Dpth (m)	0.02	Hydr. Depth (m)		0.01	
Conv. Total (m3/s)	0.2	Conv. (m3/s)		0.2	
Length Wtd. (m)		Wetted Per. (m)		14.65	
Min Ch El (m)	194.22	Shear (N/m2)		11.10	
Alpha	1.00	Stream Power (N/m s)		5.58	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	194.25	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	194.24	Reach Len. (m)			
Crit W.S. (m)	194.24	Flow Area (m2)		0.19	
E.G. Slope (m/m)	0.058399	Area (m2)		0.19	
Q Total (m3/s)	0.08	Flow (m3/s)		0.08	
Top Width (m)	16.04	Top Width (m)		16.04	
Vel Total (m/s)	0.42	Avg. Vel. (m/s)		0.42	
Max Chl Dpth (m)	0.02	Hydr. Depth (m)		0.01	
Conv. Total (m3/s)	0.3	Conv. (m3/s)		0.3	
Length Wtd. (m)		Wetted Per. (m)		16.04	
Min Ch El (m)	194.22	Shear (N/m2)		6.81	
Alpha	1.00	Stream Power (N/m s)		2.86	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	194.25	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	194.24	Reach Len. (m)			
Crit W.S. (m)	194.24	Flow Area (m2)		0.26	
E.G. Slope (m/m)	0.035802	Area (m2)		0.26	
Q Total (m3/s)	0.10	Flow (m3/s)		0.10	
Top Width (m)	17.27	Top Width (m)		17.27	
Vel Total (m/s)	0.38	Avg. Vel. (m/s)		0.38	
Max Chl Dpth (m)	0.02	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	0.5	Conv. (m3/s)		0.5	
Length Wtd. (m)		Wetted Per. (m)		17.27	
Min Ch El (m)	194.22	Shear (N/m2)		5.29	
Alpha	1.00	Stream Power (N/m s)		2.03	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	194.25	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	194.25	Reach Len. (m)			
Crit W.S. (m)	194.25	Flow Area (m2)		0.29	
E.G. Slope (m/m)	0.035886	Area (m2)		0.29	
Q Total (m3/s)	0.12	Flow (m3/s)		0.12	
Top Width (m)	17.84	Top Width (m)		17.84	
Vel Total (m/s)	0.41	Avg. Vel. (m/s)		0.41	
Max Chl Dpth (m)	0.03	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	0.6	Conv. (m3/s)		0.6	
Length Wtd. (m)		Wetted Per. (m)		17.84	
Min Ch El (m)	194.22	Shear (N/m2)		5.79	
Alpha	1.00	Stream Power (N/m s)		2.37	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	194.26	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	194.25	Reach Len. (m)			
Crit W.S. (m)	194.25	Flow Area (m2)		0.32	
E.G. Slope (m/m)	0.043536	Area (m2)		0.32	
Q Total (m3/s)	0.15	Flow (m3/s)		0.15	
Top Width (m)	18.28	Top Width (m)		18.28	
Vel Total (m/s)	0.47	Avg. Vel. (m/s)		0.47	
Max Chl Dpth (m)	0.03	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	0.7	Conv. (m3/s)		0.7	
Length Wtd. (m)		Wetted Per. (m)		18.28	
Min Ch El (m)	194.22	Shear (N/m2)		7.47	
Alpha	1.00	Stream Power (N/m s)		3.50	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	194.26	Element	Left OB	Channel	Right OB

Vel Head (m)	0.01	Wt. n-Val.	0.030
W.S. Elev (m)	194.26	Reach Len. (m)	
Crit W.S. (m)	194.26	Flow Area (m2)	0.53
E.G. Slope (m/m)	0.015819	Area (m2)	0.53
Q Total (m3/s)	0.19	Flow (m3/s)	0.19
Top Width (m)	20.87	Top Width (m)	20.87
Vel Total (m/s)	0.36	Avg. Vel. (m/s)	0.36
Max Chl Dpth (m)	0.04	Hydr. Depth (m)	0.03
Conv. Total (m3/s)	1.5	Conv. (m3/s)	1.5
Length Wtd. (m)		Wetted Per. (m)	20.87
Min Ch El (m)	194.22	Shear (N/m2)	3.92
Alpha	1.00	Stream Power (N/m s)	1.41
Frctn Loss (m)		Cum Volume (1000 m3)	
C & E Loss (m)		Cum SA (1000 m2)	

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	194.29	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	194.27	Reach Len. (m)			
Crit W.S. (m)	194.27	Flow Area (m2)		0.79	
E.G. Slope (m/m)	0.029824	Area (m2)		0.79	
Q Total (m3/s)	0.47	Flow (m3/s)		0.47	
Top Width (m)	23.55	Top Width (m)		23.55	
Vel Total (m/s)	0.60	Avg. Vel. (m/s)		0.60	
Max Chl Dpth (m)	0.05	Hydr. Depth (m)		0.03	
Conv. Total (m3/s)	2.7	Conv. (m3/s)		2.7	
Length Wtd. (m)		Wetted Per. (m)		23.55	
Min Ch El (m)	194.22	Shear (N/m2)		9.77	
Alpha	1.00	Stream Power (N/m s)		5.84	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

SUMMARY OF MANNING'S N VALUES

River:Rouge

Reach	River Sta.	n1	n2	n3
WC19	300	.035	.03	.035
WC19	200	.035	.03	.035
WC19	150	Culvert		
WC19	100	.035	.03	.035
WC19	10	.035	.03	.035

SUMMARY OF REACH LENGTHS

River: Rouge

Reach	River Sta.	Left	Channel	Right
WC19	300	112.4	112.4	112.4
WC19	200	50.6	50.6	50.6
WC19	150	Culvert		
WC19	100	36.3	36.3	36.3
WC19	10	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Rouge

Reach	River Sta.	Contr.	Expan.
WC19	300	.3	.5
WC19	200	.3	.5
WC19	150	Culvert	
WC19	100	.3	.5
WC19	10	.3	.5

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
WC19	300	2-yr	0.03	196.00	196.01		196.01	0.003833	0.11	0.28	23.75	0.31
WC19	300	5-yr	0.06	196.00	196.01		196.02	0.009387	0.18	0.33	23.98	0.50
WC19	300	10-yr	0.08	196.00	196.02		196.02	0.010871	0.21	0.37	24.21	0.55
WC19	300	25-yr	0.10	196.00	196.02		196.02	0.009317	0.22	0.45	24.59	0.53
WC19	300	50-yr	0.12	196.00	196.02		196.02	0.010486	0.25	0.48	24.77	0.57
WC19	300	100-yr	0.15	196.00	196.02		196.03	0.011076	0.27	0.55	25.08	0.59
WC19	300	Check Flow	0.19	196.00	196.03		196.03	0.012722	0.31	0.61	25.37	0.64
WC19	300	Regional	0.47	196.00	196.04		196.05	0.013578	0.44	1.06	27.44	0.72
WC19	200	2-yr	0.03	194.80	194.82	194.82	194.84	0.080985	0.66	0.05	2.59	1.55
WC19	200	5-yr	0.06	194.80	194.85	194.84	194.86	0.011156	0.48	0.13	2.75	0.68
WC19	200	10-yr	0.08	194.80	194.86	194.85	194.88	0.009490	0.51	0.16	2.82	0.65
WC19	200	25-yr	0.10	194.80	194.87	194.85	194.89	0.010921	0.58	0.17	2.85	0.71
WC19	200	50-yr	0.12	194.80	194.88	194.86	194.90	0.009467	0.60	0.20	2.90	0.68
WC19	200	100-yr	0.15	194.80	194.89	194.87	194.91	0.008975	0.65	0.23	2.97	0.68
WC19	200	Check Flow	0.19	194.80	194.91	194.88	194.94	0.007623	0.68	0.28	3.07	0.65
WC19	200	Regional	0.47	194.80	195.01	194.95	195.05	0.006186	0.91	0.51	3.96	0.64
WC19	150		Culvert									
WC19	100	2-yr	0.03	194.31	194.38	194.33	194.38	0.001156	0.18	0.16	24.11	0.23
WC19	100	5-yr	0.06	194.31	194.41		194.41	0.001322	0.25	0.24	25.43	0.26
WC19	100	10-yr	0.08	194.31	194.42		194.42	0.001664	0.30	0.26	25.89	0.30
WC19	100	25-yr	0.10	194.31	194.42		194.43	0.001974	0.35	0.29	26.29	0.33
WC19	100	50-yr	0.12	194.31	194.44	194.37	194.44	0.002062	0.38	0.32	26.81	0.34
WC19	100	100-yr	0.15	194.31	194.45	194.39	194.46	0.002139	0.42	0.36	27.54	0.36
WC19	100	Check Flow	0.19	194.31	194.46	194.39	194.47	0.002802	0.50	0.38	27.94	0.41
WC19	100	Regional	0.47	194.31	194.55		194.58	0.003677	0.78	0.60	31.74	0.51
WC19	10	2-yr	0.03	194.22	194.23	194.23	194.24	0.073624	0.32	0.09	14.13	1.25
WC19	10	5-yr	0.06	194.22	194.24	194.24	194.25	0.139033	0.50	0.12	14.65	1.78
WC19	10	10-yr	0.08	194.22	194.24	194.24	194.25	0.058399	0.42	0.19	16.04	1.23
WC19	10	25-yr	0.10	194.22	194.24	194.24	194.25	0.035802	0.38	0.26	17.27	1.00
WC19	10	50-yr	0.12	194.22	194.25	194.25	194.25	0.035886	0.41	0.29	17.84	1.02
WC19	10	100-yr	0.15	194.22	194.25	194.25	194.26	0.043536	0.47	0.32	18.28	1.13
WC19	10	Check Flow	0.19	194.22	194.26	194.26	194.26	0.015819	0.36	0.53	20.87	0.73
WC19	10	Regional	0.47	194.22	194.27	194.27	194.29	0.029824	0.60	0.79	23.55	1.04

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (m)	W.S. Elev (m)	Vel Head (m)	Frctn Loss (m)	C & E Loss (m)	Q Left (m3/s)	Q Channel (m3/s)	Q Right (m3/s)	Top Width (m)
WC19	300	2-yr	196.01	196.01	0.00	1.16	0.01		0.03		23.75
WC19	300	5-yr	196.02	196.01	0.00	1.15	0.00		0.06		23.98
WC19	300	10-yr	196.02	196.02	0.00	1.14	0.00		0.08		24.21
WC19	300	25-yr	196.02	196.02	0.00	1.13	0.00		0.10		24.59
WC19	300	50-yr	196.02	196.02	0.00	1.12	0.00		0.12		24.77
WC19	300	100-yr	196.03	196.02	0.00	1.12	0.01		0.15		25.08
WC19	300	Check Flow	196.03	196.03	0.00	1.09	0.01		0.19		25.37
WC19	300	Regional	196.05	196.04	0.01	0.99	0.01		0.47		27.44
WC19	200	2-yr	194.84	194.82	0.02				0.03		2.59
WC19	200	5-yr	194.86	194.85	0.01				0.06		2.75
WC19	200	10-yr	194.88	194.86	0.01				0.08		2.82
WC19	200	25-yr	194.89	194.87	0.02				0.10		2.85
WC19	200	50-yr	194.90	194.88	0.02				0.12		2.90
WC19	200	100-yr	194.91	194.89	0.02				0.15		2.97

WC19	200	Check Flow	194.94	194.91	0.02				0.19	3.07
WC19	200	Regional	195.05	195.01	0.04				0.47	3.96
WC19	150		Culvert							
WC19	100	2-yr	194.38	194.38	0.00	0.13	0.00		0.03	24.11
WC19	100	5-yr	194.41	194.41	0.00	0.16	0.00		0.06	25.43
WC19	100	10-yr	194.42	194.42	0.00	0.18	0.00		0.08	25.89
WC19	100	25-yr	194.43	194.42	0.01	0.19	0.00		0.10	26.29
WC19	100	50-yr	194.44	194.44	0.01	0.19	0.00		0.12	26.81
WC19	100	100-yr	194.46	194.45	0.01	0.21	0.00		0.15	27.54
WC19	100	Check Flow	194.47	194.46	0.01	0.20	0.00		0.19	27.94
WC19	100	Regional	194.58	194.55	0.03	0.29	0.01		0.47	31.74
WC19	10	2-yr	194.24	194.23	0.01				0.03	14.13
WC19	10	5-yr	194.25	194.24	0.01				0.06	14.65
WC19	10	10-yr	194.25	194.24	0.01				0.08	16.04
WC19	10	25-yr	194.25	194.24	0.01				0.10	17.27
WC19	10	50-yr	194.25	194.25	0.01				0.12	17.84
WC19	10	100-yr	194.26	194.25	0.01				0.15	18.28
WC19	10	Check Flow	194.26	194.26	0.01				0.19	20.87
WC19	10	Regional	194.29	194.27	0.02				0.47	23.55

Profile Output Table - Culvert Only

Reach	River Sta		Profile	E.G. US. (m)	W.S. US. (m)	E.G. IC (m)	E.G. OC (m)	Min El Weir Flow (m)	Q Culv Group (m3/s)	Q Weir (m3/s)	Delta WS (m)	Culv Vel US (m/s)	Culv Vel DS (m/s)
WC19	150	Culvert #1	2-yr	194.84	194.82	194.84	194.84	197.90	0.03		0.44	0.39	0.49
WC19	150	Culvert #1	5-yr	194.86	194.85	194.86	194.86	197.90	0.06		0.45	0.53	0.62
WC19	150	Culvert #1	10-yr	194.88	194.86	194.88	194.88	197.90	0.08		0.45	0.58	0.68
WC19	150	Culvert #1	25-yr	194.89	194.87	194.89	194.89	197.90	0.10		0.44	0.64	0.73
WC19	150	Culvert #1	50-yr	194.90	194.88	194.90	194.90	197.90	0.12		0.44	0.69	0.78
WC19	150	Culvert #1	100-yr	194.92	194.89	194.92	194.91	197.90	0.15		0.44	0.76	0.84
WC19	150	Culvert #1	Check Flow	194.94	194.91	194.94	194.93	197.90	0.19		0.45	0.83	0.91
WC19	150	Culvert #1	Regional	195.05	195.01	195.05	195.04	197.90	0.47		0.46	1.18	1.23

PETTICOAT CREEK

HEC-RAS ANALYSIS WC#20

HIGHWAY 407

EX. CULVERT (Ø1650)mm

196.54	196.54	HEC ST 300
196.30	196.30	

195.71	195.73	ST 200
195.59	195.61	

PROPOSED 407 TWY

195.09	195.09	ST 100
195.05	195.00	

PROP CULV WC#20
SPAN x RISE= (2.5 x 1.25)
L=45m, S=1.1%
U/S INV= 195.50
D/S INV= 195.00

194.95	194.75	ST 10
194.93	194.72	

LEGEND

- EXISTING 407 ETR
- PROPOSED 407 TWY
- CREEK FLOW DIRECTION
- EXISTING CULVERT
- PROPOSED CULVERT
- PROPOSED REGIONAL FLOODLINE

EX REG / EX 100 | PR REG / PR 100 | HEC ST — CROSS SECTION NUMBER — PARSONS HEC-RAS SECTION

PROPOSED WL ELEVATION (m)

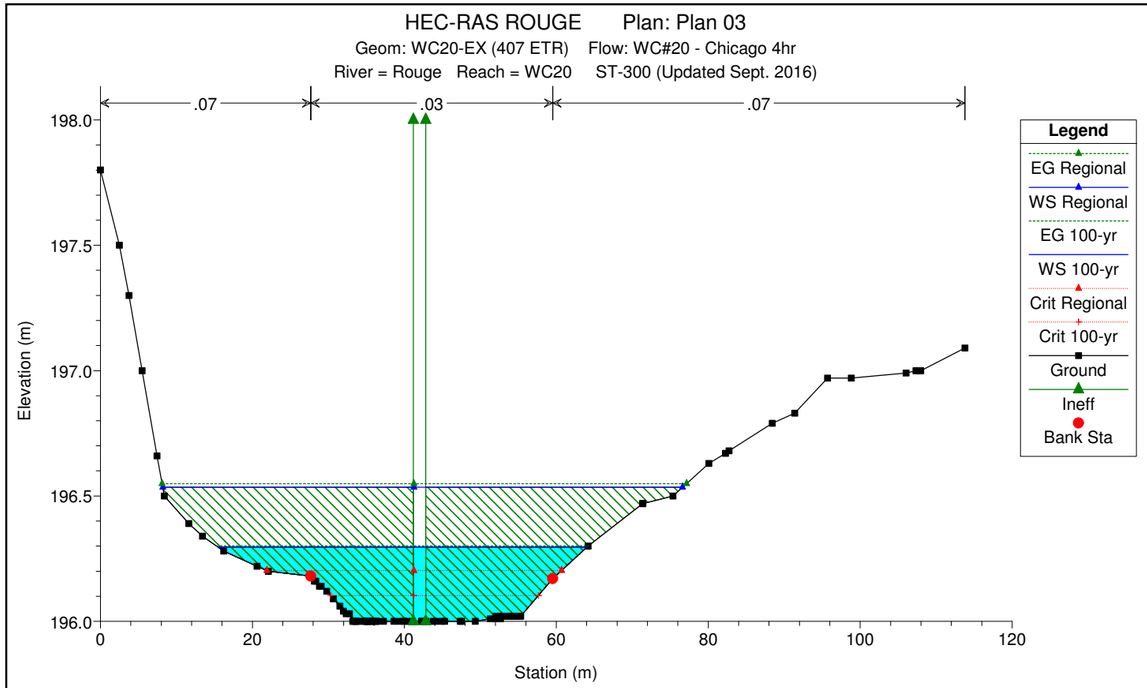
EXISTING UPDATED WL ELEVATION (m)

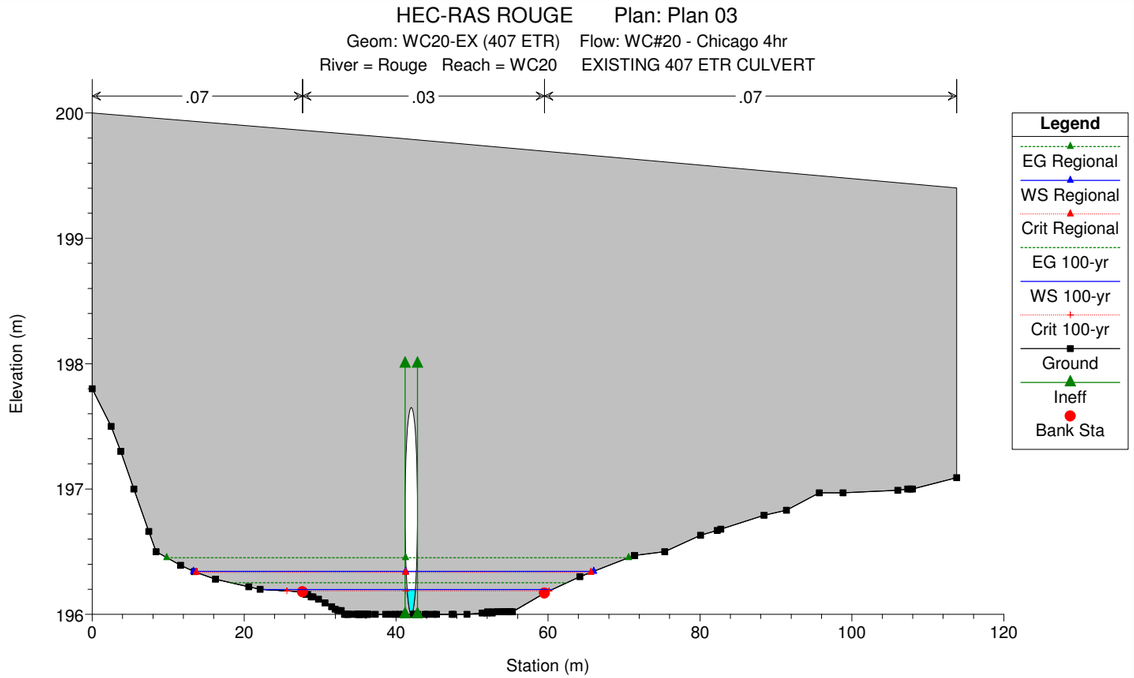
SCALE HORIZONTAL

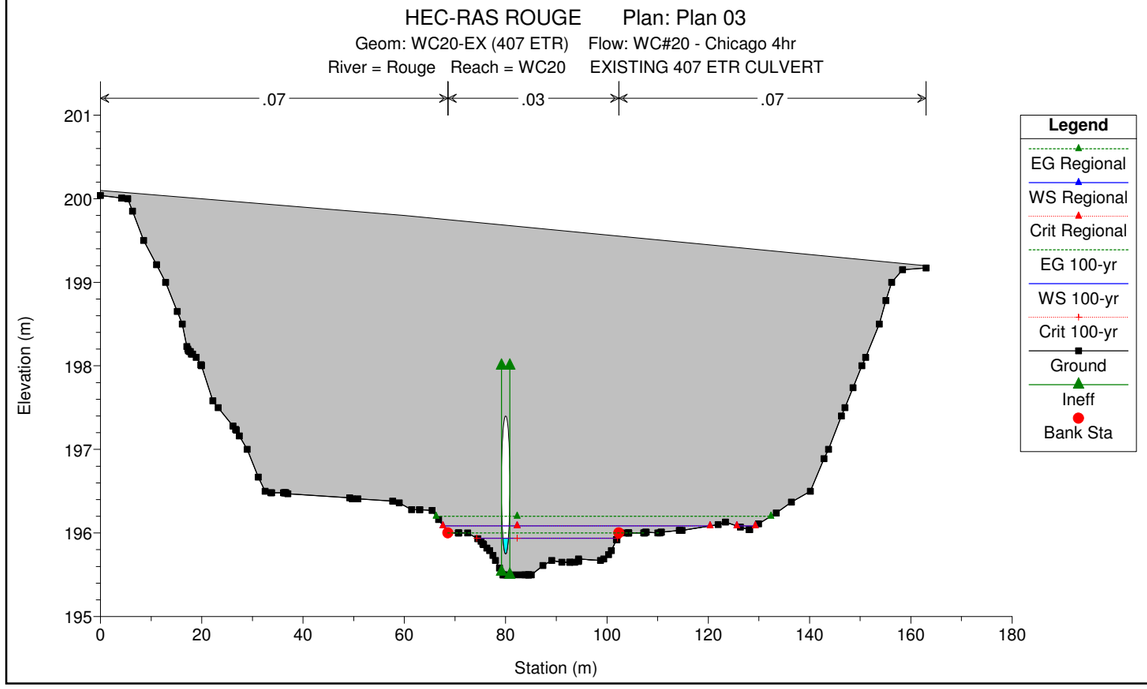
5m 0m 10m 20m 30m

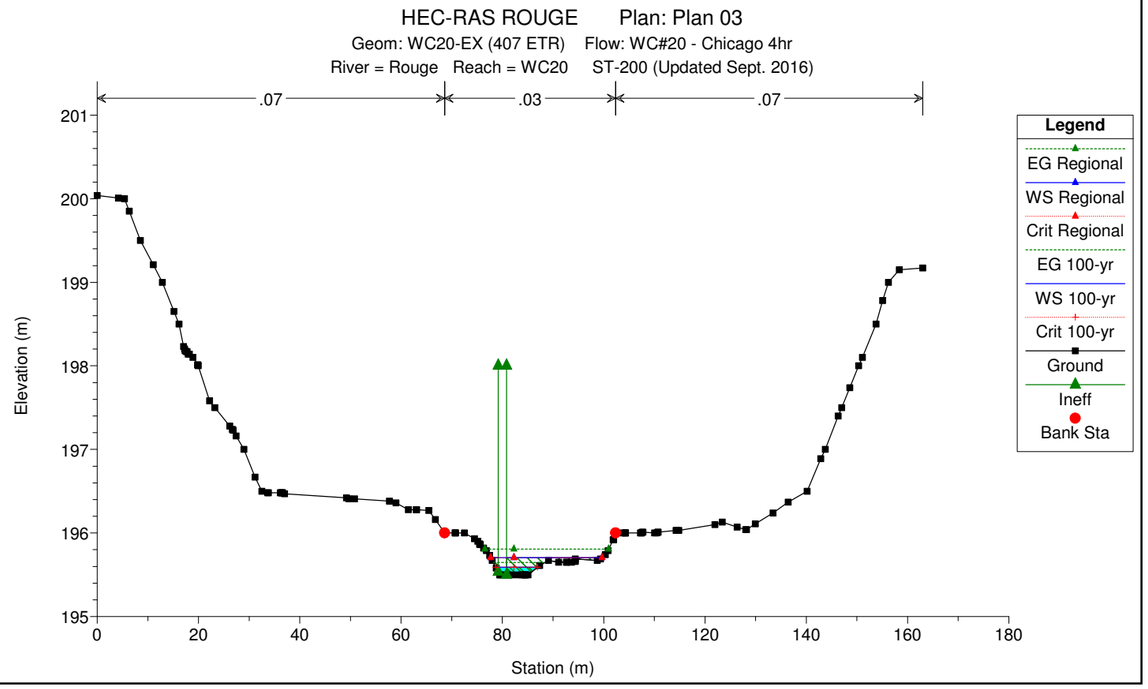
1:1000

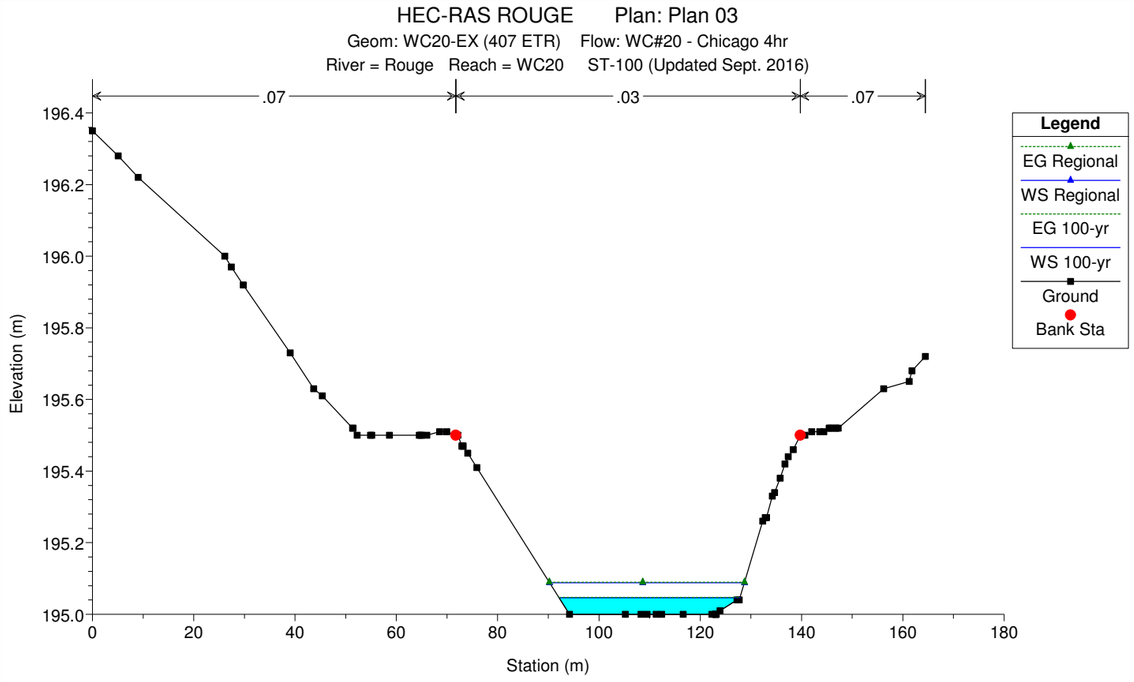
DATE: SEPTEMBER 2016	Ontario	PARSONS 625 COCHRANE DRIVE, SUITE 500 MARKHAM, ONTARIO L3R 9R9 TEL: 905-943-0500 FAX: 905-943-0400	407 TRANSITWAY FROM KENNEDY RD TO BROCK RD
SCALE: 1:1000			FIGURE 6.13 - HEC-RAS ANALYSIS - PETTICOAT CREEK (WC#20)

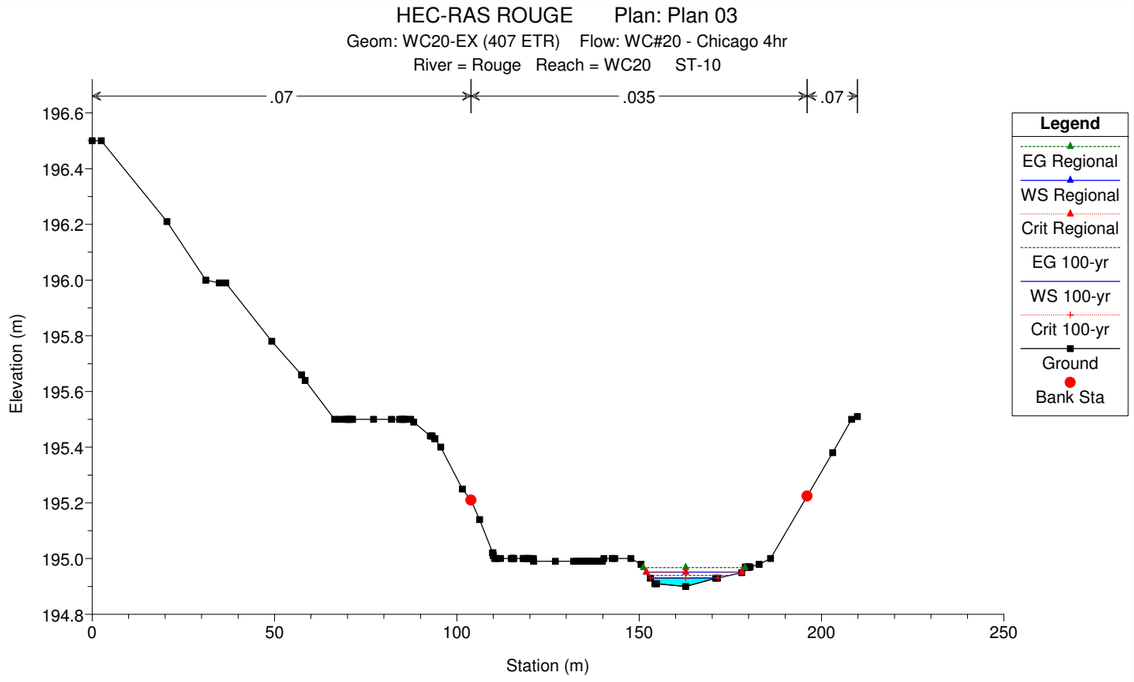

HEC-RAS ROUGE Plan: Plan 03
Geom: WC20-EX (407 ETR) Flow: WC#20 - Chicago 4hr
River = Rouge Reach = WC20 ST-300 (Updated Sept. 2016)
.07
.03
.07
198.0
197.5
197.0
196.5
196.0
Elevation (m)
0
20
40
60
80
100
120
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Crit Regional
Crit 100-yr
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 03
Geom: WC20-EX (407 ETR) Flow: WC#20 - Chicago 4hr
River = Rouge Reach = WC20 EXISTING 407 ETR CULVERT
.07
.03
.07
200
199
198
197
196
Elevation (m)
0
20
40
60
80
100
120
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 03
Geom: WC20-EX (407 ETR) Flow: WC#20 - Chicago 4hr
River = Rouge Reach = WC20 EXISTING 407 ETR CULVERT
.07
.03
.07
201
200
199
198
197
196
195
Elevation (m)
0
20
40
60
80
100
120
140
160
180
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 03
Geom: WC20-EX (407 ETR) Flow: WC#20 - Chicago 4hr
River = Rouge Reach = WC20 ST-200 (Updated Sept. 2016)
.07
.03
.07
201
200
199
198
197
196
195
Elevation (m)
0
20
40
60
80
100
120
140
160
180
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 03
Geom: WC20-EX (407 ETR) Flow: WC#20 - Chicago 4hr
River = Rouge Reach = WC20 ST-100 (Updated Sept. 2016)
.07
.03
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Bank Sta


HEC-RAS ROUGE Plan: Plan 03
Geom: WC20-EX (407 ETR) Flow: WC#20 - Chicago 4hr
River = Rouge Reach = WC20 ST-10
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta

HEC-RAS Plan: WC20-EX-4hr CH River: Rouge Reach: WC20

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC20	300	2-yr	0.03	196.00	196.13	196.03	196.13	0.000264	0.14	0.22	29.02	0.12
WC20	300	5-yr	0.06	196.00	196.19	196.05	196.19	0.000328	0.20	0.31	33.92	0.15
WC20	300	10-yr	0.08	196.00	196.22	196.06	196.22	0.000356	0.23	0.35	40.16	0.16
WC20	300	25-yr	0.10	196.00	196.24	196.07	196.24	0.000377	0.25	0.40	43.06	0.16
WC20	300	50-yr	0.12	196.00	196.27	196.10	196.27	0.000399	0.27	0.44	45.62	0.17
WC20	300	100-yr	0.15	196.00	196.30	196.10	196.30	0.000429	0.31	0.49	48.60	0.18
WC20	300	Check Flow	0.19	196.00	196.33	196.11	196.34	0.000460	0.34	0.55	51.95	0.19
WC20	300	Regional	0.47	196.00	196.54	196.20	196.55	0.000587	0.53	0.88	68.44	0.23
WC20	250		Culvert									
WC20	200	2-yr	0.03	195.50	195.53	195.53	195.55	0.032393	0.59	0.05	6.58	1.07
WC20	200	5-yr	0.06	195.50	195.56	195.56	195.58	0.013905	0.60	0.10	7.45	0.79
WC20	200	10-yr	0.08	195.50	195.56	195.56	195.60	0.028306	0.84	0.10	7.38	1.11
WC20	200	25-yr	0.10	195.50	195.58	195.58	195.61	0.021209	0.84	0.12	7.79	1.00
WC20	200	50-yr	0.12	195.50	195.58	195.58	195.63	0.021210	0.90	0.13	8.04	1.02
WC20	200	100-yr	0.15	195.50	195.59	195.59	195.65	0.025387	1.04	0.14	8.24	1.13
WC20	200	Check Flow	0.19	195.50	195.63	195.63	195.67	0.013180	0.94	0.20	9.39	0.86
WC20	200	Regional	0.47	195.50	195.71	195.71	195.81	0.015032	1.41	0.33	21.95	1.00
WC20	100	2-yr	0.03	195.00	195.02		195.02	0.000521	0.05	0.57	31.57	0.12
WC20	100	5-yr	0.06	195.00	195.03		195.03	0.000455	0.07	0.92	33.27	0.12
WC20	100	10-yr	0.08	195.00	195.04		195.04	0.000462	0.07	1.10	34.11	0.13
WC20	100	25-yr	0.10	195.00	195.04		195.04	0.000506	0.08	1.23	34.71	0.14
WC20	100	50-yr	0.12	195.00	195.04		195.04	0.000608	0.09	1.31	35.39	0.15
WC20	100	100-yr	0.15	195.00	195.05		195.05	0.000599	0.10	1.51	35.76	0.15
WC20	100	Check Flow	0.19	195.00	195.05		195.05	0.000614	0.11	1.74	36.18	0.16
WC20	100	Regional	0.47	195.00	195.09		195.09	0.000630	0.15	3.05	38.48	0.18
WC20	10	2-yr	0.03	194.90	194.92	194.92	194.92	0.039283	0.25	0.12	13.07	0.83
WC20	10	5-yr	0.06	194.90	194.92	194.92	194.93	0.157131	0.50	0.12	13.07	1.66
WC20	10	10-yr	0.08	194.90	194.92	194.92	194.93	0.138504	0.53	0.15	13.87	1.60
WC20	10	25-yr	0.10	194.90	194.92	194.92	194.93	0.075077	0.46	0.22	15.40	1.23
WC20	10	50-yr	0.12	194.90	194.93	194.93	194.94	0.055245	0.44	0.28	16.61	1.08
WC20	10	100-yr	0.15	194.90	194.93	194.93	194.94	0.045239	0.43	0.35	18.52	1.00
WC20	10	Check Flow	0.19	194.90	194.93	194.93	194.94	0.049740	0.48	0.40	19.53	1.06
WC20	10	Regional	0.47	194.90	194.95	194.95	194.97	0.039837	0.57	0.83	26.23	1.02

HEC-RAS HEC-RAS 5.0.1 April 2016
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: HEC-RAS ROUGE
Project File : HEC.prj
Run Date and Time: 9/8/2016 10:16:05 AM

Project in SI units

Project Description:
HEC-RAS model for creek crossings along the proposed 407 TWY Ph 2 started
from scratch

PLAN DATA

Plan Title: Plan 03
Plan File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.p03

Geometry Title: WC20-EX (407 ETR)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g24

Flow Title : WC#20 - Chicago 4hr
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f07

Plan Summary Information:
Number of: Cross Sections = 4 Multiple Openings = 0
Culverts = 1 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: WC#20 - Chicago 4hr
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f07

Flow Data (m3/s)

River	Reach	RS	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Check Flow	Regional
Rouge	WC20	300	.03	.06	.08	.1	.12	.15	.19	.47

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Rouge	WC20	2-yr		Critical
Rouge	WC20	5-yr		Critical
Rouge	WC20	10-yr		Critical
Rouge	WC20	25-yr		Critical
Rouge	WC20	50-yr		Critical
Rouge	WC20	100-yr		Critical
Rouge	WC20	Check Flow		Critical
Rouge	WC20	Regional		Critical

GEOMETRY DATA

Geometry Title: WC20-EX (407 ETR)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g24

CROSS SECTION

RIVER: Rouge
REACH: WC20 RS: 300

INPUT
Description: ST-300 (Updated Sept. 2016)
Station Elevation Data num= 90

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	197.8	2.49	197.5	3.75	197.3	5.5	197	7.43	196.66
8.41	196.5	11.62	196.39	13.44	196.34	16.23	196.28	20.61	196.22
22.09	196.2	27.68	196.18	28.15	196.16	28.35	196.16	28.81	196.14
29.06	196.14	29.78	196.12	30.65	196.09	31.5	196.06	31.99	196.04
32.34	196.03	32.77	196.03	33.21	196	33.28	196	33.55	196
33.6	196	33.83	196	34.07	196	34.8	196	34.84	196
35.04	196	35.06	196	35.14	196	35.16	196	35.45	196
35.75	196	35.76	196	35.81	196	36.23	196	36.26	196
36.37	196	37.25	196	38.64	196	39.37	196	39.94	196
40.39	196	41	196	42.28	196	42.29	196	42.86	196
43.82	196	44.11	196	44.91	196	45.31	196	47.36	196
47.54	196	49.32	196	51.31	196.01	51.94	196.01	52.06	196.02
52.64	196.01	52.86	196.02	53.39	196.02	53.74	196.02	54.08	196.02
54.33	196.02	54.6	196.02	54.8	196.02	54.93	196.02	55	196.02
55.11	196.02	55.31	196.02	59.52	196.17	64.19	196.3	71.36	196.47
71.38	196.47	71.41	196.47	75.36	196.5	80.08	196.63	82.28	196.67
82.73	196.68	88.41	196.79	91.39	196.83	95.7	196.97	98.83	196.97
106.03	196.99	107.33	197	107.66	197	107.98	197	113.77	197.09

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	27.68	.03	59.52	.07

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
27.68 59.52 100.8 100.8 100.8 .3 .5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	41.175	198	T
42.825	113.77	198	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	196.13	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	196.13	Reach Len. (m)	100.80	100.80	100.80
Crit W.S. (m)	196.03	Flow Area (m2)		0.22	
E.G. Slope (m/m)	0.000264	Area (m2)		3.22	

Q Total (m3/s)	0.03	Flow (m3/s)	0.03
Top Width (m)	29.02	Top Width (m)	29.02
Vel Total (m/s)	0.14	Avg. Vel. (m/s)	0.14
Max Chl Dpth (m)	0.13	Hydr. Depth (m)	0.13
Conv. Total (m3/s)	1.8	Conv. (m3/s)	1.8
Length Wtd. (m)	100.80	Wetted Per. (m)	1.65
Min Ch El (m)	196.00	Shear (N/m2)	0.34
Alpha	1.00	Stream Power (N/m s)	0.05
Frctn Loss (m)		Cum Volume (1000 m3)	0.09
C & E Loss (m)		Cum SA (1000 m2)	4.09

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	196.19	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	196.19	Reach Len. (m)	100.80	100.80	100.80
Crit W.S. (m)	196.05	Flow Area (m2)		0.31	
E.G. Slope (m/m)	0.000328	Area (m2)	0.00	4.90	0.00
Q Total (m3/s)	0.06	Flow (m3/s)		0.06	
Top Width (m)	33.92	Top Width (m)	1.53	31.84	0.56
Vel Total (m/s)	0.20	Avg. Vel. (m/s)		0.20	
Max Chl Dpth (m)	0.19	Hydr. Depth (m)		0.19	
Conv. Total (m3/s)	3.3	Conv. (m3/s)		3.3	
Length Wtd. (m)	100.80	Wetted Per. (m)		1.65	
Min Ch El (m)	196.00	Shear (N/m2)		0.60	
Alpha	1.00	Stream Power (N/m s)		0.12	
Frctn Loss (m)		Cum Volume (1000 m3)		0.15	
C & E Loss (m)		Cum SA (1000 m2)	0.08	4.40	0.03

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	196.22	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	196.22	Reach Len. (m)	100.80	100.80	100.80
Crit W.S. (m)	196.06	Flow Area (m2)		0.35	
E.G. Slope (m/m)	0.000356	Area (m2)	0.15	5.84	0.04
Q Total (m3/s)	0.08	Flow (m3/s)		0.08	
Top Width (m)	40.16	Top Width (m)	6.70	31.84	1.62
Vel Total (m/s)	0.23	Avg. Vel. (m/s)		0.23	
Max Chl Dpth (m)	0.21	Hydr. Depth (m)		0.21	
Conv. Total (m3/s)	4.2	Conv. (m3/s)		4.2	
Length Wtd. (m)	100.80	Wetted Per. (m)		1.65	
Min Ch El (m)	196.00	Shear (N/m2)		0.75	
Alpha	1.00	Stream Power (N/m s)		0.17	
Frctn Loss (m)		Cum Volume (1000 m3)		0.18	
C & E Loss (m)		Cum SA (1000 m2)	0.34	4.46	0.08

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	196.24	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	196.24	Reach Len. (m)	100.80	100.80	100.80
Crit W.S. (m)	196.07	Flow Area (m2)		0.40	
E.G. Slope (m/m)	0.000377	Area (m2)	0.35	6.69	0.09
Q Total (m3/s)	0.10	Flow (m3/s)		0.10	
Top Width (m)	43.06	Top Width (m)	8.65	31.84	2.57
Vel Total (m/s)	0.25	Avg. Vel. (m/s)		0.25	
Max Chl Dpth (m)	0.24	Hydr. Depth (m)		0.24	
Conv. Total (m3/s)	5.1	Conv. (m3/s)		5.1	
Length Wtd. (m)	100.80	Wetted Per. (m)		1.65	
Min Ch El (m)	196.00	Shear (N/m2)		0.89	
Alpha	1.00	Stream Power (N/m s)		0.22	
Frctn Loss (m)		Cum Volume (1000 m3)		0.21	
C & E Loss (m)		Cum SA (1000 m2)	0.44	4.57	0.13

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	196.27	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	196.27	Reach Len. (m)	100.80	100.80	100.80
Crit W.S. (m)	196.10	Flow Area (m2)		0.44	
E.G. Slope (m/m)	0.000399	Area (m2)	0.58	7.44	0.16
Q Total (m3/s)	0.12	Flow (m3/s)		0.12	
Top Width (m)	45.62	Top Width (m)	10.36	31.84	3.41
Vel Total (m/s)	0.27	Avg. Vel. (m/s)		0.27	
Max Chl Dpth (m)	0.26	Hydr. Depth (m)		0.26	
Conv. Total (m3/s)	6.0	Conv. (m3/s)		6.0	
Length Wtd. (m)	100.80	Wetted Per. (m)		1.65	
Min Ch El (m)	196.00	Shear (N/m2)		1.04	
Alpha	1.00	Stream Power (N/m s)		0.28	
Frctn Loss (m)		Cum Volume (1000 m3)		0.23	
C & E Loss (m)		Cum SA (1000 m2)	0.52	4.66	0.17

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	196.30	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	196.30	Reach Len. (m)	100.80	100.80	100.80
Crit W.S. (m)	196.10	Flow Area (m2)		0.49	
E.G. Slope (m/m)	0.000429	Area (m2)	0.93	8.44	0.29
Q Total (m3/s)	0.15	Flow (m3/s)		0.15	
Top Width (m)	48.60	Top Width (m)	12.22	31.84	4.54
Vel Total (m/s)	0.31	Avg. Vel. (m/s)		0.31	
Max Chl Dpth (m)	0.30	Hydr. Depth (m)		0.30	
Conv. Total (m3/s)	7.2	Conv. (m3/s)		7.2	
Length Wtd. (m)	100.80	Wetted Per. (m)		1.65	
Min Ch El (m)	196.00	Shear (N/m2)		1.25	
Alpha	1.00	Stream Power (N/m s)		0.38	
Frctn Loss (m)		Cum Volume (1000 m3)		0.27	
C & E Loss (m)		Cum SA (1000 m2)	0.62	4.75	0.23

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	196.34	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	196.33	Reach Len. (m)	100.80	100.80	100.80
Crit W.S. (m)	196.11	Flow Area (m2)		0.55	
E.G. Slope (m/m)	0.000460	Area (m2)	1.43	9.65	0.49
Q Total (m3/s)	0.19	Flow (m3/s)		0.19	
Top Width (m)	51.95	Top Width (m)	13.99	31.84	6.12
Vel Total (m/s)	0.34	Avg. Vel. (m/s)		0.34	
Max Chl Dpth (m)	0.33	Hydr. Depth (m)		0.33	
Conv. Total (m3/s)	8.9	Conv. (m3/s)		8.9	
Length Wtd. (m)	100.80	Wetted Per. (m)		1.65	
Min Ch El (m)	196.00	Shear (N/m2)		1.51	
Alpha	1.00	Stream Power (N/m s)		0.52	
Frctn Loss (m)		Cum Volume (1000 m3)		0.32	
C & E Loss (m)		Cum SA (1000 m2)	0.70	4.89	0.31

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	196.55	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	196.54	Reach Len. (m)	100.80	100.80	100.80
Crit W.S. (m)	196.20	Flow Area (m2)		0.88	
E.G. Slope (m/m)	0.000587	Area (m2)	4.89	16.04	2.70
Q Total (m3/s)	0.47	Flow (m3/s)		0.47	
Top Width (m)	68.44	Top Width (m)	19.49	31.84	17.12
Vel Total (m/s)	0.53	Avg. Vel. (m/s)		0.53	
Max Chl Dpth (m)	0.54	Hydr. Depth (m)		0.54	
Conv. Total (m3/s)	19.4	Conv. (m3/s)		19.4	
Length Wtd. (m)	100.80	Wetted Per. (m)		1.65	
Min Ch El (m)	196.00	Shear (N/m2)		3.08	
Alpha	1.00	Stream Power (N/m s)		1.64	
Frctn Loss (m)		Cum Volume (1000 m3)		0.64	
C & E Loss (m)		Cum SA (1000 m2)	0.98	6.19	0.86

CULVERT

RIVER: Rouge
REACH: WC20 RS: 250

INPUT
Description: EXISTING 407 ETR CULVERT
Distance from Upstream XS = 15
Deck/Roadway Width = 60
Weir Coefficient = 1.4
Upstream Deck/Roadway Coordinates
num= 3

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	200		40	199.8		114	199.4	

Upstream Bridge Cross Section Data
Station Elevation Data num= 90

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	197.8	2.49	197.5	3.75	197.3	5.5	197	7.43	196.66
8.41	196.5	11.62	196.39	13.44	196.34	16.23	196.28	20.61	196.22
22.09	196.2	27.68	196.18	28.15	196.16	28.35	196.16	28.81	196.14
29.06	196.14	29.78	196.12	30.65	196.09	31.5	196.06	31.99	196.04
32.34	196.03	32.77	196.03	33.21	196	33.28	196	33.55	196
33.6	196	33.83	196	34.07	196	34.8	196	34.84	196
35.04	196	35.06	196	35.14	196	35.16	196	35.45	196
35.75	196	35.76	196	35.81	196	36.23	196	36.26	196
36.37	196	37.25	196	38.64	196	39.37	196	39.94	196
40.39	196	41	196	42.28	196	42.29	196	42.86	196
43.82	196	44.11	196	44.91	196	45.31	196	47.36	196
47.54	196	49.32	196	51.31	196.01	51.94	196.01	52.06	196.02
52.64	196.01	52.86	196.02	53.39	196.02	53.74	196.02	54.08	196.02
54.33	196.02	54.6	196.02	54.8	196.02	54.93	196.02	55	196.02
55.11	196.02	55.31	196.02	59.52	196.17	64.19	196.3	71.36	196.47
71.38	196.47	71.41	196.47	75.36	196.5	80.08	196.63	82.28	196.67
82.73	196.68	88.41	196.79	91.39	196.83	95.7	196.97	98.83	196.97
106.03	196.99	107.33	197	107.66	197	107.98	197	113.77	197.09

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	27.68	.03	59.52	.07

Bank Sta: Left Right Coeff Contr. Expan.
27.68 59.52 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	41.175	198	T
42.825	113.77	198	T

Downstream Deck/Roadway Coordinates
num= 3

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	200.1		60	199.8		163	199.2	

Downstream Bridge Cross Section Data
Station Elevation Data num= 128

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	200.04	4.2	200.01	5.4	200	6.33	199.85	8.54	199.5
11.05	199.21	12.87	199	15.16	198.65	16.16	198.5	17.03	198.23
17.26	198.2	17.37	198.18	17.59	198.17	17.75	198.17	17.95	198.14
18.18	198.14	18.88	198.1	19.83	198.01	19.85	198.01	19.88	198.01
19.93	198	22.21	197.58	23.25	197.5	26.17	197.28	26.7	197.24
26.82	197.23	27.42	197.16	28.96	197	31.17	196.67	32.51	196.5
33.66	196.48	33.79	196.48	36.14	196.48	36.27	196.48	36.41	196.48
36.56	196.48	36.59	196.48	36.99	196.47	49.22	196.42	49.71	196.41
50.82	196.41	57.7	196.38	59.01	196.36	61.44	196.28	62.99	196.28
63.06	196.28	65.49	196.27	66.75	196.16	68.59	196	70.66	196
70.7	196	70.74	196	72.51	196	74.5	195.93	75.15	195.9
75.51	195.87	75.59	195.86	75.64	195.86	76.31	195.82	76.85	195.79
77.5	195.73	78	195.671	78.78	195.58	79.47	195.5	79.5	195.5
80.1	195.5	81.45	195.5	82.71	195.5	83.82	195.5	83.97	195.5
84.52	195.5	84.53	195.5	84.55	195.5	85.06	195.5	87.34	195.61
89.08	195.67	91.08	195.65	92.65	195.65	92.68	195.65	93.64	195.65
94.38	195.66	94.39	195.67	94.4	195.69	98.71	195.67	99.38	195.69
100.3	195.74	100.86	195.79	101.85	195.92	101.99	195.92	102.38	196
103.72	196	104.25	196	104.26	196	104.28	196	104.3	196
107.24	196	107.39	196	107.44	196	107.59	196.01	107.73	196.01
110.02	196	110.43	196	110.69	196.01	110.73	196.01	114.27	196.03
114.43	196.03	114.84	196.03	121.97	196.1	123.39	196.13	126.33	196.07
128.02	196.04	128.17	196.04	129.93	196.11	133.42	196.24	136.44	196.37
140.18	196.5	142.84	196.89	143.73	197	146.27	197.4	146.97	197.5
148.58	197.74	150.33	198	151.07	198.1	153.78	198.5	155.05	198.78
156.21	199	158.38	199.15	163.01	199.17				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	68.59	.03	102.38	.07

Bank Sta: Left Right Coeff Contr. Expan.
68.59 102.38 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	79.175	198	T
80.825	163.01	198	T

Upstream Embankment side slope = 2 horiz. to 1.0 vertical
Downstream Embankment side slope = 2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .98
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name	Shape	Rise	Span
Culvert #1	Circular	1.65	

FHWA Chart # 1 - Concrete Pipe Culvert
FHWA Scale # 3 - Groove end entrance; pipe projecting from fill
Solution Criteria = Highest U.S. EG

Culvert	Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
	15	85	.013	.013	0	.9	1

Upstream Elevation = 196
Centerline Station = 42
Downstream Elevation = 195.75
Centerline Station = 80

CULVERT OUTPUT Profile #2-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.03	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	0.64
Q Barrel (m3/s)	0.03	Culv Vel DS (m/s)	0.74
E.G. US. (m)	196.13	Culv Inv El Up (m)	196.00
W.S. US. (m)	196.13	Culv Inv El Dn (m)	195.75
E.G. DS (m)	195.55	Culv Frctn Ls (m)	0.00
W.S. DS (m)	195.53	Culv Exit Loss (m)	0.31
Delta EG (m)	0.58	Culv Entr Loss (m)	0.02
Delta WS (m)	0.60	Q Weir (m3/s)	
E.G. IC (m)	196.11	Weir Sta Lft (m)	
E.G. OC (m)	196.13	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	196.09	Weir Max Depth (m)	
Culv WS Outlet (m)	195.83	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.09	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.08	Min El Weir Flow (m)	199.40

Note: During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth. Therefore, the inlet will be at normal depth.

CULVERT OUTPUT Profile #5-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.06	Culv Full Len (m)	

# Barrels	1	Culv Vel US (m/s)	0.78
Q Barrel (m3/s)	0.06	Culv Vel DS (m/s)	0.88
E.G. US. (m)	196.19	Culv Inv El Up (m)	196.00
W.S. US. (m)	196.19	Culv Inv El Dn (m)	195.75
E.G. DS (m)	195.58	Culv Frctn Ls (m)	0.00
W.S. DS (m)	195.56	Culv Exit Loss (m)	0.33
Delta EG (m)	0.61	Culv Entr Loss (m)	0.03
Delta WS (m)	0.62	Q Weir (m3/s)	
E.G. IC (m)	196.16	Weir Sta Lft (m)	
E.G. OC (m)	196.19	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	196.13	Weir Max Depth (m)	
Culv WS Outlet (m)	195.87	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.13	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.12	Min El Weir Flow (m)	199.40

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #10-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.08	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	0.86
Q Barrel (m3/s)	0.08	Culv Vel DS (m/s)	0.95
E.G. US. (m)	196.22	Culv Inv El Up (m)	196.00
W.S. US. (m)	196.22	Culv Inv El Dn (m)	195.75
E.G. DS (m)	195.60	Culv Frctn Ls (m)	0.00
W.S. DS (m)	195.56	Culv Exit Loss (m)	0.34
Delta EG (m)	0.62	Culv Entr Loss (m)	0.03
Delta WS (m)	0.65	Q Weir (m3/s)	
E.G. IC (m)	196.18	Weir Sta Lft (m)	
E.G. OC (m)	196.22	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	196.15	Weir Max Depth (m)	
Culv WS Outlet (m)	195.89	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.15	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.14	Min El Weir Flow (m)	199.40

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #25-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.10	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	0.93
Q Barrel (m3/s)	0.10	Culv Vel DS (m/s)	1.01
E.G. US. (m)	196.24	Culv Inv El Up (m)	196.00
W.S. US. (m)	196.24	Culv Inv El Dn (m)	195.75
E.G. DS (m)	195.61	Culv Frctn Ls (m)	0.00
W.S. DS (m)	195.58	Culv Exit Loss (m)	0.34
Delta EG (m)	0.63	Culv Entr Loss (m)	0.04
Delta WS (m)	0.67	Q Weir (m3/s)	
E.G. IC (m)	196.20	Weir Sta Lft (m)	
E.G. OC (m)	196.24	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	196.16	Weir Max Depth (m)	
Culv WS Outlet (m)	195.90	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.16	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.15	Min El Weir Flow (m)	199.40

Note: During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth. Therefore, the inlet will be at normal depth.

CULVERT OUTPUT Profile #50-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.12	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	0.97
Q Barrel (m3/s)	0.12	Culv Vel DS (m/s)	1.06
E.G. US. (m)	196.27	Culv Inv El Up (m)	196.00
W.S. US. (m)	196.27	Culv Inv El Dn (m)	195.75
E.G. DS (m)	195.63	Culv Frctn Ls (m)	0.00
W.S. DS (m)	195.58	Culv Exit Loss (m)	0.35
Delta EG (m)	0.64	Culv Entr Loss (m)	0.04
Delta WS (m)	0.68	Q Weir (m3/s)	
E.G. IC (m)	196.22	Weir Sta Lft (m)	
E.G. OC (m)	196.27	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	196.18	Weir Max Depth (m)	
Culv WS Outlet (m)	195.92	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.18	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.17	Min El Weir Flow (m)	199.40

Note: During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth. Therefore, the inlet will be at normal depth.

CULVERT OUTPUT Profile #100-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.15	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.03
Q Barrel (m3/s)	0.15	Culv Vel DS (m/s)	1.12
E.G. US. (m)	196.30	Culv Inv El Up (m)	196.00
W.S. US. (m)	196.30	Culv Inv El Dn (m)	195.75
E.G. DS (m)	195.65	Culv Frctn Ls (m)	0.00
W.S. DS (m)	195.59	Culv Exit Loss (m)	0.36
Delta EG (m)	0.66	Culv Entr Loss (m)	0.05
Delta WS (m)	0.71	Q Weir (m3/s)	
E.G. IC (m)	196.25	Weir Sta Lft (m)	
E.G. OC (m)	196.30	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	196.20	Weir Max Depth (m)	
Culv WS Outlet (m)	195.94	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.20	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.19	Min El Weir Flow (m)	199.40

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #Check Flow Culv Group: Culvert #1

Q Culv Group (m3/s)	0.19	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.11
Q Barrel (m3/s)	0.19	Culv Vel DS (m/s)	1.19
E.G. US. (m)	196.34	Culv Inv El Up (m)	196.00
W.S. US. (m)	196.33	Culv Inv El Dn (m)	195.75
E.G. DS (m)	195.67	Culv Frctn Ls (m)	0.00
W.S. DS (m)	195.63	Culv Exit Loss (m)	0.36
Delta EG (m)	0.67	Culv Entr Loss (m)	0.06
Delta WS (m)	0.71	Q Weir (m3/s)	
E.G. IC (m)	196.28	Weir Sta Lft (m)	
E.G. OC (m)	196.34	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	196.22	Weir Max Depth (m)	
Culv WS Outlet (m)	195.96	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.22	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.21	Min El Weir Flow (m)	199.40

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #Regional Culv Group: Culvert #1

Q Culv Group (m3/s)	0.47	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.46
Q Barrel (m3/s)	0.47	Culv Vel DS (m/s)	1.51
E.G. US. (m)	196.55	Culv Inv El Up (m)	196.00
W.S. US. (m)	196.54	Culv Inv El Dn (m)	195.75
E.G. DS (m)	195.81	Culv Frctn Ls (m)	0.00
W.S. DS (m)	195.71	Culv Exit Loss (m)	0.39
Delta EG (m)	0.74	Culv Entr Loss (m)	0.10
Delta WS (m)	0.83	Q Weir (m3/s)	
E.G. IC (m)	196.45	Weir Sta Lft (m)	
E.G. OC (m)	196.55	Weir Sta Rgt (m)	

Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	196.34	Weir Max Depth (m)	
Culv WS Outlet (m)	196.08	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.34	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.33	Min El Weir Flow (m)	199.40

Note: During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth. Therefore, the inlet will be at normal depth.

CROSS SECTION

RIVER: Rouge
REACH: WC20 RS: 200

INPUT
Description: ST-200 (Updated Sept. 2016)
Station Elevation Data num= 128

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	200.04	4.2	200.01	5.4	200	6.33	199.85	8.54	199.5
11.05	199.21	12.87	199	15.16	198.65	16.16	198.5	17.03	198.23
17.26	198.2	17.37	198.18	17.59	198.17	17.75	198.17	17.95	198.14
18.18	198.14	18.88	198.1	19.83	198.01	19.85	198.01	19.88	198.01
19.93	198	22.21	197.58	23.25	197.5	26.17	197.28	26.7	197.24
26.82	197.23	27.42	197.16	28.96	197	31.17	196.67	32.51	196.5
33.66	196.48	33.79	196.48	36.14	196.48	36.27	196.48	36.41	196.48
36.56	196.48	36.59	196.48	36.99	196.47	49.22	196.42	49.71	196.41
50.82	196.41	57.7	196.38	59.01	196.36	61.44	196.28	62.99	196.28
63.06	196.28	65.49	196.27	66.75	196.16	68.59	196	70.66	196
70.7	196	70.74	196	72.51	196	74.5	195.93	75.15	195.9
75.51	195.87	75.59	195.86	75.64	195.86	76.31	195.82	76.85	195.79
77.5	195.73	78	195.671	78.78	195.58	79.47	195.5	79.5	195.5
80.1	195.5	81.45	195.5	82.71	195.5	83.82	195.5	83.97	195.5
84.52	195.5	84.53	195.5	84.55	195.5	85.06	195.5	87.34	195.61
89.08	195.67	91.08	195.65	92.65	195.65	92.68	195.65	93.64	195.65
94.38	195.66	94.39	195.67	94.4	195.69	98.71	195.67	99.38	195.69
100.3	195.74	100.86	195.79	101.85	195.92	101.99	195.92	102.38	196
103.72	196	104.25	196	104.26	196	104.28	196	104.3	196
107.24	196	107.39	196	107.44	196	107.59	196.01	107.73	196.01
110.02	196	110.43	196	110.69	196.01	110.73	196.01	114.27	196.03
114.43	196.03	114.84	196.03	121.97	196.1	123.39	196.13	126.33	196.07
128.02	196.04	128.17	196.04	129.93	196.11	133.42	196.24	136.44	196.37
140.18	196.5	142.84	196.89	143.73	197	146.27	197.4	146.97	197.5
148.58	197.74	150.33	198	151.07	198.1	153.78	198.5	155.05	198.78
156.21	199	158.38	199.15	163.01	199.17				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	68.59	.03	102.38	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
68.59	102.38	55.5	55.5	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	79.175	198	T
80.825	163.01	198	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	195.55	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	195.53	Reach Len. (m)	55.50	55.50	55.50
Crit W.S. (m)	195.53	Flow Area (m2)		0.05	
E.G. Slope (m/m)	0.032393	Area (m2)		0.21	
Q Total (m3/s)	0.03	Flow (m3/s)		0.03	
Top Width (m)	6.58	Top Width (m)		6.58	
Vel Total (m/s)	0.59	Avg. Vel. (m/s)		0.59	
Max Chl Dpth (m)	0.03	Hydr. Depth (m)		0.03	
Conv. Total (m3/s)	0.2	Conv. (m3/s)		0.2	
Length Wtd. (m)	55.50	Wetted Per. (m)		1.65	
Min Ch El (m)	195.50	Shear (N/m2)		9.80	
Alpha	1.00	Stream Power (N/m s)		5.78	
Frctn Loss (m)	0.09	Cum Volume (1000 m3)		0.04	
C & E Loss (m)	0.01	Cum SA (1000 m2)		2.30	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	195.58	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	195.56	Reach Len. (m)	55.50	55.50	55.50
Crit W.S. (m)	195.56	Flow Area (m2)		0.10	
E.G. Slope (m/m)	0.013905	Area (m2)		0.41	
Q Total (m3/s)	0.06	Flow (m3/s)		0.06	
Top Width (m)	7.45	Top Width (m)		7.45	
Vel Total (m/s)	0.60	Avg. Vel. (m/s)		0.60	
Max Chl Dpth (m)	0.06	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	0.5	Conv. (m3/s)		0.5	
Length Wtd. (m)	55.50	Wetted Per. (m)		1.65	
Min Ch El (m)	195.50	Shear (N/m2)		8.20	
Alpha	1.00	Stream Power (N/m s)		4.95	
Frctn Loss (m)	0.07	Cum Volume (1000 m3)		0.07	
C & E Loss (m)	0.01	Cum SA (1000 m2)		2.42	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	195.60	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.030	
W.S. Elev (m)	195.56	Reach Len. (m)	55.50	55.50	55.50
Crit W.S. (m)	195.56	Flow Area (m2)		0.10	
E.G. Slope (m/m)	0.028306	Area (m2)		0.39	
Q Total (m3/s)	0.08	Flow (m3/s)		0.08	
Top Width (m)	7.38	Top Width (m)		7.38	
Vel Total (m/s)	0.84	Avg. Vel. (m/s)		0.84	
Max Chl Dpth (m)	0.06	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	0.5	Conv. (m3/s)		0.5	
Length Wtd. (m)	55.50	Wetted Per. (m)		1.65	
Min Ch El (m)	195.50	Shear (N/m2)		16.04	
Alpha	1.00	Stream Power (N/m s)		13.44	
Frctn Loss (m)	0.08	Cum Volume (1000 m3)		0.08	
C & E Loss (m)	0.02	Cum SA (1000 m2)		2.48	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	195.61	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.030	
W.S. Elev (m)	195.58	Reach Len. (m)	55.50	55.50	55.50
Crit W.S. (m)	195.58	Flow Area (m2)		0.12	
E.G. Slope (m/m)	0.021209	Area (m2)		0.50	
Q Total (m3/s)	0.10	Flow (m3/s)		0.10	
Top Width (m)	7.79	Top Width (m)		7.79	
Vel Total (m/s)	0.84	Avg. Vel. (m/s)		0.84	
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	0.7	Conv. (m3/s)		0.7	
Length Wtd. (m)	55.50	Wetted Per. (m)		1.65	
Min Ch El (m)	195.50	Shear (N/m2)		14.98	
Alpha	1.00	Stream Power (N/m s)		12.59	
Frctn Loss (m)	0.08	Cum Volume (1000 m3)		0.09	
C & E Loss (m)	0.02	Cum SA (1000 m2)		2.57	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	195.63	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.030	
W.S. Elev (m)	195.58	Reach Len. (m)	55.50	55.50	55.50
Crit W.S. (m)	195.58	Flow Area (m2)		0.13	
E.G. Slope (m/m)	0.021210	Area (m2)		0.57	
Q Total (m3/s)	0.12	Flow (m3/s)		0.12	
Top Width (m)	8.04	Top Width (m)		8.04	
Vel Total (m/s)	0.90	Avg. Vel. (m/s)		0.90	
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	0.8	Conv. (m3/s)		0.8	
Length Wtd. (m)	55.50	Wetted Per. (m)		1.65	
Min Ch El (m)	195.50	Shear (N/m2)		16.71	
Alpha	1.00	Stream Power (N/m s)		15.11	
Frctn Loss (m)	0.10	Cum Volume (1000 m3)		0.10	
C & E Loss (m)	0.02	Cum SA (1000 m2)		2.65	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	195.65	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.030	
W.S. Elev (m)	195.59	Reach Len. (m)	55.50	55.50	55.50
Crit W.S. (m)	195.59	Flow Area (m2)		0.14	
E.G. Slope (m/m)	0.025387	Area (m2)		0.62	
Q Total (m3/s)	0.15	Flow (m3/s)		0.15	
Top Width (m)	8.24	Top Width (m)		8.24	
Vel Total (m/s)	1.04	Avg. Vel. (m/s)		1.04	
Max Chl Dpth (m)	0.09	Hydr. Depth (m)		0.09	
Conv. Total (m3/s)	0.9	Conv. (m3/s)		0.9	
Length Wtd. (m)	55.50	Wetted Per. (m)		1.65	
Min Ch El (m)	195.50	Shear (N/m2)		21.67	
Alpha	1.00	Stream Power (N/m s)		22.60	
Frctn Loss (m)	0.10	Cum Volume (1000 m3)		0.11	
C & E Loss (m)	0.03	Cum SA (1000 m2)		2.73	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	195.67	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.030	
W.S. Elev (m)	195.63	Reach Len. (m)	55.50	55.50	55.50
Crit W.S. (m)	195.63	Flow Area (m2)		0.20	
E.G. Slope (m/m)	0.013180	Area (m2)		0.93	
Q Total (m3/s)	0.19	Flow (m3/s)		0.19	
Top Width (m)	9.39	Top Width (m)		9.39	
Vel Total (m/s)	0.94	Avg. Vel. (m/s)		0.94	
Max Chl Dpth (m)	0.13	Hydr. Depth (m)		0.12	
Conv. Total (m3/s)	1.7	Conv. (m3/s)		1.7	
Length Wtd. (m)	55.50	Wetted Per. (m)		1.65	
Min Ch El (m)	195.50	Shear (N/m2)		15.78	
Alpha	1.00	Stream Power (N/m s)		14.86	
Frctn Loss (m)	0.09	Cum Volume (1000 m3)		0.13	
C & E Loss (m)	0.02	Cum SA (1000 m2)		2.81	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	195.81	Element	Left OB	Channel	Right OB
Vel Head (m)	0.10	Wt. n-Val.		0.030	
W.S. Elev (m)	195.71	Reach Len. (m)	55.50	55.50	55.50
Crit W.S. (m)	195.71	Flow Area (m2)		0.33	
E.G. Slope (m/m)	0.015032	Area (m2)		2.19	
Q Total (m3/s)	0.47	Flow (m3/s)		0.47	
Top Width (m)	21.95	Top Width (m)		21.95	
Vel Total (m/s)	1.41	Avg. Vel. (m/s)		1.41	
Max Chl Dpth (m)	0.21	Hydr. Depth (m)		0.20	
Conv. Total (m3/s)	3.8	Conv. (m3/s)		3.8	
Length Wtd. (m)	55.50	Wetted Per. (m)		1.65	
Min Ch El (m)	195.50	Shear (N/m2)		29.79	
Alpha	1.00	Stream Power (N/m s)		41.93	
Frctn Loss (m)	0.10	Cum Volume (1000 m3)		0.25	
C & E Loss (m)	0.05	Cum SA (1000 m2)		3.48	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The

program defaulted to critical depth.

CROSS SECTION

RIVER: Rouge
REACH: WC20 RS: 100

INPUT
Description: ST-100 (Updated Sept. 2016)
Station Elevation Data num= 72

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	196.35	5.09	196.28	9.03	196.22	26.14	196	27.42	195.97
29.78	195.92	39.03	195.73	43.69	195.63	45.36	195.61	51.38	195.52
51.45	195.52	52.25	195.5	54.92	195.5	55.16	195.5	58.62	195.5
64.53	195.5	64.76	195.5	64.97	195.5	66.02	195.5	68.55	195.51
69.94	195.51	71.77	195.5	72.15	195.5	72.97	195.47	72.98	195.47
73.04	195.47	73.08	195.47	73.09	195.47	73.12	195.47	73.2	195.47
74.1	195.45	75.88	195.41	94.18	195	105.23	195	108.31	195
109.48	195	111.28	195	112.4	195	116.64	195	122.29	195
123	195	123.02	195	123.09	195	123.16	195	123.9	195.01
127.27	195.04	127.71	195.04	132.33	195.26	132.83	195.27	132.94	195.27
133.06	195.27	134.25	195.33	134.69	195.34	135.79	195.38	136.72	195.42
137.37	195.44	138.36	195.46	139.77	195.5	140.66	195.5	141.99	195.51
143.58	195.51	144.39	195.51	145.44	195.52	145.54	195.52	145.88	195.52
146.78	195.52	146.8	195.52	147.23	195.52	156.22	195.63	161.26	195.65
161.8	195.68	164.45	195.72						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	71.77	.03	139.77	.07

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
71.77 139.77 55.6 55.6 55.6 .3 .5

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	195.02	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	195.02	Reach Len. (m)	55.60	55.60	55.60
Crit W.S. (m)		Flow Area (m2)		0.57	
E.G. Slope (m/m)	0.000521	Area (m2)		0.57	
Q Total (m3/s)	0.03	Flow (m3/s)		0.03	
Top Width (m)	31.57	Top Width (m)		31.57	
Vel Total (m/s)	0.05	Avg. Vel. (m/s)		0.05	
Max Chl Dpth (m)	0.02	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	1.3	Conv. (m3/s)		1.3	
Length Wtd. (m)	55.60	Wetted Per. (m)		31.57	
Min Ch El (m)	195.00	Shear (N/m2)		0.09	
Alpha	1.00	Stream Power (N/m s)		0.00	
Frctn Loss (m)	0.09	Cum Volume (1000 m3)		0.02	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.24	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	195.03	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	195.03	Reach Len. (m)	55.60	55.60	55.60
Crit W.S. (m)		Flow Area (m2)		0.92	
E.G. Slope (m/m)	0.000455	Area (m2)		0.92	
Q Total (m3/s)	0.06	Flow (m3/s)		0.06	
Top Width (m)	33.27	Top Width (m)		33.27	
Vel Total (m/s)	0.07	Avg. Vel. (m/s)		0.07	
Max Chl Dpth (m)	0.03	Hydr. Depth (m)		0.03	
Conv. Total (m3/s)	2.8	Conv. (m3/s)		2.8	
Length Wtd. (m)	55.60	Wetted Per. (m)		33.27	
Min Ch El (m)	195.00	Shear (N/m2)		0.12	
Alpha	1.00	Stream Power (N/m s)		0.01	
Frctn Loss (m)	0.09	Cum Volume (1000 m3)		0.03	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.29	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	195.04	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	195.04	Reach Len. (m)	55.60	55.60	55.60
Crit W.S. (m)		Flow Area (m2)		1.10	
E.G. Slope (m/m)	0.000462	Area (m2)		1.10	
Q Total (m3/s)	0.08	Flow (m3/s)		0.08	
Top Width (m)	34.11	Top Width (m)		34.11	
Vel Total (m/s)	0.07	Avg. Vel. (m/s)		0.07	
Max Chl Dpth (m)	0.04	Hydr. Depth (m)		0.03	
Conv. Total (m3/s)	3.7	Conv. (m3/s)		3.7	
Length Wtd. (m)	55.60	Wetted Per. (m)		34.11	
Min Ch El (m)	195.00	Shear (N/m2)		0.15	
Alpha	1.00	Stream Power (N/m s)		0.01	
Frctn Loss (m)	0.09	Cum Volume (1000 m3)		0.03	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.33	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	195.04	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	195.04	Reach Len. (m)	55.60	55.60	55.60
Crit W.S. (m)		Flow Area (m2)		1.23	
E.G. Slope (m/m)	0.000506	Area (m2)		1.23	
Q Total (m3/s)	0.10	Flow (m3/s)		0.10	
Top Width (m)	34.71	Top Width (m)		34.71	
Vel Total (m/s)	0.08	Avg. Vel. (m/s)		0.08	
Max Chl Dpth (m)	0.04	Hydr. Depth (m)		0.04	
Conv. Total (m3/s)	4.4	Conv. (m3/s)		4.4	
Length Wtd. (m)	55.60	Wetted Per. (m)		34.71	
Min Ch El (m)	195.00	Shear (N/m2)		0.18	
Alpha	1.00	Stream Power (N/m s)		0.01	
Frctn Loss (m)	0.10	Cum Volume (1000 m3)		0.04	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.39	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	195.04	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	195.04	Reach Len. (m)	55.60	55.60	55.60
Crit W.S. (m)		Flow Area (m2)		1.31	
E.G. Slope (m/m)	0.000608	Area (m2)		1.31	
Q Total (m3/s)	0.12	Flow (m3/s)		0.12	
Top Width (m)	35.39	Top Width (m)		35.39	
Vel Total (m/s)	0.09	Avg. Vel. (m/s)		0.09	
Max Chl Dpth (m)	0.04	Hydr. Depth (m)		0.04	
Conv. Total (m3/s)	4.9	Conv. (m3/s)		4.9	
Length Wtd. (m)	55.60	Wetted Per. (m)		35.39	
Min Ch El (m)	195.00	Shear (N/m2)		0.22	
Alpha	1.00	Stream Power (N/m s)		0.02	
Frctn Loss (m)	0.11	Cum Volume (1000 m3)		0.04	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.45	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	195.05	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	195.05	Reach Len. (m)	55.60	55.60	55.60
Crit W.S. (m)		Flow Area (m2)		1.51	
E.G. Slope (m/m)	0.000599	Area (m2)		1.51	
Q Total (m3/s)	0.15	Flow (m3/s)		0.15	
Top Width (m)	35.76	Top Width (m)		35.76	
Vel Total (m/s)	0.10	Avg. Vel. (m/s)		0.10	
Max Chl Dpth (m)	0.05	Hydr. Depth (m)		0.04	
Conv. Total (m3/s)	6.1	Conv. (m3/s)		6.1	
Length Wtd. (m)	55.60	Wetted Per. (m)		35.77	
Min Ch El (m)	195.00	Shear (N/m2)		0.25	
Alpha	1.00	Stream Power (N/m s)		0.02	
Frctn Loss (m)	0.11	Cum Volume (1000 m3)		0.05	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.51	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	195.05	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	195.05	Reach Len. (m)	55.60	55.60	55.60
Crit W.S. (m)		Flow Area (m2)		1.74	
E.G. Slope (m/m)	0.000614	Area (m2)		1.74	
Q Total (m3/s)	0.19	Flow (m3/s)		0.19	
Top Width (m)	36.18	Top Width (m)		36.18	
Vel Total (m/s)	0.11	Avg. Vel. (m/s)		0.11	
Max Chl Dpth (m)	0.05	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	7.7	Conv. (m3/s)		7.7	
Length Wtd. (m)	55.60	Wetted Per. (m)		36.18	
Min Ch El (m)	195.00	Shear (N/m2)		0.29	
Alpha	1.00	Stream Power (N/m s)		0.03	
Frctn Loss (m)	0.11	Cum Volume (1000 m3)		0.06	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.55	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	195.09	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	195.09	Reach Len. (m)	55.60	55.60	55.60
Crit W.S. (m)		Flow Area (m2)		3.05	
E.G. Slope (m/m)	0.000630	Area (m2)		3.05	
Q Total (m3/s)	0.47	Flow (m3/s)		0.47	
Top Width (m)	38.48	Top Width (m)		38.48	
Vel Total (m/s)	0.15	Avg. Vel. (m/s)		0.15	
Max Chl Dpth (m)	0.09	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	18.7	Conv. (m3/s)		18.7	
Length Wtd. (m)	55.60	Wetted Per. (m)		38.48	
Min Ch El (m)	195.00	Shear (N/m2)		0.49	
Alpha	1.00	Stream Power (N/m s)		0.08	
Frctn Loss (m)	0.11	Cum Volume (1000 m3)		0.11	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.80	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Rouge
REACH: WC20 RS: 10

INPUT
Description: ST-10
Station Elevation Data num= 97

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	196.5	2.48	196.5	20.48	196.21	31.15	196	34.86	195.99
36.6	195.99	49.27	195.78	57.38	195.66	58.4	195.64	66.49	195.5
67.94	195.5	69.55	195.5	69.95	195.5	70.16	195.5	70.67	195.5
71.28	195.5	71.38	195.5	77.12	195.5	82.09	195.5	84.31	195.5
84.8	195.5	85.21	195.5	85.5	195.5	85.84	195.5	87.32	195.5
88.14	195.49	92.72	195.44	93.13	195.44	93.23	195.44	93.92	195.43
93.96	195.43	95.57	195.4	101.51	195.25	103.87	195.21	106.2	195.14
109.8	195.02	109.83	195.02	109.85	195.02	109.96	195.01	110.38	195
110.85	195	112.01	195	114.91	195	115.13	195	115.47	195
115.48	195	115.56	195	118.22	195	118.24	195	119.23	195
119.54	195	119.73	195	120.99	195	121.03	194.99	121.07	194.99
126.99	194.99	132.01	194.99	132.81	194.99	133.7	194.99	134.06	194.99
134.34	194.99	135.66	194.99	136.06	194.99	136.5	194.99	136.71	194.99
137.04	194.99	137.22	194.99	137.4	194.99	138.95	194.99	139.3	194.99
139.45	194.99	139.91	194.99	140.28	195	142.56	195	143.28	195
147.71	195	150.5	194.98	153.05	194.93	154.3	194.91	154.75	194.91
162.71	194.9	171	194.93	171.45	194.93	178.12	194.95	179.09	194.97
179.5	194.97	179.75	194.97	179.94	194.97	179.98	194.97	180.06	194.97
180.38	194.97	182.91	194.98	186.01	195	196.05	195.224	203.08	195.38
208.26	195.5	209.84	195.51						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	103.87	.035	196.05	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
103.87	196.05	0	0	0 .1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	194.92	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	194.92	Reach Len. (m)			
Crit W.S. (m)	194.92	Flow Area (m2)		0.12	
E.G. Slope (m/m)	0.039283	Area (m2)		0.12	
Q Total (m3/s)	0.03	Flow (m3/s)		0.03	
Top Width (m)	13.07	Top Width (m)		13.07	
Vel Total (m/s)	0.25	Avg. Vel. (m/s)		0.25	
Max Chl Dpth (m)	0.02	Hydr. Depth (m)		0.01	
Conv. Total (m3/s)	0.2	Conv. (m3/s)		0.2	
Length Wtd. (m)		Wetted Per. (m)		13.07	
Min Ch El (m)	194.90	Shear (N/m2)		3.55	
Alpha	1.00	Stream Power (N/m s)		0.88	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	194.93	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	194.92	Reach Len. (m)			
Crit W.S. (m)	194.92	Flow Area (m2)		0.12	
E.G. Slope (m/m)	0.157131	Area (m2)		0.12	
Q Total (m3/s)	0.06	Flow (m3/s)		0.06	
Top Width (m)	13.07	Top Width (m)		13.07	
Vel Total (m/s)	0.50	Avg. Vel. (m/s)		0.50	
Max Chl Dpth (m)	0.02	Hydr. Depth (m)		0.01	
Conv. Total (m3/s)	0.2	Conv. (m3/s)		0.2	
Length Wtd. (m)		Wetted Per. (m)		13.07	
Min Ch El (m)	194.90	Shear (N/m2)		14.21	
Alpha	1.00	Stream Power (N/m s)		7.08	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	194.93	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	194.92	Reach Len. (m)			
Crit W.S. (m)	194.92	Flow Area (m2)		0.15	
E.G. Slope (m/m)	0.138504	Area (m2)		0.15	
Q Total (m3/s)	0.08	Flow (m3/s)		0.08	
Top Width (m)	13.87	Top Width (m)		13.87	
Vel Total (m/s)	0.53	Avg. Vel. (m/s)		0.53	
Max Chl Dpth (m)	0.02	Hydr. Depth (m)		0.01	
Conv. Total (m3/s)	0.2	Conv. (m3/s)		0.2	
Length Wtd. (m)		Wetted Per. (m)		13.87	
Min Ch El (m)	194.90	Shear (N/m2)		14.91	
Alpha	1.00	Stream Power (N/m s)		7.83	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	194.93	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	194.92	Reach Len. (m)			
Crit W.S. (m)	194.92	Flow Area (m2)		0.22	
E.G. Slope (m/m)	0.075077	Area (m2)		0.22	
Q Total (m3/s)	0.10	Flow (m3/s)		0.10	
Top Width (m)	15.40	Top Width (m)		15.40	
Vel Total (m/s)	0.46	Avg. Vel. (m/s)		0.46	
Max Chl Dpth (m)	0.02	Hydr. Depth (m)		0.01	
Conv. Total (m3/s)	0.4	Conv. (m3/s)		0.4	
Length Wtd. (m)		Wetted Per. (m)		15.40	
Min Ch El (m)	194.90	Shear (N/m2)		10.43	
Alpha	1.00	Stream Power (N/m s)		4.78	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	194.94	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	194.93	Reach Len. (m)			
Crit W.S. (m)	194.93	Flow Area (m2)		0.28	
E.G. Slope (m/m)	0.055245	Area (m2)		0.28	
Q Total (m3/s)	0.12	Flow (m3/s)		0.12	
Top Width (m)	16.61	Top Width (m)		16.61	
Vel Total (m/s)	0.44	Avg. Vel. (m/s)		0.44	
Max Chl Dpth (m)	0.03	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	0.5	Conv. (m3/s)		0.5	
Length Wtd. (m)		Wetted Per. (m)		16.61	
Min Ch El (m)	194.90	Shear (N/m2)		8.97	
Alpha	1.00	Stream Power (N/m s)		3.91	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	194.94	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	194.93	Reach Len. (m)			
Crit W.S. (m)	194.93	Flow Area (m2)		0.35	
E.G. Slope (m/m)	0.045239	Area (m2)		0.35	
Q Total (m3/s)	0.15	Flow (m3/s)		0.15	
Top Width (m)	18.52	Top Width (m)		18.52	
Vel Total (m/s)	0.43	Avg. Vel. (m/s)		0.43	
Max Chl Dpth (m)	0.03	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	0.7	Conv. (m3/s)		0.7	
Length Wtd. (m)		Wetted Per. (m)		18.52	
Min Ch El (m)	194.90	Shear (N/m2)		8.35	
Alpha	1.00	Stream Power (N/m s)		3.59	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	194.94	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	194.93	Reach Len. (m)			
Crit W.S. (m)	194.93	Flow Area (m2)		0.40	
E.G. Slope (m/m)	0.049740	Area (m2)		0.40	
Q Total (m3/s)	0.19	Flow (m3/s)		0.19	
Top Width (m)	19.53	Top Width (m)		19.53	
Vel Total (m/s)	0.48	Avg. Vel. (m/s)		0.48	
Max Chl Dpth (m)	0.03	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	0.9	Conv. (m3/s)		0.9	
Length Wtd. (m)		Wetted Per. (m)		19.53	
Min Ch El (m)	194.90	Shear (N/m2)		9.96	
Alpha	1.00	Stream Power (N/m s)		4.74	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	194.97	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	194.95	Reach Len. (m)			
Crit W.S. (m)	194.95	Flow Area (m2)		0.83	
E.G. Slope (m/m)	0.039837	Area (m2)		0.83	
Q Total (m3/s)	0.47	Flow (m3/s)		0.47	
Top Width (m)	26.23	Top Width (m)		26.23	
Vel Total (m/s)	0.57	Avg. Vel. (m/s)		0.57	
Max Chl Dpth (m)	0.05	Hydr. Depth (m)		0.03	
Conv. Total (m3/s)	2.4	Conv. (m3/s)		2.4	
Length Wtd. (m)		Wetted Per. (m)		26.23	
Min Ch El (m)	194.90	Shear (N/m2)		12.31	
Alpha	1.00	Stream Power (N/m s)		7.00	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

SUMMARY OF MANNING'S N VALUES

River:Rouge

Reach	River Sta.	n1	n2	n3
WC20	300	.07	.03	.07
WC20	250	Culvert		
WC20	200	.07	.03	.07
WC20	100	.07	.03	.07
WC20	10	.07	.035	.07

SUMMARY OF REACH LENGTHS

River: Rouge

Reach	River Sta.	Left	Channel	Right
WC20	300	100.8	100.8	100.8
WC20	250	Culvert		
WC20	200	55.5	55.5	55.5
WC20	100	55.6	55.6	55.6
WC20	10	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Rouge

Reach	River Sta.	Contr.	Expan.
WC20	300	.3	.5
WC20	250	Culvert	
WC20	200	.3	.5
WC20	100	.3	.5
WC20	10	.1	.3

Profile Output Table - Standard Table 1

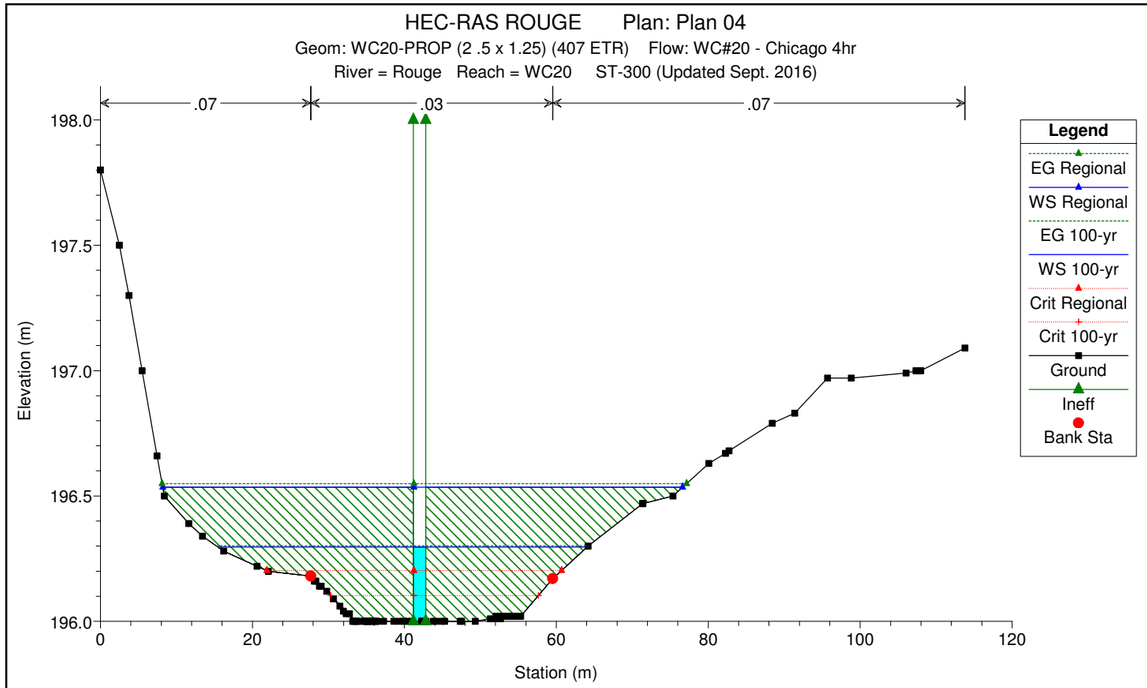
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
WC20	300	2-yr	0.03	196.00	196.13	196.03	196.13	0.000264	0.14	0.22	29.02	0.12
WC20	300	5-yr	0.06	196.00	196.19	196.05	196.19	0.000328	0.20	0.31	33.92	0.15
WC20	300	10-yr	0.08	196.00	196.22	196.06	196.22	0.000356	0.23	0.35	40.16	0.16
WC20	300	25-yr	0.10	196.00	196.24	196.07	196.24	0.000377	0.25	0.40	43.06	0.16
WC20	300	50-yr	0.12	196.00	196.27	196.10	196.27	0.000399	0.27	0.44	45.62	0.17
WC20	300	100-yr	0.15	196.00	196.30	196.10	196.30	0.000429	0.31	0.49	48.60	0.18
WC20	300	Check Flow	0.19	196.00	196.33	196.11	196.34	0.000460	0.34	0.55	51.95	0.19
WC20	300	Regional	0.47	196.00	196.54	196.20	196.55	0.000587	0.53	0.88	68.44	0.23
WC20	250		Culvert									
WC20	200	2-yr	0.03	195.50	195.53	195.53	195.55	0.032393	0.59	0.05	6.58	1.07
WC20	200	5-yr	0.06	195.50	195.56	195.56	195.58	0.013905	0.60	0.10	7.45	0.79
WC20	200	10-yr	0.08	195.50	195.56	195.56	195.60	0.028306	0.84	0.10	7.38	1.11
WC20	200	25-yr	0.10	195.50	195.58	195.58	195.61	0.021209	0.84	0.12	7.79	1.00
WC20	200	50-yr	0.12	195.50	195.58	195.58	195.63	0.021210	0.90	0.13	8.04	1.02
WC20	200	100-yr	0.15	195.50	195.59	195.59	195.65	0.025387	1.04	0.14	8.24	1.13
WC20	200	Check Flow	0.19	195.50	195.63	195.63	195.67	0.013180	0.94	0.20	9.39	0.86
WC20	200	Regional	0.47	195.50	195.71	195.71	195.81	0.015032	1.41	0.33	21.95	1.00
WC20	100	2-yr	0.03	195.00	195.02		195.02	0.000521	0.05	0.57	31.57	0.12
WC20	100	5-yr	0.06	195.00	195.03		195.03	0.000455	0.07	0.92	33.27	0.12
WC20	100	10-yr	0.08	195.00	195.04		195.04	0.000462	0.07	1.10	34.11	0.13
WC20	100	25-yr	0.10	195.00	195.04		195.04	0.000506	0.08	1.23	34.71	0.14
WC20	100	50-yr	0.12	195.00	195.04		195.04	0.000608	0.09	1.31	35.39	0.15
WC20	100	100-yr	0.15	195.00	195.05		195.05	0.000599	0.10	1.51	35.76	0.15
WC20	100	Check Flow	0.19	195.00	195.05		195.05	0.000614	0.11	1.74	36.18	0.16
WC20	100	Regional	0.47	195.00	195.09		195.09	0.000630	0.15	3.05	38.48	0.18
WC20	10	2-yr	0.03	194.90	194.92	194.92	194.92	0.039283	0.25	0.12	13.07	0.83
WC20	10	5-yr	0.06	194.90	194.92	194.92	194.93	0.157131	0.50	0.12	13.07	1.66
WC20	10	10-yr	0.08	194.90	194.92	194.92	194.93	0.138504	0.53	0.15	13.87	1.60
WC20	10	25-yr	0.10	194.90	194.92	194.92	194.93	0.075077	0.46	0.22	15.40	1.23
WC20	10	50-yr	0.12	194.90	194.93	194.93	194.94	0.055245	0.44	0.28	16.61	1.08
WC20	10	100-yr	0.15	194.90	194.93	194.93	194.94	0.045239	0.43	0.35	18.52	1.00
WC20	10	Check Flow	0.19	194.90	194.93	194.93	194.94	0.049740	0.48	0.40	19.53	1.06
WC20	10	Regional	0.47	194.90	194.95	194.95	194.97	0.039837	0.57	0.83	26.23	1.02

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (m)	W.S. Elev (m)	Vel Head (m)	Frctn Loss (m)	C & E Loss (m)	Q Left (m3/s)	Q Channel (m3/s)	Q Right (m3/s)	Top Width (m)
WC20	300	2-yr	196.13	196.13	0.00				0.03		29.02
WC20	300	5-yr	196.19	196.19	0.00				0.06		33.92
WC20	300	10-yr	196.22	196.22	0.00				0.08		40.16
WC20	300	25-yr	196.24	196.24	0.00				0.10		43.06
WC20	300	50-yr	196.27	196.27	0.00				0.12		45.62
WC20	300	100-yr	196.30	196.30	0.00				0.15		48.60
WC20	300	Check Flow	196.34	196.33	0.01				0.19		51.95
WC20	300	Regional	196.55	196.54	0.01				0.47		68.44
WC20	250		Culvert								
WC20	200	2-yr	195.55	195.53	0.02	0.09	0.01		0.03		6.58
WC20	200	5-yr	195.58	195.56	0.02	0.07	0.01		0.06		7.45
WC20	200	10-yr	195.60	195.56	0.04	0.08	0.02		0.08		7.38
WC20	200	25-yr	195.61	195.58	0.04	0.08	0.02		0.10		7.79
WC20	200	50-yr	195.63	195.58	0.04	0.10	0.02		0.12		8.04
WC20	200	100-yr	195.65	195.59	0.06	0.10	0.03		0.15		8.24
WC20	200	Check Flow	195.67	195.63	0.05	0.09	0.02		0.19		9.39
WC20	200	Regional	195.81	195.71	0.10	0.10	0.05		0.47		21.95
WC20	100	2-yr	195.02	195.02	0.00	0.09	0.00		0.03		31.57
WC20	100	5-yr	195.03	195.03	0.00	0.09	0.00		0.06		33.27
WC20	100	10-yr	195.04	195.04	0.00	0.09	0.00		0.08		34.11
WC20	100	25-yr	195.04	195.04	0.00	0.10	0.00		0.10		34.71
WC20	100	50-yr	195.04	195.04	0.00	0.11	0.00		0.12		35.39
WC20	100	100-yr	195.05	195.05	0.00	0.11	0.00		0.15		35.76
WC20	100	Check Flow	195.05	195.05	0.00	0.11	0.00		0.19		36.18
WC20	100	Regional	195.09	195.09	0.00	0.11	0.00		0.47		38.48
WC20	10	2-yr	194.92	194.92	0.00				0.03		13.07
WC20	10	5-yr	194.93	194.92	0.01				0.06		13.07
WC20	10	10-yr	194.93	194.92	0.01				0.08		13.87
WC20	10	25-yr	194.93	194.92	0.01				0.10		15.40
WC20	10	50-yr	194.94	194.93	0.01				0.12		16.61
WC20	10	100-yr	194.94	194.93	0.01				0.15		18.52
WC20	10	Check Flow	194.94	194.93	0.01				0.19		19.53
WC20	10	Regional	194.97	194.95	0.02				0.47		26.23

Profile Output Table - Culvert Only

Reach	River Sta	Profile	E.G. US. (m)	W.S. US. (m)	E.G. IC (m)	E.G. OC (m)	Min El Weir Flow (m)	Q Culv Group (m3/s)	Q Weir (m3/s)	Delta WS (m)	Culv Vel US (m/s)	Culv Vel DS (m/s)
WC20	250 Culvert #1	2-yr	196.13	196.13	196.11	196.13	199.40	0.03		0.60	0.64	0.74
WC20	250 Culvert #1	5-yr	196.19	196.19	196.16	196.19	199.40	0.06		0.62	0.78	0.88
WC20	250 Culvert #1	10-yr	196.22	196.22	196.18	196.22	199.40	0.08		0.65	0.86	0.95
WC20	250 Culvert #1	25-yr	196.24	196.24	196.20	196.24	199.40	0.10		0.67	0.93	1.01
WC20	250 Culvert #1	50-yr	196.27	196.27	196.22	196.27	199.40	0.12		0.68	0.97	1.06
WC20	250 Culvert #1	100-yr	196.30	196.30	196.25	196.30	199.40	0.15		0.71	1.03	1.12
WC20	250 Culvert #1	Check Flow	196.34	196.33	196.28	196.34	199.40	0.19		0.71	1.11	1.19
WC20	250 Culvert #1	Regional	196.55	196.54	196.45	196.55	199.40	0.47		0.83	1.46	1.51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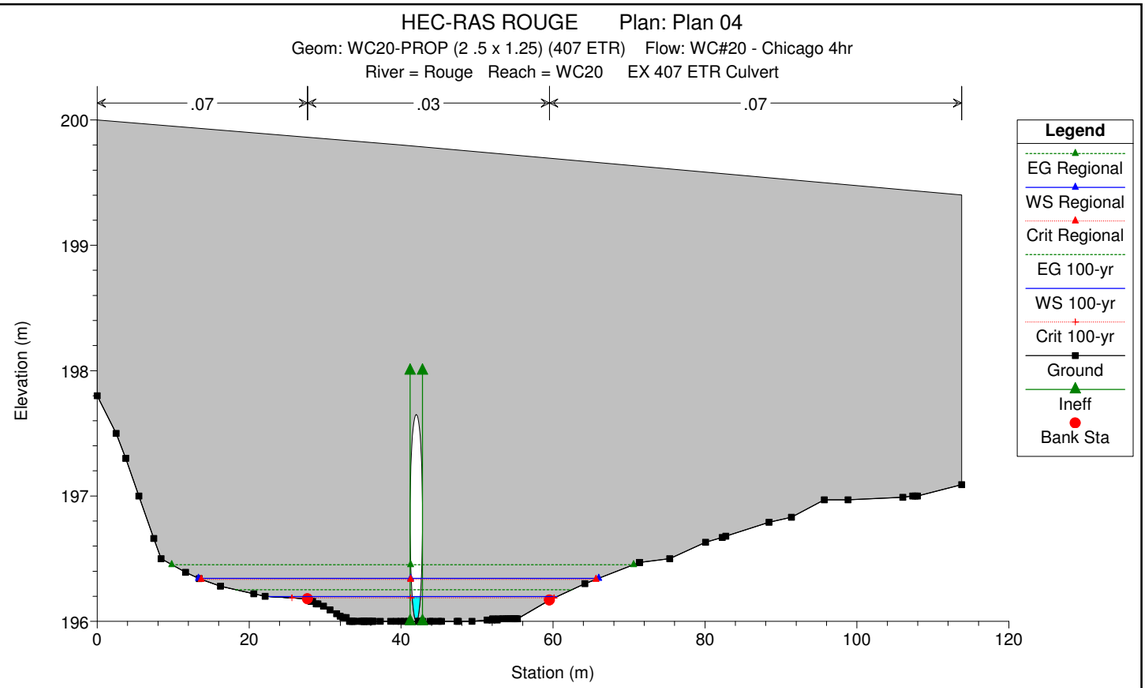
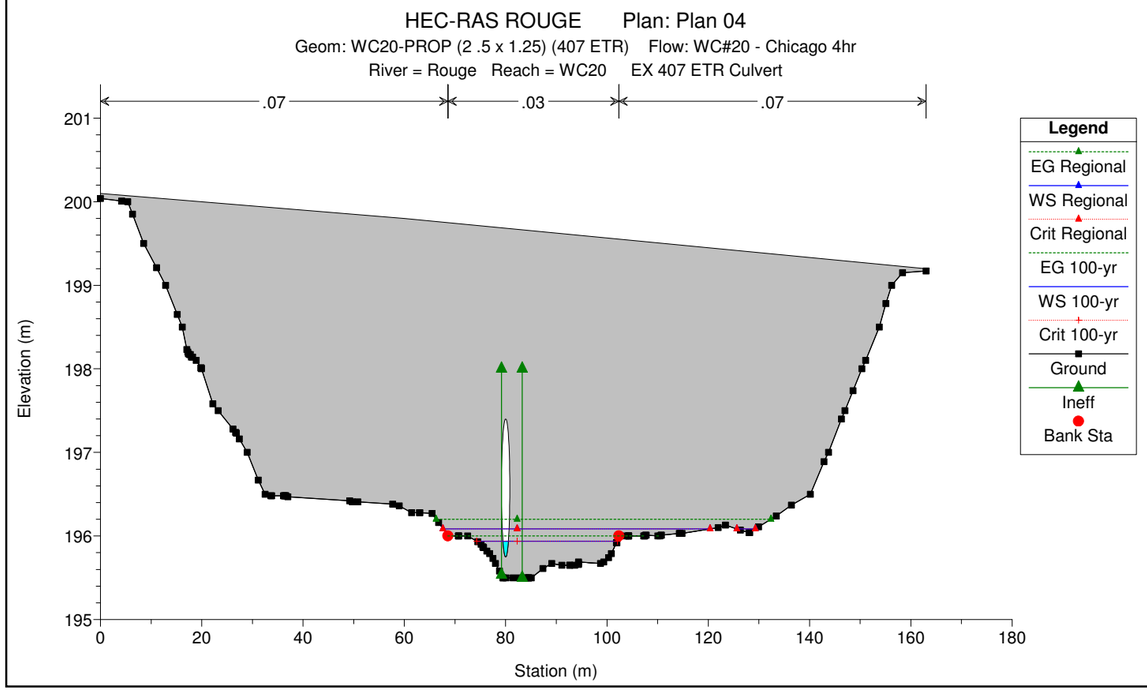
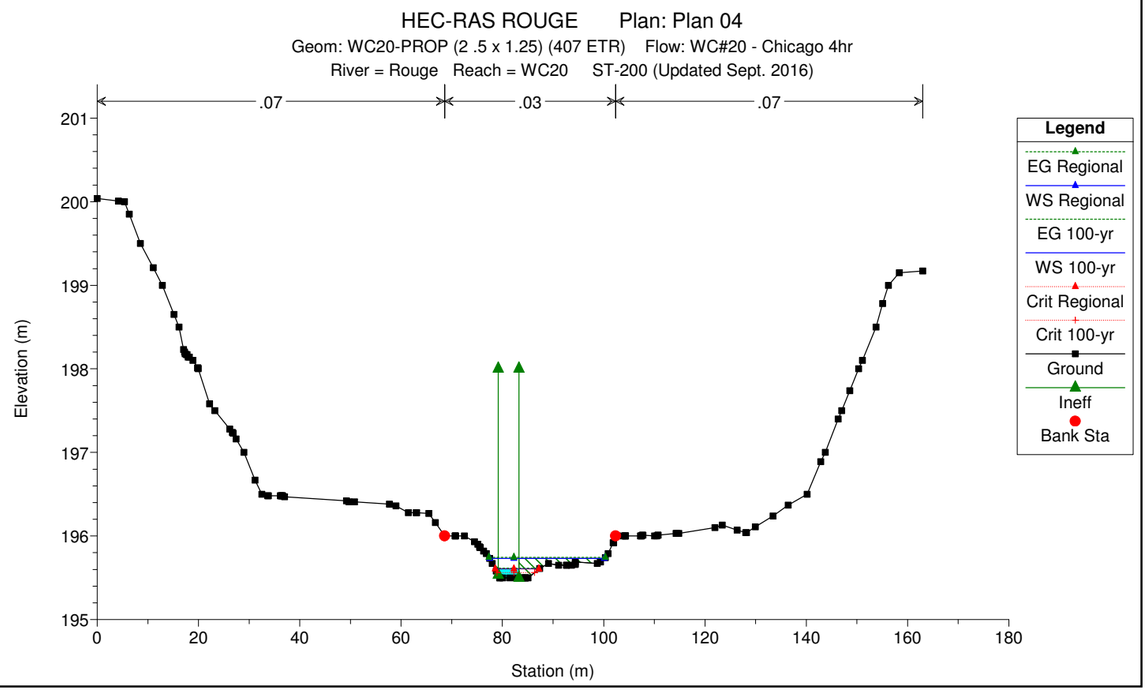
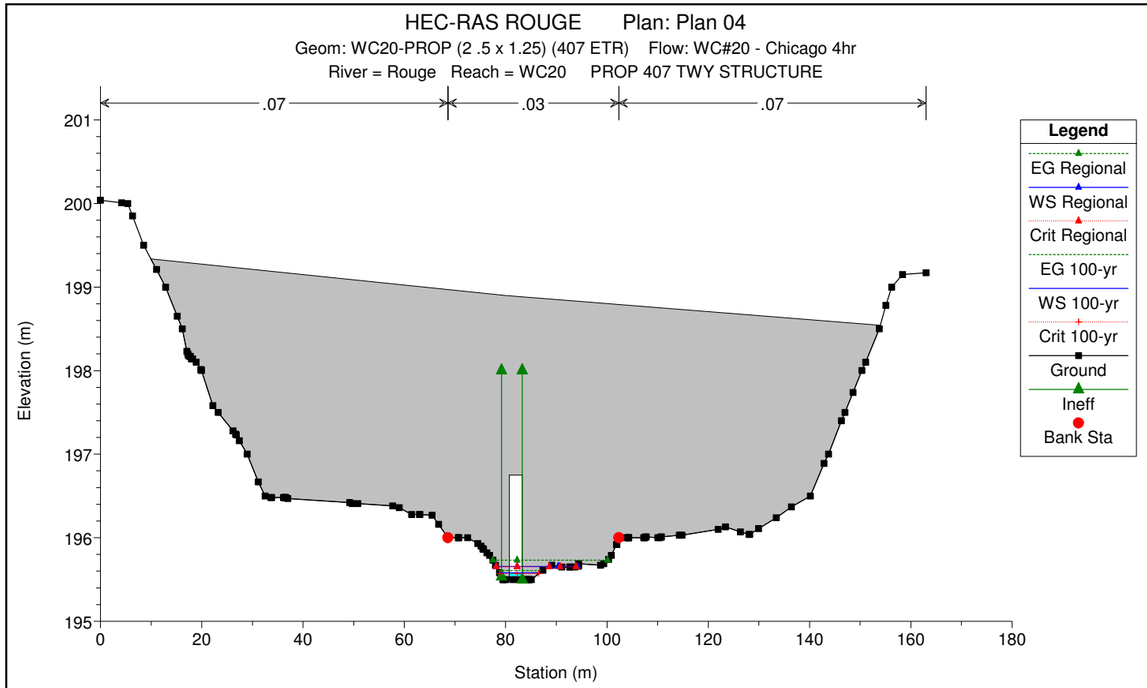
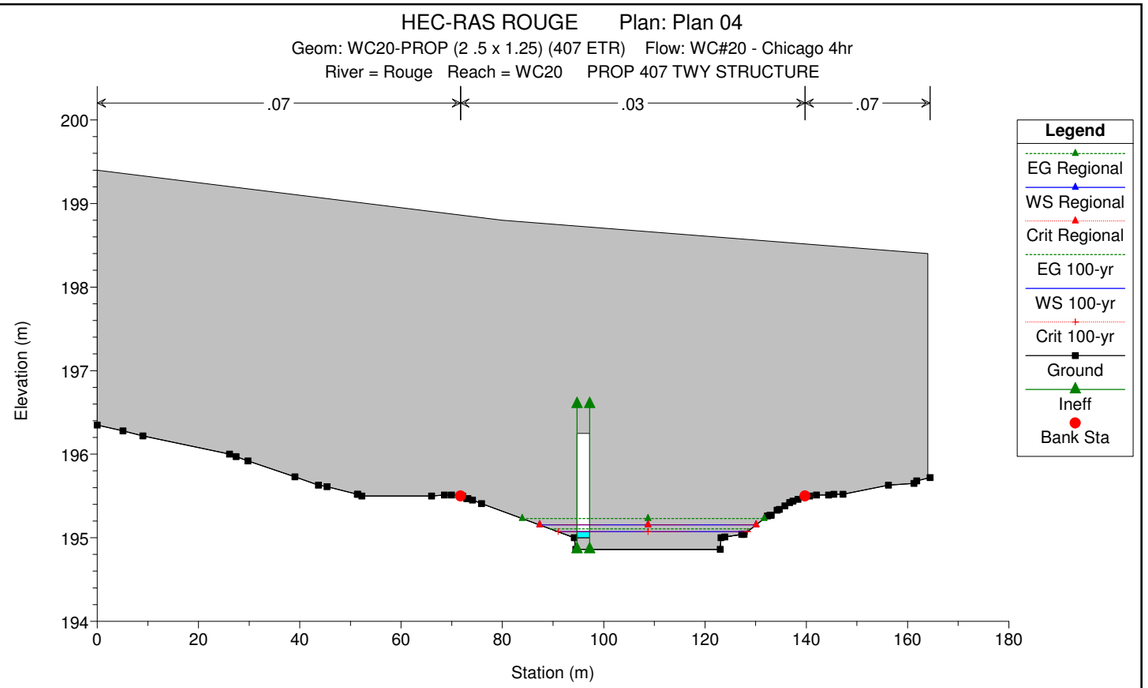
River = Rouge Reach = WC20 ST-300 (Updated Sept. 2016)
.07
.03
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Crit Regional
Crit 100-yr
Ground
Ineff
Bank Sta

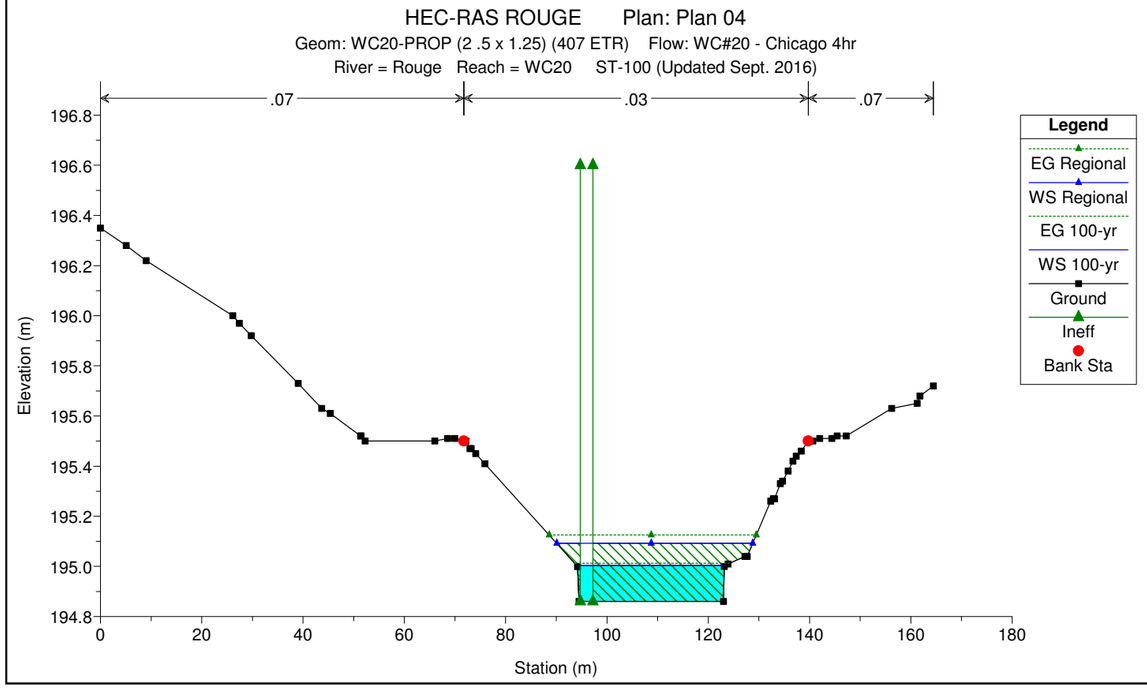

HEC-RAS ROUGE Plan: Plan 04
Geom: WC20-PROP (2 .5 x 1.25) (407 ETR) Flow: WC#20 - Chicago 4hr
River = Rouge Reach = WC20 EX 407 ETR Culvert
.07
.03
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Ineff
Bank Sta

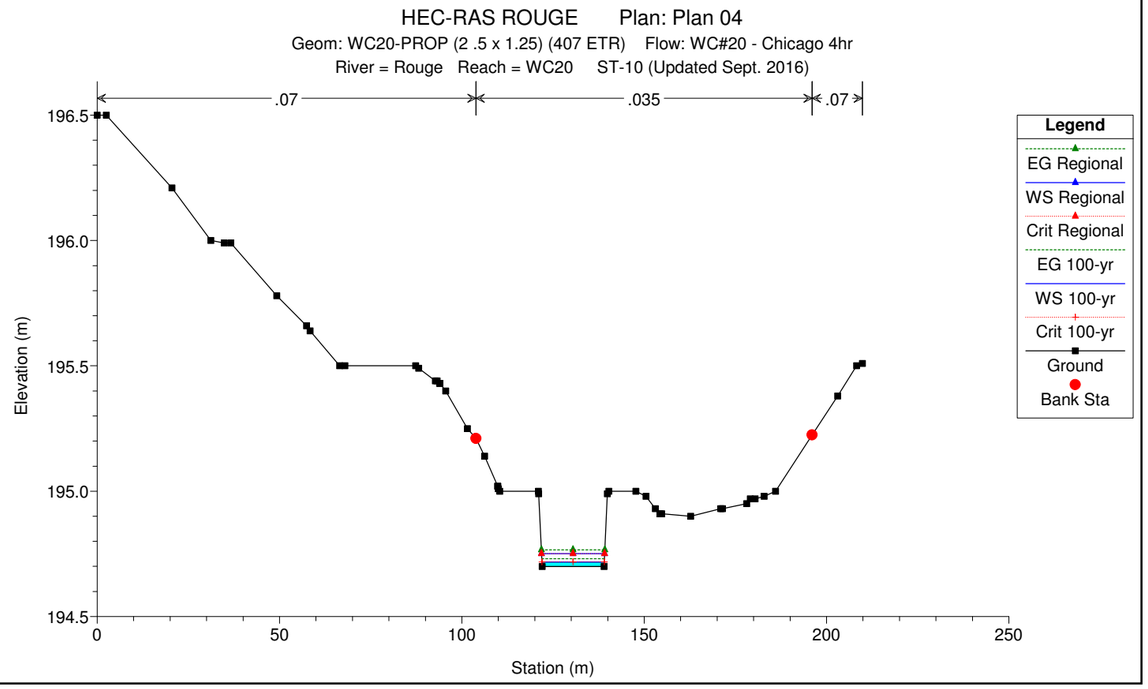

HEC-RAS ROUGE Plan: Plan 04
Geom: WC20-PROP (2 .5 x 1.25) (407 ETR) Flow: WC#20 - Chicago 4hr
River = Rouge Reach = WC20 EX 407 ETR Culvert
.07
.03
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 04
Geom: WC20-PROP (2 .5 x 1.25) (407 ETR) Flow: WC#20 - Chicago 4hr
River = Rouge Reach = WC20 ST-200 (Updated Sept. 2016)
.07
.03
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Crit Regional
Crit 100-yr
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 04
Geom: WC20-PROP (2 .5 x 1.25) (407 ETR) Flow: WC#20 - Chicago 4hr
River = Rouge Reach = WC20 PROP 407 TWY STRUCTURE
.07
.03
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 04
Geom: WC20-PROP (2 .5 x 1.25) (407 ETR) Flow: WC#20 - Chicago 4hr
River = Rouge Reach = WC20 PROP 407 TWY STRUCTURE
.07
.03
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 04
Geom: WC20-PROP (2 .5 x 1.25) (407 ETR) Flow: WC#20 - Chicago 4hr
River = Rouge Reach = WC20 ST-100 (Updated Sept. 2016)
.07
.03
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 04
Geom: WC20-PROP (2 .5 x 1.25) (407 ETR) Flow: WC#20 - Chicago 4hr
River = Rouge Reach = WC20 ST-10 (Updated Sept. 2016)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta

HEC-RAS Plan: WC20-PROP-4hr CH River: Rouge Reach: WC20

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC20	300	2-yr	0.03	196.00	196.13	196.03	196.13	0.000264	0.14	0.22	29.02	0.12
WC20	300	5-yr	0.06	196.00	196.19	196.05	196.19	0.000328	0.20	0.31	33.92	0.15
WC20	300	10-yr	0.08	196.00	196.22	196.06	196.22	0.000356	0.23	0.35	40.16	0.16
WC20	300	25-yr	0.10	196.00	196.24	196.07	196.24	0.000377	0.25	0.40	43.06	0.16
WC20	300	50-yr	0.12	196.00	196.27	196.10	196.27	0.000399	0.27	0.44	45.62	0.17
WC20	300	100-yr	0.15	196.00	196.30	196.10	196.30	0.000429	0.31	0.49	48.60	0.18
WC20	300	Check Flow	0.19	196.00	196.33	196.11	196.34	0.000460	0.34	0.55	51.95	0.19
WC20	300	Regional	0.47	196.00	196.54	196.20	196.55	0.000587	0.53	0.88	68.44	0.23
WC20	250		Culvert									
WC20	200	2-yr	0.03	195.50	195.54	195.52	195.54	0.002999	0.20	0.15	6.70	0.34
WC20	200	5-yr	0.06	195.50	195.56	195.52	195.56	0.002679	0.26	0.23	7.31	0.34
WC20	200	10-yr	0.08	195.50	195.57	195.53	195.58	0.002420	0.28	0.29	7.69	0.34
WC20	200	25-yr	0.10	195.50	195.58	195.54	195.59	0.002317	0.30	0.33	8.01	0.34
WC20	200	50-yr	0.12	195.50	195.59	195.54	195.60	0.002221	0.32	0.37	8.32	0.34
WC20	200	100-yr	0.15	195.50	195.61	195.56	195.61	0.002103	0.34	0.44	8.76	0.34
WC20	200	Check Flow	0.19	195.50	195.63	195.56	195.63	0.001998	0.37	0.51	9.43	0.34
WC20	200	Regional	0.47	195.50	195.73	195.60	195.74	0.001603	0.50	0.94	22.65	0.33
WC20	150		Culvert									
WC20	100	2-yr	0.03	194.86	194.90	194.88	194.90	0.005734	0.30	0.10	28.64	0.47
WC20	100	5-yr	0.06	194.86	194.94	194.90	194.94	0.002540	0.31	0.20	28.77	0.35
WC20	100	10-yr	0.08	194.86	194.96		194.96	0.002274	0.33	0.24	28.83	0.34
WC20	100	25-yr	0.10	194.86	194.97		194.98	0.002157	0.36	0.28	28.88	0.34
WC20	100	50-yr	0.12	194.86	194.98		194.99	0.002131	0.38	0.31	28.93	0.35
WC20	100	100-yr	0.15	194.86	195.00		195.01	0.002072	0.42	0.36	29.43	0.35
WC20	100	Check Flow	0.19	194.86	195.03		195.04	0.002037	0.46	0.42	32.77	0.36
WC20	100	Regional	0.47	194.86	195.09		195.13	0.004153	0.81	0.58	38.71	0.54
WC20	10	2-yr	0.03	194.70	194.72	194.72	194.72	0.002969	0.10	0.29	17.11	0.25
WC20	10	5-yr	0.06	194.70	194.72	194.72	194.72	0.011875	0.21	0.29	17.11	0.50
WC20	10	10-yr	0.08	194.70	194.72	194.72	194.72	0.021111	0.27	0.29	17.11	0.67
WC20	10	25-yr	0.10	194.70	194.72	194.72	194.72	0.032986	0.34	0.29	17.11	0.84
WC20	10	50-yr	0.12	194.70	194.72	194.72	194.73	0.047500	0.41	0.29	17.11	1.01
WC20	10	100-yr	0.15	194.70	194.72	194.72	194.73	0.074218	0.51	0.29	17.11	1.26
WC20	10	Check Flow	0.19	194.70	194.72	194.72	194.74	0.119079	0.65	0.29	17.11	1.60
WC20	10	Regional	0.47	194.70	194.75	194.75	194.77	0.019220	0.54	0.87	17.33	0.77

HEC-RAS HEC-RAS 5.0.1 April 2016
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
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PROJECT DATA
Project Title: HEC-RAS ROUGE
Project File : HEC.prj
Run Date and Time: 9/8/2016 10:24:47 AM

Project in SI units

Project Description:
HEC-RAS model for creek crossings along the proposed 407 TWY Ph 2 started
from scratch

PLAN DATA

Plan Title: Plan 04
Plan File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.p04

Geometry Title: WC20-PROP (2 .5 x 1.25) (407 ETR)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g26

Flow Title : WC#20 - Chicago 4hr
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f07

Plan Summary Information:
Number of: Cross Sections = 4 Multiple Openings = 0
Culverts = 2 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: WC#20 - Chicago 4hr
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f07

Flow Data (m3/s)

River	Reach	RS	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Check Flow	Regional
Rouge	WC20	300	.03	.06	.08	.1	.12	.15	.19	.47

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Rouge	WC20	2-yr		Critical
Rouge	WC20	5-yr		Critical
Rouge	WC20	10-yr		Critical
Rouge	WC20	25-yr		Critical
Rouge	WC20	50-yr		Critical
Rouge	WC20	100-yr		Critical
Rouge	WC20	Check Flow		Critical
Rouge	WC20	Regional		Critical

GEOMETRY DATA

Geometry Title: WC20-PROP (2 .5 x 1.25) (407 ETR)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g26

CROSS SECTION

RIVER: Rouge
REACH: WC20 RS: 300

INPUT
Description: ST-300 (Updated Sept. 2016)
Station Elevation Data num= 90

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	197.8	2.49	197.5	3.75	197.3	5.5	197	7.43	196.66
8.41	196.5	11.62	196.39	13.44	196.34	16.23	196.28	20.61	196.22
22.09	196.2	27.68	196.18	28.15	196.16	28.35	196.16	28.81	196.14
29.06	196.14	29.78	196.12	30.65	196.09	31.5	196.06	31.99	196.04
32.34	196.03	32.77	196.03	33.21	196	33.28	196	33.55	196
33.6	196	33.83	196	34.07	196	34.8	196	34.84	196
35.04	196	35.06	196	35.14	196	35.16	196	35.45	196
35.75	196	35.76	196	35.81	196	36.23	196	36.26	196
36.37	196	37.25	196	38.64	196	39.37	196	39.94	196
40.39	196	41	196	42.28	196	42.29	196	42.86	196
43.82	196	44.11	196	44.91	196	45.31	196	47.36	196
47.54	196	49.32	196	51.31	196.01	51.94	196.01	52.06	196.02
52.64	196.01	52.86	196.02	53.39	196.02	53.74	196.02	54.08	196.02
54.33	196.02	54.6	196.02	54.8	196.02	54.93	196.02	55	196.02
55.11	196.02	55.31	196.02	59.52	196.17	64.19	196.3	71.36	196.47
71.38	196.47	71.41	196.47	75.36	196.5	80.08	196.63	82.28	196.67
82.73	196.68	88.41	196.79	91.39	196.83	95.7	196.97	98.83	196.97
106.03	196.99	107.33	197	107.66	197	107.98	197	113.77	197.09

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	27.68	.03	59.52	.07

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
27.68 59.52 100.8 100.8 100.8 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	41.175	198	T
42.825	113.77	198	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	196.13	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.00	Wt. n-Val.		0.030		
W.S. Elev (m)	196.13	Reach Len. (m)	100.80	100.80	100.80	
Crit W.S. (m)	196.03	Flow Area (m2)		0.22		
E.G. Slope (m/m)	0.000264	Area (m2)		3.22		

Q Total (m3/s)	0.03	Flow (m3/s)	0.03
Top Width (m)	29.02	Top Width (m)	29.02
Vel Total (m/s)	0.14	Avg. Vel. (m/s)	0.14
Max Chl Dpth (m)	0.13	Hydr. Depth (m)	0.13
Conv. Total (m3/s)	1.8	Conv. (m3/s)	1.8
Length Wtd. (m)	100.80	Wetted Per. (m)	1.65
Min Ch El (m)	196.00	Shear (N/m2)	0.34
Alpha	1.00	Stream Power (N/m s)	0.05
Frctn Loss (m)		Cum Volume (1000 m3)	0.09
C & E Loss (m)		Cum SA (1000 m2)	3.81

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	196.19	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	196.19	Reach Len. (m)	100.80	100.80	100.80
Crit W.S. (m)	196.05	Flow Area (m2)		0.31	
E.G. Slope (m/m)	0.000328	Area (m2)	0.00	4.90	0.00
Q Total (m3/s)	0.06	Flow (m3/s)		0.06	
Top Width (m)	33.92	Top Width (m)	1.53	31.84	0.56
Vel Total (m/s)	0.20	Avg. Vel. (m/s)		0.20	
Max Chl Dpth (m)	0.19	Hydr. Depth (m)		0.19	
Conv. Total (m3/s)	3.3	Conv. (m3/s)		3.3	
Length Wtd. (m)	100.80	Wetted Per. (m)		1.65	
Min Ch El (m)	196.00	Shear (N/m2)		0.60	
Alpha	1.00	Stream Power (N/m s)		0.12	
Frctn Loss (m)		Cum Volume (1000 m3)		0.15	
C & E Loss (m)		Cum SA (1000 m2)	0.08	4.01	0.03

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	196.22	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	196.22	Reach Len. (m)	100.80	100.80	100.80
Crit W.S. (m)	196.06	Flow Area (m2)		0.35	
E.G. Slope (m/m)	0.000356	Area (m2)	0.15	5.84	0.04
Q Total (m3/s)	0.08	Flow (m3/s)		0.08	
Top Width (m)	40.16	Top Width (m)	6.70	31.84	1.62
Vel Total (m/s)	0.23	Avg. Vel. (m/s)		0.23	
Max Chl Dpth (m)	0.21	Hydr. Depth (m)		0.21	
Conv. Total (m3/s)	4.2	Conv. (m3/s)		4.2	
Length Wtd. (m)	100.80	Wetted Per. (m)		1.65	
Min Ch El (m)	196.00	Shear (N/m2)		0.75	
Alpha	1.00	Stream Power (N/m s)		0.17	
Frctn Loss (m)		Cum Volume (1000 m3)		0.18	
C & E Loss (m)		Cum SA (1000 m2)	0.34	4.04	0.08

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	196.24	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	196.24	Reach Len. (m)	100.80	100.80	100.80
Crit W.S. (m)	196.07	Flow Area (m2)		0.40	
E.G. Slope (m/m)	0.000377	Area (m2)	0.35	6.69	0.09
Q Total (m3/s)	0.10	Flow (m3/s)		0.10	
Top Width (m)	43.06	Top Width (m)	8.65	31.84	2.57
Vel Total (m/s)	0.25	Avg. Vel. (m/s)		0.25	
Max Chl Dpth (m)	0.24	Hydr. Depth (m)		0.24	
Conv. Total (m3/s)	5.1	Conv. (m3/s)		5.1	
Length Wtd. (m)	100.80	Wetted Per. (m)		1.65	
Min Ch El (m)	196.00	Shear (N/m2)		0.89	
Alpha	1.00	Stream Power (N/m s)		0.22	
Frctn Loss (m)		Cum Volume (1000 m3)		0.21	
C & E Loss (m)		Cum SA (1000 m2)	0.44	4.07	0.13

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	196.27	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	196.27	Reach Len. (m)	100.80	100.80	100.80
Crit W.S. (m)	196.10	Flow Area (m2)		0.44	
E.G. Slope (m/m)	0.000399	Area (m2)	0.58	7.44	0.16
Q Total (m3/s)	0.12	Flow (m3/s)		0.12	
Top Width (m)	45.62	Top Width (m)	10.36	31.84	3.41
Vel Total (m/s)	0.27	Avg. Vel. (m/s)		0.27	
Max Chl Dpth (m)	0.26	Hydr. Depth (m)		0.26	
Conv. Total (m3/s)	6.0	Conv. (m3/s)		6.0	
Length Wtd. (m)	100.80	Wetted Per. (m)		1.65	
Min Ch El (m)	196.00	Shear (N/m2)		1.04	
Alpha	1.00	Stream Power (N/m s)		0.28	
Frctn Loss (m)		Cum Volume (1000 m3)		0.23	
C & E Loss (m)		Cum SA (1000 m2)	0.52	4.09	0.17

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	196.30	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	196.30	Reach Len. (m)	100.80	100.80	100.80
Crit W.S. (m)	196.10	Flow Area (m2)		0.49	
E.G. Slope (m/m)	0.000429	Area (m2)	0.93	8.44	0.29
Q Total (m3/s)	0.15	Flow (m3/s)		0.15	
Top Width (m)	48.60	Top Width (m)	12.22	31.84	4.54
Vel Total (m/s)	0.31	Avg. Vel. (m/s)		0.31	
Max Chl Dpth (m)	0.30	Hydr. Depth (m)		0.30	
Conv. Total (m3/s)	7.2	Conv. (m3/s)		7.2	
Length Wtd. (m)	100.80	Wetted Per. (m)		1.65	
Min Ch El (m)	196.00	Shear (N/m2)		1.25	
Alpha	1.00	Stream Power (N/m s)		0.38	
Frctn Loss (m)		Cum Volume (1000 m3)		0.27	
C & E Loss (m)		Cum SA (1000 m2)	0.62	4.15	0.23

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	196.34	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	196.33	Reach Len. (m)	100.80	100.80	100.80
Crit W.S. (m)	196.11	Flow Area (m2)		0.55	
E.G. Slope (m/m)	0.000460	Area (m2)	1.43	9.65	0.49
Q Total (m3/s)	0.19	Flow (m3/s)		0.19	
Top Width (m)	51.95	Top Width (m)	13.99	31.84	6.12
Vel Total (m/s)	0.34	Avg. Vel. (m/s)		0.34	
Max Chl Dpth (m)	0.33	Hydr. Depth (m)		0.33	
Conv. Total (m3/s)	8.9	Conv. (m3/s)		8.9	
Length Wtd. (m)	100.80	Wetted Per. (m)		1.65	
Min Ch El (m)	196.00	Shear (N/m2)		1.51	
Alpha	1.00	Stream Power (N/m s)		0.52	
Frctn Loss (m)		Cum Volume (1000 m3)		0.32	
C & E Loss (m)		Cum SA (1000 m2)	0.70	4.37	0.31

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	196.55	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	196.54	Reach Len. (m)	100.80	100.80	100.80
Crit W.S. (m)	196.20	Flow Area (m2)		0.88	
E.G. Slope (m/m)	0.000587	Area (m2)	4.89	16.04	2.70
Q Total (m3/s)	0.47	Flow (m3/s)		0.47	
Top Width (m)	68.44	Top Width (m)	19.49	31.84	17.12
Vel Total (m/s)	0.53	Avg. Vel. (m/s)		0.53	
Max Chl Dpth (m)	0.54	Hydr. Depth (m)		0.54	
Conv. Total (m3/s)	19.4	Conv. (m3/s)		19.4	
Length Wtd. (m)	100.80	Wetted Per. (m)		1.65	
Min Ch El (m)	196.00	Shear (N/m2)		3.08	
Alpha	1.00	Stream Power (N/m s)		1.64	
Frctn Loss (m)		Cum Volume (1000 m3)		0.60	
C & E Loss (m)		Cum SA (1000 m2)	0.98	5.71	0.86

CULVERT

RIVER: Rouge
REACH: WC20 RS: 250

INPUT
Description: EX 407 ETR Culvert
Distance from Upstream XS = 15
Deck/Roadway Width = 60
Weir Coefficient = 1.4
Upstream Deck/Roadway Coordinates
num= 3

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	200		40	199.8		114	199.4	

Upstream Bridge Cross Section Data
Station Elevation Data num= 90

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	197.8	2.49	197.5	3.75	197.3	5.5	197	7.43	196.66
8.41	196.5	11.62	196.39	13.44	196.34	16.23	196.28	20.61	196.22
22.09	196.2	27.68	196.18	28.15	196.16	28.35	196.16	28.81	196.14
29.06	196.14	29.78	196.12	30.65	196.09	31.5	196.06	31.99	196.04
32.34	196.03	32.77	196.03	33.21	196	33.28	196	33.55	196
33.6	196	33.83	196	34.07	196	34.8	196	34.84	196
35.04	196	35.06	196	35.14	196	35.16	196	35.45	196
35.75	196	35.76	196	35.81	196	36.23	196	36.26	196
36.37	196	37.25	196	38.64	196	39.37	196	39.94	196
40.39	196	41	196	42.28	196	42.29	196	42.86	196
43.82	196	44.11	196	44.91	196	45.31	196	47.36	196
47.54	196	49.32	196	51.31	196.01	51.94	196.01	52.06	196.02
52.64	196.01	52.86	196.02	53.39	196.02	53.74	196.02	54.08	196.02
54.33	196.02	54.6	196.02	54.8	196.02	54.93	196.02	55	196.02
55.11	196.02	55.31	196.02	59.52	196.17	64.19	196.3	71.36	196.47
71.38	196.47	71.41	196.47	75.36	196.5	80.08	196.63	82.28	196.67
82.73	196.68	88.41	196.79	91.39	196.83	95.7	196.97	98.83	196.97
106.03	196.99	107.33	197	107.66	197	107.98	197	113.77	197.09

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	27.68	.03	59.52	.07

Bank Sta: Left Right Coeff Contr. Expan.
27.68 59.52 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	41.175	198	T
42.825	113.77	198	T

Downstream Deck/Roadway Coordinates
num= 3

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	200.1		60	199.8		163	199.2	

Downstream Bridge Cross Section Data
Station Elevation Data num= 128

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	200.04	4.2	200.01	5.4	200	6.33	199.85	8.54	199.5
11.05	199.21	12.87	199	15.16	198.65	16.16	198.5	17.03	198.23
17.26	198.2	17.37	198.18	17.59	198.17	17.75	198.17	17.95	198.14
18.18	198.14	18.88	198.1	19.83	198.01	19.85	198.01	19.88	198.01
19.93	198	22.21	197.58	23.25	197.5	26.17	197.28	26.7	197.24
26.82	197.23	27.42	197.16	28.96	197	31.17	196.67	32.51	196.5
33.66	196.48	33.79	196.48	36.14	196.48	36.27	196.48	36.41	196.48
36.56	196.48	36.59	196.48	36.99	196.47	49.22	196.42	49.71	196.41
50.82	196.41	57.7	196.38	59.01	196.36	61.44	196.28	62.99	196.28
63.06	196.28	65.49	196.27	66.75	196.16	68.59	196	70.66	196
70.7	196	70.74	196	72.51	196	74.5	195.93	75.15	195.9
75.51	195.87	75.59	195.86	75.64	195.86	76.31	195.82	76.85	195.79
77.5	195.73	78	195.671	78.78	195.58	79.47	195.5	79.5	195.5
80.1	195.5	81.45	195.5	82.71	195.5	83.82	195.5	83.97	195.5
84.52	195.5	84.53	195.5	84.55	195.5	85.06	195.5	87.34	195.61
89.08	195.67	91.08	195.65	92.65	195.65	92.68	195.65	93.64	195.65
94.38	195.66	94.39	195.67	94.4	195.69	98.71	195.67	99.38	195.69
100.3	195.74	100.86	195.79	101.85	195.92	101.99	195.92	102.38	196
103.72	196	104.25	196	104.26	196	104.28	196	104.3	196
107.24	196	107.39	196	107.44	196	107.59	196.01	107.73	196.01
110.02	196	110.43	196	110.69	196.01	110.73	196.01	114.27	196.03
114.43	196.03	114.84	196.03	121.97	196.1	123.39	196.13	126.33	196.07
128.02	196.04	128.17	196.04	129.93	196.11	133.42	196.24	136.44	196.37
140.18	196.5	142.84	196.89	143.73	197	146.27	197.4	146.97	197.5
148.58	197.74	150.33	198	151.07	198.1	153.78	198.5	155.05	198.78
156.21	199	158.38	199.15	163.01	199.17				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	68.59	.03	102.38	.07

Bank Sta: Left Right Coeff Contr. Expan.
68.59 102.38 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	79.175	198	T
83.25	163.01	198	T

Upstream Embankment side slope = 2 horiz. to 1.0 vertical
Downstream Embankment side slope = 2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .98
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name	Shape	Rise	Span
Culvert #1	Circular	1.65	

FHWA Chart # 1 - Concrete Pipe Culvert
FHWA Scale # 3 - Groove end entrance; pipe projecting from fill
Solution Criteria = Highest U.S. EG

Culvert	Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
	15	85	.013	.013	0	.9	1

Upstream Elevation = 196
Centerline Station = 42
Downstream Elevation = 195.75
Centerline Station = 80

CULVERT OUTPUT Profile #2-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.03	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	0.64
Q Barrel (m3/s)	0.03	Culv Vel DS (m/s)	0.74
E.G. US. (m)	196.13	Culv Inv El Up (m)	196.00
W.S. US. (m)	196.13	Culv Inv El Dn (m)	195.75
E.G. DS (m)	195.54	Culv Frctn Ls (m)	0.00
W.S. DS (m)	195.54	Culv Exit Loss (m)	0.32
Delta EG (m)	0.59	Culv Entr Loss (m)	0.02
Delta WS (m)	0.59	Q Weir (m3/s)	
E.G. IC (m)	196.11	Weir Sta Lft (m)	
E.G. OC (m)	196.13	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	196.09	Weir Max Depth (m)	
Culv WS Outlet (m)	195.83	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.09	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.08	Min El Weir Flow (m)	199.40

Note: During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth. Therefore, the inlet will be at normal depth.

CULVERT OUTPUT Profile #5-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.06	Culv Full Len (m)	

# Barrels	1	Culv Vel US (m/s)	0.78
Q Barrel (m3/s)	0.06	Culv Vel DS (m/s)	0.88
E.G. US. (m)	196.19	Culv Inv El Up (m)	196.00
W.S. US. (m)	196.19	Culv Inv El Dn (m)	195.75
E.G. DS (m)	195.56	Culv Frctn Ls (m)	0.00
W.S. DS (m)	195.56	Culv Exit Loss (m)	0.35
Delta EG (m)	0.63	Culv Entr Loss (m)	0.03
Delta WS (m)	0.63	Q Weir (m3/s)	
E.G. IC (m)	196.16	Weir Sta Lft (m)	
E.G. OC (m)	196.19	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	196.13	Weir Max Depth (m)	
Culv WS Outlet (m)	195.87	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.13	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.12	Min El Weir Flow (m)	199.40

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #10-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.08	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	0.86
Q Barrel (m3/s)	0.08	Culv Vel DS (m/s)	0.95
E.G. US. (m)	196.22	Culv Inv El Up (m)	196.00
W.S. US. (m)	196.22	Culv Inv El Dn (m)	195.75
E.G. DS (m)	195.58	Culv Frctn Ls (m)	0.00
W.S. DS (m)	195.57	Culv Exit Loss (m)	0.36
Delta EG (m)	0.64	Culv Entr Loss (m)	0.03
Delta WS (m)	0.64	Q Weir (m3/s)	
E.G. IC (m)	196.18	Weir Sta Lft (m)	
E.G. OC (m)	196.22	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	196.15	Weir Max Depth (m)	
Culv WS Outlet (m)	195.89	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.15	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.14	Min El Weir Flow (m)	199.40

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #25-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.10	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	0.93
Q Barrel (m3/s)	0.10	Culv Vel DS (m/s)	1.01
E.G. US. (m)	196.24	Culv Inv El Up (m)	196.00
W.S. US. (m)	196.24	Culv Inv El Dn (m)	195.75
E.G. DS (m)	195.59	Culv Frctn Ls (m)	0.00
W.S. DS (m)	195.58	Culv Exit Loss (m)	0.37
Delta EG (m)	0.66	Culv Entr Loss (m)	0.04
Delta WS (m)	0.66	Q Weir (m3/s)	
E.G. IC (m)	196.20	Weir Sta Lft (m)	
E.G. OC (m)	196.24	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	196.16	Weir Max Depth (m)	
Culv WS Outlet (m)	195.90	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.16	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.15	Min El Weir Flow (m)	199.40

Note: During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth. Therefore, the inlet will be at normal depth.

CULVERT OUTPUT Profile #50-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.12	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	0.97
Q Barrel (m3/s)	0.12	Culv Vel DS (m/s)	1.06
E.G. US. (m)	196.27	Culv Inv El Up (m)	196.00
W.S. US. (m)	196.27	Culv Inv El Dn (m)	195.75
E.G. DS (m)	195.60	Culv Frctn Ls (m)	0.00
W.S. DS (m)	195.59	Culv Exit Loss (m)	0.38
Delta EG (m)	0.67	Culv Entr Loss (m)	0.04
Delta WS (m)	0.67	Q Weir (m3/s)	
E.G. IC (m)	196.22	Weir Sta Lft (m)	
E.G. OC (m)	196.27	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	196.18	Weir Max Depth (m)	
Culv WS Outlet (m)	195.92	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.18	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.17	Min El Weir Flow (m)	199.40

Note: During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth. Therefore, the inlet will be at normal depth.

CULVERT OUTPUT Profile #100-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.15	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.03
Q Barrel (m3/s)	0.15	Culv Vel DS (m/s)	1.12
E.G. US. (m)	196.30	Culv Inv El Up (m)	196.00
W.S. US. (m)	196.30	Culv Inv El Dn (m)	195.75
E.G. DS (m)	195.61	Culv Frctn Ls (m)	0.00
W.S. DS (m)	195.61	Culv Exit Loss (m)	0.39
Delta EG (m)	0.69	Culv Entr Loss (m)	0.05
Delta WS (m)	0.69	Q Weir (m3/s)	
E.G. IC (m)	196.25	Weir Sta Lft (m)	
E.G. OC (m)	196.30	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	196.20	Weir Max Depth (m)	
Culv WS Outlet (m)	195.94	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.20	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.19	Min El Weir Flow (m)	199.40

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #Check Flow Culv Group: Culvert #1

Q Culv Group (m3/s)	0.19	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.11
Q Barrel (m3/s)	0.19	Culv Vel DS (m/s)	1.19
E.G. US. (m)	196.34	Culv Inv El Up (m)	196.00
W.S. US. (m)	196.33	Culv Inv El Dn (m)	195.75
E.G. DS (m)	195.63	Culv Frctn Ls (m)	0.00
W.S. DS (m)	195.63	Culv Exit Loss (m)	0.40
Delta EG (m)	0.71	Culv Entr Loss (m)	0.06
Delta WS (m)	0.71	Q Weir (m3/s)	
E.G. IC (m)	196.28	Weir Sta Lft (m)	
E.G. OC (m)	196.34	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	196.22	Weir Max Depth (m)	
Culv WS Outlet (m)	195.96	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.22	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.21	Min El Weir Flow (m)	199.40

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #Regional Culv Group: Culvert #1

Q Culv Group (m3/s)	0.47	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.46
Q Barrel (m3/s)	0.47	Culv Vel DS (m/s)	1.51
E.G. US. (m)	196.55	Culv Inv El Up (m)	196.00
W.S. US. (m)	196.54	Culv Inv El Dn (m)	195.75
E.G. DS (m)	195.74	Culv Frctn Ls (m)	0.00
W.S. DS (m)	195.73	Culv Exit Loss (m)	0.46
Delta EG (m)	0.81	Culv Entr Loss (m)	0.10
Delta WS (m)	0.80	Q Weir (m3/s)	
E.G. IC (m)	196.45	Weir Sta Lft (m)	
E.G. OC (m)	196.55	Weir Sta Rgt (m)	

Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	196.34	Weir Max Depth (m)	
Culv WS Outlet (m)	196.08	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.34	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.33	Min El Weir Flow (m)	199.40

Note: During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth. Therefore, the inlet will be at normal depth.

CROSS SECTION

RIVER: Rouge
REACH: WC20 RS: 200

INPUT
Description: ST-200 (Updated Sept. 2016)
Station Elevation Data num= 128

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	200.04	4.2	200.01	5.4	200	6.33	199.85	8.54	199.5
11.05	199.21	12.87	199	15.16	198.65	16.16	198.5	17.03	198.23
17.26	198.2	17.37	198.18	17.59	198.17	17.75	198.17	17.95	198.14
18.18	198.14	18.88	198.1	19.83	198.01	19.85	198.01	19.88	198.01
19.93	198	22.21	197.58	23.25	197.5	26.17	197.28	26.7	197.24
26.82	197.23	27.42	197.16	28.96	197	31.17	196.67	32.51	196.5
33.66	196.48	33.79	196.48	36.14	196.48	36.27	196.48	36.41	196.48
36.56	196.48	36.59	196.48	36.99	196.47	49.22	196.42	49.71	196.41
50.82	196.41	57.7	196.38	59.01	196.36	61.44	196.28	62.99	196.28
63.06	196.28	65.49	196.27	66.75	196.16	68.59	196	70.66	196
70.7	196	70.74	196	72.51	196	74.5	195.93	75.15	195.9
75.51	195.87	75.59	195.86	75.64	195.86	76.31	195.82	76.85	195.79
77.5	195.73	78	195.671	78.78	195.58	79.47	195.5	79.5	195.5
80.1	195.5	81.45	195.5	82.71	195.5	83.82	195.5	83.97	195.5
84.52	195.5	84.53	195.5	84.55	195.5	85.06	195.5	87.34	195.61
89.08	195.67	91.08	195.65	92.65	195.65	92.68	195.65	93.64	195.65
94.38	195.66	94.39	195.67	94.4	195.69	98.71	195.67	99.38	195.69
100.3	195.74	100.86	195.79	101.85	195.92	101.99	195.92	102.38	196
103.72	196	104.25	196	104.26	196	104.28	196	104.3	196
107.24	196	107.39	196	107.44	196	107.59	196.01	107.73	196.01
110.02	196	110.43	196	110.69	196.01	110.73	196.01	114.27	196.03
114.43	196.03	114.84	196.03	121.97	196.1	123.39	196.13	126.33	196.07
128.02	196.04	128.17	196.04	129.93	196.11	133.42	196.24	136.44	196.37
140.18	196.5	142.84	196.89	143.73	197	146.27	197.4	146.97	197.5
148.58	197.74	150.33	198	151.07	198.1	153.78	198.5	155.05	198.78
156.21	199	158.38	199.15	163.01	199.17				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	68.59	.03	102.38	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
68.59	102.38	55.5	55.5	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	79.175	198	T
83.25	163.01	198	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	195.54	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	195.54	Reach Len. (m)	55.50	55.50	55.50
Crit W.S. (m)	195.52	Flow Area (m2)		0.15	
E.G. Slope (m/m)	0.002999	Area (m2)		0.23	
Q Total (m3/s)	0.03	Flow (m3/s)		0.03	
Top Width (m)	6.70	Top Width (m)		6.70	
Vel Total (m/s)	0.20	Avg. Vel. (m/s)		0.20	
Max Chl Dpth (m)	0.04	Hydr. Depth (m)		0.04	
Conv. Total (m3/s)	0.5	Conv. (m3/s)		0.5	
Length Wtd. (m)	55.50	Wetted Per. (m)		4.08	
Min Ch El (m)	195.50	Shear (N/m2)		1.08	
Alpha	1.00	Stream Power (N/m s)		0.22	
Frctn Loss (m)		Cum Volume (1000 m3)		0.04	
C & E Loss (m)		Cum SA (1000 m2)		2.01	

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	195.56	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	195.56	Reach Len. (m)	55.50	55.50	55.50
Crit W.S. (m)	195.52	Flow Area (m2)		0.23	
E.G. Slope (m/m)	0.002679	Area (m2)		0.38	
Q Total (m3/s)	0.06	Flow (m3/s)		0.06	
Top Width (m)	7.31	Top Width (m)		7.31	
Vel Total (m/s)	0.26	Avg. Vel. (m/s)		0.26	
Max Chl Dpth (m)	0.06	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	1.2	Conv. (m3/s)		1.2	
Length Wtd. (m)	55.50	Wetted Per. (m)		4.08	
Min Ch El (m)	195.50	Shear (N/m2)		1.51	
Alpha	1.00	Stream Power (N/m s)		0.39	
Frctn Loss (m)		Cum Volume (1000 m3)		0.06	
C & E Loss (m)		Cum SA (1000 m2)		2.03	

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	195.58	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	195.57	Reach Len. (m)	55.50	55.50	55.50
Crit W.S. (m)	195.53	Flow Area (m2)		0.29	
E.G. Slope (m/m)	0.002420	Area (m2)		0.48	
Q Total (m3/s)	0.08	Flow (m3/s)		0.08	
Top Width (m)	7.69	Top Width (m)		7.69	
Vel Total (m/s)	0.28	Avg. Vel. (m/s)		0.28	
Max Chl Dpth (m)	0.07	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	1.6	Conv. (m3/s)		1.6	
Length Wtd. (m)	55.50	Wetted Per. (m)		4.08	
Min Ch El (m)	195.50	Shear (N/m2)		1.67	
Alpha	1.00	Stream Power (N/m s)		0.47	
Frctn Loss (m)		Cum Volume (1000 m3)		0.08	
C & E Loss (m)		Cum SA (1000 m2)		2.05	

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	195.59	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	195.58	Reach Len. (m)	55.50	55.50	55.50
Crit W.S. (m)	195.54	Flow Area (m2)		0.33	
E.G. Slope (m/m)	0.002317	Area (m2)		0.56	
Q Total (m3/s)	0.10	Flow (m3/s)		0.10	
Top Width (m)	8.01	Top Width (m)		8.01	
Vel Total (m/s)	0.30	Avg. Vel. (m/s)		0.30	
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	2.1	Conv. (m3/s)		2.1	
Length Wtd. (m)	55.50	Wetted Per. (m)		4.08	
Min Ch El (m)	195.50	Shear (N/m2)		1.85	
Alpha	1.00	Stream Power (N/m s)		0.56	
Frctn Loss (m)		Cum Volume (1000 m3)		0.09	
C & E Loss (m)		Cum SA (1000 m2)		2.06	

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	195.60	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	195.59	Reach Len. (m)	55.50	55.50	55.50
Crit W.S. (m)	195.54	Flow Area (m2)		0.37	
E.G. Slope (m/m)	0.002221	Area (m2)		0.65	
Q Total (m3/s)	0.12	Flow (m3/s)		0.12	
Top Width (m)	8.32	Top Width (m)		8.32	
Vel Total (m/s)	0.32	Avg. Vel. (m/s)		0.32	

Max Chl Dpth (m)	0.09	Hydr. Depth (m)	0.09
Conv. Total (m3/s)	2.5	Conv. (m3/s)	2.5
Length Wtd. (m)	55.50	Wetted Per. (m)	4.08
Min Ch El (m)	195.50	Shear (N/m2)	2.00
Alpha	1.00	Stream Power (N/m s)	0.64
Frctn Loss (m)		Cum Volume (1000 m3)	0.10
C & E Loss (m)		Cum SA (1000 m2)	2.07

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	195.61	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	195.61	Reach Len. (m)	55.50	55.50	55.50
Crit W.S. (m)	195.56	Flow Area (m2)		0.44	
E.G. Slope (m/m)	0.002103	Area (m2)		0.78	
Q Total (m3/s)	0.15	Flow (m3/s)		0.15	
Top Width (m)	8.76	Top Width (m)		8.76	
Vel Total (m/s)	0.34	Avg. Vel. (m/s)		0.34	
Max Chl Dpth (m)	0.11	Hydr. Depth (m)		0.11	
Conv. Total (m3/s)	3.3	Conv. (m3/s)		3.3	
Length Wtd. (m)	55.50	Wetted Per. (m)		4.08	
Min Ch El (m)	195.50	Shear (N/m2)		2.20	
Alpha	1.00	Stream Power (N/m s)		0.76	
Frctn Loss (m)		Cum Volume (1000 m3)		0.11	
C & E Loss (m)		Cum SA (1000 m2)		2.11	

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	195.63	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	195.63	Reach Len. (m)	55.50	55.50	55.50
Crit W.S. (m)	195.56	Flow Area (m2)		0.51	
E.G. Slope (m/m)	0.001998	Area (m2)		0.94	
Q Total (m3/s)	0.19	Flow (m3/s)		0.19	
Top Width (m)	9.43	Top Width (m)		9.43	
Vel Total (m/s)	0.37	Avg. Vel. (m/s)		0.37	
Max Chl Dpth (m)	0.13	Hydr. Depth (m)		0.13	
Conv. Total (m3/s)	4.3	Conv. (m3/s)		4.3	
Length Wtd. (m)	55.50	Wetted Per. (m)		4.08	
Min Ch El (m)	195.50	Shear (N/m2)		2.45	
Alpha	1.00	Stream Power (N/m s)		0.91	
Frctn Loss (m)		Cum Volume (1000 m3)		0.13	
C & E Loss (m)		Cum SA (1000 m2)		2.29	

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	195.74	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	195.73	Reach Len. (m)	55.50	55.50	55.50
Crit W.S. (m)	195.60	Flow Area (m2)		0.94	
E.G. Slope (m/m)	0.001603	Area (m2)		2.76	
Q Total (m3/s)	0.47	Flow (m3/s)		0.47	
Top Width (m)	22.65	Top Width (m)		22.65	
Vel Total (m/s)	0.50	Avg. Vel. (m/s)		0.50	
Max Chl Dpth (m)	0.23	Hydr. Depth (m)		0.23	
Conv. Total (m3/s)	11.7	Conv. (m3/s)		11.7	
Length Wtd. (m)	55.50	Wetted Per. (m)		4.08	
Min Ch El (m)	195.50	Shear (N/m2)		3.62	
Alpha	1.00	Stream Power (N/m s)		1.81	
Frctn Loss (m)		Cum Volume (1000 m3)		0.22	
C & E Loss (m)		Cum SA (1000 m2)		2.96	

CULVERT

RIVER: Rouge
REACH: WC20 RS: 150

INPUT
Description: PROP 407 TWY STRUCTURE
Distance from Upstream XS = 17
Deck/Roadway Width = 14
Weir Coefficient = 1.4
Upstream Deck/Roadway Coordinates
num= 3

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0	199.4	80	198.9	163	198.5

Upstream Bridge Cross Section Data
Station Elevation Data num= 128

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	200.04	4.2	200.01	5.4	200	6.33	199.85	8.54	199.5
11.05	199.21	12.87	199	15.16	198.65	16.16	198.5	17.03	198.23
17.26	198.2	17.37	198.18	17.59	198.17	17.75	198.17	17.95	198.14
18.18	198.14	18.88	198.1	19.83	198.01	19.85	198.01	19.88	198.01
19.93	198	22.21	197.58	23.25	197.5	26.17	197.28	26.7	197.24
26.82	197.23	27.42	197.16	28.96	197	31.17	196.67	32.51	196.5
33.66	196.48	33.79	196.48	36.14	196.48	36.27	196.48	36.41	196.48
36.56	196.48	36.59	196.48	36.99	196.47	49.22	196.42	49.71	196.41
50.82	196.41	57.7	196.38	59.01	196.36	61.44	196.28	62.99	196.28
63.06	196.28	65.49	196.27	66.75	196.16	68.59	196	70.66	196
70.7	196	70.74	196	72.51	196	74.5	195.93	75.15	195.9
75.51	195.87	75.59	195.86	75.64	195.86	76.31	195.82	76.85	195.79
77.5	195.73	78	195.671	78.78	195.58	79.47	195.5	79.5	195.5
80.1	195.5	81.45	195.5	82.71	195.5	83.82	195.5	83.97	195.5
84.52	195.5	84.53	195.5	84.55	195.5	85.06	195.5	87.34	195.61
89.08	195.67	91.08	195.65	92.65	195.65	92.68	195.65	93.64	195.65
94.38	195.66	94.39	195.67	94.4	195.69	98.71	195.67	99.38	195.69
100.3	195.74	100.86	195.79	101.85	195.92	101.99	195.92	102.38	196
103.72	196	104.25	196	104.26	196	104.28	196	104.3	196
107.24	196	107.39	196	107.44	196	107.59	196.01	107.73	196.01
110.02	196	110.43	196	110.69	196.01	110.73	196.01	114.27	196.03
114.43	196.03	114.84	196.03	121.97	196.1	123.39	196.13	126.33	196.07
128.02	196.04	128.17	196.04	129.93	196.11	133.42	196.24	136.44	196.37
140.18	196.5	142.84	196.89	143.73	197	146.27	197.4	146.97	197.5
148.58	197.74	150.33	198	151.07	198.1	153.78	198.5	155.05	198.78
156.21	199	158.38	199.15	163.01	199.17				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	68.59	.03	102.38	.07

Bank Sta: Left Right Coeff Contr. Expan.
68.59 102.38 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	79.175	198	T
83.25	163.01	198	T

Downstream Deck/Roadway Coordinates
num= 3

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0	199.4	80	198.8	164	198.4

Downstream Bridge Cross Section Data
Station Elevation Data num= 48

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	196.35	5.09	196.28	9.03	196.22	26.14	196	27.42	195.97
29.78	195.92	39.03	195.73	43.69	195.63	45.36	195.61	51.38	195.52
51.45	195.52	52.25	195.5	66.02	195.5	68.55	195.51	69.94	195.51
71.77	195.5	72.15	195.5	72.97	195.47	73.2	195.47	74.1	195.45
75.88	195.41	94.18	195	94.5	194.86	123	194.86	123.16	195
123.9	195.01	127.27	195.04	127.71	195.04	132.33	195.26	132.83	195.27
132.94	195.27	133.06	195.27	134.25	195.33	134.69	195.34	135.79	195.38
136.72	195.42	137.37	195.44	138.36	195.46	139.77	195.5	140.66	195.5
141.99	195.51	144.39	195.51	145.44	195.52	147.23	195.52	156.22	195.63
161.26	195.65	161.8	195.68	164.45	195.72				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val

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      0     .07   71.77     .03  139.77     .07

Bank Sta: Left   Right    Coeff Contr.   Expan.
          71.77  139.77          .3        .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   94.75   196.6       T
   97.25  164.45   196.6       T

Upstream Embankment side slope              =       2 horiz. to 1.0 vertical
Downstream Embankment side slope            =       2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1           Box    1.25     2.5
FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                 5      45     .013     .025        0                  .2               1
Upstream   Elevation =  195.5
           Centerline Station =  82
Downstream Elevation =  195
           Centerline Station =  96

CULVERT OUTPUT  Profile #2-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.03    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         0.39
  Q Barrel (m3/s)           0.03    Culv Vel DS (m/s)         0.49
  E.G. US. (m)            195.54    Culv Inv El Up (m)      195.50
  W.S. US. (m)            195.54    Culv Inv El Dn (m)      195.00
  E.G. DS (m)             194.90    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             194.90    Culv Exit Loss (m)        0.13
  Delta EG (m)              0.64    Culv Entr Loss (m)        0.00
  Delta WS (m)              0.64    Q Weir (m3/s)
  E.G. IC (m)             195.53    Weir Sta Lft (m)
  E.G. OC (m)             195.54    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       195.53    Weir Max Depth (m)
  Culv WS Outlet (m)      195.02    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.03    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.02    Min El Weir Flow (m)    198.55


Note:    During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth.  Therefore, the
         inlet will be at normal depth.

CULVERT OUTPUT  Profile #5-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.06    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         0.53
  Q Barrel (m3/s)           0.06    Culv Vel DS (m/s)         0.62
  E.G. US. (m)            195.56    Culv Inv El Up (m)      195.50
  W.S. US. (m)            195.56    Culv Inv El Dn (m)      195.00
  E.G. DS (m)             194.94    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             194.94    Culv Exit Loss (m)        0.12
  Delta EG (m)              0.62    Culv Entr Loss (m)        0.00
  Delta WS (m)              0.62    Q Weir (m3/s)
  E.G. IC (m)             195.55    Weir Sta Lft (m)
  E.G. OC (m)             195.56    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       195.55    Weir Max Depth (m)
  Culv WS Outlet (m)      195.04    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.05    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.04    Min El Weir Flow (m)    198.55


Note:    During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth.  Therefore, the
         inlet will be at normal depth.

CULVERT OUTPUT  Profile #10-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.08    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         0.58
  Q Barrel (m3/s)           0.08    Culv Vel DS (m/s)         0.68
  E.G. US. (m)            195.58    Culv Inv El Up (m)      195.50
  W.S. US. (m)            195.57    Culv Inv El Dn (m)      195.00
  E.G. DS (m)             194.96    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             194.96    Culv Exit Loss (m)        0.11
  Delta EG (m)              0.61    Culv Entr Loss (m)        0.00
  Delta WS (m)              0.62    Q Weir (m3/s)
  E.G. IC (m)             195.57    Weir Sta Lft (m)
  E.G. OC (m)             195.58    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       195.55    Weir Max Depth (m)
  Culv WS Outlet (m)      195.05    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.05    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.05    Min El Weir Flow (m)    198.55


Note:    During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth.  Therefore, the
         inlet will be at normal depth.

CULVERT OUTPUT  Profile #25-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.10    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         0.64
  Q Barrel (m3/s)           0.10    Culv Vel DS (m/s)         0.73
  E.G. US. (m)            195.59    Culv Inv El Up (m)      195.50
  W.S. US. (m)            195.58    Culv Inv El Dn (m)      195.00
  E.G. DS (m)             194.98    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             194.97    Culv Exit Loss (m)        0.10
  Delta EG (m)              0.61    Culv Entr Loss (m)        0.00
  Delta WS (m)              0.61    Q Weir (m3/s)
  E.G. IC (m)             195.58    Weir Sta Lft (m)
  E.G. OC (m)             195.59    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       195.56    Weir Max Depth (m)
  Culv WS Outlet (m)      195.05    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.06    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.05    Min El Weir Flow (m)    198.55


Note:    During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth.  Therefore, the
         inlet will be at normal depth.

CULVERT OUTPUT  Profile #50-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.12    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         0.69
  Q Barrel (m3/s)           0.12    Culv Vel DS (m/s)         0.78
  E.G. US. (m)            195.60    Culv Inv El Up (m)      195.50
  W.S. US. (m)            195.59    Culv Inv El Dn (m)      195.00
  E.G. DS (m)             194.99    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             194.98    Culv Exit Loss (m)        0.10
  Delta EG (m)              0.61    Culv Entr Loss (m)        0.00
  Delta WS (m)              0.61    Q Weir (m3/s)
  E.G. IC (m)             195.59    Weir Sta Lft (m)
  E.G. OC (m)             195.60    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       195.57    Weir Max Depth (m)
  Culv WS Outlet (m)      195.06    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.07    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.06    Min El Weir Flow (m)    198.55


Note:    During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth.  Therefore, the
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inlet will be at normal depth.

CULVERT OUTPUT Profile #100-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.15	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	0.76
Q Barrel (m3/s)	0.15	Culv Vel DS (m/s)	0.84
E.G. US. (m)	195.61	Culv Inv El Up (m)	195.50
W.S. US. (m)	195.61	Culv Inv El Dn (m)	195.00
E.G. DS (m)	195.01	Culv Frctn Ls (m)	0.00
W.S. DS (m)	195.00	Culv Exit Loss (m)	0.09
Delta EG (m)	0.60	Culv Entr Loss (m)	0.01
Delta WS (m)	0.60	Q Weir (m3/s)	
E.G. IC (m)	195.60	Weir Sta Lft (m)	
E.G. OC (m)	195.61	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	195.58	Weir Max Depth (m)	
Culv WS Outlet (m)	195.07	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.08	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.07	Min El Weir Flow (m)	198.55

Note: During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth. Therefore, the inlet will be at normal depth.

CULVERT OUTPUT Profile #Check Flow Culv Group: Culvert #1

Q Culv Group (m3/s)	0.19	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	0.83
Q Barrel (m3/s)	0.19	Culv Vel DS (m/s)	0.91
E.G. US. (m)	195.63	Culv Inv El Up (m)	195.50
W.S. US. (m)	195.63	Culv Inv El Dn (m)	195.00
E.G. DS (m)	195.04	Culv Frctn Ls (m)	0.00
W.S. DS (m)	195.03	Culv Exit Loss (m)	0.09
Delta EG (m)	0.60	Culv Entr Loss (m)	0.01
Delta WS (m)	0.60	Q Weir (m3/s)	
E.G. IC (m)	195.62	Weir Sta Lft (m)	
E.G. OC (m)	195.63	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	195.59	Weir Max Depth (m)	
Culv WS Outlet (m)	195.08	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.09	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.08	Min El Weir Flow (m)	198.55

Note: During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth. Therefore, the inlet will be at normal depth.

CULVERT OUTPUT Profile #Regional Culv Group: Culvert #1

Q Culv Group (m3/s)	0.47	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.20
Q Barrel (m3/s)	0.47	Culv Vel DS (m/s)	1.23
E.G. US. (m)	195.74	Culv Inv El Up (m)	195.50
W.S. US. (m)	195.73	Culv Inv El Dn (m)	195.00
E.G. DS (m)	195.13	Culv Frctn Ls (m)	0.00
W.S. DS (m)	195.09	Culv Exit Loss (m)	0.10
Delta EG (m)	0.62	Culv Entr Loss (m)	0.01
Delta WS (m)	0.64	Q Weir (m3/s)	
E.G. IC (m)	195.73	Weir Sta Lft (m)	
E.G. OC (m)	195.74	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	195.66	Weir Max Depth (m)	
Culv WS Outlet (m)	195.15	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.16	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.15	Min El Weir Flow (m)	198.55

Note: During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth. Therefore, the inlet will be at normal depth.

CROSS SECTION

RIVER: Rouge
REACH: WC20 RS: 100

INPUT
Description: ST-100 (Updated Sept. 2016)
channel re-alignment needed to allow
flow into the proposed culvert; creek invert lowered from 195 to
194.86
Station Elevation Data num= 48

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	196.35	5.09	196.28	9.03	196.22	26.14	196	27.42	195.97		
29.78	195.92	39.03	195.73	43.69	195.63	45.36	195.61	51.38	195.52		
51.45	195.52	52.25	195.5	66.02	195.5	68.55	195.51	69.94	195.51		
71.77	195.5	72.15	195.5	72.97	195.47	73.2	195.47	74.1	195.45		
75.88	195.41	94.18	195	94.5	194.86	123	194.86	123.16	195		
123.9	195.01	127.27	195.04	127.71	195.04	132.33	195.26	132.83	195.27		
132.94	195.27	133.06	195.27	134.25	195.33	134.69	195.34	135.79	195.38		
136.72	195.42	137.37	195.44	138.36	195.46	139.77	195.5	140.66	195.5		
141.99	195.51	144.39	195.51	145.44	195.52	147.23	195.52	156.22	195.63		
161.26	195.65	161.8	195.68	164.45	195.72						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	71.77	.03	139.77	.07

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
71.77 139.77 45 45 45 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	94.75	196.6	T
97.25	164.45	196.6	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	194.90	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.00	Wt. n-Val.		0.030		
W.S. Elev (m)	194.90	Reach Len. (m)	45.00	45.00	45.00	
Crit W.S. (m)	194.88	Flow Area (m2)		0.10		
E.G. Slope (m/m)	0.005734	Area (m2)		1.15		
Q Total (m3/s)	0.03	Flow (m3/s)		0.03		
Top Width (m)	28.64	Top Width (m)		28.64		
Vel Total (m/s)	0.30	Avg. Vel. (m/s)		0.30		
Max Chl Dpth (m)	0.04	Hydr. Depth (m)		0.04		
Conv. Total (m3/s)	0.4	Conv. (m3/s)		0.4		
Length Wtd. (m)	45.00	Wetted Per. (m)		2.50		
Min Ch El (m)	194.86	Shear (N/m2)		2.27		
Alpha	1.00	Stream Power (N/m s)		0.67		
Frctn Loss (m)	0.18	Cum Volume (1000 m3)		0.03		
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.03		

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	194.94	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.00	Wt. n-Val.		0.030		
W.S. Elev (m)	194.94	Reach Len. (m)	45.00	45.00	45.00	
Crit W.S. (m)	194.90	Flow Area (m2)		0.20		
E.G. Slope (m/m)	0.002540	Area (m2)		2.24		
Q Total (m3/s)	0.06	Flow (m3/s)		0.06		
Top Width (m)	28.77	Top Width (m)		28.77		
Vel Total (m/s)	0.31	Avg. Vel. (m/s)		0.31		
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.08		
Conv. Total (m3/s)	1.2	Conv. (m3/s)		1.2		
Length Wtd. (m)	45.00	Wetted Per. (m)		2.50		
Min Ch El (m)	194.86	Shear (N/m2)		1.95		
Alpha	1.00	Stream Power (N/m s)		0.60		
Frctn Loss (m)	0.21	Cum Volume (1000 m3)		0.06		
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.03		

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	194.96	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	194.96	Reach Len. (m)	45.00	45.00	45.00
Crit W.S. (m)		Flow Area (m2)		0.24	
E.G. Slope (m/m)	0.002274	Area (m2)		2.75	
Q Total (m3/s)	0.08	Flow (m3/s)		0.08	
Top Width (m)	28.83	Top Width (m)		28.83	
Vel Total (m/s)	0.33	Avg. Vel. (m/s)		0.33	
Max Chl Dpth (m)	0.10	Hydr. Depth (m)		0.10	
Conv. Total (m3/s)	1.7	Conv. (m3/s)		1.7	
Length Wtd. (m)	45.00	Wetted Per. (m)		2.50	
Min Ch El (m)	194.86	Shear (N/m2)		2.14	
Alpha	1.00	Stream Power (N/m s)		0.71	
Frctn Loss (m)	0.23	Cum Volume (1000 m3)		0.07	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.03	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	194.98	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	194.97	Reach Len. (m)	45.00	45.00	45.00
Crit W.S. (m)		Flow Area (m2)		0.28	
E.G. Slope (m/m)	0.002157	Area (m2)		3.20	
Q Total (m3/s)	0.10	Flow (m3/s)		0.10	
Top Width (m)	28.88	Top Width (m)		28.88	
Vel Total (m/s)	0.36	Avg. Vel. (m/s)		0.36	
Max Chl Dpth (m)	0.11	Hydr. Depth (m)		0.11	
Conv. Total (m3/s)	2.2	Conv. (m3/s)		2.2	
Length Wtd. (m)	45.00	Wetted Per. (m)		2.50	
Min Ch El (m)	194.86	Shear (N/m2)		2.36	
Alpha	1.00	Stream Power (N/m s)		0.85	
Frctn Loss (m)	0.25	Cum Volume (1000 m3)		0.08	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.03	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	194.99	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	194.98	Reach Len. (m)	45.00	45.00	45.00
Crit W.S. (m)		Flow Area (m2)		0.31	
E.G. Slope (m/m)	0.002131	Area (m2)		3.59	
Q Total (m3/s)	0.12	Flow (m3/s)		0.12	
Top Width (m)	28.93	Top Width (m)		28.93	
Vel Total (m/s)	0.38	Avg. Vel. (m/s)		0.38	
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.12	
Conv. Total (m3/s)	2.6	Conv. (m3/s)		2.6	
Length Wtd. (m)	45.00	Wetted Per. (m)		2.50	
Min Ch El (m)	194.86	Shear (N/m2)		2.61	
Alpha	1.00	Stream Power (N/m s)		1.00	
Frctn Loss (m)	0.26	Cum Volume (1000 m3)		0.09	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.04	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	195.01	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	195.00	Reach Len. (m)	45.00	45.00	45.00
Crit W.S. (m)		Flow Area (m2)		0.36	
E.G. Slope (m/m)	0.002072	Area (m2)		4.14	
Q Total (m3/s)	0.15	Flow (m3/s)		0.15	
Top Width (m)	29.43	Top Width (m)		29.43	
Vel Total (m/s)	0.42	Avg. Vel. (m/s)		0.42	
Max Chl Dpth (m)	0.14	Hydr. Depth (m)		0.14	
Conv. Total (m3/s)	3.3	Conv. (m3/s)		3.3	
Length Wtd. (m)	45.00	Wetted Per. (m)		2.50	
Min Ch El (m)	194.86	Shear (N/m2)		2.92	
Alpha	1.00	Stream Power (N/m s)		1.22	
Frctn Loss (m)	0.27	Cum Volume (1000 m3)		0.10	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.05	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	195.04	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	195.03	Reach Len. (m)	45.00	45.00	45.00
Crit W.S. (m)		Flow Area (m2)		0.42	
E.G. Slope (m/m)	0.002037	Area (m2)		4.85	
Q Total (m3/s)	0.19	Flow (m3/s)		0.19	
Top Width (m)	32.77	Top Width (m)		32.77	
Vel Total (m/s)	0.46	Avg. Vel. (m/s)		0.46	
Max Chl Dpth (m)	0.17	Hydr. Depth (m)		0.17	
Conv. Total (m3/s)	4.2	Conv. (m3/s)		4.2	
Length Wtd. (m)	45.00	Wetted Per. (m)		2.50	
Min Ch El (m)	194.86	Shear (N/m2)		3.33	
Alpha	1.00	Stream Power (N/m s)		1.52	
Frctn Loss (m)	0.29	Cum Volume (1000 m3)		0.12	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.12	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	195.13	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.030	
W.S. Elev (m)	195.09	Reach Len. (m)	45.00	45.00	45.00
Crit W.S. (m)		Flow Area (m2)		0.58	
E.G. Slope (m/m)	0.004153	Area (m2)		7.21	
Q Total (m3/s)	0.47	Flow (m3/s)		0.47	
Top Width (m)	38.71	Top Width (m)		38.71	
Vel Total (m/s)	0.81	Avg. Vel. (m/s)		0.81	
Max Chl Dpth (m)	0.23	Hydr. Depth (m)		0.23	
Conv. Total (m3/s)	7.3	Conv. (m3/s)		7.3	
Length Wtd. (m)	45.00	Wetted Per. (m)		2.50	
Min Ch El (m)	194.86	Shear (N/m2)		9.44	
Alpha	1.00	Stream Power (N/m s)		7.66	
Frctn Loss (m)	0.35	Cum Volume (1000 m3)		0.18	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.26	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Rouge
REACH: WC20 RS: 10

INPUT

Description: ST-10 (Updated Sept. 2016)
Station Elevation Data num= 48

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	196.5	2.48	196.5	20.48	196.21	31.15	196	34.86	195.99
36.6	195.99	49.27	195.78	57.38	195.66	58.4	195.64	66.49	195.5
67.94	195.5	87.32	195.5	88.14	195.49	92.72	195.44	93.23	195.44
93.92	195.43	93.96	195.43	95.57	195.4	101.51	195.25	103.87	195.21
106.2	195.14	109.8	195.02	109.85	195.02	109.96	195.01	110.38	195
120.99	195	121.03	194.99	122	194.7	139	194.7	139.91	194.99
140.28	195	147.71	195	150.5	194.98	153.05	194.93	154.3	194.91
154.75	194.91	162.71	194.9	171	194.93	171.45	194.93	178.12	194.95
179.09	194.97	180.38	194.97	182.91	194.98	186.01	195	196.05	195.224
203.08	195.38	208.26	195.5	209.84	195.51				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	103.87	.035	196.05	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
103.87	196.05	0	0	.3	.5

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	194.72	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	194.72	Reach Len. (m)			
Crit W.S. (m)	194.72	Flow Area (m2)		0.29	
E.G. Slope (m/m)	0.002969	Area (m2)		0.29	
Q Total (m3/s)	0.03	Flow (m3/s)		0.03	
Top Width (m)	17.11	Top Width (m)		17.11	
Vel Total (m/s)	0.10	Avg. Vel. (m/s)		0.10	
Max Chl Dpth (m)	0.02	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	0.6	Conv. (m3/s)		0.6	
Length Wtd. (m)		Wetted Per. (m)		17.12	
Min Ch El (m)	194.70	Shear (N/m2)		0.50	
Alpha	1.00	Stream Power (N/m s)		0.05	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	194.72	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	194.72	Reach Len. (m)			
Crit W.S. (m)	194.72	Flow Area (m2)		0.29	
E.G. Slope (m/m)	0.011875	Area (m2)		0.29	
Q Total (m3/s)	0.06	Flow (m3/s)		0.06	
Top Width (m)	17.11	Top Width (m)		17.11	
Vel Total (m/s)	0.21	Avg. Vel. (m/s)		0.21	
Max Chl Dpth (m)	0.02	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	0.6	Conv. (m3/s)		0.6	
Length Wtd. (m)		Wetted Per. (m)		17.12	
Min Ch El (m)	194.70	Shear (N/m2)		1.98	
Alpha	1.00	Stream Power (N/m s)		0.41	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	194.72	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	194.72	Reach Len. (m)			
Crit W.S. (m)	194.72	Flow Area (m2)		0.29	
E.G. Slope (m/m)	0.021111	Area (m2)		0.29	
Q Total (m3/s)	0.08	Flow (m3/s)		0.08	
Top Width (m)	17.11	Top Width (m)		17.11	
Vel Total (m/s)	0.27	Avg. Vel. (m/s)		0.27	
Max Chl Dpth (m)	0.02	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	0.6	Conv. (m3/s)		0.6	
Length Wtd. (m)		Wetted Per. (m)		17.12	
Min Ch El (m)	194.70	Shear (N/m2)		3.52	
Alpha	1.00	Stream Power (N/m s)		0.97	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	194.72	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	194.72	Reach Len. (m)			
Crit W.S. (m)	194.72	Flow Area (m2)		0.29	
E.G. Slope (m/m)	0.032986	Area (m2)		0.29	
Q Total (m3/s)	0.10	Flow (m3/s)		0.10	
Top Width (m)	17.11	Top Width (m)		17.11	
Vel Total (m/s)	0.34	Avg. Vel. (m/s)		0.34	
Max Chl Dpth (m)	0.02	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	0.6	Conv. (m3/s)		0.6	
Length Wtd. (m)		Wetted Per. (m)		17.12	
Min Ch El (m)	194.70	Shear (N/m2)		5.50	
Alpha	1.00	Stream Power (N/m s)		1.89	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	194.73	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	194.72	Reach Len. (m)			
Crit W.S. (m)	194.72	Flow Area (m2)		0.29	
E.G. Slope (m/m)	0.047500	Area (m2)		0.29	
Q Total (m3/s)	0.12	Flow (m3/s)		0.12	
Top Width (m)	17.11	Top Width (m)		17.11	
Vel Total (m/s)	0.41	Avg. Vel. (m/s)		0.41	
Max Chl Dpth (m)	0.02	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	0.6	Conv. (m3/s)		0.6	
Length Wtd. (m)		Wetted Per. (m)		17.12	
Min Ch El (m)	194.70	Shear (N/m2)		7.93	
Alpha	1.00	Stream Power (N/m s)		3.27	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	194.73	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	194.72	Reach Len. (m)			
Crit W.S. (m)	194.72	Flow Area (m2)		0.29	
E.G. Slope (m/m)	0.074218	Area (m2)		0.29	
Q Total (m3/s)	0.15	Flow (m3/s)		0.15	
Top Width (m)	17.11	Top Width (m)		17.11	
Vel Total (m/s)	0.51	Avg. Vel. (m/s)		0.51	
Max Chl Dpth (m)	0.02	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	0.6	Conv. (m3/s)		0.6	
Length Wtd. (m)		Wetted Per. (m)		17.12	
Min Ch El (m)	194.70	Shear (N/m2)		12.39	
Alpha	1.00	Stream Power (N/m s)		6.38	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	194.74	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	194.72	Reach Len. (m)			
Crit W.S. (m)	194.72	Flow Area (m2)		0.29	
E.G. Slope (m/m)	0.119079	Area (m2)		0.29	
Q Total (m3/s)	0.19	Flow (m3/s)		0.19	
Top Width (m)	17.11	Top Width (m)		17.11	

Vel Total (m/s)	0.65	Avg. Vel. (m/s)	0.65
Max Chl Dpth (m)	0.02	Hydr. Depth (m)	0.02
Conv. Total (m3/s)	0.6	Conv. (m3/s)	0.6
Length Wtd. (m)		Wetted Per. (m)	17.12
Min Ch El (m)	194.70	Shear (N/m2)	19.87
Alpha	1.00	Stream Power (N/m s)	12.96
Frctn Loss (m)		Cum Volume (1000 m3)	
C & E Loss (m)		Cum SA (1000 m2)	

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	194.77	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	194.75	Reach Len. (m)			
Crit W.S. (m)	194.75	Flow Area (m2)		0.87	
E.G. Slope (m/m)	0.019220	Area (m2)		0.87	
Q Total (m3/s)	0.47	Flow (m3/s)		0.47	
Top Width (m)	17.33	Top Width (m)		17.33	
Vel Total (m/s)	0.54	Avg. Vel. (m/s)		0.54	
Max Chl Dpth (m)	0.05	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	3.4	Conv. (m3/s)		3.4	
Length Wtd. (m)		Wetted Per. (m)		17.34	
Min Ch El (m)	194.70	Shear (N/m2)		9.47	
Alpha	1.00	Stream Power (N/m s)		5.11	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

SUMMARY OF MANNING'S N VALUES

River:Rouge

Reach	River Sta.	n1	n2	n3
WC20	300	.07	.03	.07
WC20	250	Culvert		
WC20	200	.07	.03	.07
WC20	150	Culvert		
WC20	100	.07	.03	.07
WC20	10	.07	.035	.07

SUMMARY OF REACH LENGTHS

River: Rouge

Reach	River Sta.	Left	Channel	Right
WC20	300	100.8	100.8	100.8
WC20	250	Culvert		
WC20	200	55.5	55.5	55.5
WC20	150	Culvert		
WC20	100	45	45	45
WC20	10	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Rouge

Reach	River Sta.	Contr.	Expan.
WC20	300	.3	.5
WC20	250	Culvert	
WC20	200	.3	.5
WC20	150	Culvert	
WC20	100	.3	.5
WC20	10	.3	.5

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
WC20	300	2-yr	0.03	196.00	196.13	196.03	196.13	0.000264	0.14	0.22	29.02	0.12
WC20	300	5-yr	0.06	196.00	196.19	196.05	196.19	0.000328	0.20	0.31	33.92	0.15
WC20	300	10-yr	0.08	196.00	196.22	196.06	196.22	0.000356	0.23	0.35	40.16	0.16
WC20	300	25-yr	0.10	196.00	196.24	196.07	196.24	0.000377	0.25	0.40	43.06	0.16
WC20	300	50-yr	0.12	196.00	196.27	196.10	196.27	0.000399	0.27	0.44	45.62	0.17
WC20	300	100-yr	0.15	196.00	196.30	196.10	196.30	0.000429	0.31	0.49	48.60	0.18
WC20	300	Check Flow	0.19	196.00	196.33	196.11	196.34	0.000460	0.34	0.55	51.95	0.19
WC20	300	Regional	0.47	196.00	196.54	196.20	196.55	0.000587	0.53	0.88	68.44	0.23
WC20	250		Culvert									
WC20	200	2-yr	0.03	195.50	195.54	195.52	195.54	0.002999	0.20	0.15	6.70	0.34
WC20	200	5-yr	0.06	195.50	195.56	195.52	195.56	0.002679	0.26	0.23	7.31	0.34
WC20	200	10-yr	0.08	195.50	195.57	195.53	195.58	0.002420	0.28	0.29	7.69	0.34
WC20	200	25-yr	0.10	195.50	195.58	195.54	195.59	0.002317	0.30	0.33	8.01	0.34
WC20	200	50-yr	0.12	195.50	195.59	195.54	195.60	0.002221	0.32	0.37	8.32	0.34
WC20	200	100-yr	0.15	195.50	195.61	195.56	195.61	0.002103	0.34	0.44	8.76	0.34
WC20	200	Check Flow	0.19	195.50	195.63	195.56	195.63	0.001998	0.37	0.51	9.43	0.34
WC20	200	Regional	0.47	195.50	195.73	195.60	195.74	0.001603	0.50	0.94	22.65	0.33
WC20	150		Culvert									
WC20	100	2-yr	0.03	194.86	194.90	194.88	194.90	0.005734	0.30	0.10	28.64	0.47
WC20	100	5-yr	0.06	194.86	194.94	194.90	194.94	0.002540	0.31	0.20	28.77	0.35
WC20	100	10-yr	0.08	194.86	194.96		194.96	0.002274	0.33	0.24	28.83	0.34
WC20	100	25-yr	0.10	194.86	194.97		194.98	0.002157	0.36	0.28	28.88	0.34
WC20	100	50-yr	0.12	194.86	194.98		194.99	0.002131	0.38	0.31	28.93	0.35
WC20	100	100-yr	0.15	194.86	195.00		195.01	0.002072	0.42	0.36	29.43	0.35
WC20	100	Check Flow	0.19	194.86	195.03		195.04	0.002037	0.46	0.42	32.77	0.36
WC20	100	Regional	0.47	194.86	195.09		195.13	0.004153	0.81	0.58	38.71	0.54
WC20	10	2-yr	0.03	194.70	194.72	194.72	194.72	0.002969	0.10	0.29	17.11	0.25
WC20	10	5-yr	0.06	194.70	194.72	194.72	194.72	0.011875	0.21	0.29	17.11	0.50
WC20	10	10-yr	0.08	194.70	194.72	194.72	194.72	0.021111	0.27	0.29	17.11	0.67
WC20	10	25-yr	0.10	194.70	194.72	194.72	194.72	0.032986	0.34	0.29	17.11	0.84
WC20	10	50-yr	0.12	194.70	194.72	194.72	194.73	0.047500	0.41	0.29	17.11	1.01
WC20	10	100-yr	0.15	194.70	194.72	194.72	194.73	0.074218	0.51	0.29	17.11	1.26
WC20	10	Check Flow	0.19	194.70	194.72	194.72	194.74	0.119079	0.65	0.29	17.11	1.60
WC20	10	Regional	0.47	194.70	194.75	194.75	194.77	0.019220	0.54	0.87	17.33	0.77

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (m)	W.S. Elev (m)	Vel Head (m)	Frctn Loss (m)	C & E Loss (m)	Q Left (m3/s)	Q Channel (m3/s)	Q Right (m3/s)	Top Width (m)
WC20	300	2-yr	196.13	196.13	0.00				0.03		29.02
WC20	300	5-yr	196.19	196.19	0.00				0.06		33.92
WC20	300	10-yr	196.22	196.22	0.00				0.08		40.16
WC20	300	25-yr	196.24	196.24	0.00				0.10		43.06
WC20	300	50-yr	196.27	196.27	0.00				0.12		45.62
WC20	300	100-yr	196.30	196.30	0.00				0.15		48.60
WC20	300	Check Flow	196.34	196.33	0.01				0.19		51.95
WC20	300	Regional	196.55	196.54	0.01				0.47		68.44
WC20	250		Culvert								
WC20	200	2-yr	195.54	195.54	0.00				0.03		6.70
WC20	200	5-yr	195.56	195.56	0.00				0.06		7.31
WC20	200	10-yr	195.58	195.57	0.00				0.08		7.69
WC20	200	25-yr	195.59	195.58	0.00				0.10		8.01
WC20	200	50-yr	195.60	195.59	0.01				0.12		8.32

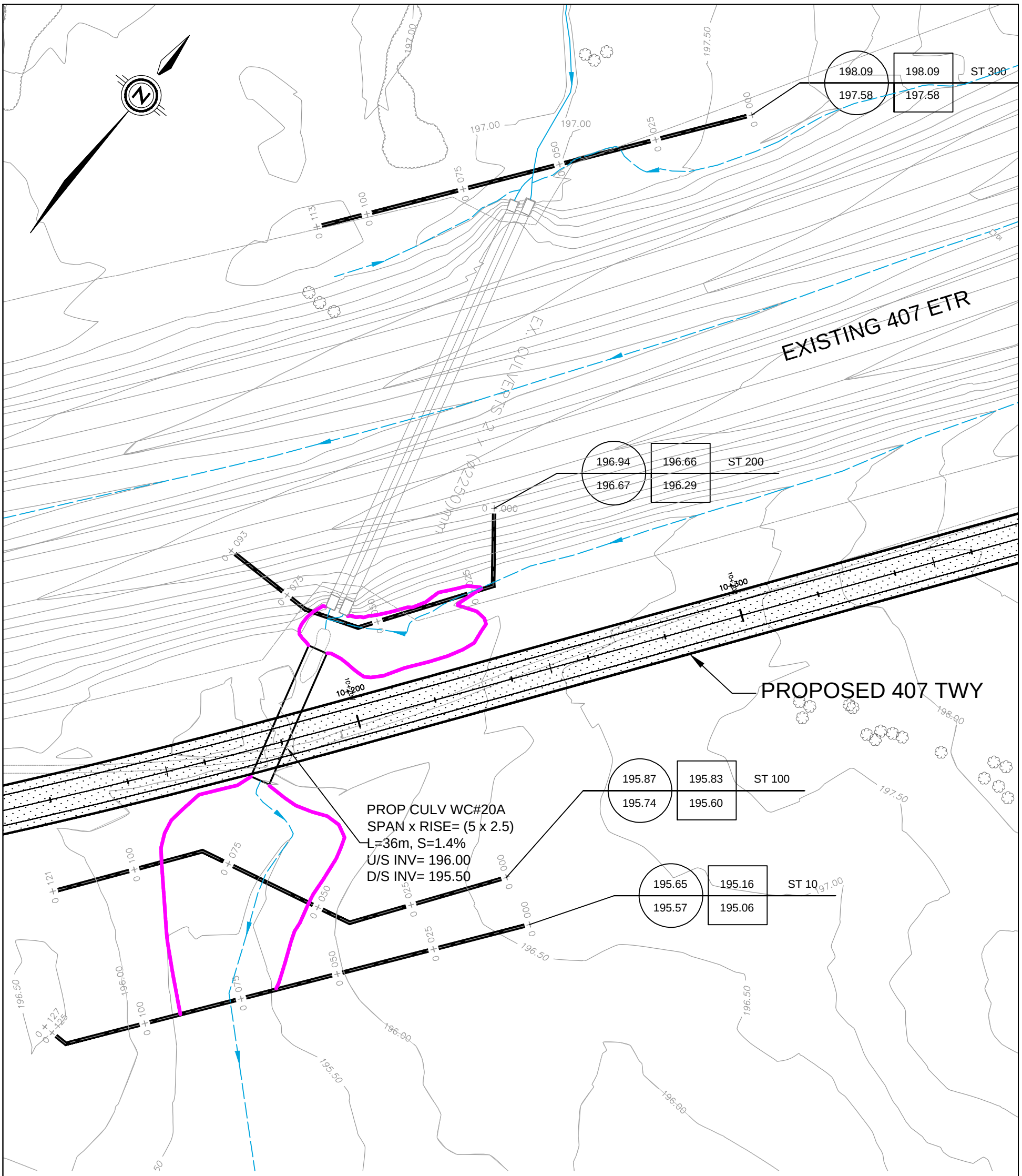
WC20	200	100-yr	195.61	195.61	0.01			0.15	8.76
WC20	200	Check Flow	195.63	195.63	0.01			0.19	9.43
WC20	200	Regional	195.74	195.73	0.01			0.47	22.65
WC20	150		Culvert						
WC20	100	2-yr	194.90	194.90	0.00	0.18	0.00	0.03	28.64
WC20	100	5-yr	194.94	194.94	0.00	0.21	0.00	0.06	28.77
WC20	100	10-yr	194.96	194.96	0.01	0.23	0.00	0.08	28.83
WC20	100	25-yr	194.98	194.97	0.01	0.25	0.00	0.10	28.88
WC20	100	50-yr	194.99	194.98	0.01	0.26	0.00	0.12	28.93
WC20	100	100-yr	195.01	195.00	0.01	0.27	0.00	0.15	29.43
WC20	100	Check Flow	195.04	195.03	0.01	0.29	0.00	0.19	32.77
WC20	100	Regional	195.13	195.09	0.03	0.35	0.01	0.47	38.71
WC20	10	2-yr	194.72	194.72	0.00			0.03	17.11
WC20	10	5-yr	194.72	194.72	0.00			0.06	17.11
WC20	10	10-yr	194.72	194.72	0.00			0.08	17.11
WC20	10	25-yr	194.72	194.72	0.01			0.10	17.11
WC20	10	50-yr	194.73	194.72	0.01			0.12	17.11
WC20	10	100-yr	194.73	194.72	0.01			0.15	17.11
WC20	10	Check Flow	194.74	194.72	0.02			0.19	17.11
WC20	10	Regional	194.77	194.75	0.01			0.47	17.33

Profile Output Table - Culvert Only

Reach	River Sta		Profile	E.G. US. (m)	W.S. US. (m)	E.G. IC (m)	E.G. OC (m)	Min El Weir Flow (m)	Q Culv Group (m3/s)	Q Weir (m3/s)	Delta WS (m)	Culv Vel US (m/s)	Culv Vel DS (m/s)
WC20	250	Culvert #1	2-yr	196.13	196.13	196.11	196.13	199.40	0.03		0.59	0.64	0.74
WC20	250	Culvert #1	5-yr	196.19	196.19	196.16	196.19	199.40	0.06		0.63	0.78	0.88
WC20	250	Culvert #1	10-yr	196.22	196.22	196.18	196.22	199.40	0.08		0.64	0.86	0.95
WC20	250	Culvert #1	25-yr	196.24	196.24	196.20	196.24	199.40	0.10		0.66	0.93	1.01
WC20	250	Culvert #1	50-yr	196.27	196.27	196.22	196.27	199.40	0.12		0.67	0.97	1.06
WC20	250	Culvert #1	100-yr	196.30	196.30	196.25	196.30	199.40	0.15		0.69	1.03	1.12
WC20	250	Culvert #1	Check Flow	196.34	196.33	196.28	196.34	199.40	0.19		0.71	1.11	1.19
WC20	250	Culvert #1	Regional	196.55	196.54	196.45	196.55	199.40	0.47		0.80	1.46	1.51
WC20	150	Culvert #1	2-yr	195.54	195.54	195.53	195.54	198.55	0.03		0.64	0.39	0.49
WC20	150	Culvert #1	5-yr	195.56	195.56	195.55	195.56	198.55	0.06		0.62	0.53	0.62
WC20	150	Culvert #1	10-yr	195.58	195.57	195.57	195.58	198.55	0.08		0.62	0.58	0.68
WC20	150	Culvert #1	25-yr	195.59	195.58	195.58	195.59	198.55	0.10		0.61	0.64	0.73
WC20	150	Culvert #1	50-yr	195.60	195.59	195.59	195.60	198.55	0.12		0.61	0.69	0.78
WC20	150	Culvert #1	100-yr	195.61	195.61	195.60	195.61	198.55	0.15		0.60	0.76	0.84
WC20	150	Culvert #1	Check Flow	195.63	195.63	195.62	195.63	198.55	0.19		0.60	0.83	0.91
WC20	150	Culvert #1	Regional	195.74	195.73	195.73	195.74	198.55	0.47		0.64	1.20	1.23

PETTICOAT CREEK

HEC-RAS ANALYSIS WC#20A



LEGEND

EXISTING 407 ETR

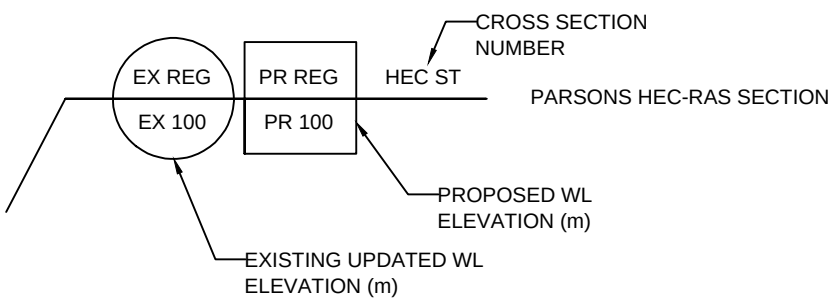
PROPOSED 407 TWY

CREEK FLOW DIRECTION

EXISTING CULVERT

PROPOSED CULVERT

PROPOSED REGIONAL FLOODLINE

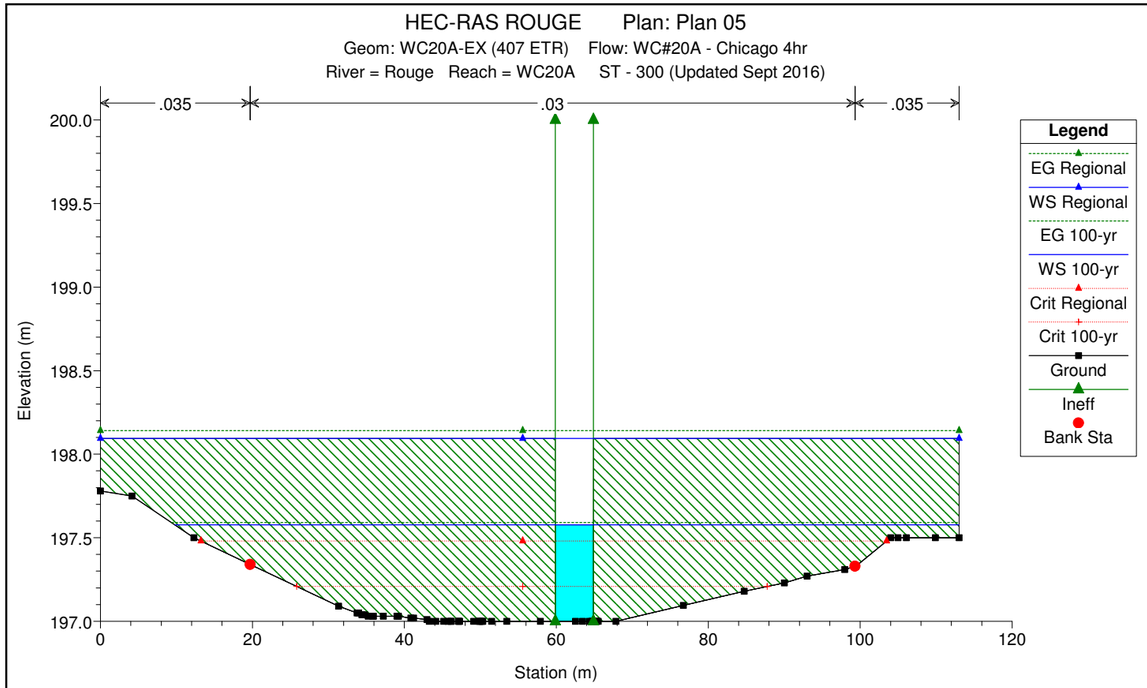


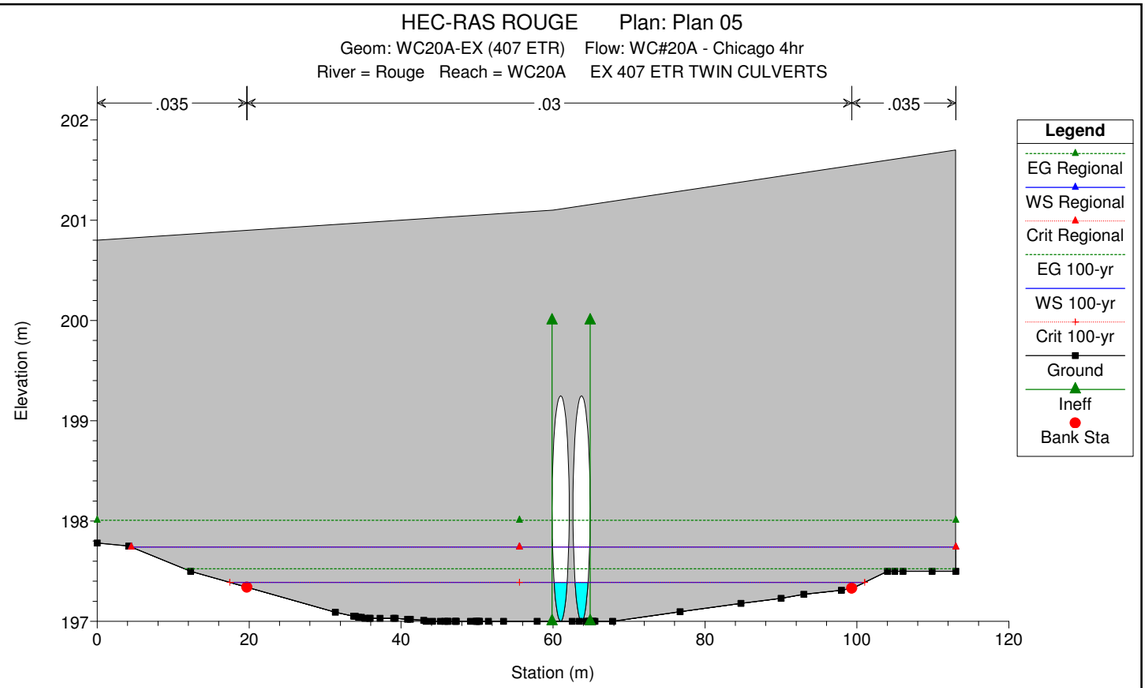
SCALE HORIZONTAL

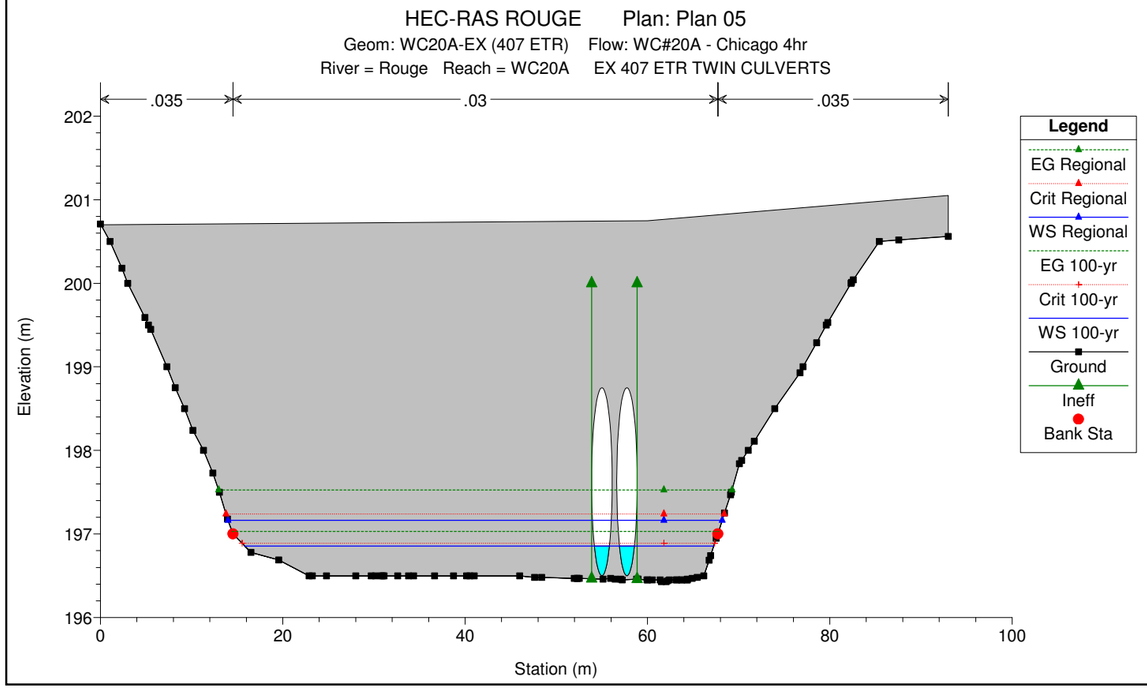
5m 0m 10m 20m 30m

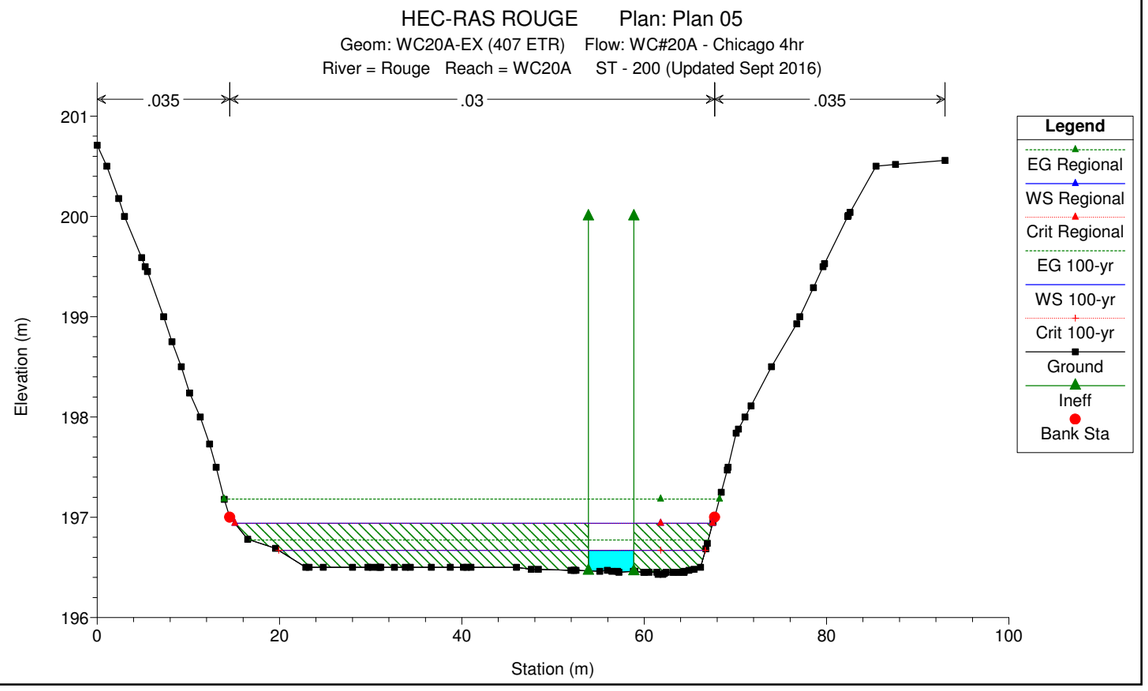
1:1000

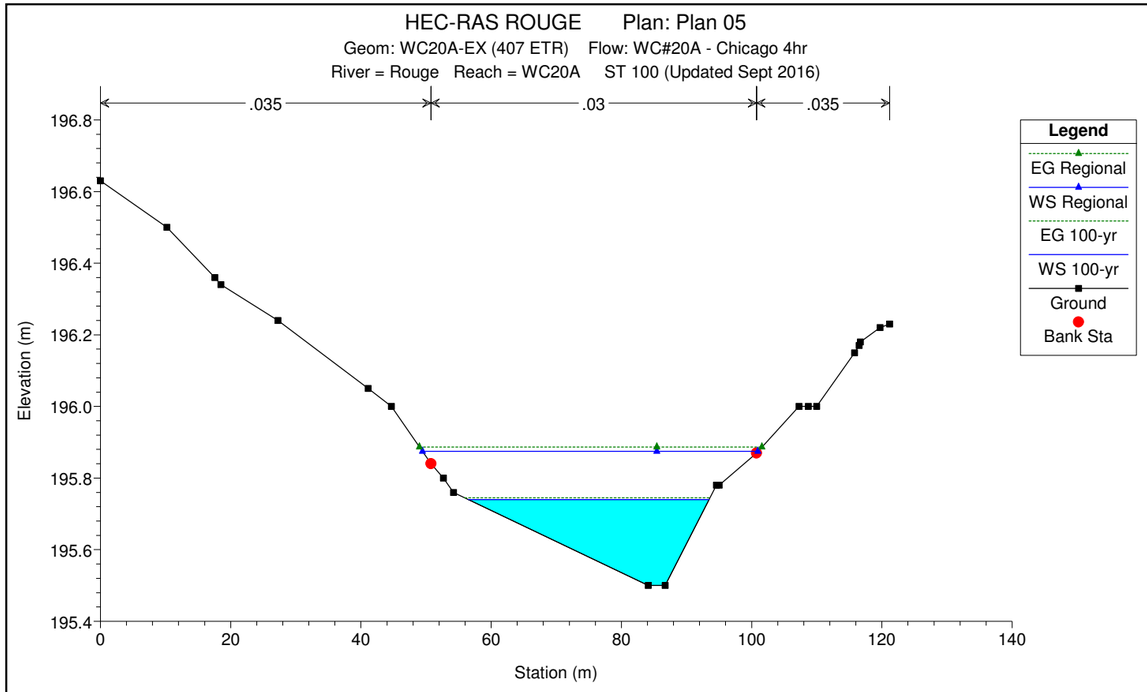
DATE: SEPTEMBER 2016	Ontario	PARSONS 625 COCHRANE DRIVE, SUITE 500 MARKHAM, ONTARIO L3R 9R9 TEL: 905-943-0500 FAX: 905-943-0400	407 TRANSITWAY FROM KENNEDY RD TO BROCK RD
SCALE: 1:1000			FIGURE 6.14 - HEC-RAS ANALYSIS - PETTICOAT CREEK (WC#20A)

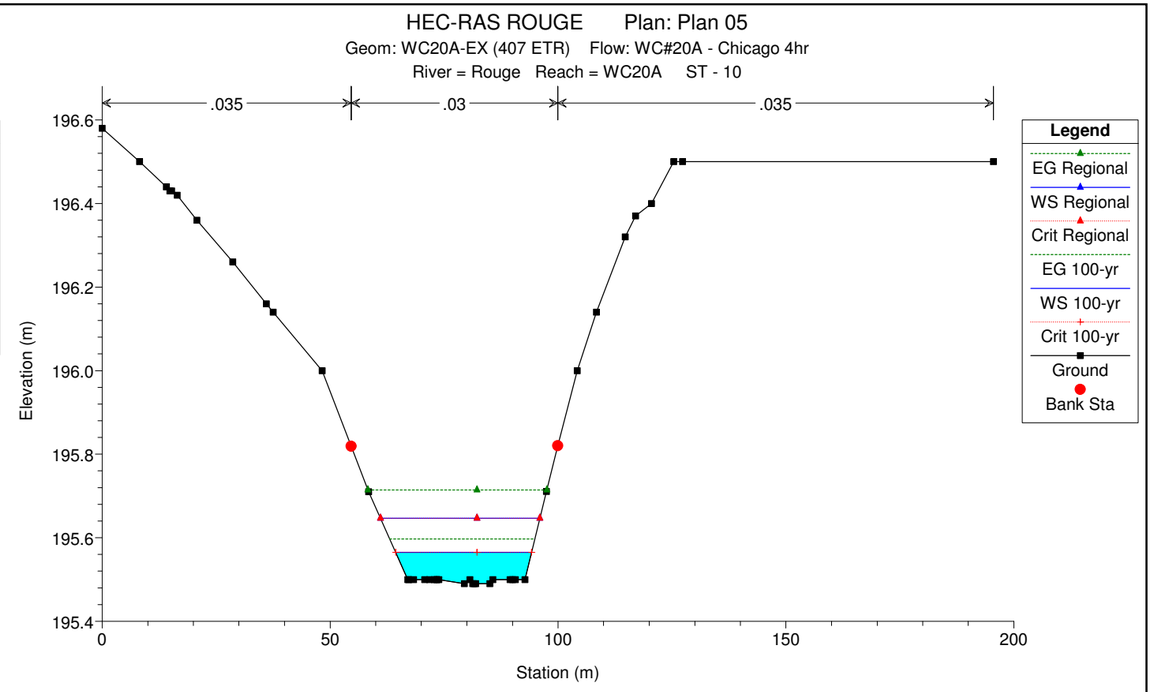

HEC-RAS ROUGE Plan: Plan 05
Geom: WC20A-EX (407 ETR) Flow: WC#20A - Chicago 4hr
River = Rouge Reach = WC20A ST - 300 (Updated Sept 2016)
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Crit Regional
Crit 100-yr
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 05
Geom: WC20A-EX (407 ETR) Flow: WC#20A - Chicago 4hr
River = Rouge Reach = WC20A EX 407 ETR TWIN CULVERTS
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 05
Geom: WC20A-EX (407 ETR) Flow: WC#20A - Chicago 4hr
River = Rouge Reach = WC20A EX 407 ETR TWIN CULVERTS
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG Regional
Crit Regional
WS Regional
EG 100-yr
Crit 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 05
Geom: WC20A-EX (407 ETR) Flow: WC#20A - Chicago 4hr
River = Rouge Reach = WC20A ST - 200 (Updated Sept 2016)
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 05
Geom: WC20A-EX (407 ETR) Flow: WC#20A - Chicago 4hr
River = Rouge Reach = WC20A ST 100 (Updated Sept 2016)
.035
.03
.035
Elevation (m)
196.8
196.6
196.4
196.2
196.0
195.8
195.6
195.4
0
20
40
60
80
100
120
140
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Bank Sta


HEC-RAS ROUGE Plan: Plan 05
Geom: WC20A-EX (407 ETR) Flow: WC#20A - Chicago 4hr
River = Rouge Reach = WC20A ST - 10
.035
.03
.035
Elevation (m)
196.6
196.4
196.2
196.0
195.8
195.6
195.4
0
50
100
150
200
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta

HEC-RAS Plan: WC20A-EX-4hr CH River: Rouge Reach: WC20A

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC20A	300	2-yr	0.32	197.00	197.27	197.09	197.27	0.000305	0.24	1.33	69.54	0.15
WC20A	300	5-yr	0.57	197.00	197.36	197.11	197.36	0.000368	0.32	1.78	81.10	0.17
WC20A	300	10-yr	0.77	197.00	197.41	197.13	197.42	0.000405	0.37	2.07	85.34	0.18
WC20A	300	25-yr	1.04	197.00	197.48	197.16	197.49	0.000446	0.43	2.41	90.29	0.20
WC20A	300	50-yr	1.26	197.00	197.53	197.18	197.54	0.000475	0.48	2.65	101.68	0.21
WC20A	300	100-yr	1.49	197.00	197.58	197.21	197.59	0.000500	0.52	2.88	103.21	0.22
WC20A	300	Check Flow	1.94	197.00	197.66	197.25	197.68	0.000543	0.59	3.30	105.90	0.23
WC20A	300	Regional	5.22	197.00	198.09	197.48	198.14	0.000726	0.95	5.47	113.02	0.29
WC20A	250		Culvert									
WC20A	200	2-yr	0.32	196.43	196.53	196.53	196.57	0.024791	0.90	0.36	43.96	1.08
WC20A	200	5-yr	0.57	196.43	196.57	196.57	196.63	0.018482	1.04	0.55	44.75	1.00
WC20A	200	10-yr	0.77	196.43	196.59	196.59	196.66	0.017166	1.15	0.67	45.26	1.00
WC20A	200	25-yr	1.04	196.43	196.62	196.62	196.71	0.016063	1.27	0.82	45.87	1.00
WC20A	200	50-yr	1.26	196.43	196.65	196.65	196.74	0.015472	1.35	0.93	46.33	1.00
WC20A	200	100-yr	1.49	196.43	196.67	196.67	196.77	0.014802	1.43	1.04	46.79	1.00
WC20A	200	Check Flow	1.94	196.43	196.70	196.70	196.83	0.014794	1.59	1.22	47.78	1.02
WC20A	200	Regional	5.22	196.43	196.94	196.94	197.18	0.011429	2.18	2.39	52.41	1.01
WC20A	100	2-yr	0.32	195.50	195.65	195.56	195.65	0.000740	0.17	1.89	23.40	0.19
WC20A	100	5-yr	0.57	195.50	195.67		195.67	0.001044	0.22	2.56	27.19	0.23
WC20A	100	10-yr	0.77	195.50	195.69		195.69	0.001286	0.26	2.96	29.24	0.26
WC20A	100	25-yr	1.04	195.50	195.72		195.72	0.001125	0.27	3.90	33.53	0.25
WC20A	100	50-yr	1.26	195.50	195.73		195.73	0.001269	0.29	4.31	35.21	0.27
WC20A	100	100-yr	1.49	195.50	195.74		195.74	0.001371	0.31	4.74	36.94	0.28
WC20A	100	Check Flow	1.94	195.50	195.77		195.77	0.001396	0.34	5.71	40.15	0.29
WC20A	100	Regional	5.22	195.50	195.87		195.89	0.001670	0.49	10.73	51.50	0.34
WC20A	10	2-yr	0.32	195.49	195.52	195.52	195.54	0.084708	0.67	0.48	26.65	1.59
WC20A	10	5-yr	0.57	195.49	195.53	195.53	195.55	0.030017	0.61	0.94	27.73	1.05
WC20A	10	10-yr	0.77	195.49	195.55	195.55	195.56	0.013317	0.53	1.46	28.90	0.75
WC20A	10	25-yr	1.04	195.49	195.54	195.54	195.58	0.038031	0.82	1.27	28.48	1.24
WC20A	10	50-yr	1.26	195.49	195.56	195.56	195.59	0.024263	0.76	1.65	29.31	1.03
WC20A	10	100-yr	1.49	195.49	195.57	195.57	195.60	0.022077	0.79	1.89	29.83	1.00
WC20A	10	Check Flow	1.94	195.49	195.57	195.57	195.62	0.025134	0.90	2.15	30.37	1.09
WC20A	10	Regional	5.22	195.49	195.65	195.65	195.71	0.018203	1.15	4.53	35.00	1.02

HEC-RAS HEC-RAS 5.0.1 April 2016
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: HEC-RAS ROUGE
Project File : HEC.prj
Run Date and Time: 9/8/2016 10:42:59 AM

Project in SI units

Project Description:
HEC-RAS model for creek crossings along the proposed 407 TWY Ph 2 started
from scratch

PLAN DATA

Plan Title: Plan 05
Plan File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.p05

Geometry Title: WC20A-EX (407 ETR)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g02

Flow Title : WC#20A - Chicago 4hr
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f08

Plan Summary Information:
Number of: Cross Sections = 4 Multiple Openings = 0
Culverts = 1 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: WC#20A - Chicago 4hr
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f08

Flow Data (m3/s)

River	Reach	RS	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Check Flow	Regional
Rouge	WC20A	300	.32	.57	.77	1.04	1.26	1.49	1.94	5.22

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Rouge	WC20A	2-yr		Critical
Rouge	WC20A	5-yr		Critical
Rouge	WC20A	10-yr		Critical
Rouge	WC20A	25-yr		Critical
Rouge	WC20A	50-yr		Critical
Rouge	WC20A	100-yr		Critical
Rouge	WC20A	Check Flow		Critical
Rouge	WC20A	Regional		Critical

GEOMETRY DATA

Geometry Title: WC20A-EX (407 ETR)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g02

CROSS SECTION

RIVER: Rouge
REACH: WC20A RS: 300

INPUT
Description: ST - 300 (Updated Sept 2016)
Station Elevation Data num= 57

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	197.78	4.15	197.75	12.31	197.5	19.72	197.34	31.35	197.09
33.78	197.05	33.98	197.05	34.41	197.04	34.76	197.04	35.24	197.03
35.85	197.03	35.92	197.03	37.23	197.03	39.01	197.03	39.24	197.03
40.85	197.02	41.22	197.02	42.98	197.01	43.29	197	44.15	197
45.18	197	45.75	197	46.11	197	46.17	197	47.09	197
47.21	197	47.27	197	49.12	197	49.85	197	49.93	197
50.03	197	50.23	197	50.33	197	51.48	197	53.49	197
57.89	197	62.54	197	63.47	197	64.34	197	64.64	197
64.8	197	65.28	197	65.29	197	65.53	197	67.84	197
76.72	197.095	84.74	197.18	90.01	197.23	93.02	197.27	97.97	197.31
99.33	197.329	99.43	197.33	104	197.5	104.98	197.5	106.06	197.5
109.89	197.5	113.02	197.5						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	19.72	.03	99.33	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
19.72 99.33 123.3 123.3 123.3 .3 .5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	59.875	200	T
64.875	113.02	200	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	197.27	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	197.27	Reach Len. (m)	123.30	123.30	123.30
Crit W.S. (m)	197.09	Flow Area (m2)		1.33	
E.G. Slope (m/m)	0.000305	Area (m2)		13.34	
Q Total (m3/s)	0.32	Flow (m3/s)		0.32	
Top Width (m)	69.54	Top Width (m)		69.54	
Vel Total (m/s)	0.24	Avg. Vel. (m/s)		0.24	
Max Chl Dpth (m)	0.27	Hydr. Depth (m)		0.27	
Conv. Total (m3/s)	18.3	Conv. (m3/s)		18.3	
Length Wtd. (m)	123.30	Wetted Per. (m)		5.00	

Min Ch El (m)	197.00	Shear (N/m2)	0.79
Alpha	1.00	Stream Power (N/m s)	0.19
Frctn Loss (m)		Cum Volume (1000 m3)	0.31
C & E Loss (m)		Cum SA (1000 m2)	10.57

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	197.36	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	197.36	Reach Len. (m)	123.30	123.30	123.30
Crit W.S. (m)	197.11	Flow Area (m2)		1.78	
E.G. Slope (m/m)	0.000368	Area (m2)	0.01	20.13	0.01
Q Total (m3/s)	0.57	Flow (m3/s)		0.57	
Top Width (m)	81.10	Top Width (m)	0.71	79.61	0.78
Vel Total (m/s)	0.32	Avg. Vel. (m/s)		0.32	
Max Chl Dpth (m)	0.36	Hydr. Depth (m)		0.36	
Conv. Total (m3/s)	29.7	Conv. (m3/s)		29.7	
Length Wtd. (m)	123.30	Wetted Per. (m)		5.00	
Min Ch El (m)	197.00	Shear (N/m2)		1.28	
Alpha	1.00	Stream Power (N/m s)		0.41	
Frctn Loss (m)		Cum Volume (1000 m3)		0.48	
C & E Loss (m)		Cum SA (1000 m2)	0.04	11.51	0.05

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	197.42	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	197.41	Reach Len. (m)	123.30	123.30	123.30
Crit W.S. (m)	197.13	Flow Area (m2)		2.07	
E.G. Slope (m/m)	0.000405	Area (m2)	0.12	24.75	0.10
Q Total (m3/s)	0.77	Flow (m3/s)		0.77	
Top Width (m)	85.34	Top Width (m)	3.39	79.61	2.34
Vel Total (m/s)	0.37	Avg. Vel. (m/s)		0.37	
Max Chl Dpth (m)	0.41	Hydr. Depth (m)		0.41	
Conv. Total (m3/s)	38.2	Conv. (m3/s)		38.2	
Length Wtd. (m)	123.30	Wetted Per. (m)		5.00	
Min Ch El (m)	197.00	Shear (N/m2)		1.64	
Alpha	1.00	Stream Power (N/m s)		0.61	
Frctn Loss (m)		Cum Volume (1000 m3)		0.60	
C & E Loss (m)		Cum SA (1000 m2)	0.21	11.71	0.14

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	197.49	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	197.48	Reach Len. (m)	123.30	123.30	123.30
Crit W.S. (m)	197.16	Flow Area (m2)		2.41	
E.G. Slope (m/m)	0.000446	Area (m2)	0.46	30.14	0.32
Q Total (m3/s)	1.04	Flow (m3/s)		1.04	
Top Width (m)	90.29	Top Width (m)	6.52	79.61	4.16
Vel Total (m/s)	0.43	Avg. Vel. (m/s)		0.43	
Max Chl Dpth (m)	0.48	Hydr. Depth (m)		0.48	
Conv. Total (m3/s)	49.2	Conv. (m3/s)		49.2	
Length Wtd. (m)	123.30	Wetted Per. (m)		5.00	
Min Ch El (m)	197.00	Shear (N/m2)		2.11	
Alpha	1.00	Stream Power (N/m s)		0.91	
Frctn Loss (m)		Cum Volume (1000 m3)		0.75	
C & E Loss (m)		Cum SA (1000 m2)	0.40	12.01	0.26

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	197.54	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	197.53	Reach Len. (m)	123.30	123.30	123.30
Crit W.S. (m)	197.18	Flow Area (m2)		2.65	
E.G. Slope (m/m)	0.000475	Area (m2)	0.83	34.03	0.81
Q Total (m3/s)	1.26	Flow (m3/s)		1.26	
Top Width (m)	101.68	Top Width (m)	8.38	79.61	13.69
Vel Total (m/s)	0.48	Avg. Vel. (m/s)		0.48	
Max Chl Dpth (m)	0.53	Hydr. Depth (m)		0.53	
Conv. Total (m3/s)	57.8	Conv. (m3/s)		57.8	
Length Wtd. (m)	123.30	Wetted Per. (m)		5.00	
Min Ch El (m)	197.00	Shear (N/m2)		2.47	
Alpha	1.00	Stream Power (N/m s)		1.17	
Frctn Loss (m)		Cum Volume (1000 m3)		0.86	
C & E Loss (m)		Cum SA (1000 m2)	0.52	12.17	0.84

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	197.59	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	197.58	Reach Len. (m)	123.30	123.30	123.30
Crit W.S. (m)	197.21	Flow Area (m2)		2.88	
E.G. Slope (m/m)	0.000500	Area (m2)	1.26	37.76	1.45
Q Total (m3/s)	1.49	Flow (m3/s)		1.49	
Top Width (m)	103.21	Top Width (m)	9.91	79.61	13.69
Vel Total (m/s)	0.52	Avg. Vel. (m/s)		0.52	
Max Chl Dpth (m)	0.58	Hydr. Depth (m)		0.58	
Conv. Total (m3/s)	66.6	Conv. (m3/s)		66.6	
Length Wtd. (m)	123.30	Wetted Per. (m)		5.00	
Min Ch El (m)	197.00	Shear (N/m2)		2.83	
Alpha	1.00	Stream Power (N/m s)		1.46	
Frctn Loss (m)		Cum Volume (1000 m3)		0.97	
C & E Loss (m)		Cum SA (1000 m2)	0.61	12.33	0.84

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	197.68	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	197.66	Reach Len. (m)	123.30	123.30	123.30
Crit W.S. (m)	197.25	Flow Area (m2)		3.30	
E.G. Slope (m/m)	0.000543	Area (m2)	2.19	44.32	2.58
Q Total (m3/s)	1.94	Flow (m3/s)		1.94	
Top Width (m)	105.90	Top Width (m)	12.60	79.61	13.69
Vel Total (m/s)	0.59	Avg. Vel. (m/s)		0.59	
Max Chl Dpth (m)	0.66	Hydr. Depth (m)		0.66	
Conv. Total (m3/s)	83.2	Conv. (m3/s)		83.2	
Length Wtd. (m)	123.30	Wetted Per. (m)		5.00	
Min Ch El (m)	197.00	Shear (N/m2)		3.51	
Alpha	1.00	Stream Power (N/m s)		2.07	
Frctn Loss (m)		Cum Volume (1000 m3)		1.17	
C & E Loss (m)		Cum SA (1000 m2)	0.78	12.62	0.84

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	198.14	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.030	
W.S. Elev (m)	198.09	Reach Len. (m)	123.30	123.30	123.30
Crit W.S. (m)	197.48	Flow Area (m2)		5.47	
E.G. Slope (m/m)	0.000726	Area (m2)	10.20	78.98	8.54
Q Total (m3/s)	5.22	Flow (m3/s)		5.22	
Top Width (m)	113.02	Top Width (m)	19.72	79.61	13.69
Vel Total (m/s)	0.95	Avg. Vel. (m/s)		0.95	
Max Chl Dpth (m)	1.09	Hydr. Depth (m)		1.09	
Conv. Total (m3/s)	193.8	Conv. (m3/s)		193.8	
Length Wtd. (m)	123.30	Wetted Per. (m)		5.00	
Min Ch El (m)	197.00	Shear (N/m2)		7.79	
Alpha	1.00	Stream Power (N/m s)		7.43	
Frctn Loss (m)		Cum Volume (1000 m3)	0.00	2.38	0.00
C & E Loss (m)		Cum SA (1000 m2)	1.29	13.75	0.86

CULVERT

RIVER: Rouge
REACH: WC20A RS: 250

```
INPUT
Description: EX 407 ETR TWIN CULVERTS
Distance from Upstream XS =    31.5
Deck/Roadway Width        =      69
Weir Coefficient          =     1.4
Upstream  Deck/Roadway Coordinates
    num=       3
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0   200.8              60   201.1             113   201.7

Upstream Bridge Cross Section Data
Station Elevation Data    num=      57
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  197.78    4.15  197.75   12.31   197.5   19.72  197.34   31.35  197.09
   33.78  197.05   33.98  197.05   34.41  197.04   34.76  197.04   35.24  197.03
   35.85  197.03   35.92  197.03   37.23  197.03   39.01  197.03   39.24  197.03
   40.85  197.02   41.22  197.02   42.98  197.01   43.29     197   44.15     197
   45.18     197   45.75     197   46.11     197   46.17     197   47.09     197
   47.21     197   47.27     197   49.12     197   49.85     197   49.93     197
   50.03     197   50.23     197   50.33     197   51.48     197   53.49     197
   57.89     197   62.54     197   63.47     197   64.34     197   64.64     197
    64.8     197   65.28     197   65.29     197   65.53     197   67.84     197
   76.72 197.095   84.74  197.18   90.01  197.23   93.02  197.27   97.97  197.31
   99.33 197.329   99.43  197.33     104   197.5  104.98   197.5  106.06   197.5
  109.89   197.5  113.02   197.5

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .035   19.72     .03   99.33    .035

Bank Sta: Left   Right    Coeff Contr.   Expan.
         19.72   99.33          .3        .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0  59.875     200       T
  64.875  113.02     200       T

Downstream  Deck/Roadway Coordinates
    num=       3
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0   200.7              60  200.75              93  201.05

Downstream Bridge Cross Section Data
Station Elevation Data    num=      91
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  200.71    1.04   200.5    2.36  200.18       3     200    4.88  199.59
    5.27   199.5     5.5  199.45    7.28     199     8.2  198.75    9.23   198.5
   10.13  198.24   11.31     198   12.34  197.73   13.04   197.5   13.92  197.18
   14.55     197    16.5  196.78   19.55  196.69   22.87   196.5   23.25   196.5
   24.79   196.5   28.01   196.5   29.69   196.5   30.17   196.5   30.83   196.5
   30.96   196.5    31.1   196.5   32.61   196.5    33.8   196.5   34.34   196.5
   36.65   196.5   38.72   196.5   40.17   196.5   40.52   196.5      41   196.5
   45.98   196.5   47.61  196.48    48.4  196.48   51.97  196.47   52.29  196.47
    52.3  196.47   52.53  196.47   55.12  196.46   55.95  196.47   56.46  196.46
   57.05  196.46   57.23  196.45   58.81  196.46   58.95  196.46   58.98  196.46
   59.94  196.45   60.02  196.45   60.54  196.45   61.38  196.45   61.53  196.43
   62.05  196.43   62.22  196.44   62.41  196.45   63.17  196.45   63.22  196.45
   63.75  196.45   63.77  196.45   64.33  196.45   64.37  196.45   64.37  196.46
   64.89  196.47   65.46  196.48   66.18   196.5   66.76 196.686   66.93  196.74
   67.53  196.95   67.74     197   68.45  197.25   69.12  197.47    69.2   197.5
   70.07  197.84   70.32  197.88   71.05     198   71.72  198.11   73.95   198.5
   76.74  198.93   77.06     199   78.55  199.29   79.62   199.5   79.78  199.53
   82.34     200   82.39  200.01   82.58  200.04   85.42   200.5   87.57  200.52
   92.98  200.56

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0    .035   14.55     .03   67.74    .035

Bank Sta: Left   Right    Coeff Contr.   Expan.
         14.55   67.74          .3        .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0  53.875     200       T
  58.875   92.98     200       T

Upstream Embankment side slope              =       2 horiz. to 1.0 vertical
Downstream Embankment side slope            =       2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  2

Culvert Name     Shape      Rise    Span
Culvert #1      Circular    2.25
FHWA Chart # 1 - Concrete Pipe Culvert
FHWA Scale # 3 - Groove end entrance; pipe projecting from fill
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                 6     113     .013     .013        0                  .5               1
Upstream   Elevation =  197
           Centerline Station =  61
Downstream Elevation =  196.5
           Centerline Station =  55

Culvert Name     Shape      Rise    Span
Culvert #2      Circular    2.25
FHWA Chart # 1 - Concrete Pipe Culvert
FHWA Scale # 3 - Groove end entrance; pipe projecting from fill
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                 6     114     .013     .013        0                  .5               1
Upstream   Elevation =  197
           Centerline Station =  63.75
Downstream Elevation =  196.5
           Centerline Station =  57.75

CULVERT OUTPUT  Profile #2-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.16    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         1.09
  Q Barrel (m3/s)           0.16    Culv Vel DS (m/s)         1.17
  E.G. US. (m)            197.27    Culv Inv El Up (m)      197.00
  W.S. US. (m)            197.27    Culv Inv El Dn (m)      196.50
  E.G. DS (m)             196.57    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             196.53    Culv Exit Loss (m)        0.17
  Delta EG (m)              0.70    Culv Entr Loss (m)        0.03
  Delta WS (m)              0.73    Q Weir (m3/s)
  E.G. IC (m)             197.23    Weir Sta Lft (m)
  E.G. OC (m)             197.27    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       197.18    Weir Max Depth (m)
  Culv WS Outlet (m)      196.67    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.17    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.18    Min El Weir Flow (m)    200.70


Note:    During the supercritical analysis, the water surface at the inlet was within 0.01 feet of normal depth.  Therefore,
         the outlet will be at normal depth.
Note:    The flow in the culvert is entirely supercritical.

CULVERT OUTPUT  Profile #5-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.29    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         1.26
  Q Barrel (m3/s)           0.29    Culv Vel DS (m/s)         1.39
  E.G. US. (m)            197.36    Culv Inv El Up (m)      197.00
  W.S. US. (m)            197.36    Culv Inv El Dn (m)      196.50
  E.G. DS (m)             196.63    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             196.57    Culv Exit Loss (m)        0.20
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Delta EG (m)	0.74	Culv Entr Loss (m)	0.04
Delta WS (m)	0.79	Q Weir (m3/s)	
E.G. IC (m)	197.32	Weir Sta Lft (m)	
E.G. OC (m)	197.36	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	197.24	Weir Max Depth (m)	
Culv WS Outlet (m)	196.72	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.22	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.24	Min El Weir Flow (m)	200.70

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #10-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.39	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.37
Q Barrel (m3/s)	0.39	Culv Vel DS (m/s)	1.52
E.G. US. (m)	197.42	Culv Inv El Up (m)	197.00
W.S. US. (m)	197.41	Culv Inv El Dn (m)	196.50
E.G. DS (m)	196.66	Culv Frctn Ls (m)	0.00
W.S. DS (m)	196.59	Culv Exit Loss (m)	0.21
Delta EG (m)	0.76	Culv Entr Loss (m)	0.05
Delta WS (m)	0.82	Q Weir (m3/s)	
E.G. IC (m)	197.37	Weir Sta Lft (m)	
E.G. OC (m)	197.42	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	197.28	Weir Max Depth (m)	
Culv WS Outlet (m)	196.76	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.26	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.28	Min El Weir Flow (m)	200.70

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #25-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.52	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.48
Q Barrel (m3/s)	0.52	Culv Vel DS (m/s)	1.67
E.G. US. (m)	197.49	Culv Inv El Up (m)	197.00
W.S. US. (m)	197.48	Culv Inv El Dn (m)	196.50
E.G. DS (m)	196.71	Culv Frctn Ls (m)	0.00
W.S. DS (m)	196.62	Culv Exit Loss (m)	0.23
Delta EG (m)	0.78	Culv Entr Loss (m)	0.06
Delta WS (m)	0.86	Q Weir (m3/s)	
E.G. IC (m)	197.43	Weir Sta Lft (m)	
E.G. OC (m)	197.49	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	197.32	Weir Max Depth (m)	
Culv WS Outlet (m)	196.80	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.30	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.32	Min El Weir Flow (m)	200.70

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #50-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.63	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.56
Q Barrel (m3/s)	0.63	Culv Vel DS (m/s)	1.77
E.G. US. (m)	197.54	Culv Inv El Up (m)	197.00
W.S. US. (m)	197.53	Culv Inv El Dn (m)	196.50
E.G. DS (m)	196.74	Culv Frctn Ls (m)	0.00
W.S. DS (m)	196.65	Culv Exit Loss (m)	0.25
Delta EG (m)	0.80	Culv Entr Loss (m)	0.06
Delta WS (m)	0.88	Q Weir (m3/s)	
E.G. IC (m)	197.48	Weir Sta Lft (m)	
E.G. OC (m)	197.54	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	197.36	Weir Max Depth (m)	
Culv WS Outlet (m)	196.83	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.33	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.36	Min El Weir Flow (m)	200.70

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #100-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.75	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.63
Q Barrel (m3/s)	0.75	Culv Vel DS (m/s)	1.85
E.G. US. (m)	197.59	Culv Inv El Up (m)	197.00
W.S. US. (m)	197.58	Culv Inv El Dn (m)	196.50
E.G. DS (m)	196.77	Culv Frctn Ls (m)	0.00
W.S. DS (m)	196.67	Culv Exit Loss (m)	0.26
Delta EG (m)	0.82	Culv Entr Loss (m)	0.07
Delta WS (m)	0.91	Q Weir (m3/s)	
E.G. IC (m)	197.52	Weir Sta Lft (m)	
E.G. OC (m)	197.59	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	197.39	Weir Max Depth (m)	
Culv WS Outlet (m)	196.86	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.36	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.39	Min El Weir Flow (m)	200.70

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #Check Flow Culv Group: Culvert #1

Q Culv Group (m3/s)	0.97	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.75
Q Barrel (m3/s)	0.97	Culv Vel DS (m/s)	2.01
E.G. US. (m)	197.68	Culv Inv El Up (m)	197.00
W.S. US. (m)	197.66	Culv Inv El Dn (m)	196.50
E.G. DS (m)	196.83	Culv Frctn Ls (m)	0.00
W.S. DS (m)	196.70	Culv Exit Loss (m)	0.28
Delta EG (m)	0.84	Culv Entr Loss (m)	0.08
Delta WS (m)	0.95	Q Weir (m3/s)	
E.G. IC (m)	197.60	Weir Sta Lft (m)	
E.G. OC (m)	197.68	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	197.44	Weir Max Depth (m)	
Culv WS Outlet (m)	196.90	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.40	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.44	Min El Weir Flow (m)	200.70

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #Regional Culv Group: Culvert #1

Q Culv Group (m3/s)	2.62	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	2.30
Q Barrel (m3/s)	2.62	Culv Vel DS (m/s)	2.68
E.G. US. (m)	198.14	Culv Inv El Up (m)	197.00
W.S. US. (m)	198.09	Culv Inv El Dn (m)	196.50
E.G. DS (m)	197.18	Culv Frctn Ls (m)	0.00
W.S. DS (m)	196.94	Culv Exit Loss (m)	0.35

Delta EG (m)	0.96	Culv Entr Loss (m)	0.13
Delta WS (m)	1.16	Q Weir (m3/s)	
E.G. IC (m)	198.01	Weir Sta Lft (m)	
E.G. OC (m)	198.14	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	197.74	Weir Max Depth (m)	
Culv WS Outlet (m)	197.16	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.66	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.74	Min El Weir Flow (m)	200.70

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #2-yr Culv Group: Culvert #2

Q Culv Group (m3/s)	0.16	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.09
Q Barrel (m3/s)	0.16	Culv Vel DS (m/s)	1.17
E.G. US. (m)	197.27	Culv Inv El Up (m)	197.00
W.S. US. (m)	197.27	Culv Inv El Dn (m)	196.50
E.G. DS (m)	196.57	Culv Frctn Ls (m)	0.00
W.S. DS (m)	196.53	Culv Exit Loss (m)	0.17
Delta EG (m)	0.70	Culv Entr Loss (m)	0.03
Delta WS (m)	0.73	Q Weir (m3/s)	
E.G. IC (m)	197.23	Weir Sta Lft (m)	
E.G. OC (m)	197.27	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	197.18	Weir Max Depth (m)	
Culv WS Outlet (m)	196.67	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.17	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.18	Min El Weir Flow (m)	200.70

Note: During the supercritical analysis, the water surface at the inlet was within 0.01 feet of normal depth. Therefore, the outlet will be at normal depth.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #5-yr Culv Group: Culvert #2

Q Culv Group (m3/s)	0.28	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.26
Q Barrel (m3/s)	0.28	Culv Vel DS (m/s)	1.39
E.G. US. (m)	197.36	Culv Inv El Up (m)	197.00
W.S. US. (m)	197.36	Culv Inv El Dn (m)	196.50
E.G. DS (m)	196.63	Culv Frctn Ls (m)	0.00
W.S. DS (m)	196.57	Culv Exit Loss (m)	0.20
Delta EG (m)	0.74	Culv Entr Loss (m)	0.04
Delta WS (m)	0.79	Q Weir (m3/s)	
E.G. IC (m)	197.31	Weir Sta Lft (m)	
E.G. OC (m)	197.36	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	197.24	Weir Max Depth (m)	
Culv WS Outlet (m)	196.72	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.22	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.24	Min El Weir Flow (m)	200.70

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #10-yr Culv Group: Culvert #2

Q Culv Group (m3/s)	0.38	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.37
Q Barrel (m3/s)	0.38	Culv Vel DS (m/s)	1.51
E.G. US. (m)	197.42	Culv Inv El Up (m)	197.00
W.S. US. (m)	197.41	Culv Inv El Dn (m)	196.50
E.G. DS (m)	196.66	Culv Frctn Ls (m)	0.00
W.S. DS (m)	196.59	Culv Exit Loss (m)	0.21
Delta EG (m)	0.76	Culv Entr Loss (m)	0.05
Delta WS (m)	0.82	Q Weir (m3/s)	
E.G. IC (m)	197.37	Weir Sta Lft (m)	
E.G. OC (m)	197.42	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	197.28	Weir Max Depth (m)	
Culv WS Outlet (m)	196.76	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.26	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.28	Min El Weir Flow (m)	200.70

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #25-yr Culv Group: Culvert #2

Q Culv Group (m3/s)	0.52	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.48
Q Barrel (m3/s)	0.52	Culv Vel DS (m/s)	1.66
E.G. US. (m)	197.49	Culv Inv El Up (m)	197.00
W.S. US. (m)	197.48	Culv Inv El Dn (m)	196.50
E.G. DS (m)	196.71	Culv Frctn Ls (m)	0.00
W.S. DS (m)	196.62	Culv Exit Loss (m)	0.23
Delta EG (m)	0.78	Culv Entr Loss (m)	0.06
Delta WS (m)	0.86	Q Weir (m3/s)	
E.G. IC (m)	197.43	Weir Sta Lft (m)	
E.G. OC (m)	197.49	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	197.32	Weir Max Depth (m)	
Culv WS Outlet (m)	196.80	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.30	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.32	Min El Weir Flow (m)	200.70

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #50-yr Culv Group: Culvert #2

Q Culv Group (m3/s)	0.63	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.55
Q Barrel (m3/s)	0.63	Culv Vel DS (m/s)	1.76
E.G. US. (m)	197.54	Culv Inv El Up (m)	197.00
W.S. US. (m)	197.53	Culv Inv El Dn (m)	196.50
E.G. DS (m)	196.74	Culv Frctn Ls (m)	0.00
W.S. DS (m)	196.65	Culv Exit Loss (m)	0.25
Delta EG (m)	0.80	Culv Entr Loss (m)	0.06
Delta WS (m)	0.88	Q Weir (m3/s)	
E.G. IC (m)	197.47	Weir Sta Lft (m)	
E.G. OC (m)	197.54	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	197.36	Weir Max Depth (m)	
Culv WS Outlet (m)	196.83	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.33	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.36	Min El Weir Flow (m)	200.70

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #100-yr Culv Group: Culvert #2

Q Culv Group (m3/s)	0.74	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.62
Q Barrel (m3/s)	0.74	Culv Vel DS (m/s)	1.84
E.G. US. (m)	197.59	Culv Inv El Up (m)	197.00
W.S. US. (m)	197.58	Culv Inv El Dn (m)	196.50
E.G. DS (m)	196.77	Culv Frctn Ls (m)	0.00
W.S. DS (m)	196.67	Culv Exit Loss (m)	0.26

Delta EG (m)	0.82	Culv Entr Loss (m)	0.07
Delta WS (m)	0.91	Q Weir (m3/s)	
E.G. IC (m)	197.52	Weir Sta Lft (m)	
E.G. OC (m)	197.59	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	197.39	Weir Max Depth (m)	
Culv WS Outlet (m)	196.86	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.36	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.39	Min El Weir Flow (m)	200.70

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #Check Flow Culv Group: Culvert #2

Q Culv Group (m3/s)	0.97	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.74
Q Barrel (m3/s)	0.97	Culv Vel DS (m/s)	2.00
E.G. US. (m)	197.68	Culv Inv El Up (m)	197.00
W.S. US. (m)	197.66	Culv Inv El Dn (m)	196.50
E.G. DS (m)	196.83	Culv Frctn Ls (m)	0.00
W.S. DS (m)	196.70	Culv Exit Loss (m)	0.27
Delta EG (m)	0.84	Culv Entr Loss (m)	0.08
Delta WS (m)	0.95	Q Weir (m3/s)	
E.G. IC (m)	197.59	Weir Sta Lft (m)	
E.G. OC (m)	197.68	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	197.44	Weir Max Depth (m)	
Culv WS Outlet (m)	196.90	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.40	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.44	Min El Weir Flow (m)	200.70

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #Regional Culv Group: Culvert #2

Q Culv Group (m3/s)	2.60	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	2.30
Q Barrel (m3/s)	2.60	Culv Vel DS (m/s)	2.66
E.G. US. (m)	198.14	Culv Inv El Up (m)	197.00
W.S. US. (m)	198.09	Culv Inv El Dn (m)	196.50
E.G. DS (m)	197.18	Culv Frctn Ls (m)	0.00
W.S. DS (m)	196.94	Culv Exit Loss (m)	0.34
Delta EG (m)	0.96	Culv Entr Loss (m)	0.13
Delta WS (m)	1.16	Q Weir (m3/s)	
E.G. IC (m)	198.01	Weir Sta Lft (m)	
E.G. OC (m)	198.14	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	197.74	Weir Max Depth (m)	
Culv WS Outlet (m)	197.16	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.66	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.74	Min El Weir Flow (m)	200.70

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CROSS SECTION

RIVER: Rouge
REACH: WC20A RS: 200

INPUT
Description: ST - 200 (Updated Sept 2016)
Station Elevation Data num= 91

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	200.71	1.04	200.5	2.36	200.18	3	200	4.88	199.59
5.27	199.5	5.5	199.45	7.28	199	8.2	198.75	9.23	198.5
10.13	198.24	11.31	198	12.34	197.73	13.04	197.5	13.92	197.18
14.55	197	16.5	196.78	19.55	196.69	22.87	196.5	23.25	196.5
24.79	196.5	28.01	196.5	29.69	196.5	30.17	196.5	30.83	196.5
30.96	196.5	31.1	196.5	32.61	196.5	33.8	196.5	34.34	196.5
36.65	196.5	38.72	196.5	40.17	196.5	40.52	196.5	41	196.5
45.98	196.5	47.61	196.48	48.4	196.48	51.97	196.47	52.29	196.47
52.3	196.47	52.53	196.47	55.12	196.46	55.95	196.47	56.46	196.46
57.05	196.46	57.23	196.45	58.81	196.46	58.95	196.46	58.98	196.46
59.94	196.45	60.02	196.45	60.54	196.45	61.38	196.45	61.53	196.43
62.05	196.43	62.22	196.44	62.41	196.45	63.17	196.45	63.22	196.45
63.75	196.45	63.77	196.45	64.33	196.45	64.37	196.45	64.37	196.46
64.89	196.47	65.46	196.48	66.18	196.5	66.76	196.686	66.93	196.74
67.53	196.95	67.74	197	68.45	197.25	69.12	197.47	69.2	197.5
70.07	197.84	70.32	197.88	71.05	198	71.72	198.11	73.95	198.5
76.74	198.93	77.06	199	78.55	199.29	79.62	199.5	79.78	199.53
82.34	200	82.39	200.01	82.58	200.04	85.42	200.5	87.57	200.52
92.98	200.56								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	14.55	.03	67.74	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
14.55	67.74	77	77	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	53.875	200	T
58.875	92.98	200	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	196.57	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.030	
W.S. Elev (m)	196.53	Reach Len. (m)	77.00	77.00	77.00
Crit W.S. (m)	196.53	Flow Area (m2)		0.36	
E.G. Slope (m/m)	0.024791	Area (m2)		2.07	
Q Total (m3/s)	0.32	Flow (m3/s)		0.32	
Top Width (m)	43.96	Top Width (m)		43.96	
Vel Total (m/s)	0.90	Avg. Vel. (m/s)		0.90	
Max Chl Dpth (m)	0.10	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	2.0	Conv. (m3/s)		2.0	
Length Wtd. (m)	77.00	Wetted Per. (m)		5.00	
Min Ch El (m)	196.43	Shear (N/m2)		17.28	
Alpha	1.00	Stream Power (N/m s)		15.56	
Frctn Loss (m)	0.17	Cum Volume (1000 m3)		0.20	
C & E Loss (m)	0.02	Cum SA (1000 m2)		3.57	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	196.63	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.030	
W.S. Elev (m)	196.57	Reach Len. (m)	77.00	77.00	77.00
Crit W.S. (m)	196.57	Flow Area (m2)		0.55	
E.G. Slope (m/m)	0.018482	Area (m2)		3.79	
Q Total (m3/s)	0.57	Flow (m3/s)		0.57	
Top Width (m)	44.75	Top Width (m)		44.75	
Vel Total (m/s)	1.04	Avg. Vel. (m/s)		1.04	
Max Chl Dpth (m)	0.14	Hydr. Depth (m)		0.11	

Conv. Total (m3/s)	4.2	Conv. (m3/s)	4.2
Length Wtd. (m)	77.00	Wetted Per. (m)	5.00
Min Ch El (m)	196.43	Shear (N/m2)	19.89
Alpha	1.00	Stream Power (N/m s)	20.66
Frctn Loss (m)	0.21	Cum Volume (1000 m3)	0.31
C & E Loss (m)	0.03	Cum SA (1000 m2)	3.85

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	196.66	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.030	
W.S. Elev (m)	196.59	Reach Len. (m)	77.00	77.00	77.00
Crit W.S. (m)	196.59	Flow Area (m2)		0.67	
E.G. Slope (m/m)	0.017166	Area (m2)		4.90	
Q Total (m3/s)	0.77	Flow (m3/s)		0.77	
Top Width (m)	45.26	Top Width (m)		45.26	
Vel Total (m/s)	1.15	Avg. Vel. (m/s)		1.15	
Max Chl Dpth (m)	0.16	Hydr. Depth (m)		0.13	
Conv. Total (m3/s)	5.9	Conv. (m3/s)		5.9	
Length Wtd. (m)	77.00	Wetted Per. (m)		5.00	
Min Ch El (m)	196.43	Shear (N/m2)		22.62	
Alpha	1.00	Stream Power (N/m s)		25.92	
Frctn Loss (m)	0.24	Cum Volume (1000 m3)		0.39	
C & E Loss (m)	0.03	Cum SA (1000 m2)		4.01	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	196.71	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.		0.030	
W.S. Elev (m)	196.62	Reach Len. (m)	77.00	77.00	77.00
Crit W.S. (m)	196.62	Flow Area (m2)		0.82	
E.G. Slope (m/m)	0.016063	Area (m2)		6.25	
Q Total (m3/s)	1.04	Flow (m3/s)		1.04	
Top Width (m)	45.87	Top Width (m)		45.87	
Vel Total (m/s)	1.27	Avg. Vel. (m/s)		1.27	
Max Chl Dpth (m)	0.19	Hydr. Depth (m)		0.16	
Conv. Total (m3/s)	8.2	Conv. (m3/s)		8.2	
Length Wtd. (m)	77.00	Wetted Per. (m)		5.00	
Min Ch El (m)	196.43	Shear (N/m2)		25.86	
Alpha	1.00	Stream Power (N/m s)		32.76	
Frctn Loss (m)	0.22	Cum Volume (1000 m3)		0.49	
C & E Loss (m)	0.04	Cum SA (1000 m2)		4.27	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	196.74	Element	Left OB	Channel	Right OB
Vel Head (m)	0.09	Wt. n-Val.		0.030	
W.S. Elev (m)	196.65	Reach Len. (m)	77.00	77.00	77.00
Crit W.S. (m)	196.65	Flow Area (m2)		0.93	
E.G. Slope (m/m)	0.015472	Area (m2)		7.27	
Q Total (m3/s)	1.26	Flow (m3/s)		1.26	
Top Width (m)	46.33	Top Width (m)		46.33	
Vel Total (m/s)	1.35	Avg. Vel. (m/s)		1.35	
Max Chl Dpth (m)	0.22	Hydr. Depth (m)		0.19	
Conv. Total (m3/s)	10.1	Conv. (m3/s)		10.1	
Length Wtd. (m)	77.00	Wetted Per. (m)		5.00	
Min Ch El (m)	196.43	Shear (N/m2)		28.27	
Alpha	1.00	Stream Power (N/m s)		38.23	
Frctn Loss (m)	0.24	Cum Volume (1000 m3)		0.56	
C & E Loss (m)	0.04	Cum SA (1000 m2)		4.40	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	196.77	Element	Left OB	Channel	Right OB
Vel Head (m)	0.10	Wt. n-Val.		0.030	
W.S. Elev (m)	196.67	Reach Len. (m)	77.00	77.00	77.00
Crit W.S. (m)	196.67	Flow Area (m2)		1.04	
E.G. Slope (m/m)	0.014802	Area (m2)		8.32	
Q Total (m3/s)	1.49	Flow (m3/s)		1.49	
Top Width (m)	46.79	Top Width (m)		46.79	
Vel Total (m/s)	1.43	Avg. Vel. (m/s)		1.43	
Max Chl Dpth (m)	0.24	Hydr. Depth (m)		0.21	
Conv. Total (m3/s)	12.2	Conv. (m3/s)		12.2	
Length Wtd. (m)	77.00	Wetted Per. (m)		5.00	
Min Ch El (m)	196.43	Shear (N/m2)		30.31	
Alpha	1.00	Stream Power (N/m s)		43.25	
Frctn Loss (m)	0.25	Cum Volume (1000 m3)		0.63	
C & E Loss (m)	0.05	Cum SA (1000 m2)		4.53	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	196.83	Element	Left OB	Channel	Right OB
Vel Head (m)	0.13	Wt. n-Val.		0.030	
W.S. Elev (m)	196.70	Reach Len. (m)	77.00	77.00	77.00
Crit W.S. (m)	196.70	Flow Area (m2)		1.22	
E.G. Slope (m/m)	0.014794	Area (m2)		10.01	
Q Total (m3/s)	1.94	Flow (m3/s)		1.94	
Top Width (m)	47.78	Top Width (m)		47.78	
Vel Total (m/s)	1.59	Avg. Vel. (m/s)		1.59	

Max Chl Dpth (m)	0.28	Hydr. Depth (m)	0.24
Conv. Total (m3/s)	16.0	Conv. (m3/s)	16.0
Length Wtd. (m)	77.00	Wetted Per. (m)	5.00
Min Ch El (m)	196.43	Shear (N/m2)	35.49
Alpha	1.00	Stream Power (N/m s)	56.28
Frctn Loss (m)	0.25	Cum Volume (1000 m3)	0.76
C & E Loss (m)	0.06	Cum SA (1000 m2)	4.77

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	197.18	Element	Left OB	Channel	Right OB
Vel Head (m)	0.24	Wt. n-Val.		0.030	
W.S. Elev (m)	196.94	Reach Len. (m)	77.00	77.00	77.00
Crit W.S. (m)	196.94	Flow Area (m2)		2.39	
E.G. Slope (m/m)	0.011429	Area (m2)		21.89	
Q Total (m3/s)	5.22	Flow (m3/s)		5.22	
Top Width (m)	52.41	Top Width (m)		52.41	
Vel Total (m/s)	2.18	Avg. Vel. (m/s)		2.18	
Max Chl Dpth (m)	0.51	Hydr. Depth (m)		0.48	
Conv. Total (m3/s)	48.8	Conv. (m3/s)		48.8	
Length Wtd. (m)	77.00	Wetted Per. (m)		5.00	
Min Ch El (m)	196.43	Shear (N/m2)		53.65	
Alpha	1.00	Stream Power (N/m s)		117.00	
Frctn Loss (m)	0.27	Cum Volume (1000 m3)	0.00	1.55	0.00
C & E Loss (m)	0.12	Cum SA (1000 m2)	0.08	5.61	0.01

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Rouge
REACH: WC20A RS: 100

INPUT
Description: ST 100 (Updated Sept 2016)
Station Elevation Data num= 23

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	196.63	10.19	196.5	17.58	196.36	18.5	196.34	27.26	196.24
41.12	196.05	44.68	196	50.77	195.84	52.68	195.8	54.2	195.76
84.12	195.5	86.72	195.5	94.58	195.78	95.01	195.78	100.74	195.87
107.28	196	108.7	196	109.98	196	115.8	196.15	116.5	196.17
116.71	196.18	119.7	196.22	121.21	196.23				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	50.77	.03	100.74	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
50.77	100.74	39.2	39.2	.3	.5

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	195.65	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	195.65	Reach Len. (m)	39.20	39.20	39.20
Crit W.S. (m)	195.56	Flow Area (m2)		1.89	
E.G. Slope (m/m)	0.000740	Area (m2)		1.89	
Q Total (m3/s)	0.32	Flow (m3/s)		0.32	
Top Width (m)	23.40	Top Width (m)		23.40	
Vel Total (m/s)	0.17	Avg. Vel. (m/s)		0.17	
Max Chl Dpth (m)	0.15	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	11.8	Conv. (m3/s)		11.8	
Length Wtd. (m)	39.20	Wetted Per. (m)		23.41	
Min Ch El (m)	195.50	Shear (N/m2)		0.59	
Alpha	1.00	Stream Power (N/m s)		0.10	
Frctn Loss (m)	0.10	Cum Volume (1000 m3)		0.05	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.98	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	195.67	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	195.67	Reach Len. (m)	39.20	39.20	39.20
Crit W.S. (m)		Flow Area (m2)		2.56	
E.G. Slope (m/m)	0.001044	Area (m2)		2.56	
Q Total (m3/s)	0.57	Flow (m3/s)		0.57	
Top Width (m)	27.19	Top Width (m)		27.19	
Vel Total (m/s)	0.22	Avg. Vel. (m/s)		0.22	
Max Chl Dpth (m)	0.17	Hydr. Depth (m)		0.09	
Conv. Total (m3/s)	17.6	Conv. (m3/s)		17.6	
Length Wtd. (m)	39.20	Wetted Per. (m)		27.19	
Min Ch El (m)	195.50	Shear (N/m2)		0.96	
Alpha	1.00	Stream Power (N/m s)		0.21	
Frctn Loss (m)	0.12	Cum Volume (1000 m3)		0.07	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.08	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	195.69	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	195.69	Reach Len. (m)	39.20	39.20	39.20
Crit W.S. (m)		Flow Area (m2)		2.96	
E.G. Slope (m/m)	0.001286	Area (m2)		2.96	
Q Total (m3/s)	0.77	Flow (m3/s)		0.77	
Top Width (m)	29.24	Top Width (m)		29.24	
Vel Total (m/s)	0.26	Avg. Vel. (m/s)		0.26	
Max Chl Dpth (m)	0.19	Hydr. Depth (m)		0.10	
Conv. Total (m3/s)	21.5	Conv. (m3/s)		21.5	
Length Wtd. (m)	39.20	Wetted Per. (m)		29.25	
Min Ch El (m)	195.50	Shear (N/m2)		1.28	
Alpha	1.00	Stream Power (N/m s)		0.33	
Frctn Loss (m)	0.12	Cum Volume (1000 m3)		0.09	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.14	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	195.72	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	195.72	Reach Len. (m)	39.20	39.20	39.20

Crit W.S. (m)		Flow Area (m2)	3.90
E.G. Slope (m/m)	0.001125	Area (m2)	3.90
Q Total (m3/s)	1.04	Flow (m3/s)	1.04
Top Width (m)	33.53	Top Width (m)	33.53
Vel Total (m/s)	0.27	Avg. Vel. (m/s)	0.27
Max Chl Dpth (m)	0.22	Hydr. Depth (m)	0.12
Conv. Total (m3/s)	31.0	Conv. (m3/s)	31.0
Length Wtd. (m)	39.20	Wetted Per. (m)	33.53
Min Ch El (m)	195.50	Shear (N/m2)	1.28
Alpha	1.00	Stream Power (N/m s)	0.34
Frctn Loss (m)	0.13	Cum Volume (1000 m3)	0.10
C & E Loss (m)	0.01	Cum SA (1000 m2)	1.22

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	195.73	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	195.73	Reach Len. (m)	39.20	39.20	39.20
Crit W.S. (m)		Flow Area (m2)		4.31	
E.G. Slope (m/m)	0.001269	Area (m2)		4.31	
Q Total (m3/s)	1.26	Flow (m3/s)		1.26	
Top Width (m)	35.21	Top Width (m)		35.21	
Vel Total (m/s)	0.29	Avg. Vel. (m/s)		0.29	
Max Chl Dpth (m)	0.23	Hydr. Depth (m)		0.12	
Conv. Total (m3/s)	35.4	Conv. (m3/s)		35.4	
Length Wtd. (m)	39.20	Wetted Per. (m)		35.21	
Min Ch El (m)	195.50	Shear (N/m2)		1.52	
Alpha	1.00	Stream Power (N/m s)		0.45	
Frctn Loss (m)	0.13	Cum Volume (1000 m3)		0.12	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.26	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	195.74	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	195.74	Reach Len. (m)	39.20	39.20	39.20
Crit W.S. (m)		Flow Area (m2)		4.74	
E.G. Slope (m/m)	0.001371	Area (m2)		4.74	
Q Total (m3/s)	1.49	Flow (m3/s)		1.49	
Top Width (m)	36.94	Top Width (m)		36.94	
Vel Total (m/s)	0.31	Avg. Vel. (m/s)		0.31	
Max Chl Dpth (m)	0.24	Hydr. Depth (m)		0.13	
Conv. Total (m3/s)	40.2	Conv. (m3/s)		40.2	
Length Wtd. (m)	39.20	Wetted Per. (m)		36.95	
Min Ch El (m)	195.50	Shear (N/m2)		1.73	
Alpha	1.00	Stream Power (N/m s)		0.54	
Frctn Loss (m)	0.14	Cum Volume (1000 m3)		0.13	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.31	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	195.77	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	195.77	Reach Len. (m)	39.20	39.20	39.20
Crit W.S. (m)		Flow Area (m2)		5.71	
E.G. Slope (m/m)	0.001396	Area (m2)		5.71	
Q Total (m3/s)	1.94	Flow (m3/s)		1.94	
Top Width (m)	40.15	Top Width (m)		40.15	
Vel Total (m/s)	0.34	Avg. Vel. (m/s)		0.34	
Max Chl Dpth (m)	0.27	Hydr. Depth (m)		0.14	
Conv. Total (m3/s)	51.9	Conv. (m3/s)		51.9	
Length Wtd. (m)	39.20	Wetted Per. (m)		40.15	
Min Ch El (m)	195.50	Shear (N/m2)		1.95	
Alpha	1.00	Stream Power (N/m s)		0.66	
Frctn Loss (m)	0.14	Cum Volume (1000 m3)		0.15	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.38	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	195.89	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.	0.035	0.030	0.000
W.S. Elev (m)	195.87	Reach Len. (m)	39.20	39.20	39.20
Crit W.S. (m)		Flow Area (m2)	0.02	10.70	0.00
E.G. Slope (m/m)	0.001670	Area (m2)	0.02	10.70	0.00
Q Total (m3/s)	5.22	Flow (m3/s)	0.00	5.22	0.00
Top Width (m)	51.50	Top Width (m)	1.31	49.97	0.22
Vel Total (m/s)	0.49	Avg. Vel. (m/s)	0.08	0.49	0.02
Max Chl Dpth (m)	0.37	Hydr. Depth (m)	0.02	0.21	0.00
Conv. Total (m3/s)	127.7	Conv. (m3/s)	0.0	127.7	0.0
Length Wtd. (m)	39.20	Wetted Per. (m)	1.31	49.98	0.22
Min Ch El (m)	195.50	Shear (N/m2)	0.28	3.51	
Alpha	1.00	Stream Power (N/m s)	0.02	1.71	
Frctn Loss (m)	0.15	Cum Volume (1000 m3)	0.00	0.30	0.00
C & E Loss (m)	0.02	Cum SA (1000 m2)	0.03	1.67	0.00

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Rouge
REACH: WC20A RS: 10

INPUT
Description: ST - 10
Station Elevation Data num= 43

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	196.58	8.22	196.5	14.08	196.44	14.87	196.43	15.25	196.43
16.48	196.42	20.8	196.36	28.64	196.26	36	196.16	37.53	196.14
48.24	196	54.6	195.819	58.44	195.71	67.04	195.5	67.23	195.5
68.31	195.5	70.77	195.5	71.82	195.5	72.85	195.5	73.33	195.5
73.4	195.5	73.86	195.5	79.42	195.49	80.64	195.5	81.28	195.49
81.62	195.49	81.95	195.49	85.02	195.49	85.71	195.5	89.5	195.5
90.04	195.5	90.65	195.5	92.72	195.5	97.47	195.711	99.94	195.82
104.19	196	108.4	196.14	114.71	196.32	117	196.37	120.5	196.4
125.39	196.5	127.32	196.5	195.5	196.5				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	54.6	.03	99.94	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
54.6	99.94	0	0	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	195.54	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	195.52	Reach Len. (m)			
Crit W.S. (m)	195.52	Flow Area (m2)		0.48	
E.G. Slope (m/m)	0.084708	Area (m2)		0.48	
Q Total (m3/s)	0.32	Flow (m3/s)		0.32	
Top Width (m)	26.65	Top Width (m)		26.65	
Vel Total (m/s)	0.67	Avg. Vel. (m/s)		0.67	
Max Chl Dpth (m)	0.03	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	1.1	Conv. (m3/s)		1.1	

Length Wtd. (m)		Wetted Per. (m)	26.65
Min Ch El (m)	195.49	Shear (N/m2)	14.96
Alpha	1.00	Stream Power (N/m s)	9.97
Frctn Loss (m)		Cum Volume (1000 m3)	
C & E Loss (m)		Cum SA (1000 m2)	

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	195.55	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	195.53	Reach Len. (m)			
Crit W.S. (m)	195.53	Flow Area (m2)		0.94	
E.G. Slope (m/m)	0.030017	Area (m2)		0.94	
Q Total (m3/s)	0.57	Flow (m3/s)		0.57	
Top Width (m)	27.73	Top Width (m)		27.73	
Vel Total (m/s)	0.61	Avg. Vel. (m/s)		0.61	
Max Chl Dpth (m)	0.04	Hydr. Depth (m)		0.03	
Conv. Total (m3/s)	3.3	Conv. (m3/s)		3.3	
Length Wtd. (m)		Wetted Per. (m)		27.73	
Min Ch El (m)	195.49	Shear (N/m2)		9.99	
Alpha	1.00	Stream Power (N/m s)		6.05	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	195.56	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	195.55	Reach Len. (m)			
Crit W.S. (m)	195.55	Flow Area (m2)		1.46	
E.G. Slope (m/m)	0.013317	Area (m2)		1.46	
Q Total (m3/s)	0.77	Flow (m3/s)		0.77	
Top Width (m)	28.90	Top Width (m)		28.90	
Vel Total (m/s)	0.53	Avg. Vel. (m/s)		0.53	
Max Chl Dpth (m)	0.06	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	6.7	Conv. (m3/s)		6.7	
Length Wtd. (m)		Wetted Per. (m)		28.90	
Min Ch El (m)	195.49	Shear (N/m2)		6.61	
Alpha	1.00	Stream Power (N/m s)		3.48	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	195.58	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.030	
W.S. Elev (m)	195.54	Reach Len. (m)			
Crit W.S. (m)	195.54	Flow Area (m2)		1.27	
E.G. Slope (m/m)	0.038031	Area (m2)		1.27	
Q Total (m3/s)	1.04	Flow (m3/s)		1.04	
Top Width (m)	28.48	Top Width (m)		28.48	
Vel Total (m/s)	0.82	Avg. Vel. (m/s)		0.82	
Max Chl Dpth (m)	0.05	Hydr. Depth (m)		0.04	
Conv. Total (m3/s)	5.3	Conv. (m3/s)		5.3	
Length Wtd. (m)		Wetted Per. (m)		28.48	
Min Ch El (m)	195.49	Shear (N/m2)		16.65	
Alpha	1.00	Stream Power (N/m s)		13.62	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	195.59	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.030	
W.S. Elev (m)	195.56	Reach Len. (m)			
Crit W.S. (m)	195.56	Flow Area (m2)		1.65	
E.G. Slope (m/m)	0.024263	Area (m2)		1.65	
Q Total (m3/s)	1.26	Flow (m3/s)		1.26	
Top Width (m)	29.31	Top Width (m)		29.31	
Vel Total (m/s)	0.76	Avg. Vel. (m/s)		0.76	
Max Chl Dpth (m)	0.07	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	8.1	Conv. (m3/s)		8.1	
Length Wtd. (m)		Wetted Per. (m)		29.31	
Min Ch El (m)	195.49	Shear (N/m2)		13.40	
Alpha	1.00	Stream Power (N/m s)		10.23	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	195.60	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.030	
W.S. Elev (m)	195.57	Reach Len. (m)			
Crit W.S. (m)	195.57	Flow Area (m2)		1.89	
E.G. Slope (m/m)	0.022077	Area (m2)		1.89	
Q Total (m3/s)	1.49	Flow (m3/s)		1.49	
Top Width (m)	29.83	Top Width (m)		29.83	
Vel Total (m/s)	0.79	Avg. Vel. (m/s)		0.79	
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	10.0	Conv. (m3/s)		10.0	
Length Wtd. (m)		Wetted Per. (m)		29.83	
Min Ch El (m)	195.49	Shear (N/m2)		13.73	
Alpha	1.00	Stream Power (N/m s)		10.81	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	195.62	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.030	
W.S. Elev (m)	195.57	Reach Len. (m)			
Crit W.S. (m)	195.57	Flow Area (m2)		2.15	
E.G. Slope (m/m)	0.025134	Area (m2)		2.15	
Q Total (m3/s)	1.94	Flow (m3/s)		1.94	
Top Width (m)	30.37	Top Width (m)		30.37	
Vel Total (m/s)	0.90	Avg. Vel. (m/s)		0.90	
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	12.2	Conv. (m3/s)		12.2	
Length Wtd. (m)		Wetted Per. (m)		30.37	
Min Ch El (m)	195.49	Shear (N/m2)		17.43	
Alpha	1.00	Stream Power (N/m s)		15.75	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	195.71	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.030	
W.S. Elev (m)	195.65	Reach Len. (m)			
Crit W.S. (m)	195.65	Flow Area (m2)		4.53	
E.G. Slope (m/m)	0.018203	Area (m2)		4.53	
Q Total (m3/s)	5.22	Flow (m3/s)		5.22	
Top Width (m)	35.00	Top Width (m)		35.00	
Vel Total (m/s)	1.15	Avg. Vel. (m/s)		1.15	
Max Chl Dpth (m)	0.16	Hydr. Depth (m)		0.13	
Conv. Total (m3/s)	38.7	Conv. (m3/s)		38.7	
Length Wtd. (m)		Wetted Per. (m)		35.01	
Min Ch El (m)	195.49	Shear (N/m2)		23.12	
Alpha	1.00	Stream Power (N/m s)		26.62	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

SUMMARY OF MANNING'S N VALUES

River:Rouge

Reach	River Sta.	n1	n2	n3
WC20A	300	.035	.03	.035
WC20A	250	Culvert		
WC20A	200	.035	.03	.035
WC20A	100	.035	.03	.035
WC20A	10	.035	.03	.035

SUMMARY OF REACH LENGTHS

River: Rouge

Reach	River Sta.	Left	Channel	Right
WC20A	300	123.3	123.3	123.3
WC20A	250	Culvert		
WC20A	200	77	77	77
WC20A	100	39.2	39.2	39.2
WC20A	10	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Rouge

Reach	River Sta.	Contr.	Expan.
WC20A	300	.3	.5
WC20A	250	Culvert	
WC20A	200	.3	.5
WC20A	100	.3	.5
WC20A	10	.1	.3

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
WC20A	300	2-yr	0.32	197.00	197.27	197.09	197.27	0.000305	0.24	1.33	69.54	0.15
WC20A	300	5-yr	0.57	197.00	197.36	197.11	197.36	0.000368	0.32	1.78	81.10	0.17
WC20A	300	10-yr	0.77	197.00	197.41	197.13	197.42	0.000405	0.37	2.07	85.34	0.18
WC20A	300	25-yr	1.04	197.00	197.48	197.16	197.49	0.000446	0.43	2.41	90.29	0.20
WC20A	300	50-yr	1.26	197.00	197.53	197.18	197.54	0.000475	0.48	2.65	101.68	0.21
WC20A	300	100-yr	1.49	197.00	197.58	197.21	197.59	0.000500	0.52	2.88	103.21	0.22
WC20A	300	Check Flow	1.94	197.00	197.66	197.25	197.68	0.000543	0.59	3.30	105.90	0.23
WC20A	300	Regional	5.22	197.00	198.09	197.48	198.14	0.000726	0.95	5.47	113.02	0.29
WC20A	250		Culvert									
WC20A	200	2-yr	0.32	196.43	196.53	196.53	196.57	0.024791	0.90	0.36	43.96	1.08
WC20A	200	5-yr	0.57	196.43	196.57	196.57	196.63	0.018482	1.04	0.55	44.75	1.00
WC20A	200	10-yr	0.77	196.43	196.59	196.59	196.66	0.017166	1.15	0.67	45.26	1.00
WC20A	200	25-yr	1.04	196.43	196.62	196.62	196.71	0.016063	1.27	0.82	45.87	1.00
WC20A	200	50-yr	1.26	196.43	196.65	196.65	196.74	0.015472	1.35	0.93	46.33	1.00
WC20A	200	100-yr	1.49	196.43	196.67	196.67	196.77	0.014802	1.43	1.04	46.79	1.00
WC20A	200	Check Flow	1.94	196.43	196.70	196.70	196.83	0.014794	1.59	1.22	47.78	1.02
WC20A	200	Regional	5.22	196.43	196.94	196.94	197.18	0.011429	2.18	2.39	52.41	1.01
WC20A	100	2-yr	0.32	195.50	195.65	195.56	195.65	0.000740	0.17	1.89	23.40	0.19
WC20A	100	5-yr	0.57	195.50	195.67		195.67	0.001044	0.22	2.56	27.19	0.23
WC20A	100	10-yr	0.77	195.50	195.69		195.69	0.001286	0.26	2.96	29.24	0.26
WC20A	100	25-yr	1.04	195.50	195.72		195.72	0.001125	0.27	3.90	33.53	0.25
WC20A	100	50-yr	1.26	195.50	195.73		195.73	0.001269	0.29	4.31	35.21	0.27
WC20A	100	100-yr	1.49	195.50	195.74		195.74	0.001371	0.31	4.74	36.94	0.28
WC20A	100	Check Flow	1.94	195.50	195.77		195.77	0.001396	0.34	5.71	40.15	0.29
WC20A	100	Regional	5.22	195.50	195.87		195.89	0.001670	0.49	10.73	51.50	0.34
WC20A	10	2-yr	0.32	195.49	195.52	195.52	195.54	0.084708	0.67	0.48	26.65	1.59
WC20A	10	5-yr	0.57	195.49	195.53	195.53	195.55	0.030017	0.61	0.94	27.73	1.05
WC20A	10	10-yr	0.77	195.49	195.55	195.55	195.56	0.013317	0.53	1.46	28.90	0.75
WC20A	10	25-yr	1.04	195.49	195.54	195.54	195.58	0.038031	0.82	1.27	28.48	1.24
WC20A	10	50-yr	1.26	195.49	195.56	195.56	195.59	0.024263	0.76	1.65	29.31	1.03
WC20A	10	100-yr	1.49	195.49	195.57	195.57	195.60	0.022077	0.79	1.89	29.83	1.00
WC20A	10	Check Flow	1.94	195.49	195.57	195.57	195.62	0.025134	0.90	2.15	30.37	1.09
WC20A	10	Regional	5.22	195.49	195.65	195.65	195.71	0.018203	1.15	4.53	35.00	1.02

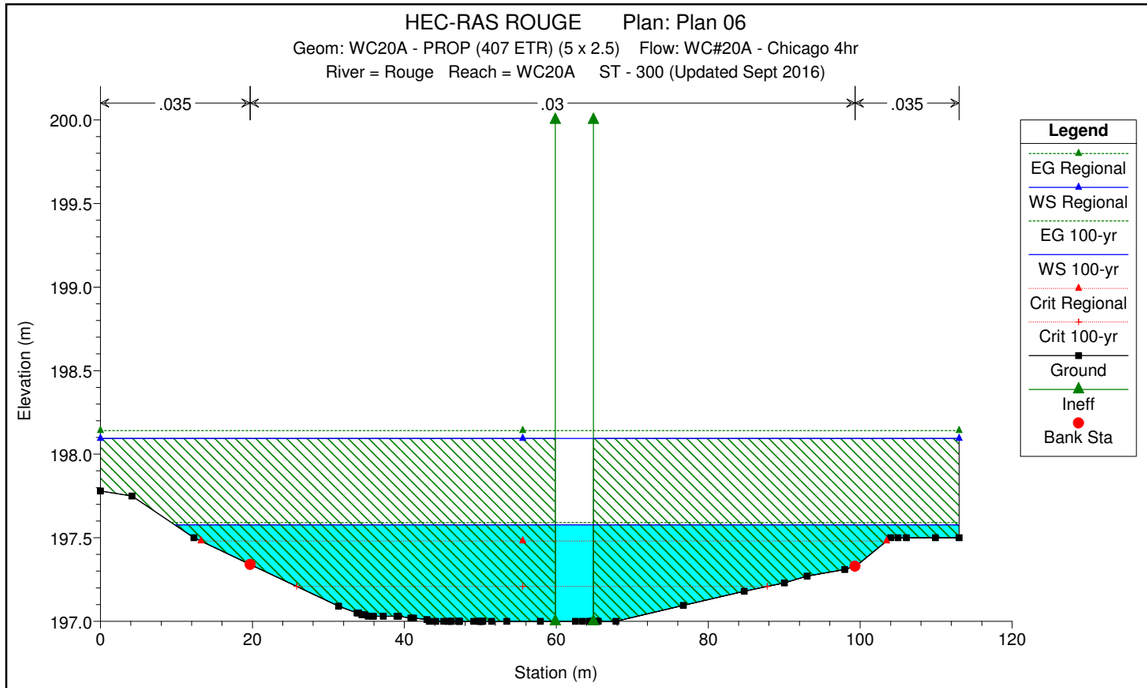
Profile Output Table - Standard Table 2

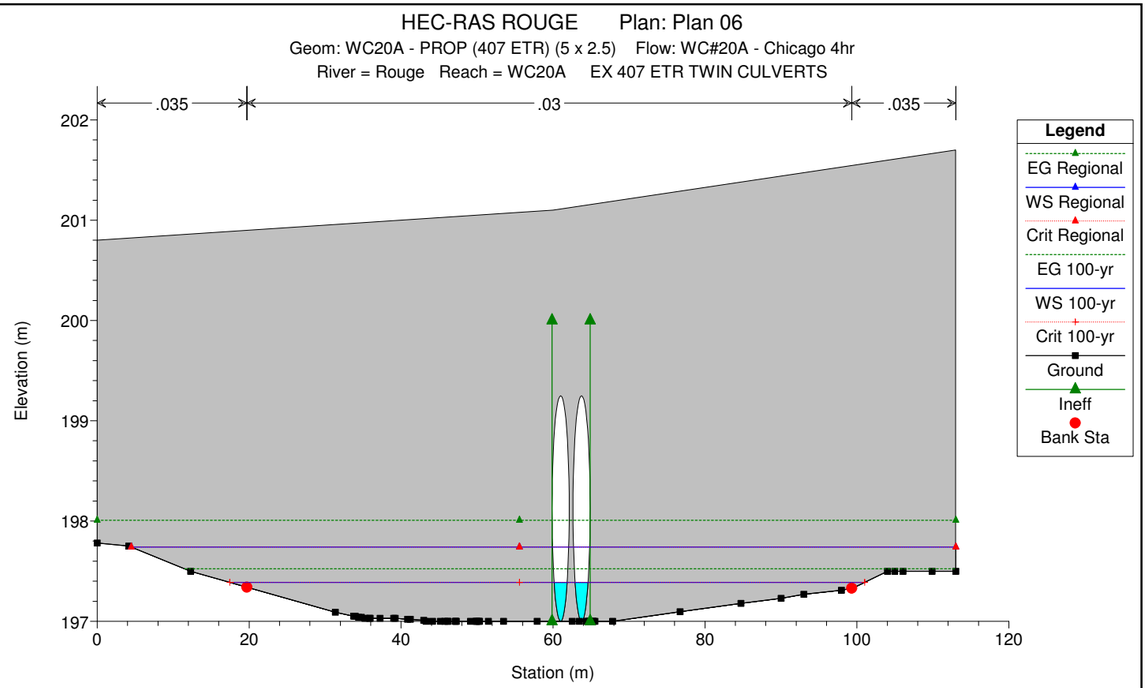
Reach	River Sta	Profile	E.G. Elev (m)	W.S. Elev (m)	Vel Head (m)	Frctn Loss (m)	C & E Loss (m)	Q Left (m3/s)	Q Channel (m3/s)	Q Right (m3/s)	Top Width (m)
WC20A	300	2-yr	197.27	197.27	0.00				0.32		69.54
WC20A	300	5-yr	197.36	197.36	0.01				0.57		81.10
WC20A	300	10-yr	197.42	197.41	0.01				0.77		85.34
WC20A	300	25-yr	197.49	197.48	0.01				1.04		90.29
WC20A	300	50-yr	197.54	197.53	0.01				1.26		101.68
WC20A	300	100-yr	197.59	197.58	0.01				1.49		103.21
WC20A	300	Check Flow	197.68	197.66	0.02				1.94		105.90
WC20A	300	Regional	198.14	198.09	0.05				5.22		113.02
WC20A	250		Culvert								
WC20A	200	2-yr	196.57	196.53	0.04	0.17	0.02		0.32		43.96
WC20A	200	5-yr	196.63	196.57	0.06	0.21	0.03		0.57		44.75
WC20A	200	10-yr	196.66	196.59	0.07	0.24	0.03		0.77		45.26
WC20A	200	25-yr	196.71	196.62	0.08	0.22	0.04		1.04		45.87
WC20A	200	50-yr	196.74	196.65	0.09	0.24	0.04		1.26		46.33
WC20A	200	100-yr	196.77	196.67	0.10	0.25	0.05		1.49		46.79
WC20A	200	Check Flow	196.83	196.70	0.13	0.25	0.06		1.94		47.78
WC20A	200	Regional	197.18	196.94	0.24	0.27	0.12		5.22		52.41
WC20A	100	2-yr	195.65	195.65	0.00	0.10	0.01		0.32		23.40
WC20A	100	5-yr	195.67	195.67	0.00	0.12	0.00		0.57		27.19
WC20A	100	10-yr	195.69	195.69	0.00	0.12	0.00		0.77		29.24
WC20A	100	25-yr	195.72	195.72	0.00	0.13	0.01		1.04		33.53
WC20A	100	50-yr	195.73	195.73	0.00	0.13	0.01		1.26		35.21
WC20A	100	100-yr	195.74	195.74	0.01	0.14	0.01		1.49		36.94
WC20A	100	Check Flow	195.77	195.77	0.01	0.14	0.01		1.94		40.15
WC20A	100	Regional	195.89	195.87	0.01	0.15	0.02	0.00	5.22	0.00	51.50
WC20A	10	2-yr	195.54	195.52	0.02				0.32		26.65
WC20A	10	5-yr	195.55	195.53	0.02				0.57		27.73
WC20A	10	10-yr	195.56	195.55	0.01				0.77		28.90
WC20A	10	25-yr	195.58	195.54	0.03				1.04		28.48
WC20A	10	50-yr	195.59	195.56	0.03				1.26		29.31
WC20A	10	100-yr	195.60	195.57	0.03				1.49		29.83
WC20A	10	Check Flow	195.62	195.57	0.04				1.94		30.37
WC20A	10	Regional	195.71	195.65	0.07				5.22		35.00

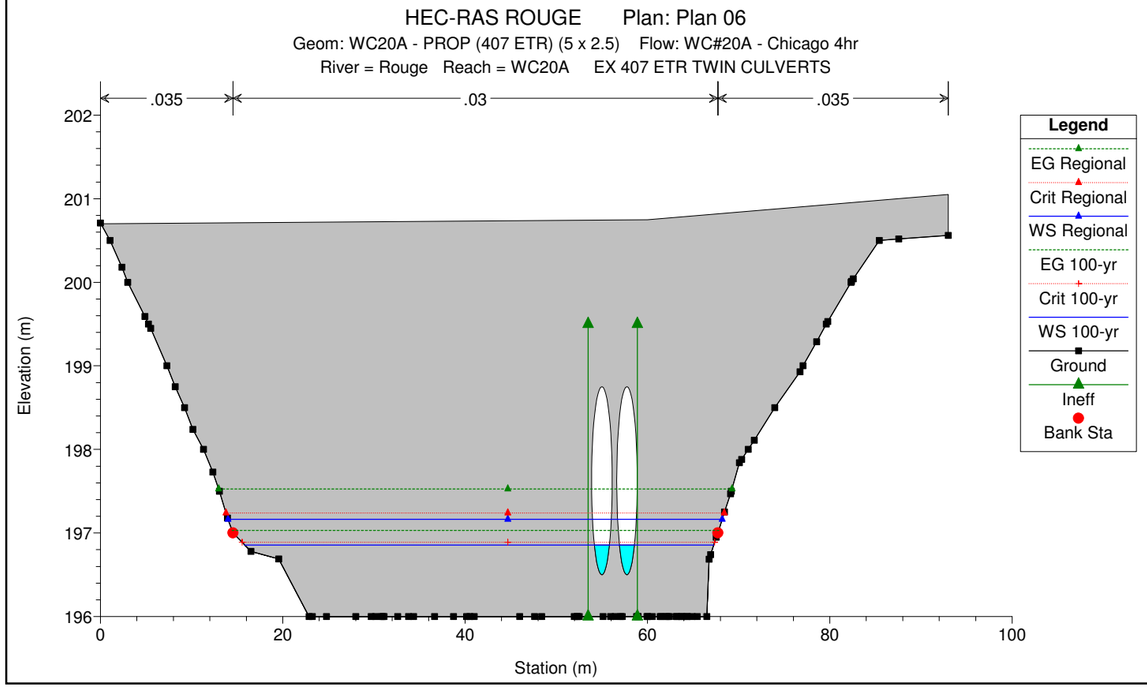
Profile Output Table - Culvert Only

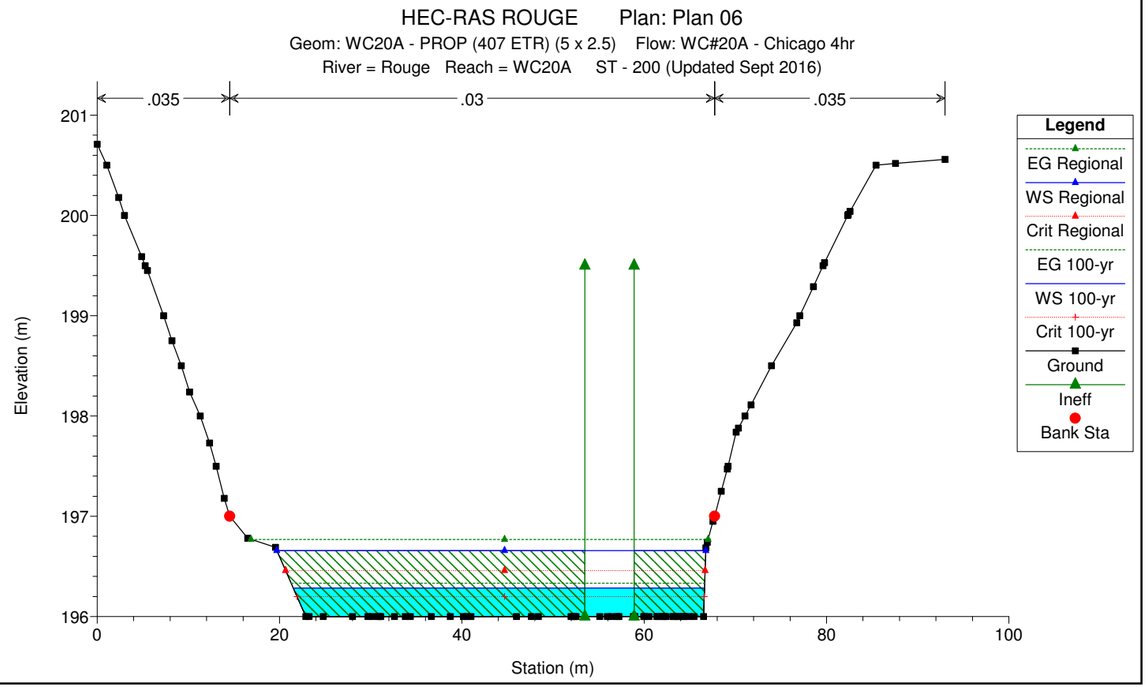
Reach	River Sta		Profile	E.G. US. (m)	W.S. US. (m)	E.G. IC (m)	E.G. OC (m)	Min El Weir Flow (m)	Q Culv Group (m3/s)	Q Weir (m3/s)	Delta WS (m)	Culv Vel US (m/s)	Culv Vel DS (m/s)
WC20A	250	Culvert #1	2-yr	197.27	197.27	197.23	197.27	200.70	0.16		0.73	1.09	1.17
WC20A	250	Culvert #2	2-yr	197.27	197.27	197.23	197.27	200.70	0.16		0.73	1.09	1.17
WC20A	250	Culvert #1	5-yr	197.36	197.36	197.32	197.36	200.70	0.29		0.79	1.26	1.39
WC20A	250	Culvert #2	5-yr	197.36	197.36	197.31	197.36	200.70	0.28		0.79	1.26	1.39
WC20A	250	Culvert #1	10-yr	197.42	197.41	197.37	197.42	200.70	0.39		0.82	1.37	1.52
WC20A	250	Culvert #2	10-yr	197.42	197.41	197.37	197.42	200.70	0.38		0.82	1.37	1.51
WC20A	250	Culvert #1	25-yr	197.49	197.48	197.43	197.49	200.70	0.52		0.86	1.48	1.67
WC20A	250	Culvert #2	25-yr	197.49	197.48	197.43	197.49	200.70	0.52		0.86	1.48	1.66
WC20A	250	Culvert #1	50-yr	197.54	197.53	197.48	197.54	200.70	0.63		0.88	1.56	1.77
WC20A	250	Culvert #2	50-yr	197.54	197.53	197.47	197.54	200.70	0.63		0.88	1.55	1.76

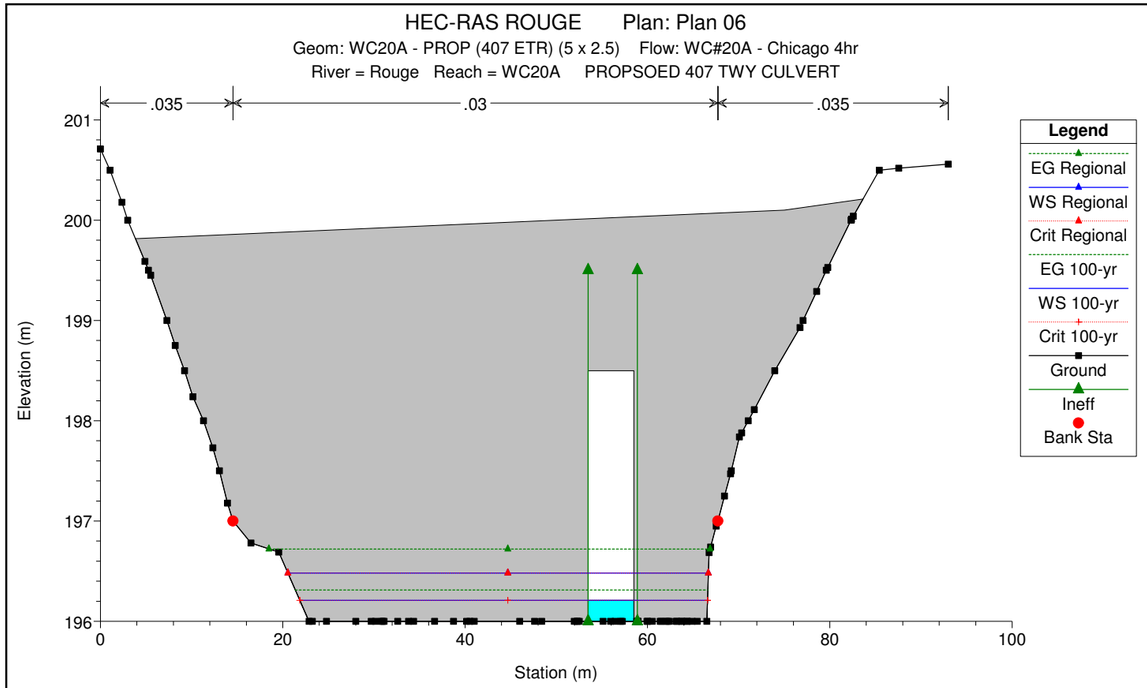
WC20A	250	Culvert #1	100-yr	197.59	197.58	197.52	197.59	200.70	0.75	0.91	1.63	1.85
WC20A	250	Culvert #2	100-yr	197.59	197.58	197.52	197.59	200.70	0.74	0.91	1.62	1.84
WC20A	250	Culvert #1	Check Flow	197.68	197.66	197.60	197.68	200.70	0.97	0.95	1.75	2.01
WC20A	250	Culvert #2	Check Flow	197.68	197.66	197.59	197.68	200.70	0.97	0.95	1.74	2.00
WC20A	250	Culvert #1	Regional	198.14	198.09	198.01	198.14	200.70	2.62	1.16	2.30	2.68
WC20A	250	Culvert #2	Regional	198.14	198.09	198.01	198.14	200.70	2.60	1.16	2.30	2.66

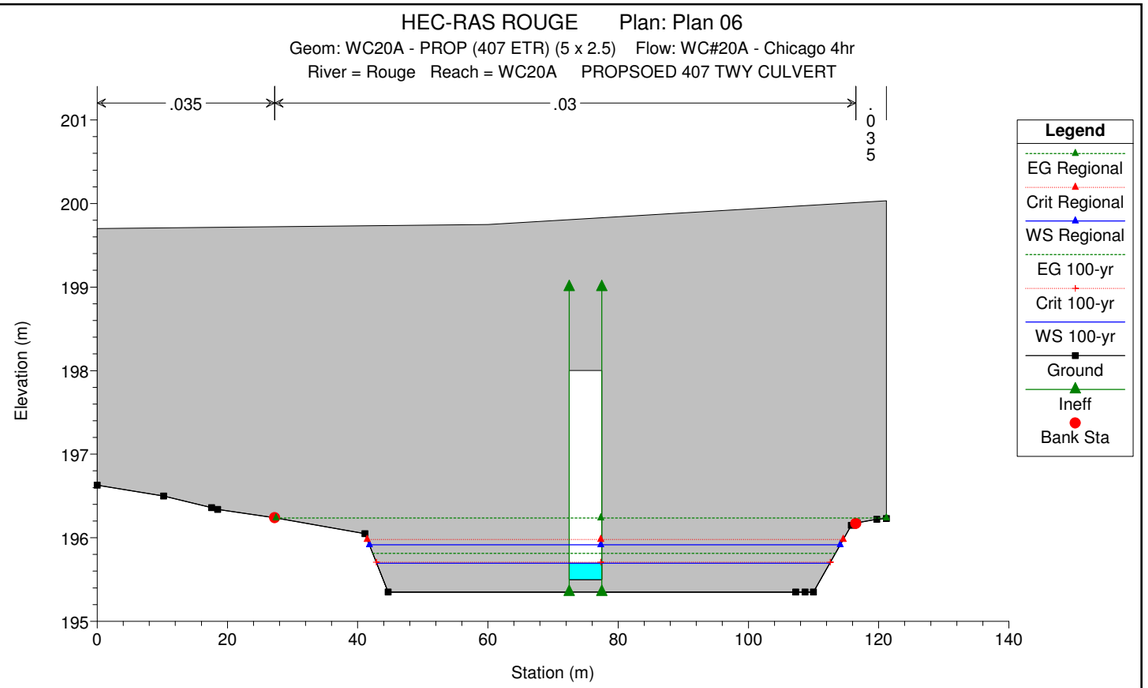

HEC-RAS ROUGE Plan: Plan 06
Geom: WC20A - PROP (407 ETR) (5 x 2.5) Flow: WC#20A - Chicago 4hr
River = Rouge Reach = WC20A ST - 300 (Updated Sept 2016)
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Crit Regional
Crit 100-yr
Ground
Ineff
Bank Sta

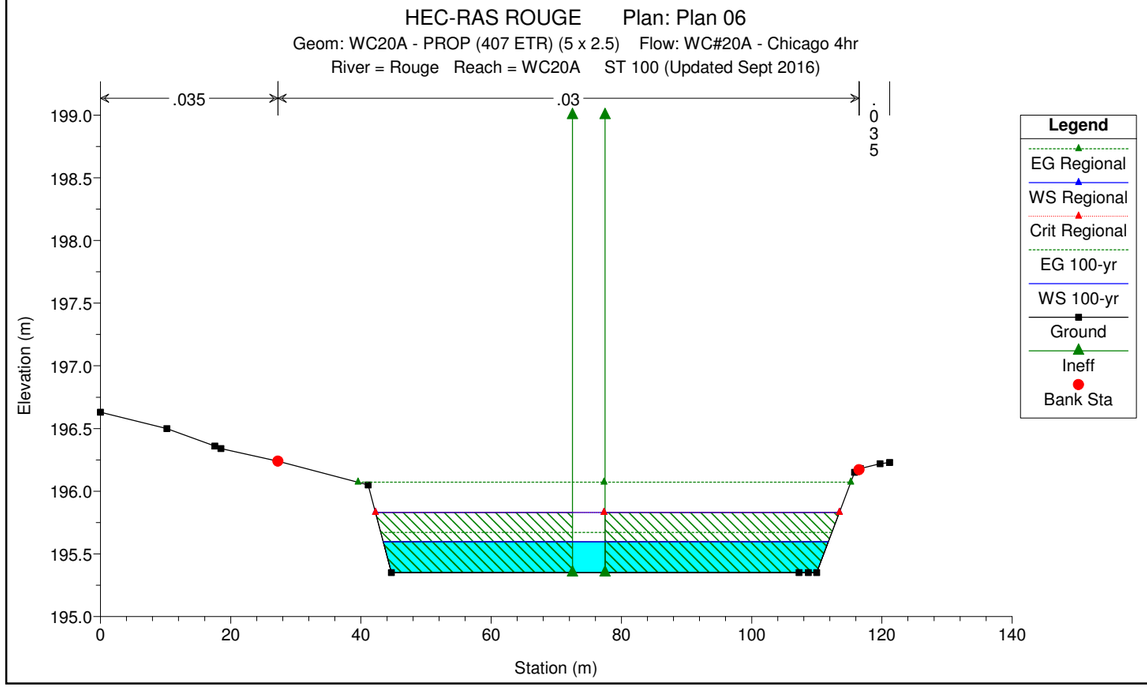

HEC-RAS ROUGE Plan: Plan 06
Geom: WC20A - PROP (407 ETR) (5 x 2.5) Flow: WC#20A - Chicago 4hr
River = Rouge Reach = WC20A EX 407 ETR TWIN CULVERTS
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Ineff
Bank Sta

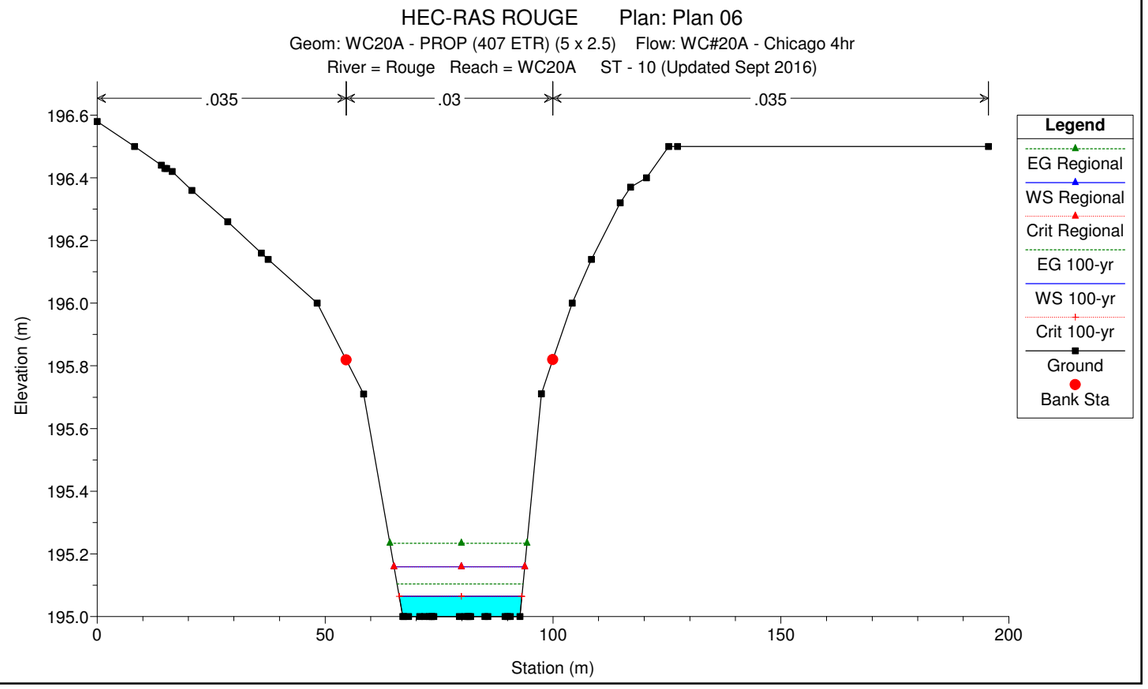

HEC-RAS ROUGE Plan: Plan 06
Geom: WC20A - PROP (407 ETR) (5 x 2.5) Flow: WC#20A - Chicago 4hr
River = Rouge Reach = WC20A EX 407 ETR TWIN CULVERTS
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG Regional
Crit Regional
WS Regional
EG 100-yr
Crit 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 06
Geom: WC20A - PROP (407 ETR) (5 x 2.5) Flow: WC#20A - Chicago 4hr
River = Rouge Reach = WC20A ST - 200 (Updated Sept 2016)
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 06
Geom: WC20A - PROP (407 ETR) (5 x 2.5) Flow: WC#20A - Chicago 4hr
River = Rouge Reach = WC20A PROPSOED 407 TWY CULVERT
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 06
Geom: WC20A - PROP (407 ETR) (5 x 2.5) Flow: WC#20A - Chicago 4hr
River = Rouge Reach = WC20A PROPSOED 407 TWY CULVERT
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG Regional
Crit Regional
WS Regional
EG 100-yr
Crit 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 06
Geom: WC20A - PROP (407 ETR) (5 x 2.5) Flow: WC#20A - Chicago 4hr
River = Rouge Reach = WC20A ST 100 (Updated Sept 2016)
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 06
Geom: WC20A - PROP (407 ETR) (5 x 2.5) Flow: WC#20A - Chicago 4hr
River = Rouge Reach = WC20A ST - 10 (Updated Sept 2016)
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta

HEC-RAS Plan: WC20A-PROP-4hr CH River: Rouge Reach: WC20A

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC20A	300	2-yr	0.32	197.00	197.27	197.09	197.27	0.000305	0.24	1.33	69.54	0.15
WC20A	300	5-yr	0.57	197.00	197.36	197.11	197.36	0.000368	0.32	1.78	81.10	0.17
WC20A	300	10-yr	0.77	197.00	197.41	197.13	197.42	0.000405	0.37	2.07	85.34	0.18
WC20A	300	25-yr	1.04	197.00	197.48	197.16	197.49	0.000446	0.43	2.41	90.29	0.20
WC20A	300	50-yr	1.26	197.00	197.53	197.18	197.54	0.000475	0.48	2.65	101.68	0.21
WC20A	300	100-yr	1.49	197.00	197.58	197.21	197.59	0.000500	0.52	2.88	103.21	0.22
WC20A	300	Check Flow	1.94	197.00	197.66	197.25	197.68	0.000543	0.59	3.30	105.90	0.23
WC20A	300	Regional	5.22	197.00	198.09	197.48	198.14	0.000726	0.95	5.47	113.02	0.29
WC20A	250		Culvert									
WC20A	200	2-yr	0.32	196.00	196.10	196.07	196.12	0.007127	0.60	0.53	44.14	0.61
WC20A	200	5-yr	0.57	196.00	196.15	196.10	196.18	0.005606	0.71	0.81	44.41	0.58
WC20A	200	10-yr	0.77	196.00	196.18	196.13	196.21	0.005227	0.78	0.99	44.58	0.58
WC20A	200	25-yr	1.04	196.00	196.22	196.16	196.26	0.004890	0.86	1.21	44.80	0.58
WC20A	200	50-yr	1.26	196.00	196.26	196.18	196.30	0.004687	0.92	1.37	44.95	0.58
WC20A	200	100-yr	1.49	196.00	196.29	196.20	196.33	0.004516	0.97	1.53	45.11	0.58
WC20A	200	Check Flow	1.94	196.00	196.34	196.24	196.40	0.004257	1.06	1.83	45.40	0.58
WC20A	200	Regional	5.22	196.00	196.66	196.46	196.77	0.003417	1.47	3.54	47.05	0.58
WC20A	150		Culvert									
WC20A	100	2-yr	0.32	195.35	195.46	195.42	195.48	0.005379	0.57	0.56	66.69	0.54
WC20A	100	5-yr	0.57	195.35	195.50	195.45	195.53	0.005903	0.74	0.77	67.21	0.60
WC20A	100	10-yr	0.77	195.35	195.53		195.57	0.006032	0.84	0.92	67.57	0.62
WC20A	100	25-yr	1.04	195.35	195.55		195.60	0.008408	1.04	1.00	67.76	0.75
WC20A	100	50-yr	1.26	195.35	195.57		195.64	0.008592	1.13	1.11	68.05	0.77
WC20A	100	100-yr	1.49	195.35	195.60		195.67	0.008405	1.20	1.24	68.36	0.77
WC20A	100	Check Flow	1.94	195.35	195.60	195.60	195.72	0.013869	1.56	1.25	68.38	0.99
WC20A	100	Regional	5.22	195.35	195.83	195.83	196.07	0.011388	2.18	2.40	71.22	1.00
WC20A	10	2-yr	0.32	195.00	195.02	195.02	195.04	0.033878	0.51	0.63	26.13	1.05
WC20A	10	5-yr	0.57	195.00	195.03	195.03	195.06	0.035477	0.65	0.88	26.31	1.14
WC20A	10	10-yr	0.77	195.00	195.04	195.04	195.07	0.041568	0.77	1.00	26.40	1.26
WC20A	10	25-yr	1.04	195.00	195.05	195.05	195.08	0.023318	0.72	1.44	26.71	1.00
WC20A	10	50-yr	1.26	195.00	195.06	195.06	195.09	0.024332	0.79	1.59	26.82	1.04
WC20A	10	100-yr	1.49	195.00	195.06	195.06	195.10	0.028311	0.88	1.68	26.88	1.13
WC20A	10	Check Flow	1.94	195.00	195.09	195.09	195.12	0.014578	0.80	2.43	27.40	0.86
WC20A	10	Regional	5.22	195.00	195.16	195.16	195.23	0.016574	1.21	4.31	28.66	1.00

HEC-RAS HEC-RAS 5.0.1 April 2016
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: HEC-RAS ROUGE
Project File : HEC.prj
Run Date and Time: 9/8/2016 10:51:23 AM

Project in SI units

Project Description:
HEC-RAS model for creek crossings along the proposed 407 TWY Ph 2 started
from scratch

PLAN DATA

Plan Title: Plan 06
Plan File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.p06

Geometry Title: WC20A - PROP (407 ETR) (5 x 2.5)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g18

Flow Title : WC#20A - Chicago 4hr
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f08

Plan Summary Information:
Number of: Cross Sections = 4 Multiple Openings = 0
Culverts = 2 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: WC#20A - Chicago 4hr
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f08

Flow Data (m3/s)

River	Reach	RS	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Check Flow	Regional
Rouge	WC20A	300	.32	.57	.77	1.04	1.26	1.49	1.94	5.22

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Rouge	WC20A	2-yr		Critical
Rouge	WC20A	5-yr		Critical
Rouge	WC20A	10-yr		Critical
Rouge	WC20A	25-yr		Critical
Rouge	WC20A	50-yr		Critical
Rouge	WC20A	100-yr		Critical
Rouge	WC20A	Check Flow		Critical
Rouge	WC20A	Regional		Critical

GEOMETRY DATA

Geometry Title: WC20A - PROP (407 ETR) (5 x 2.5)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g18

CROSS SECTION

RIVER: Rouge
REACH: WC20A RS: 300

INPUT
Description: ST - 300 (Updated Sept 2016)
Station Elevation Data num= 57

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	197.78	4.15	197.75	12.31	197.5	19.72	197.34	31.35	197.09
33.78	197.05	33.98	197.05	34.41	197.04	34.76	197.04	35.24	197.03
35.85	197.03	35.92	197.03	37.23	197.03	39.01	197.03	39.24	197.03
40.85	197.02	41.22	197.02	42.98	197.01	43.29	197	44.15	197
45.18	197	45.75	197	46.11	197	46.17	197	47.09	197
47.21	197	47.27	197	49.12	197	49.85	197	49.93	197
50.03	197	50.23	197	50.33	197	51.48	197	53.49	197
57.89	197	62.54	197	63.47	197	64.34	197	64.64	197
64.8	197	65.28	197	65.29	197	65.53	197	67.84	197
76.72	197.095	84.74	197.18	90.01	197.23	93.02	197.27	97.97	197.31
99.33	197.329	99.43	197.33	104	197.5	104.98	197.5	106.06	197.5
109.89	197.5	113.02	197.5						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	19.72	.03	99.33	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
19.72 99.33 123.3 123.3 123.3 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	59.875	200	T
64.875	113.02	200	T

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	197.59	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	197.58	Reach Len. (m)	123.30	123.30	123.30
Crit W.S. (m)	197.21	Flow Area (m2)		2.88	
E.G. Slope (m/m)	0.000500	Area (m2)	1.26	37.76	1.45
Q Total (m3/s)	1.49	Flow (m3/s)		1.49	
Top Width (m)	103.21	Top Width (m)	9.91	79.61	13.69
Vel Total (m/s)	0.52	Avg. Vel. (m/s)		0.52	
Max Chl Dpth (m)	0.58	Hydr. Depth (m)		0.58	
Conv. Total (m3/s)	66.6	Conv. (m3/s)		66.6	
Length Wtd. (m)	123.30	Wetted Per. (m)		5.00	

Min Ch El (m)	197.00	Shear (N/m2)		2.83	
Alpha	1.00	Stream Power (N/m s)		1.46	
Frctn Loss (m)		Cum Volume (1000 m3)		0.83	
C & E Loss (m)		Cum SA (1000 m2)	0.61	13.24	0.84

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	198.14	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.030	
W.S. Elev (m)	198.09	Reach Len. (m)	123.30	123.30	123.30
Crit W.S. (m)	197.48	Flow Area (m2)		5.47	
E.G. Slope (m/m)	0.000726	Area (m2)	10.20	78.98	8.54
Q Total (m3/s)	5.22	Flow (m3/s)		5.22	
Top Width (m)	113.02	Top Width (m)	19.72	79.61	13.69
Vel Total (m/s)	0.95	Avg. Vel. (m/s)		0.95	
Max Chl Dpth (m)	1.09	Hydr. Depth (m)		1.09	
Conv. Total (m3/s)	193.8	Conv. (m3/s)		193.8	
Length Wtd. (m)	123.30	Wetted Per. (m)		5.00	
Min Ch El (m)	197.00	Shear (N/m2)		7.79	
Alpha	1.00	Stream Power (N/m s)		7.43	
Frctn Loss (m)		Cum Volume (1000 m3)		1.85	
C & E Loss (m)		Cum SA (1000 m2)	1.22	13.61	0.84

CULVERT

RIVER: Rouge
REACH: WC20A RS: 250

INPUT
Description: EX 407 ETR TWIN CULVERTS
Distance from Upstream XS = 31.5
Deck/Roadway Width = 69
Weir Coefficient = 1.4
Upstream Deck/Roadway Coordinates
num= 3

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0	200.8	60	201.1	113	201.7

Upstream Bridge Cross Section Data
Station Elevation Data num= 57

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	197.78	4.15	197.75	12.31	197.5	19.72	197.34	31.35	197.09
33.78	197.05	33.98	197.05	34.41	197.04	34.76	197.04	35.24	197.03
35.85	197.03	35.92	197.03	37.23	197.03	39.01	197.03	39.24	197.03
40.85	197.02	41.22	197.02	42.98	197.01	43.29	197	44.15	197
45.18	197	45.75	197	46.11	197	46.17	197	47.09	197
47.21	197	47.27	197	49.12	197	49.85	197	49.93	197
50.03	197	50.23	197	50.33	197	51.48	197	53.49	197
57.89	197	62.54	197	63.47	197	64.34	197	64.64	197
64.8	197	65.28	197	65.29	197	65.53	197	67.84	197
76.72	197.095	84.74	197.18	90.01	197.23	93.02	197.27	97.97	197.31
99.33	197.329	99.43	197.33	104	197.5	104.98	197.5	106.06	197.5
109.89	197.5	113.02	197.5						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	19.72	.03	99.33	.035

Bank Sta: Left Right Coeff Contr. Expan.
19.72 99.33 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	59.875	200	T
64.875	113.02	200	T

Downstream Deck/Roadway Coordinates
num= 3

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0	200.7	60	200.75	93	201.05

Downstream Bridge Cross Section Data
Station Elevation Data num= 90

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	200.71	1.04	200.5	2.36	200.18	3	200	4.88	199.59
5.27	199.5	5.5	199.45	7.28	199	8.2	198.75	9.23	198.5
10.13	198.24	11.31	198	12.34	197.73	13.04	197.5	13.92	197.18
14.55	197	16.5	196.78	19.55	196.69	22.87	196	23.25	196
24.79	196	28.01	196	29.69	196	30.17	196	30.83	196
30.96	196	31.1	196	32.61	196	33.8	196	34.34	196
36.65	196	38.72	196	40.17	196	40.52	196	41	196
45.98	196	47.61	196	48.4	196	51.97	196	52.29	196
52.3	196	52.53	196	55.12	196	55.95	196	56.46	196
57.05	196	57.23	196	58.81	196	58.95	196	58.98	196
59.94	196	60.02	196	60.54	196	61.38	196	61.53	196
62.05	196	62.22	196	62.41	196	63.17	196	63.22	196
63.75	196	63.77	196	64.33	196	64.37	196	64.89	196
65.46	196	66.5	196	66.76	196.686	66.93	196.74	67.53	196.95
67.74	197	68.45	197.25	69.12	197.47	69.2	197.5	70.07	197.84
70.32	197.88	71.05	198	71.72	198.11	73.95	198.5	76.74	198.93
77.06	199	78.55	199.29	79.62	199.5	79.78	199.53	82.34	200
82.39	200.01	82.58	200.04	85.42	200.5	87.57	200.52	92.98	200.56

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	14.55	.03	67.74	.035

Bank Sta: Left Right Coeff Contr. Expan.
14.55 67.74 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	53.5	199.5	T
58.88	92.98	199.5	T

Upstream Embankment side slope = 2 horiz. to 1.0 vertical
Downstream Embankment side slope = 2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .98
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Culverts = 2

Culvert Name	Shape	Rise	Span
Culvert #1	Circular	2.25	

FHWA Chart # 1 - Concrete Pipe Culvert
FHWA Scale # 3 - Groove end entrance; pipe projecting from fill
Solution Criteria = Highest U.S. EG

Culvert	Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
	6	113	.013	.013	0	.5	1

Upstream Elevation = 197
Centerline Station = 61
Downstream Elevation = 196.5
Centerline Station = 55

Culvert Name	Shape	Rise	Span
Culvert #2	Circular	2.25	

FHWA Chart # 1 - Concrete Pipe Culvert
FHWA Scale # 3 - Groove end entrance; pipe projecting from fill
Solution Criteria = Highest U.S. EG

Culvert	Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
	6	114	.013	.013	0	.5	1

Upstream Elevation = 197
Centerline Station = 63.75
Downstream Elevation = 196.5
Centerline Station = 57.75

CULVERT OUTPUT Profile #100-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.75	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.63

Q Barrel (m3/s)	0.75	Culv Vel DS (m/s)	1.85
E.G. US. (m)	197.59	Culv Inv El Up (m)	197.00
W.S. US. (m)	197.58	Culv Inv El Dn (m)	196.50
E.G. DS (m)	196.33	Culv Frctn Ls (m)	0.00
W.S. DS (m)	196.29	Culv Exit Loss (m)	0.70
Delta EG (m)	1.26	Culv Entr Loss (m)	0.07
Delta WS (m)	1.29	Q Weir (m3/s)	
E.G. IC (m)	197.52	Weir Sta Lft (m)	
E.G. OC (m)	197.59	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	197.39	Weir Max Depth (m)	
Culv WS Outlet (m)	196.86	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.36	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.39	Min El Weir Flow (m)	200.70

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #Regional Culv Group: Culvert #1

Q Culv Group (m3/s)	2.62	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	2.30
Q Barrel (m3/s)	2.62	Culv Vel DS (m/s)	2.68
E.G. US. (m)	198.14	Culv Inv El Up (m)	197.00
W.S. US. (m)	198.09	Culv Inv El Dn (m)	196.50
E.G. DS (m)	196.77	Culv Frctn Ls (m)	0.00
W.S. DS (m)	196.66	Culv Exit Loss (m)	0.76
Delta EG (m)	1.37	Culv Entr Loss (m)	0.13
Delta WS (m)	1.44	Q Weir (m3/s)	
E.G. IC (m)	198.01	Weir Sta Lft (m)	
E.G. OC (m)	198.14	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	197.74	Weir Max Depth (m)	
Culv WS Outlet (m)	197.16	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.66	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.74	Min El Weir Flow (m)	200.70

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #100-yr Culv Group: Culvert #2

Q Culv Group (m3/s)	0.74	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.62
Q Barrel (m3/s)	0.74	Culv Vel DS (m/s)	1.84
E.G. US. (m)	197.59	Culv Inv El Up (m)	197.00
W.S. US. (m)	197.58	Culv Inv El Dn (m)	196.50
E.G. DS (m)	196.33	Culv Frctn Ls (m)	0.00
W.S. DS (m)	196.29	Culv Exit Loss (m)	0.70
Delta EG (m)	1.26	Culv Entr Loss (m)	0.07
Delta WS (m)	1.29	Q Weir (m3/s)	
E.G. IC (m)	197.52	Weir Sta Lft (m)	
E.G. OC (m)	197.59	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	197.39	Weir Max Depth (m)	
Culv WS Outlet (m)	196.86	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.36	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.39	Min El Weir Flow (m)	200.70

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #Regional Culv Group: Culvert #2

Q Culv Group (m3/s)	2.60	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	2.30
Q Barrel (m3/s)	2.60	Culv Vel DS (m/s)	2.66
E.G. US. (m)	198.14	Culv Inv El Up (m)	197.00
W.S. US. (m)	198.09	Culv Inv El Dn (m)	196.50
E.G. DS (m)	196.77	Culv Frctn Ls (m)	0.00
W.S. DS (m)	196.66	Culv Exit Loss (m)	0.76
Delta EG (m)	1.37	Culv Entr Loss (m)	0.13
Delta WS (m)	1.44	Q Weir (m3/s)	
E.G. IC (m)	198.01	Weir Sta Lft (m)	
E.G. OC (m)	198.14	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	197.74	Weir Max Depth (m)	
Culv WS Outlet (m)	197.16	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.66	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.74	Min El Weir Flow (m)	200.70

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CROSS SECTION

RIVER: Rouge
REACH: WC20A RS: 200

INPUT
Description: ST - 200 (Updated Sept 2016)
Station Elevation Data num= 90

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	200.71	1.04	200.5	2.36	200.18	3	200	4.88	199.59		
5.27	199.5	5.5	199.45	7.28	199	8.2	198.75	9.23	198.5		
10.13	198.24	11.31	198	12.34	197.73	13.04	197.5	13.92	197.18		
14.55	197	16.5	196.78	19.55	196.69	22.87	196	23.25	196		
24.79	196	28.01	196	29.69	196	30.17	196	30.83	196		
30.96	196	31.1	196	32.61	196	33.8	196	34.34	196		
36.65	196	38.72	196	40.17	196	40.52	196	41	196		
45.98	196	47.61	196	48.4	196	51.97	196	52.29	196		
52.3	196	52.53	196	55.12	196	55.95	196	56.46	196		
57.05	196	57.23	196	58.81	196	58.95	196	58.98	196		
59.94	196	60.02	196	60.54	196	61.38	196	61.53	196		
62.05	196	62.22	196	62.41	196	63.17	196	63.22	196		
63.75	196	63.77	196	64.33	196	64.37	196	64.89	196		
65.46	196	66.5	196	66.76	196.686	66.93	196.74	67.53	196.95		
67.74	197	68.45	197.25	69.12	197.47	69.2	197.5	70.07	197.84		
70.32	197.88	71.05	198	71.72	198.11	73.95	198.5	76.74	198.93		
77.06	199	78.55	199.29	79.62	199.5	79.78	199.53	82.34	200		
82.39	200.01	82.58	200.04	85.42	200.5	87.57	200.52	92.98	200.56		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	14.55	.03	67.74	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
14.55	67.74	65	65	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	53.5	199.5	T
58.88	92.98	199.5	T

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	196.33	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.030	
W.S. Elev (m)	196.29	Reach Len. (m)	65.00	65.00	65.00
Crit W.S. (m)	196.20	Flow Area (m2)		1.53	
E.G. Slope (m/m)	0.004516	Area (m2)		12.66	
Q Total (m3/s)	1.49	Flow (m3/s)		1.49	
Top Width (m)	45.11	Top Width (m)		45.11	
Vel Total (m/s)	0.97	Avg. Vel. (m/s)		0.97	
Max Chl Dpth (m)	0.29	Hydr. Depth (m)		0.29	
Conv. Total (m3/s)	22.2	Conv. (m3/s)		22.2	

Length Wtd. (m)	65.00	Wetted Per. (m)	5.38
Min Ch El (m)	196.00	Shear (N/m2)	12.64
Alpha	1.00	Stream Power (N/m s)	12.27
Frctn Loss (m)		Cum Volume (1000 m3)	0.49
C & E Loss (m)		Cum SA (1000 m2)	5.55

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	196.77	Element	Left OB	Channel	Right OB
Vel Head (m)	0.11	Wt. n-Val.		0.030	
W.S. Elev (m)	196.66	Reach Len. (m)	65.00	65.00	65.00
Crit W.S. (m)	196.46	Flow Area (m2)		3.54	
E.G. Slope (m/m)	0.003417	Area (m2)		29.84	
Q Total (m3/s)	5.22	Flow (m3/s)		5.22	
Top Width (m)	47.05	Top Width (m)		47.05	
Vel Total (m/s)	1.47	Avg. Vel. (m/s)		1.47	
Max Chl Dpth (m)	0.66	Hydr. Depth (m)		0.66	
Conv. Total (m3/s)	89.3	Conv. (m3/s)		89.3	
Length Wtd. (m)	65.00	Wetted Per. (m)		5.38	
Min Ch El (m)	196.00	Shear (N/m2)		22.05	
Alpha	1.00	Stream Power (N/m s)		32.51	
Frctn Loss (m)		Cum Volume (1000 m3)		1.03	
C & E Loss (m)		Cum SA (1000 m2)		5.80	

CULVERT

RIVER: Rouge
REACH: WC20A RS: 150

INPUT
Description: PROPSOED 407 TWY CULVERT
Distance from Upstream XS = 20
Deck/Roadway Width = 15
Weir Coefficient = 1.4
Upstream Deck/Roadway Coordinates
num= 3

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0	199.8	75	200.1	121	200.7

Upstream Bridge Cross Section Data
Station Elevation Data num= 90

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	200.71	1.04	200.5	2.36	200.18	3	200	4.88	199.59
5.27	199.5	5.5	199.45	7.28	199	8.2	198.75	9.23	198.5
10.13	198.24	11.31	198	12.34	197.73	13.04	197.5	13.92	197.18
14.55	197	16.5	196.78	19.55	196.69	22.87	196	23.25	196
24.79	196	28.01	196	29.69	196	30.17	196	30.83	196
30.96	196	31.1	196	32.61	196	33.8	196	34.34	196
36.65	196	38.72	196	40.17	196	40.52	196	41	196
45.98	196	47.61	196	48.4	196	51.97	196	52.29	196
52.3	196	52.53	196	55.12	196	55.95	196	56.46	196
57.05	196	57.23	196	58.81	196	58.95	196	58.98	196
59.94	196	60.02	196	60.54	196	61.38	196	61.53	196
62.05	196	62.22	196	62.41	196	63.17	196	63.22	196
63.75	196	63.77	196	64.33	196	64.37	196	64.89	196
65.46	196	66.5	196	66.76	196.686	66.93	196.74	67.53	196.95
67.74	197	68.45	197.25	69.12	197.47	69.2	197.5	70.07	197.84
70.32	197.88	71.05	198	71.72	198.11	73.95	198.5	76.74	198.93
77.06	199	78.55	199.29	79.62	199.5	79.78	199.53	82.34	200
82.39	200.01	82.58	200.04	85.42	200.5	87.57	200.52	92.98	200.56

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	14.55	.03	67.74	.035

Bank Sta: Left Right Coeff Contr. Expan.
14.55 67.74 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	53.5	199.5	T
58.88	92.98	199.5	T

Downstream Deck/Roadway Coordinates
num= 3

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0	199.7	60	199.75	125	200.05

Downstream Bridge Cross Section Data
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	196.63	10.19	196.5	17.58	196.36	18.5	196.34	27.26	196.24
41.12	196.05	44.68	195.35	107.28	195.35	108.7	195.35	109.98	195.35
115.8	196.15	116.5	196.17	116.71	196.18	119.7	196.22	121.21	196.23

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	27.26	.03	116.5	.035

Bank Sta: Left Right Coeff Contr. Expan.
27.26 116.5 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	72.5	199	T
77.5	121.21	199	T

Upstream Embankment side slope = 2 horiz. to 1.0 vertical
Downstream Embankment side slope = 2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .98
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name	Shape	Rise	Span
Culvert #1	Box	2.5	5

FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG

Culvert Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
7	36	.013	.025	0	.2	1

Upstream Elevation = 196
Centerline Station = 56
Downstream Elevation = 195.5
Centerline Station = 75

CULVERT OUTPUT Profile #100-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	1.49	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.43
Q Barrel (m3/s)	1.49	Culv Vel DS (m/s)	1.54
E.G. US. (m)	196.33	Culv Inv El Up (m)	196.00
W.S. US. (m)	196.29	Culv Inv El Dn (m)	195.50
E.G. DS (m)	195.67	Culv Frctn Ls (m)	0.00
W.S. DS (m)	195.60	Culv Exit Loss (m)	0.14
Delta EG (m)	0.66	Culv Entr Loss (m)	0.02
Delta WS (m)	0.69	Q Weir (m3/s)	
E.G. IC (m)	196.30	Weir Sta Lft (m)	
E.G. OC (m)	196.33	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	196.21	Weir Max Depth (m)	
Culv WS Outlet (m)	195.69	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.19	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.21	Min El Weir Flow (m)	199.82

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #Regional Culv Group: Culvert #1

Q Culv Group (m3/s)	5.22	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	2.17
Q Barrel (m3/s)	5.22	Culv Vel DS (m/s)	2.51
E.G. US. (m)	196.77	Culv Inv El Up (m)	196.00
W.S. US. (m)	196.66	Culv Inv El Dn (m)	195.50
E.G. DS (m)	196.07	Culv Frctn Ls (m)	0.00
W.S. DS (m)	195.83	Culv Exit Loss (m)	0.17
Delta EG (m)	0.70	Culv Entr Loss (m)	0.05
Delta WS (m)	0.83	Q Weir (m3/s)	
E.G. IC (m)	196.74	Weir Sta Lft (m)	
E.G. OC (m)	196.77	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	196.48	Weir Max Depth (m)	
Culv WS Outlet (m)	195.92	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.42	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.48	Min El Weir Flow (m)	199.82

Warning: Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross section downstream of the culvert has supercritical flow.
Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CROSS SECTION

RIVER: Rouge
REACH: WC20A RS: 100

INPUT
Description: ST 100 (Updated Sept 2016)
Station Elevation Data num= 15

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	196.63	10.19	196.5	17.58	196.36	18.5	196.34	27.26	196.24
41.12	196.05	44.68	195.35	107.28	195.35	108.7	195.35	109.98	195.35
115.8	196.15	116.5	196.17	116.71	196.18	119.7	196.22	121.21	196.23

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	27.26	.03	116.5	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
27.26	116.5	39.2	39.2	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	72.5	199	T
77.5	121.21	199	T

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	195.67	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.030	
W.S. Elev (m)	195.60	Reach Len. (m)	39.20	39.20	39.20
Crit W.S. (m)		Flow Area (m2)		1.24	
E.G. Slope (m/m)	0.008405	Area (m2)		16.54	
Q Total (m3/s)	1.49	Flow (m3/s)		1.49	
Top Width (m)	68.36	Top Width (m)		68.36	
Vel Total (m/s)	1.20	Avg. Vel. (m/s)		1.20	
Max Chl Dpth (m)	0.25	Hydr. Depth (m)		0.25	
Conv. Total (m3/s)	16.3	Conv. (m3/s)		16.3	
Length Wtd. (m)	39.20	Wetted Per. (m)		5.00	
Min Ch El (m)	195.35	Shear (N/m2)		20.39	
Alpha	1.00	Stream Power (N/m s)		24.56	
Frctn Loss (m)	0.55	Cum Volume (1000 m3)		0.36	
C & E Loss (m)	0.02	Cum SA (1000 m2)		1.87	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	196.07	Element	Left OB	Channel	Right OB
Vel Head (m)	0.24	Wt. n-Val.		0.030	
W.S. Elev (m)	195.83	Reach Len. (m)	39.20	39.20	39.20
Crit W.S. (m)	195.83	Flow Area (m2)		2.40	
E.G. Slope (m/m)	0.011388	Area (m2)		32.71	
Q Total (m3/s)	5.22	Flow (m3/s)		5.22	
Top Width (m)	71.22	Top Width (m)		71.22	
Vel Total (m/s)	2.18	Avg. Vel. (m/s)		2.18	
Max Chl Dpth (m)	0.48	Hydr. Depth (m)		0.48	
Conv. Total (m3/s)	48.9	Conv. (m3/s)		48.9	
Length Wtd. (m)	39.20	Wetted Per. (m)		5.00	
Min Ch El (m)	195.35	Shear (N/m2)		53.52	
Alpha	1.00	Stream Power (N/m s)		116.59	
Frctn Loss (m)	0.53	Cum Volume (1000 m3)		0.73	
C & E Loss (m)	0.08	Cum SA (1000 m2)		1.96	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Rouge
REACH: WC20A RS: 10

INPUT
Description: ST - 10 (Updated Sept 2016)
Station Elevation Data num= 43

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	196.58	8.22	196.5	14.08	196.44	14.87	196.43	15.25	196.43
16.48	196.42	20.8	196.36	28.64	196.26	36	196.16	37.53	196.14
48.24	196	54.6	195.819	58.44	195.71	67.04	195	67.23	195
68.31	195	70.77	195	71.82	195	72.85	195	73.33	195
73.4	195	73.86	195	79.42	195	80.64	195	81.28	195
81.62	195	81.95	195	85.02	195	85.71	195	89.5	195
90.04	195	90.65	195	92.72	195	97.47	195.711	99.94	195.82
104.19	196	108.4	196.14	114.71	196.32	117	196.37	120.5	196.4
125.39	196.5	127.32	196.5	195.5	196.5				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	54.6	.03	99.94	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
54.6	99.94	0	0	.3	.5

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	195.10	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.030	
W.S. Elev (m)	195.06	Reach Len. (m)			
Crit W.S. (m)	195.06	Flow Area (m2)		1.68	
E.G. Slope (m/m)	0.028311	Area (m2)		1.68	
Q Total (m3/s)	1.49	Flow (m3/s)		1.49	
Top Width (m)	26.88	Top Width (m)		26.88	
Vel Total (m/s)	0.88	Avg. Vel. (m/s)		0.88	
Max Chl Dpth (m)	0.06	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	8.9	Conv. (m3/s)		8.9	
Length Wtd. (m)		Wetted Per. (m)		26.89	

Min Ch El (m)	195.00	Shear (N/m2)	17.39
Alpha	1.00	Stream Power (N/m s)	15.38
Frctn Loss (m)		Cum Volume (1000 m3)	
C & E Loss (m)		Cum SA (1000 m2)	

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	195.23	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.030	
W.S. Elev (m)	195.16	Reach Len. (m)			
Crit W.S. (m)	195.16	Flow Area (m2)		4.31	
E.G. Slope (m/m)	0.016574	Area (m2)		4.31	
Q Total (m3/s)	5.22	Flow (m3/s)		5.22	
Top Width (m)	28.66	Top Width (m)		28.66	
Vel Total (m/s)	1.21	Avg. Vel. (m/s)		1.21	
Max Chl Dpth (m)	0.16	Hydr. Depth (m)		0.15	
Conv. Total (m3/s)	40.5	Conv. (m3/s)		40.5	
Length Wtd. (m)		Wetted Per. (m)		28.68	
Min Ch El (m)	195.00	Shear (N/m2)		24.40	
Alpha	1.00	Stream Power (N/m s)		29.59	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

SUMMARY OF MANNING'S N VALUES

River:Rouge

Reach	River Sta.	n1	n2	n3
WC20A	300	.035	.03	.035
WC20A	250	Culvert		
WC20A	200	.035	.03	.035
WC20A	150	Culvert		
WC20A	100	.035	.03	.035
WC20A	10	.035	.03	.035

SUMMARY OF REACH LENGTHS

River: Rouge

Reach	River Sta.	Left	Channel	Right
WC20A	300	123.3	123.3	123.3
WC20A	250	Culvert		
WC20A	200	65	65	65
WC20A	150	Culvert		
WC20A	100	39.2	39.2	39.2
WC20A	10	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Rouge

Reach	River Sta.	Contr.	Expan.
WC20A	300	.3	.5
WC20A	250	Culvert	
WC20A	200	.3	.5
WC20A	150	Culvert	
WC20A	100	.3	.5
WC20A	10	.3	.5

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
WC20A	300	100-yr	1.49	197.00	197.58	197.21	197.59	0.000500	0.52	2.88	103.21	0.22
WC20A	300	Regional	5.22	197.00	198.09	197.48	198.14	0.000726	0.95	5.47	113.02	0.29
WC20A	250		Culvert									
WC20A	200	100-yr	1.49	196.00	196.29	196.20	196.33	0.004516	0.97	1.53	45.11	0.58
WC20A	200	Regional	5.22	196.00	196.66	196.46	196.77	0.003417	1.47	3.54	47.05	0.58
WC20A	150		Culvert									
WC20A	100	100-yr	1.49	195.35	195.60		195.67	0.008405	1.20	1.24	68.36	0.77
WC20A	100	Regional	5.22	195.35	195.83	195.83	196.07	0.011388	2.18	2.40	71.22	1.00
WC20A	10	100-yr	1.49	195.00	195.06	195.06	195.10	0.028311	0.88	1.68	26.88	1.13
WC20A	10	Regional	5.22	195.00	195.16	195.16	195.23	0.016574	1.21	4.31	28.66	1.00

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (m)	W.S. Elev (m)	Vel Head (m)	Frctn Loss (m)	C & E Loss (m)	Q Left (m3/s)	Q Channel (m3/s)	Q Right (m3/s)	Top Width (m)
WC20A	300	100-yr	197.59	197.58	0.01				1.49		103.21
WC20A	300	Regional	198.14	198.09	0.05				5.22		113.02
WC20A	250		Culvert								
WC20A	200	100-yr	196.33	196.29	0.05				1.49		45.11
WC20A	200	Regional	196.77	196.66	0.11				5.22		47.05
WC20A	150		Culvert								
WC20A	100	100-yr	195.67	195.60	0.07	0.55	0.02		1.49		68.36
WC20A	100	Regional	196.07	195.83	0.24	0.53	0.08		5.22		71.22
WC20A	10	100-yr	195.10	195.06	0.04				1.49		26.88
WC20A	10	Regional	195.23	195.16	0.07				5.22		28.66

Profile Output Table - Culvert Only

Reach	River Sta		Profile	E.G. US. (m)	W.S. US. (m)	E.G. IC (m)	E.G. OC (m)	Min El Weir Flow (m)	Q Culv Group (m3/s)	Q Weir (m3/s)	Delta WS (m)	Culv Vel US (m/s)	Culv Vel DS (m/s)
WC20A	250	Culvert #1	100-yr	197.59	197.58	197.52	197.59	200.70	0.75		1.29	1.63	1.85
WC20A	250	Culvert #2	100-yr	197.59	197.58	197.52	197.59	200.70	0.74		1.29	1.62	1.84
WC20A	250	Culvert #1	Regional	198.14	198.09	198.01	198.14	200.70	2.62		1.44	2.30	2.68
WC20A	250	Culvert #2	Regional	198.14	198.09	198.01	198.14	200.70	2.60		1.44	2.30	2.66
WC20A	150	Culvert #1	100-yr	196.33	196.29	196.30	196.33	199.82	1.49		0.69	1.43	1.54
WC20A	150	Culvert #1	Regional	196.77	196.66	196.74	196.77	199.82	5.22		0.83	2.17	2.51

PETTICOAT CREEK

HEC-RAS ANALYSIS WC#21

EXISTING 407 ETR

EX CULVERTS 3 x (@2000)mm

PROPOSED 407 TWY

10+900
10+800
10+700

0+105
0+100
0+075
0+050
0+025
0+000
0+166
0+150
0+125
0+100
0+075
0+050
0+025
0+000

201.08	201.05	ST 300
200.87	200.82	

200.92	200.85	ST 200
200.73	200.63	

200.14	200.14	ST 100
200.09	199.97	

PROP CULV WC#21
SPAN x RISE= (4.5 x 2)
L=38m, S=1.2%
U/S INV= 200.47
D/S INV= 200.00

POND ID P-2

LEGEND

- EXISTING 407 ETR
- PROPOSED 407 TWY
- CREEK FLOW DIRECTION
- EXISTING CULVERT
- PROPOSED CULVERT
- PROPOSED REGIONAL FLOODLINE

CROSS SECTION NUMBER

EX REG	PR REG	HEC ST
EX 100	PR 100	

PARSONS HEC-RAS SECTION

PROPOSED WL ELEVATION (m)

EXISTING UPDATED WL ELEVATION (m)

SCALE HORIZONTAL

5m 0m 10m 20m 30m

1:1000

DATE: SEPTEMBER 2016

SCALE: 1:1000

Ontario

PARSONS

625 COCHRANE DRIVE, SUITE 500
MARKHAM, ONTARIO L3R 9R9
TEL: 905-943-0500
FAX: 905-943-0400

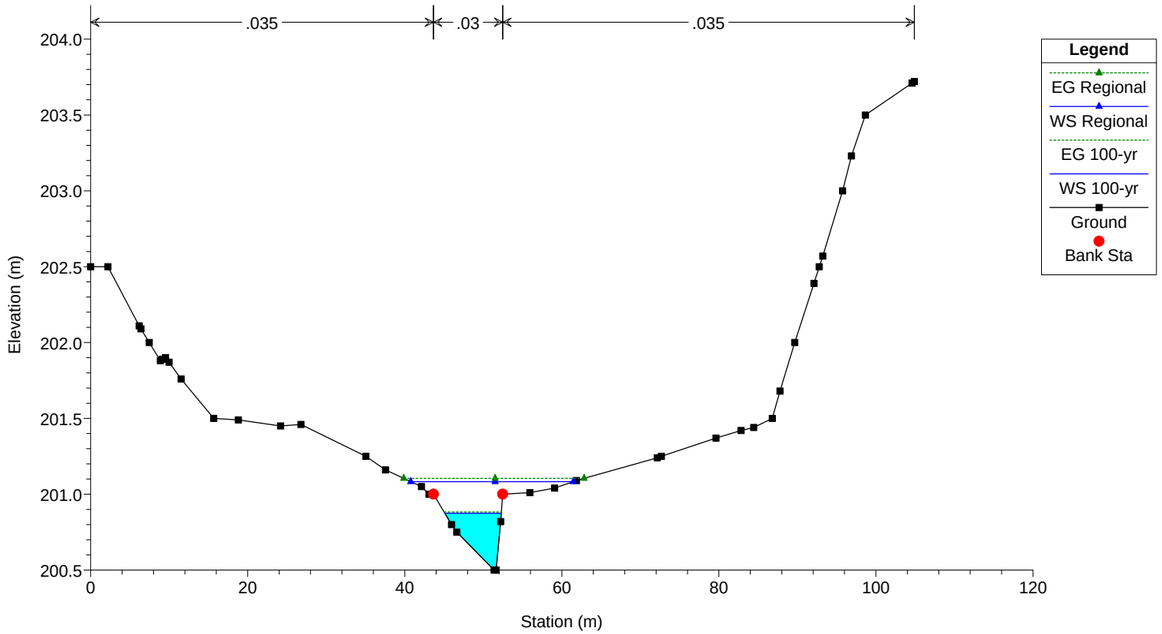
407 TRANSITWAY FROM KENNEDY RD TO BROCK RD

FIGURE 6.15 - HEC-RAS ANALYSIS - PETTICOAT CREEK (WC#21)

HEC-RAS ROUGE

Geom: WC21-EX Flow: WC#21 - Chicago 4hr (Known WS)

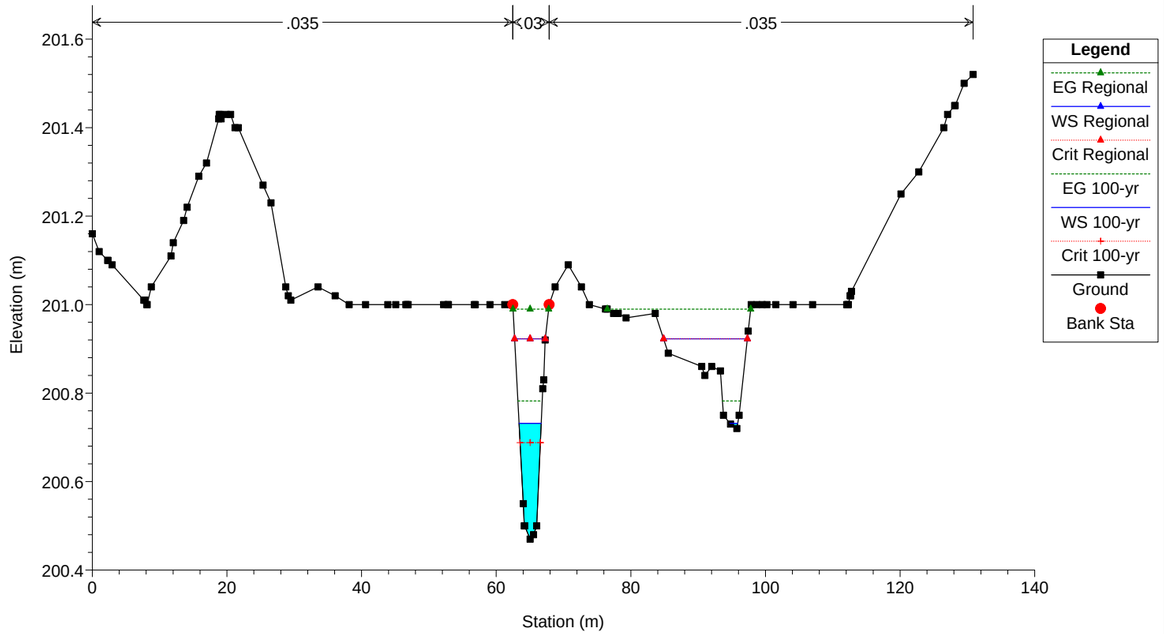
ST - 300



HEC-RAS ROUGE

Geom: WC21-EX Flow: WC#21 - Chicago 4hr (Known WS)

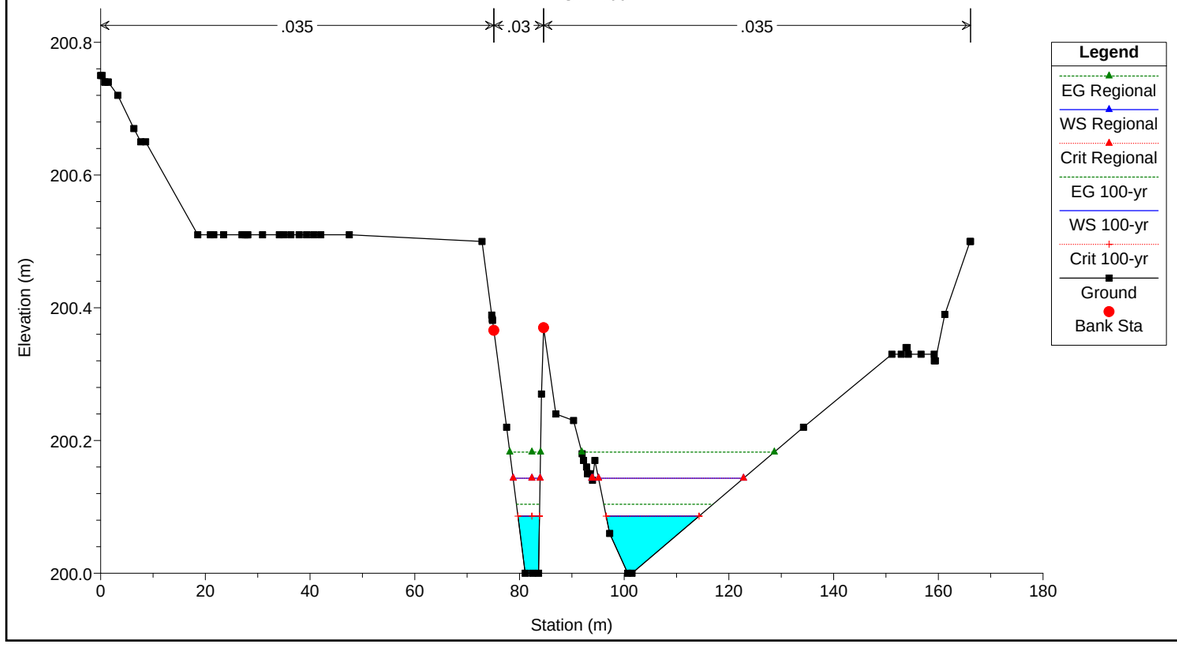
ST - 200



HEC-RAS ROUGE

Geom: WC21-EX Flow: WC#21 - Chicago 4hr (Known WS)

ST - 100



HEC-RAS Plan: WC21-EX-4hr CH River: Rouge Reach: WC21

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC21	300	2-yr	0.13	200.50	200.70		200.71	0.001338	0.27	0.48	4.46	0.27
WC21	300	5-yr	0.23	200.50	200.75		200.76	0.001300	0.31	0.74	5.52	0.27
WC21	300	10-yr	0.32	200.50	200.79		200.80	0.001194	0.33	0.96	6.10	0.27
WC21	300	25-yr	0.43	200.50	200.82		200.83	0.001297	0.37	1.15	6.51	0.28
WC21	300	50-yr	0.52	200.50	200.85		200.86	0.001274	0.39	1.32	6.85	0.29
WC21	300	100-yr	0.62	200.50	200.87		200.88	0.001255	0.41	1.50	7.18	0.29
WC21	300	Check Flow	0.80	200.50	200.91		200.92	0.001282	0.45	1.79	7.68	0.30
WC21	300	Regional	2.25	200.50	201.08		201.10	0.001545	0.66	3.86	20.69	0.35
WC21	200	2-yr	0.13	200.47	200.60	200.55	200.61	0.006456	0.56	0.23	2.43	0.57
WC21	200	5-yr	0.23	200.47	200.64	200.59	200.67	0.005694	0.64	0.36	2.74	0.57
WC21	200	10-yr	0.32	200.47	200.68	200.62	200.70	0.005719	0.71	0.45	2.94	0.58
WC21	200	25-yr	0.43	200.47	200.67	200.65	200.72	0.011836	1.00	0.43	2.90	0.83
WC21	200	50-yr	0.52	200.47	200.71	200.67	200.75	0.008991	0.97	0.54	3.13	0.74
WC21	200	100-yr	0.62	200.47	200.73	200.69	200.78	0.008473	1.00	0.63	4.46	0.73
WC21	200	Check Flow	0.80	200.47	200.78	200.72	200.83	0.006898	0.99	0.89	6.24	0.67
WC21	200	Regional	2.25	200.47	200.92	200.92	200.99	0.007545	1.28	2.42	17.02	0.74
WC21	100	2-yr	0.13	200.00	200.04	200.04	200.05	0.017237	0.49	0.35	12.97	0.81
WC21	100	5-yr	0.23	200.00	200.05	200.05	200.07	0.026806	0.68	0.45	14.68	1.03
WC21	100	10-yr	0.32	200.00	200.06	200.06	200.08	0.029567	0.77	0.56	16.24	1.10
WC21	100	25-yr	0.43	200.00	200.08	200.08	200.09	0.010378	0.56	1.03	21.17	0.69
WC21	100	50-yr	0.52	200.00	200.08	200.08	200.10	0.015177	0.68	1.03	21.17	0.83
WC21	100	100-yr	0.62	200.00	200.09	200.09	200.10	0.017862	0.75	1.11	21.84	0.91
WC21	100	Check Flow	0.80	200.00	200.09	200.09	200.12	0.029916	0.97	1.11	21.82	1.18
WC21	100	Regional	2.25	200.00	200.14	200.14	200.18	0.022405	1.12	2.67	33.04	1.09

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X    X
X     X  X        X           X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X           X  X     X    X        X
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PROJECT DATA
Project Title: HEC-RAS ROUGE
Project File : HEC.prj
Run Date and Time: 1/19/2016 3:19:58 PM

Project in SI units

Project Description:
HEC-RAS model for creek crossings along the proposed 407 TWY Ph 2 started from
scratch

PLAN DATA

Plan Title: Plan 14
Plan File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.p14

Geometry Title: WC21-EX
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g03

Flow Title : WC#21 - Chicago 4hr (Known WS)
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f10

Plan Summary Information:
Number of: Cross Sections = 3 Multiple Openings = 0
Culverts = 0 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: WC#21 - Chicago 4hr (Known WS)
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f10

Flow Data (m3/s)

River	Reach	RS	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Check Flow	Regional
Rouge	WC21	300	.13	.23	.32	.43	.52	.62	.8	2.25

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Rouge	WC21	2-yr		Critical
Rouge	WC21	5-yr		Critical
Rouge	WC21	10-yr		Critical
Rouge	WC21	25-yr		Critical
Rouge	WC21	50-yr		Critical
Rouge	WC21	100-yr		Critical
Rouge	WC21	Check Flow		Critical
Rouge	WC21	Regional		Critical

GEOMETRY DATA

Geometry Title: WC21-EX
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g03

CROSS SECTION

RIVER: Rouge
REACH: WC21 RS: 300

INPUT
Description: ST - 300
Station Elevation Data num= 47

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	202.5	2.2	202.5	6.18	202.11	6.4	202.09	7.46	202
8.87	201.88	9.13	201.89	9.52	201.89	9.54	201.9	9.98	201.87
11.52	201.76	15.68	201.5	18.81	201.49	24.19	201.45	26.78	201.46
35.04	201.25	37.55	201.16	42.13	201.05	43.07	201	43.65	201
45.96	200.8	46.63	200.75	51.37	200.5	51.44	200.5	51.45	200.5
51.63	200.5	52.21	200.82	52.46	201	55.92	201.01	59.08	201.04
61.86	201.09	72.17	201.24	72.68	201.25	79.63	201.37	82.83	201.42
84.44	201.44	86.79	201.5	87.78	201.68	89.66	202	92.11	202.39
92.78	202.5	93.23	202.57	95.75	203	96.87	203.23	98.65	203.5
104.6	203.71	104.89	203.72						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	43.65	.03	52.46	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
43.65 52.46 37.8 37.8 37.8 .1 .3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	200.71	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	200.70	Reach Len. (m)	37.80	37.80	37.80
Crit W.S. (m)		Flow Area (m2)		0.48	
E.G. Slope (m/m)	0.001338	Area (m2)		0.48	
Q Total (m3/s)	0.13	Flow (m3/s)		0.13	
Top Width (m)	4.46	Top Width (m)		4.46	
Vel Total (m/s)	0.27	Avg. Vel. (m/s)		0.27	
Max Chl Dpth (m)	0.20	Hydr. Depth (m)		0.11	
Conv. Total (m3/s)	3.6	Conv. (m3/s)		3.6	
Length Wtd. (m)	37.80	Wetted Per. (m)		4.51	
Min Ch El (m)	200.50	Shear (N/m2)		1.39	
Alpha	1.00	Stream Power (N/m s)	5021.91	0.00	0.00
Frctn Loss (m)	0.10	Cum Volume (1000 m3)		0.02	0.01
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.29	0.27

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	200.76	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	200.75	Reach Len. (m)	37.80	37.80	37.80
Crit W.S. (m)		Flow Area (m2)		0.74	
E.G. Slope (m/m)	0.001300	Area (m2)		0.74	
Q Total (m3/s)	0.23	Flow (m3/s)		0.23	
Top Width (m)	5.52	Top Width (m)		5.52	
Vel Total (m/s)	0.31	Avg. Vel. (m/s)		0.31	
Max Chl Dpth (m)	0.25	Hydr. Depth (m)		0.13	
Conv. Total (m3/s)	6.4	Conv. (m3/s)		6.4	
Length Wtd. (m)	37.80	Wetted Per. (m)		5.59	
Min Ch El (m)	200.50	Shear (N/m2)		1.68	
Alpha	1.00	Stream Power (N/m s)	5021.91	0.00	0.00
Frctn Loss (m)	0.09	Cum Volume (1000 m3)		0.03	0.01
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.33	0.31

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	200.80	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	200.79	Reach Len. (m)	37.80	37.80	37.80
Crit W.S. (m)		Flow Area (m2)		0.96	
E.G. Slope (m/m)	0.001194	Area (m2)		0.96	
Q Total (m3/s)	0.32	Flow (m3/s)		0.32	
Top Width (m)	6.10	Top Width (m)		6.10	
Vel Total (m/s)	0.33	Avg. Vel. (m/s)		0.33	
Max Chl Dpth (m)	0.29	Hydr. Depth (m)		0.16	
Conv. Total (m3/s)	9.3	Conv. (m3/s)		9.3	
Length Wtd. (m)	37.80	Wetted Per. (m)		6.19	
Min Ch El (m)	200.50	Shear (N/m2)		1.82	
Alpha	1.00	Stream Power (N/m s)	5021.91	0.00	0.00
Frctn Loss (m)	0.09	Cum Volume (1000 m3)		0.04	0.01
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.35	0.35

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	200.83	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	200.82	Reach Len. (m)	37.80	37.80	37.80
Crit W.S. (m)		Flow Area (m2)		1.15	
E.G. Slope (m/m)	0.001297	Area (m2)		1.15	
Q Total (m3/s)	0.43	Flow (m3/s)		0.43	
Top Width (m)	6.51	Top Width (m)		6.51	
Vel Total (m/s)	0.37	Avg. Vel. (m/s)		0.37	
Max Chl Dpth (m)	0.32	Hydr. Depth (m)		0.18	
Conv. Total (m3/s)	11.9	Conv. (m3/s)		11.9	
Length Wtd. (m)	37.80	Wetted Per. (m)		6.61	
Min Ch El (m)	200.50	Shear (N/m2)		2.21	
Alpha	1.00	Stream Power (N/m s)	5021.91	0.00	0.00
Frctn Loss (m)	0.11	Cum Volume (1000 m3)		0.05	0.02
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.37	0.48

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	200.86	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	200.85	Reach Len. (m)	37.80	37.80	37.80
Crit W.S. (m)		Flow Area (m2)		1.32	
E.G. Slope (m/m)	0.001274	Area (m2)		1.32	
Q Total (m3/s)	0.52	Flow (m3/s)		0.52	
Top Width (m)	6.85	Top Width (m)		6.85	
Vel Total (m/s)	0.39	Avg. Vel. (m/s)		0.39	
Max Chl Dpth (m)	0.35	Hydr. Depth (m)		0.19	
Conv. Total (m3/s)	14.6	Conv. (m3/s)		14.6	
Length Wtd. (m)	37.80	Wetted Per. (m)		6.95	
Min Ch El (m)	200.50	Shear (N/m2)		2.38	
Alpha	1.00	Stream Power (N/m s)	5021.91	0.00	0.00
Frctn Loss (m)	0.10	Cum Volume (1000 m3)		0.06	0.02
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.39	0.48

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	200.88	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	200.87	Reach Len. (m)	37.80	37.80	37.80
Crit W.S. (m)		Flow Area (m2)		1.50	
E.G. Slope (m/m)	0.001255	Area (m2)		1.50	
Q Total (m3/s)	0.62	Flow (m3/s)		0.62	
Top Width (m)	7.18	Top Width (m)		7.18	
Vel Total (m/s)	0.41	Avg. Vel. (m/s)		0.41	
Max Chl Dpth (m)	0.37	Hydr. Depth (m)		0.21	
Conv. Total (m3/s)	17.5	Conv. (m3/s)		17.5	
Length Wtd. (m)	37.80	Wetted Per. (m)		7.30	
Min Ch El (m)	200.50	Shear (N/m2)		2.54	
Alpha	1.00	Stream Power (N/m s)	5021.91	0.00	0.00
Frctn Loss (m)	0.10	Cum Volume (1000 m3)		0.07	0.02
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.40	0.55

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	200.92	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	200.91	Reach Len. (m)	37.80	37.80	37.80
Crit W.S. (m)		Flow Area (m2)		1.79	
E.G. Slope (m/m)	0.001282	Area (m2)		1.79	
Q Total (m3/s)	0.80	Flow (m3/s)		0.80	
Top Width (m)	7.68	Top Width (m)		7.68	
Vel Total (m/s)	0.45	Avg. Vel. (m/s)		0.45	
Max Chl Dpth (m)	0.41	Hydr. Depth (m)		0.23	
Conv. Total (m3/s)	22.3	Conv. (m3/s)		22.3	
Length Wtd. (m)	37.80	Wetted Per. (m)		7.81	
Min Ch El (m)	200.50	Shear (N/m2)		2.88	
Alpha	1.00	Stream Power (N/m s)	5021.91	0.00	0.00
Frctn Loss (m)	0.09	Cum Volume (1000 m3)		0.08	0.03
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.43	0.62

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	201.10	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.	0.035	0.030	0.035
W.S. Elev (m)	201.08	Reach Len. (m)	37.80	37.80	37.80

Crit W.S. (m)		Flow Area (m2)	0.12	3.24	0.50
E.G. Slope (m/m)	0.001545	Area (m2)	0.12	3.24	0.50
Q Total (m3/s)	2.25	Flow (m3/s)	0.02	2.15	0.08
Top Width (m)	20.69	Top Width (m)	2.88	8.81	9.00
Vel Total (m/s)	0.58	Avg. Vel. (m/s)	0.14	0.66	0.16
Max Chl Dpth (m)	0.58	Hydr. Depth (m)	0.04	0.37	0.06
Conv. Total (m3/s)	57.2	Conv. (m3/s)	0.4	54.7	2.1
Length Wtd. (m)	37.80	Wetted Per. (m)	2.88	8.97	9.00
Min Ch El (m)	200.50	Shear (N/m2)	0.65	5.47	0.84
Alpha	1.25	Stream Power (N/m s)	5021.91	0.00	0.00
Frctn Loss (m)	0.11	Cum Volume (1000 m3)	0.00	0.14	0.12
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.05	0.52	1.53

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Rouge
REACH: WC21 RS: 200

INPUT
Description: ST - 200
Station Elevation Data num= 101

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	201.16	1.01	201.12	2.28	201.1	2.32	201.1	2.94	201.09
7.65	201.01	7.78	201.01	7.81	201.01	8.11	201	8.15	201
8.76	201.04	11.68	201.11	12.02	201.14	13.56	201.19	14.08	201.22
15.81	201.29	16.95	201.32	18.77	201.42	18.86	201.43	18.99	201.43
19.13	201.42	19.93	201.43	20.54	201.43	21.19	201.4	21.68	201.4
25.36	201.27	26.55	201.23	28.74	201.04	29.12	201.02	29.49	201.01
33.52	201.04	36.07	201.02	38.15	201	40.59	201	43.89	201
45.08	201	46.58	201	46.75	201	46.92	201	52.18	201
52.81	201	52.91	201	56.74	201	56.9	201	59.07	201
61.26	201	62.19	201	62.46	201	64.02	200.55	64.17	200.5
64.21	200.5	64.23	200.5	65.04	200.47	65.55	200.48	66.01	200.5
66.91	200.81	67.06	200.83	67.27	200.92	67.87	201	68.75	201.04
70.7	201.09	72.65	201.04	73.84	201	76.24	200.99	76.48	200.99
77.44	200.98	77.93	200.98	78.14	200.98	79.29	200.97	83.63	200.98
85.56	200.89	90.53	200.86	91.01	200.84	92.02	200.86	93.31	200.85
93.76	200.75	94.8	200.73	95.74	200.72	96.09	200.75	97.44	200.94
97.89	201	98.71	201	99.51	201	100.21	201	101.54	201
104.1	201	107	201	112.06	201	112.18	201	112.31	201
112.57	201.02	112.67	201.02	112.78	201.03	120.14	201.25	122.78	201.3
126.5	201.4	127.06	201.43	128.11	201.45	128.19	201.45	129.51	201.5
130.84	201.52								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	62.46	.03	67.87	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
62.46	67.87	55.8	55.8	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	200.61	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	200.60	Reach Len. (m)	55.80	55.80	55.80
Crit W.S. (m)	200.55	Flow Area (m2)		0.23	
E.G. Slope (m/m)	0.006456	Area (m2)		0.23	
Q Total (m3/s)	0.13	Flow (m3/s)		0.13	
Top Width (m)	2.43	Top Width (m)		2.43	
Vel Total (m/s)	0.56	Avg. Vel. (m/s)		0.56	
Max Chl Dpth (m)	0.13	Hydr. Depth (m)		0.10	
Conv. Total (m3/s)	1.6	Conv. (m3/s)		1.6	
Length Wtd. (m)	55.80	Wetted Per. (m)		2.46	
Min Ch El (m)	200.47	Shear (N/m2)		6.01	
Alpha	1.00	Stream Power (N/m s)	6264.34	0.00	0.00
Frctn Loss (m)	0.55	Cum Volume (1000 m3)		0.01	0.01
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.16	0.27

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	200.67	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	200.64	Reach Len. (m)	55.80	55.80	55.80
Crit W.S. (m)	200.59	Flow Area (m2)		0.36	
E.G. Slope (m/m)	0.005694	Area (m2)		0.36	
Q Total (m3/s)	0.23	Flow (m3/s)		0.23	
Top Width (m)	2.74	Top Width (m)		2.74	
Vel Total (m/s)	0.64	Avg. Vel. (m/s)		0.64	
Max Chl Dpth (m)	0.17	Hydr. Depth (m)		0.13	
Conv. Total (m3/s)	3.0	Conv. (m3/s)		3.0	
Length Wtd. (m)	55.80	Wetted Per. (m)		2.78	
Min Ch El (m)	200.47	Shear (N/m2)		7.19	
Alpha	1.00	Stream Power (N/m s)	6264.34	0.00	0.00
Frctn Loss (m)	0.60	Cum Volume (1000 m3)		0.01	0.01
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.17	0.31

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	200.70	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.030	
W.S. Elev (m)	200.68	Reach Len. (m)	55.80	55.80	55.80
Crit W.S. (m)	200.62	Flow Area (m2)		0.45	
E.G. Slope (m/m)	0.005719	Area (m2)		0.45	
Q Total (m3/s)	0.32	Flow (m3/s)		0.32	
Top Width (m)	2.94	Top Width (m)		2.94	
Vel Total (m/s)	0.71	Avg. Vel. (m/s)		0.71	
Max Chl Dpth (m)	0.21	Hydr. Depth (m)		0.15	
Conv. Total (m3/s)	4.2	Conv. (m3/s)		4.2	
Length Wtd. (m)	55.80	Wetted Per. (m)		3.00	
Min Ch El (m)	200.47	Shear (N/m2)		8.41	
Alpha	1.00	Stream Power (N/m s)	6264.34	0.00	0.00
Frctn Loss (m)	0.62	Cum Volume (1000 m3)		0.02	0.01
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.18	0.35

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	200.72	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.030	
W.S. Elev (m)	200.67	Reach Len. (m)	55.80	55.80	55.80
Crit W.S. (m)	200.65	Flow Area (m2)		0.43	
E.G. Slope (m/m)	0.011836	Area (m2)		0.43	
Q Total (m3/s)	0.43	Flow (m3/s)		0.43	
Top Width (m)	2.90	Top Width (m)		2.90	
Vel Total (m/s)	1.00	Avg. Vel. (m/s)		1.00	
Max Chl Dpth (m)	0.20	Hydr. Depth (m)		0.15	
Conv. Total (m3/s)	4.0	Conv. (m3/s)		4.0	
Length Wtd. (m)	55.80	Wetted Per. (m)		2.95	
Min Ch El (m)	200.47	Shear (N/m2)		16.88	

Alpha	1.00	Stream Power (N/m s)	6264.34	0.00	0.00
Frctn Loss (m)	0.62	Cum Volume (1000 m3)		0.02	0.02
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.19	0.48

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	200.75	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.030	
W.S. Elev (m)	200.71	Reach Len. (m)	55.80	55.80	55.80
Crit W.S. (m)	200.67	Flow Area (m2)		0.54	
E.G. Slope (m/m)	0.008991	Area (m2)		0.54	
Q Total (m3/s)	0.52	Flow (m3/s)		0.52	
Top Width (m)	3.13	Top Width (m)		3.13	
Vel Total (m/s)	0.97	Avg. Vel. (m/s)		0.97	
Max Chl Dpth (m)	0.24	Hydr. Depth (m)		0.17	
Conv. Total (m3/s)	5.5	Conv. (m3/s)		5.5	
Length Wtd. (m)	55.80	Wetted Per. (m)		3.19	
Min Ch El (m)	200.47	Shear (N/m2)		14.88	
Alpha	1.00	Stream Power (N/m s)	6264.34	0.00	0.00
Frctn Loss (m)	0.64	Cum Volume (1000 m3)		0.02	0.02
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.20	0.48

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	200.78	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.030	0.035
W.S. Elev (m)	200.73	Reach Len. (m)	55.80	55.80	55.80
Crit W.S. (m)	200.69	Flow Area (m2)		0.62	0.01
E.G. Slope (m/m)	0.008473	Area (m2)		0.62	0.01
Q Total (m3/s)	0.62	Flow (m3/s)		0.62	0.00
Top Width (m)	4.46	Top Width (m)		3.29	1.16
Vel Total (m/s)	0.99	Avg. Vel. (m/s)		1.00	0.09
Max Chl Dpth (m)	0.26	Hydr. Depth (m)		0.19	0.01
Conv. Total (m3/s)	6.7	Conv. (m3/s)		6.7	0.0
Length Wtd. (m)	55.80	Wetted Per. (m)		3.37	1.16
Min Ch El (m)	200.47	Shear (N/m2)		15.35	0.51
Alpha	1.02	Stream Power (N/m s)	6264.34	0.00	0.00
Frctn Loss (m)	0.66	Cum Volume (1000 m3)		0.03	0.02
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.21	0.53

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	200.83	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.030	0.035
W.S. Elev (m)	200.78	Reach Len. (m)	55.80	55.80	55.80
Crit W.S. (m)	200.72	Flow Area (m2)		0.78	0.11
E.G. Slope (m/m)	0.006898	Area (m2)		0.78	0.11
Q Total (m3/s)	0.80	Flow (m3/s)		0.77	0.03
Top Width (m)	6.24	Top Width (m)		3.59	2.65
Vel Total (m/s)	0.90	Avg. Vel. (m/s)		0.99	0.28
Max Chl Dpth (m)	0.31	Hydr. Depth (m)		0.22	0.04
Conv. Total (m3/s)	9.6	Conv. (m3/s)		9.3	0.4
Length Wtd. (m)	55.80	Wetted Per. (m)		3.67	2.66
Min Ch El (m)	200.47	Shear (N/m2)		14.37	2.76
Alpha	1.16	Stream Power (N/m s)	6264.34	0.00	0.00
Frctn Loss (m)	0.70	Cum Volume (1000 m3)		0.03	0.03
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.21	0.57

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	200.99	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.030	0.035
W.S. Elev (m)	200.92	Reach Len. (m)	55.80	55.80	55.80
Crit W.S. (m)	200.92	Flow Area (m2)		1.37	1.05
E.G. Slope (m/m)	0.007545	Area (m2)		1.37	1.05
Q Total (m3/s)	2.25	Flow (m3/s)		1.75	0.50
Top Width (m)	17.02	Top Width (m)		4.56	12.46
Vel Total (m/s)	0.93	Avg. Vel. (m/s)		1.28	0.47
Max Chl Dpth (m)	0.45	Hydr. Depth (m)		0.30	0.08
Conv. Total (m3/s)	25.9	Conv. (m3/s)		20.2	5.7
Length Wtd. (m)	55.80	Wetted Per. (m)		4.70	12.48
Min Ch El (m)	200.47	Shear (N/m2)		21.65	6.20
Alpha	1.52	Stream Power (N/m s)	6264.34	0.00	0.00
Frctn Loss (m)	0.67	Cum Volume (1000 m3)		0.05	0.09
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.27	1.13

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: Rouge
REACH: WC21 RS: 100

INPUT
Description: ST - 100
Station Elevation Data num= 66

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	200.75	.3	200.75	.77	200.74	.85	200.74	1.4	200.74
1.44	200.74	3.29	200.72	6.35	200.67	7.66	200.65	8.59	200.65
18.55	200.51	20.97	200.51	21.61	200.51	23.5	200.51	26.99	200.51
27.44	200.51	27.67	200.51	27.7	200.51	28	200.51	28.05	200.51
28.09	200.51	30.92	200.51	34.14	200.51	34.96	200.51	36.33	200.51
37.91	200.51	39.34	200.51	40.69	200.51	42.03	200.51	47.48	200.51
72.83	200.5	74.7	200.389	74.8	200.383	74.84	200.381	75.1	200.366
77.55	200.22	81.09	200	82.47	200	83.64	200	84.21	200.27
84.62	200.37	86.96	200.24	90.33	200.23	91.97	200.18	92.22	200.17
92.81	200.16	92.98	200.15	93.47	200.15	93.94	200.14	94.41	200.17
97.22	200.06	100.67	200	101.5	200	134.25	200.22	151.14	200.33
152.91	200.33	153.84	200.34	154.05	200.34	154.27	200.33	156.7	200.33
159.22	200.33	159.23	200.32	159.42	200.32	161.23	200.39	166.07	200.5
166.16	200.5								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	75.1	.03	84.62	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
75.1	84.62	0	0	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	200.05	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	0.035
W.S. Elev (m)	200.04	Reach Len. (m)			
Crit W.S. (m)	200.04	Flow Area (m2)		0.13	0.22
E.G. Slope (m/m)	0.017237	Area (m2)		0.13	0.22
Q Total (m3/s)	0.13	Flow (m3/s)		0.06	0.07
Top Width (m)	12.97	Top Width (m)		3.33	9.65
Vel Total (m/s)	0.37	Avg. Vel. (m/s)		0.49	0.31
Max Chl Dpth (m)	0.04	Hydr. Depth (m)		0.04	0.02
Conv. Total (m3/s)	1.0	Conv. (m3/s)		0.5	0.5
Length Wtd. (m)		Wetted Per. (m)		3.34	9.65
Min Ch El (m)	200.00	Shear (N/m2)		6.36	3.92
Alpha	1.18	Stream Power (N/m s)	7955.38	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	200.07	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	0.035
W.S. Elev (m)	200.05	Reach Len. (m)			
Crit W.S. (m)	200.05	Flow Area (m2)		0.15	0.30
E.G. Slope (m/m)	0.026806	Area (m2)		0.15	0.30
Q Total (m3/s)	0.23	Flow (m3/s)		0.10	0.13
Top Width (m)	14.68	Top Width (m)		3.47	11.21
Vel Total (m/s)	0.51	Avg. Vel. (m/s)		0.68	0.42
Max Chl Dpth (m)	0.05	Hydr. Depth (m)		0.04	0.03
Conv. Total (m3/s)	1.4	Conv. (m3/s)		0.6	0.8
Length Wtd. (m)		Wetted Per. (m)		3.48	11.22
Min Ch El (m)	200.00	Shear (N/m2)		11.44	7.11
Alpha	1.18	Stream Power (N/m s)	7955.38	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	200.08	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	0.035
W.S. Elev (m)	200.06	Reach Len. (m)			
Crit W.S. (m)	200.06	Flow Area (m2)		0.18	0.39
E.G. Slope (m/m)	0.029567	Area (m2)		0.18	0.39
Q Total (m3/s)	0.32	Flow (m3/s)		0.13	0.19
Top Width (m)	16.24	Top Width (m)		3.59	12.65
Vel Total (m/s)	0.57	Avg. Vel. (m/s)		0.77	0.48
Max Chl Dpth (m)	0.06	Hydr. Depth (m)		0.05	0.03
Conv. Total (m3/s)	1.9	Conv. (m3/s)		0.8	1.1
Length Wtd. (m)		Wetted Per. (m)		3.61	12.65
Min Ch El (m)	200.00	Shear (N/m2)		14.15	8.85
Alpha	1.17	Stream Power (N/m s)	7955.38	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	200.09	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	0.035
W.S. Elev (m)	200.08	Reach Len. (m)			
Crit W.S. (m)	200.08	Flow Area (m2)		0.27	0.76
E.G. Slope (m/m)	0.010378	Area (m2)		0.27	0.76
Q Total (m3/s)	0.43	Flow (m3/s)		0.15	0.28
Top Width (m)	21.17	Top Width (m)		4.05	17.12
Vel Total (m/s)	0.42	Avg. Vel. (m/s)		0.56	0.37
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.07	0.04
Conv. Total (m3/s)	4.2	Conv. (m3/s)		1.5	2.7
Length Wtd. (m)		Wetted Per. (m)		4.07	17.12
Min Ch El (m)	200.00	Shear (N/m2)		6.80	4.52
Alpha	1.14	Stream Power (N/m s)	7955.38	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	200.10	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	0.035
W.S. Elev (m)	200.08	Reach Len. (m)			
Crit W.S. (m)	200.08	Flow Area (m2)		0.27	0.76
E.G. Slope (m/m)	0.015177	Area (m2)		0.27	0.76
Q Total (m3/s)	0.52	Flow (m3/s)		0.18	0.34
Top Width (m)	21.17	Top Width (m)		4.05	17.12
Vel Total (m/s)	0.50	Avg. Vel. (m/s)		0.68	0.44
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.07	0.04
Conv. Total (m3/s)	4.2	Conv. (m3/s)		1.5	2.7
Length Wtd. (m)		Wetted Per. (m)		4.07	17.12
Min Ch El (m)	200.00	Shear (N/m2)		9.94	6.62
Alpha	1.14	Stream Power (N/m s)	7955.38	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	200.10	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	0.035
W.S. Elev (m)	200.09	Reach Len. (m)			
Crit W.S. (m)	200.09	Flow Area (m2)		0.29	0.82
E.G. Slope (m/m)	0.017862	Area (m2)		0.29	0.82
Q Total (m3/s)	0.62	Flow (m3/s)		0.21	0.41
Top Width (m)	21.84	Top Width (m)		4.11	17.73
Vel Total (m/s)	0.56	Avg. Vel. (m/s)		0.75	0.49
Max Chl Dpth (m)	0.09	Hydr. Depth (m)		0.07	0.05
Conv. Total (m3/s)	4.6	Conv. (m3/s)		1.6	3.0
Length Wtd. (m)		Wetted Per. (m)		4.14	17.73
Min Ch El (m)	200.00	Shear (N/m2)		12.12	8.12
Alpha	1.13	Stream Power (N/m s)	7955.38	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	200.12	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.030	0.035
W.S. Elev (m)	200.09	Reach Len. (m)			
Crit W.S. (m)	200.09	Flow Area (m2)		0.29	0.82
E.G. Slope (m/m)	0.029916	Area (m2)		0.29	0.82
Q Total (m3/s)	0.80	Flow (m3/s)		0.28	0.52
Top Width (m)	21.82	Top Width (m)		4.11	17.71
Vel Total (m/s)	0.72	Avg. Vel. (m/s)		0.97	0.64
Max Chl Dpth (m)	0.09	Hydr. Depth (m)		0.07	0.05
Conv. Total (m3/s)	4.6	Conv. (m3/s)		1.6	3.0
Length Wtd. (m)		Wetted Per. (m)		4.13	17.71
Min Ch El (m)	200.00	Shear (N/m2)		20.28	13.58
Alpha	1.13	Stream Power (N/m s)	7955.38	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			

C & E Loss (m)		Cum SA (1000 m2)			

Warning: Divided flow computed for this cross-section.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	200.18	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.030	0.035
W.S. Elev (m)	200.14	Reach Len. (m)			
Crit W.S. (m)	200.14	Flow Area (m2)		0.55	2.12
E.G. Slope (m/m)	0.022405	Area (m2)		0.55	2.12
Q Total (m3/s)	2.25	Flow (m3/s)		0.62	1.63
Top Width (m)	33.04	Top Width (m)		5.15	27.88
Vel Total (m/s)	0.84	Avg. Vel. (m/s)		1.12	0.77
Max Chl Dpth (m)	0.14	Hydr. Depth (m)		0.11	0.08
Conv. Total (m3/s)	15.0	Conv. (m3/s)		4.1	10.9
Length Wtd. (m)		Wetted Per. (m)		5.19	27.89
Min Ch El (m)	200.00	Shear (N/m2)		23.32	16.70
Alpha	1.09	Stream Power (N/m s)	7955.38	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

Warning: Divided flow computed for this cross-section.

SUMMARY OF MANNING'S N VALUES

River:Rouge

Reach	River Sta.	n1	n2	n3
WC21	300	.035	.03	.035
WC21	200	.035	.03	.035
WC21	100	.035	.03	.035

SUMMARY OF REACH LENGTHS

River: Rouge

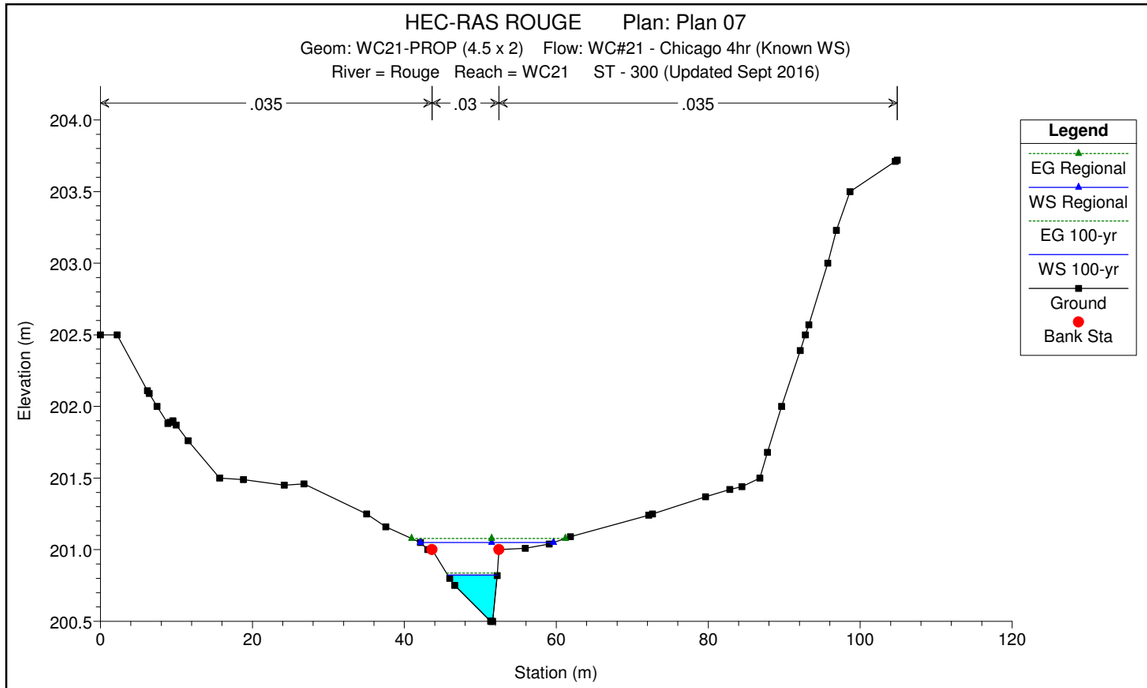
Reach	River Sta.	Left	Channel	Right
WC21	300	37.8	37.8	37.8
WC21	200	55.8	55.8	55.8
WC21	100	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Rouge

Reach	River Sta.	Contr.	Expan.
WC21	300	.1	.3
WC21	200	.1	.3
WC21	100	.1	.3

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
WC21	300	2-yr	0.13	200.50	200.70		200.71	0.001338	0.27	0.48	4.46	0.27
WC21	300	5-yr	0.23	200.50	200.75		200.76	0.001300	0.31	0.74	5.52	0.27
WC21	300	10-yr	0.32	200.50	200.79		200.80	0.001194	0.33	0.96	6.10	0.27
WC21	300	25-yr	0.43	200.50	200.82		200.83	0.001297	0.37	1.15	6.51	0.28
WC21	300	50-yr	0.52	200.50	200.85		200.86	0.001274	0.39	1.32	6.85	0.29
WC21	300	100-yr	0.62	200.50	200.87		200.88	0.001255	0.41	1.50	7.18	0.29
WC21	300	Check Flow	0.80	200.50	200.91		200.92	0.001282	0.45	1.79	7.68	0.30
WC21	300	Regional	2.25	200.50	201.08		201.10	0.001545	0.66	3.86	20.69	0.35
WC21	200	2-yr	0.13	200.47	200.60	200.55	200.61	0.006456	0.56	0.23	2.43	0.57
WC21	200	5-yr	0.23	200.47	200.64	200.59	200.67	0.005694	0.64	0.36	2.74	0.57
WC21	200	10-yr	0.32	200.47	200.68	200.62	200.70	0.005719	0.71	0.45	2.94	0.58
WC21	200	25-yr	0.43	200.47	200.67	200.65	200.72	0.011836	1.00	0.43	2.90	0.83
WC21	200	50-yr	0.52	200.47	200.71	200.67	200.75	0.008991	0.97	0.54	3.13	0.74
WC21	200	100-yr	0.62	200.47	200.73	200.69	200.78	0.008473	1.00	0.63	4.46	0.73
WC21	200	Check Flow	0.80	200.47	200.78	200.72	200.83	0.006898	0.99	0.89	6.24	0.67
WC21	200	Regional	2.25	200.47	200.92	200.92	200.99	0.007545	1.28	2.42	17.02	0.74
WC21	100	2-yr	0.13	200.00	200.04	200.04	200.05	0.017237	0.49	0.35	12.97	0.81
WC21	100	5-yr	0.23	200.00	200.05	200.05	200.07	0.026806	0.68	0.45	14.68	1.03
WC21	100	10-yr	0.32	200.00	200.06	200.06	200.08	0.029567	0.77	0.56	16.24	1.10
WC21	100	25-yr	0.43	200.00	200.08	200.08	200.09	0.010378	0.56	1.03	21.17	0.69
WC21	100	50-yr	0.52	200.00	200.08	200.08	200.10	0.015177	0.68	1.03	21.17	0.83
WC21	100	100-yr	0.62	200.00	200.09	200.09	200.10	0.017862	0.75	1.11	21.84	0.91
WC21	100	Check Flow	0.80	200.00	200.09	200.09	200.12	0.029916	0.97	1.11	21.82	1.18
WC21	100	Regional	2.25	200.00	200.14	200.14	200.18	0.022405	1.12	2.67	33.04	1.09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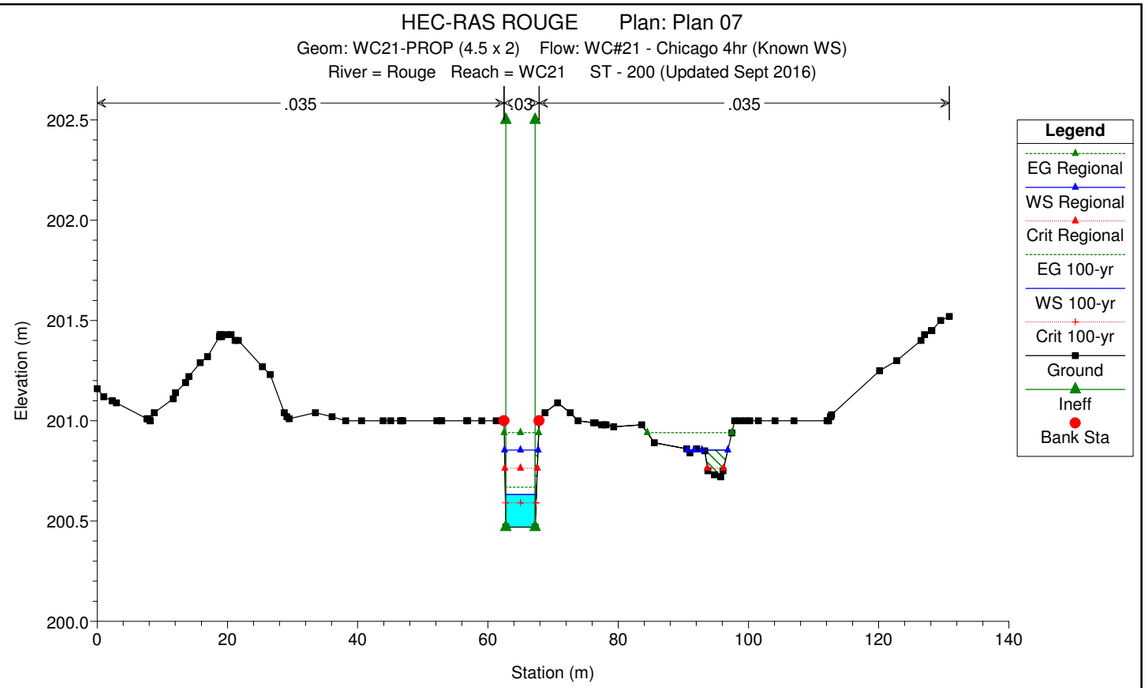
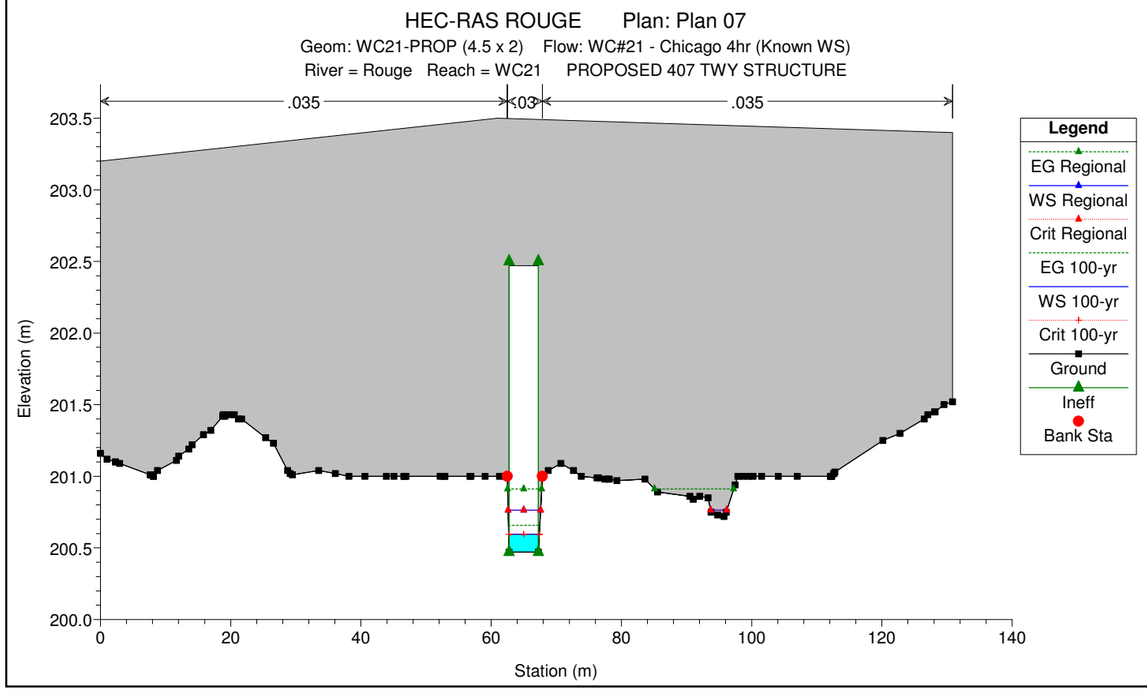
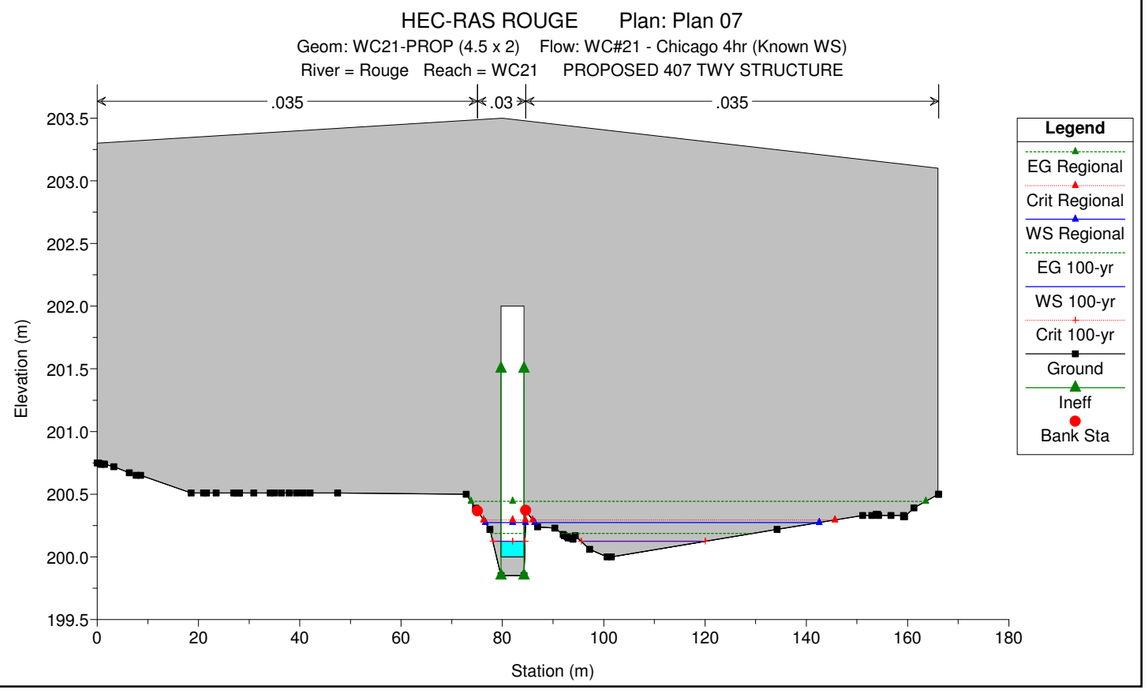
Geom: WC21-PROP (4.5 x 2) Flow: WC#21 - Chicago 4hr (Known WS)
River = Rouge Reach = WC21 ST - 300 (Updated Sept 2016)
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Bank Sta


HEC-RAS ROUGE Plan: Plan 07
Geom: WC21-PROP (4.5 x 2) Flow: WC#21 - Chicago 4hr (Known WS)
River = Rouge Reach = WC21 ST - 200 (Updated Sept 2016)
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Ineff
Bank Sta

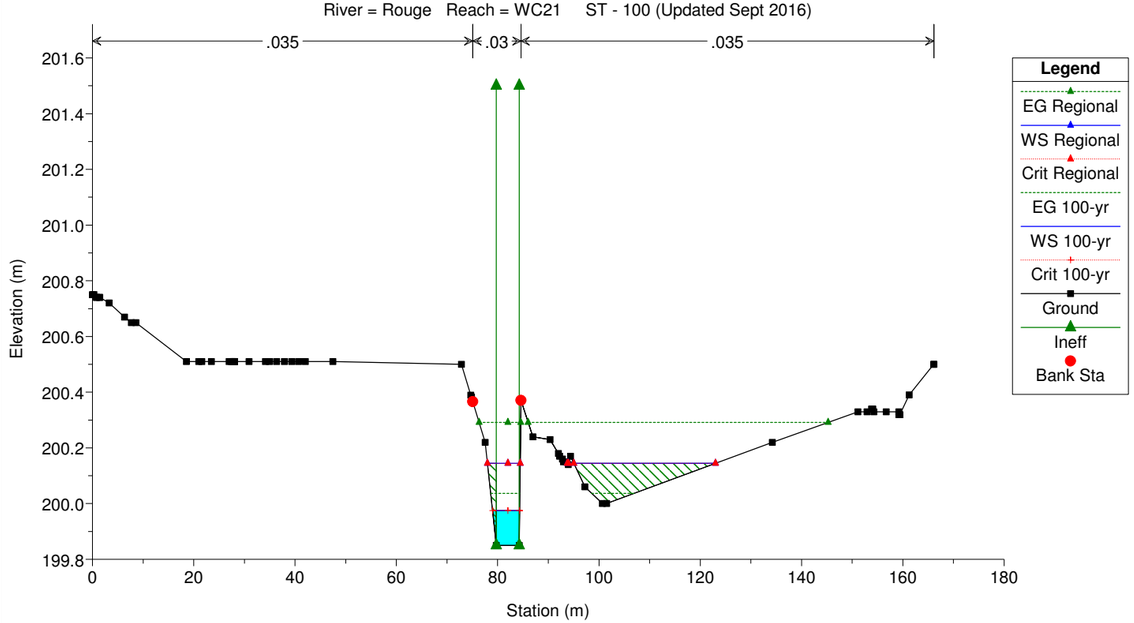

HEC-RAS ROUGE Plan: Plan 07
Geom: WC21-PROP (4.5 x 2) Flow: WC#21 - Chicago 4hr (Known WS)
River = Rouge Reach = WC21 PROPOSED 407 TWY STRUCTURE
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Ineff
Bank Sta


HEC-RAS ROUGE Plan: Plan 07
Geom: WC21-PROP (4.5 x 2) Flow: WC#21 - Chicago 4hr (Known WS)
River = Rouge Reach = WC21 PROPOSED 407 TWY STRUCTURE
.035
.03
.035
Elevation (m)
Station (m)
Legend
EG Regional
Crit Regional
WS Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Ineff
Bank Sta

HEC-RAS ROUGE Plan: Plan 07

Geom: WC21-PROP (4.5 x 2) Flow: WC#21 - Chicago 4hr (Known WS)

River = Rouge Reach = WC21 ST - 100 (Updated Sept 2016)



HEC-RAS Plan: WC21- PROP-4hr CH River: Rouge Reach: WC21

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC21	300	2-yr	0.13	200.50	200.69	200.61	200.69	0.001823	0.31	0.42	4.21	0.31
WC21	300	5-yr	0.23	200.50	200.73		200.74	0.002184	0.38	0.61	5.03	0.35
WC21	300	10-yr	0.32	200.50	200.76		200.77	0.002289	0.42	0.76	5.59	0.36
WC21	300	25-yr	0.43	200.50	200.78		200.79	0.002555	0.48	0.90	5.96	0.39
WC21	300	50-yr	0.52	200.50	200.80		200.82	0.002598	0.51	1.03	6.26	0.40
WC21	300	100-yr	0.62	200.50	200.82		200.84	0.002728	0.54	1.14	6.50	0.41
WC21	300	Check Flow	0.80	200.50	200.85		200.87	0.002773	0.59	1.36	6.92	0.42
WC21	300	Regional	2.25	200.50	201.05		201.08	0.002226	0.75	3.24	17.50	0.41
WC21	200	2-yr	0.13	200.47	200.52	200.51	200.54	0.012261	0.53	0.25	4.59	0.73
WC21	200	5-yr	0.23	200.47	200.55	200.53	200.57	0.011006	0.65	0.36	4.64	0.73
WC21	200	10-yr	0.32	200.47	200.57	200.55	200.60	0.010131	0.72	0.45	4.67	0.73
WC21	200	25-yr	0.43	200.47	200.60	200.58	200.63	0.008284	0.76	0.57	4.72	0.69
WC21	200	50-yr	0.52	200.47	200.61	200.59	200.65	0.008124	0.82	0.64	4.74	0.69
WC21	200	100-yr	0.62	200.47	200.63	200.59	200.67	0.007398	0.85	0.73	4.78	0.68
WC21	200	Check Flow	0.80	200.47	200.66	200.62	200.71	0.006910	0.92	0.87	4.83	0.67
WC21	200	Regional	2.25	200.47	200.85	200.76	200.94	0.005491	1.30	1.73	10.11	0.67
WC21	150		Culvert									
WC21	100	2-yr	0.13	199.85	199.90	199.90	199.92	0.015558	0.57	0.23	4.84	0.81
WC21	100	5-yr	0.23	199.85	199.91	199.91	199.95	0.022039	0.79	0.29	4.93	1.00
WC21	100	10-yr	0.32	199.85	199.92	199.92	199.97	0.027944	0.97	0.33	4.99	1.15
WC21	100	25-yr	0.43	199.85	199.96	199.96	200.00	0.014801	0.91	0.47	5.20	0.89
WC21	100	50-yr	0.52	199.85	199.96	199.96	200.02	0.019394	1.06	0.49	5.23	1.02
WC21	100	100-yr	0.62	199.85	199.97	199.97	200.04	0.017696	1.11	0.56	5.33	1.00
WC21	100	Check Flow	0.80	199.85	200.00	200.00	200.07	0.016653	1.20	0.67	5.48	1.00
WC21	100	Regional	2.25	199.85	200.14	200.14	200.29	0.013235	1.70	1.33	34.71	1.00

HEC-RAS HEC-RAS 5.0.1 April 2016
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: HEC-RAS ROUGE
Project File : HEC.prj
Run Date and Time: 9/8/2016 11:11:11 AM

Project in SI units

Project Description:
HEC-RAS model for creek crossings along the proposed 407 TWY Ph 2 started
from scratch

PLAN DATA

Plan Title: Plan 07
Plan File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.p07

Geometry Title: WC21-PROP (4.5 x 2)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g23

Flow Title : WC#21 - Chicago 4hr (Known WS)
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f10

Plan Summary Information:
Number of: Cross Sections = 3 Multiple Openings = 0
Culverts = 1 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: WC#21 - Chicago 4hr (Known WS)
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.f10

Flow Data (m3/s)

River	Reach	RS	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Check Flow	Regional
Rouge	WC21	300	.13	.23	.32	.43	.52	.62	.8	2.25

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
Rouge	WC21	2-yr		Critical
Rouge	WC21	5-yr		Critical
Rouge	WC21	10-yr		Critical
Rouge	WC21	25-yr		Critical
Rouge	WC21	50-yr		Critical
Rouge	WC21	100-yr		Critical
Rouge	WC21	Check Flow		Critical
Rouge	WC21	Regional		Critical

GEOMETRY DATA

Geometry Title: WC21-PROP (4.5 x 2)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\ROUGE\HEC-RAS ROU\HEC.g23

CROSS SECTION

RIVER: Rouge
REACH: WC21 RS: 300

INPUT
Description: ST - 300 (Updated Sept 2016)
Station Elevation Data num= 47

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	202.5	2.2	202.5	6.18	202.11	6.4	202.09	7.46	202
8.87	201.88	9.13	201.89	9.52	201.89	9.54	201.9	9.98	201.87
11.52	201.76	15.68	201.5	18.81	201.49	24.19	201.45	26.78	201.46
35.04	201.25	37.55	201.16	42.13	201.05	43.07	201	43.65	201
45.96	200.8	46.63	200.75	51.37	200.5	51.44	200.5	51.45	200.5
51.63	200.5	52.21	200.82	52.46	201	55.92	201.01	59.08	201.04
61.86	201.09	72.17	201.24	72.68	201.25	79.63	201.37	82.83	201.42
84.44	201.44	86.79	201.5	87.78	201.68	89.66	202	92.11	202.39
92.78	202.5	93.23	202.57	95.75	203	96.87	203.23	98.65	203.5
104.6	203.71	104.89	203.72						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	43.65	.03	52.46	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
43.65 52.46 37.8 37.8 37.8 .3 .5

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	200.69	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.030	
W.S. Elev (m)	200.69	Reach Len. (m)	37.80	37.80	37.80
Crit W.S. (m)	200.61	Flow Area (m2)		0.42	
E.G. Slope (m/m)	0.001823	Area (m2)		0.42	
Q Total (m3/s)	0.13	Flow (m3/s)		0.13	
Top Width (m)	4.21	Top Width (m)		4.21	
Vel Total (m/s)	0.31	Avg. Vel. (m/s)		0.31	
Max Chl Dpth (m)	0.19	Hydr. Depth (m)		0.10	
Conv. Total (m3/s)	3.0	Conv. (m3/s)		3.0	
Length Wtd. (m)	37.80	Wetted Per. (m)		4.26	
Min Ch El (m)	200.50	Shear (N/m2)		1.78	
Alpha	1.00	Stream Power (N/m s)		0.55	
Frctn Loss (m)	0.14	Cum Volume (1000 m3)		0.03	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.43	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	200.74	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	200.73	Reach Len. (m)	37.80	37.80	37.80
Crit W.S. (m)		Flow Area (m2)		0.61	
E.G. Slope (m/m)	0.002184	Area (m2)		0.61	
Q Total (m3/s)	0.23	Flow (m3/s)		0.23	
Top Width (m)	5.03	Top Width (m)		5.03	
Vel Total (m/s)	0.38	Avg. Vel. (m/s)		0.38	
Max Chl Dpth (m)	0.23	Hydr. Depth (m)		0.12	
Conv. Total (m3/s)	4.9	Conv. (m3/s)		4.9	
Length Wtd. (m)	37.80	Wetted Per. (m)		5.10	
Min Ch El (m)	200.50	Shear (N/m2)		2.56	
Alpha	1.00	Stream Power (N/m s)		0.97	
Frctn Loss (m)	0.16	Cum Volume (1000 m3)		0.04	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.45	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	200.77	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	200.76	Reach Len. (m)	37.80	37.80	37.80
Crit W.S. (m)		Flow Area (m2)		0.76	
E.G. Slope (m/m)	0.002289	Area (m2)		0.76	
Q Total (m3/s)	0.32	Flow (m3/s)		0.32	
Top Width (m)	5.59	Top Width (m)		5.59	
Vel Total (m/s)	0.42	Avg. Vel. (m/s)		0.42	
Max Chl Dpth (m)	0.26	Hydr. Depth (m)		0.14	
Conv. Total (m3/s)	6.7	Conv. (m3/s)		6.7	
Length Wtd. (m)	37.80	Wetted Per. (m)		5.66	
Min Ch El (m)	200.50	Shear (N/m2)		3.03	
Alpha	1.00	Stream Power (N/m s)		1.27	
Frctn Loss (m)	0.16	Cum Volume (1000 m3)		0.05	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.46	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	200.79	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	200.78	Reach Len. (m)	37.80	37.80	37.80
Crit W.S. (m)		Flow Area (m2)		0.90	
E.G. Slope (m/m)	0.002555	Area (m2)		0.90	
Q Total (m3/s)	0.43	Flow (m3/s)		0.43	
Top Width (m)	5.96	Top Width (m)		5.96	
Vel Total (m/s)	0.48	Avg. Vel. (m/s)		0.48	
Max Chl Dpth (m)	0.28	Hydr. Depth (m)		0.15	
Conv. Total (m3/s)	8.5	Conv. (m3/s)		8.5	
Length Wtd. (m)	37.80	Wetted Per. (m)		6.04	
Min Ch El (m)	200.50	Shear (N/m2)		3.75	
Alpha	1.00	Stream Power (N/m s)		1.78	
Frctn Loss (m)	0.16	Cum Volume (1000 m3)		0.06	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.48	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	200.82	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	200.80	Reach Len. (m)	37.80	37.80	37.80
Crit W.S. (m)		Flow Area (m2)		1.03	
E.G. Slope (m/m)	0.002598	Area (m2)		1.03	
Q Total (m3/s)	0.52	Flow (m3/s)		0.52	
Top Width (m)	6.26	Top Width (m)		6.26	
Vel Total (m/s)	0.51	Avg. Vel. (m/s)		0.51	
Max Chl Dpth (m)	0.30	Hydr. Depth (m)		0.16	
Conv. Total (m3/s)	10.2	Conv. (m3/s)		10.2	
Length Wtd. (m)	37.80	Wetted Per. (m)		6.35	
Min Ch El (m)	200.50	Shear (N/m2)		4.13	
Alpha	1.00	Stream Power (N/m s)		2.09	
Frctn Loss (m)	0.16	Cum Volume (1000 m3)		0.07	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.49	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	200.84	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	200.82	Reach Len. (m)	37.80	37.80	37.80
Crit W.S. (m)		Flow Area (m2)		1.14	
E.G. Slope (m/m)	0.002728	Area (m2)		1.14	
Q Total (m3/s)	0.62	Flow (m3/s)		0.62	
Top Width (m)	6.50	Top Width (m)		6.50	
Vel Total (m/s)	0.54	Avg. Vel. (m/s)		0.54	
Max Chl Dpth (m)	0.32	Hydr. Depth (m)		0.18	
Conv. Total (m3/s)	11.9	Conv. (m3/s)		11.9	
Length Wtd. (m)	37.80	Wetted Per. (m)		6.60	
Min Ch El (m)	200.50	Shear (N/m2)		4.64	
Alpha	1.00	Stream Power (N/m s)		2.51	
Frctn Loss (m)	0.16	Cum Volume (1000 m3)		0.07	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.50	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	200.87	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	200.85	Reach Len. (m)	37.80	37.80	37.80
Crit W.S. (m)		Flow Area (m2)		1.36	
E.G. Slope (m/m)	0.002773	Area (m2)		1.36	
Q Total (m3/s)	0.80	Flow (m3/s)		0.80	
Top Width (m)	6.92	Top Width (m)		6.92	
Vel Total (m/s)	0.59	Avg. Vel. (m/s)		0.59	
Max Chl Dpth (m)	0.35	Hydr. Depth (m)		0.20	
Conv. Total (m3/s)	15.2	Conv. (m3/s)		15.2	
Length Wtd. (m)	37.80	Wetted Per. (m)		7.03	
Min Ch El (m)	200.50	Shear (N/m2)		5.27	
Alpha	1.00	Stream Power (N/m s)		3.10	
Frctn Loss (m)	0.16	Cum Volume (1000 m3)		0.09	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.51	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	201.08	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.	0.035	0.030	0.035
W.S. Elev (m)	201.05	Reach Len. (m)	37.80	37.80	37.80
Crit W.S. (m)		Flow Area (m2)	0.05	2.95	0.24
E.G. Slope (m/m)	0.002226	Area (m2)	0.05	2.95	0.24
Q Total (m3/s)	2.25	Flow (m3/s)	0.01	2.21	0.03
Top Width (m)	17.50	Top Width (m)	1.52	8.81	7.17

Vel Total (m/s)	0.69	Avg. Vel. (m/s)	0.14	0.75	0.14		
Max Chl Dpth (m)	0.55	Hydr. Depth (m)	0.03	0.33	0.03		
Conv. Total (m3/s)	47.7	Conv. (m3/s)	0.2	46.8	0.7		
Length Wtd. (m)	37.80	Wetted Per. (m)	1.52	8.97	7.17		
Min Ch El (m)	200.50	Shear (N/m2)	0.75	7.18	0.72		
Alpha	1.14	Stream Power (N/m s)	0.11	5.38	0.10		
Frctn Loss (m)	0.13	Cum Volume (1000 m3)	0.00	0.18	0.01		
C & E Loss (m)	0.02	Cum SA (1000 m2)	0.03	0.59	1.16		

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: Rouge
REACH: WC21 RS: 200

INPUT
Description: ST - 200 (Updated Sept 2016)
Station Elevation Data num= 93

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	201.16	1.01	201.12	2.28	201.1	2.32	201.1	2.94	201.09
7.65	201.01	7.78	201.01	7.81	201.01	8.11	201	8.15	201
8.76	201.04	11.68	201.11	12.02	201.14	13.56	201.19	14.08	201.22
15.81	201.29	16.95	201.32	18.77	201.42	18.86	201.43	18.99	201.43
19.13	201.42	19.93	201.43	20.54	201.43	21.19	201.4	21.68	201.4
25.36	201.27	26.55	201.23	28.74	201.04	29.12	201.02	29.49	201.01
33.52	201.04	36.07	201.02	38.15	201	40.59	201	43.89	201
45.08	201	46.58	201	46.75	201	46.92	201	52.18	201
52.81	201	52.91	201	56.74	201	56.9	201	59.07	201
61.26	201	62.19	201	62.46	201	62.75	200.47	67.25	200.47
67.87	201	68.75	201.04	70.7	201.09	72.65	201.04	73.84	201
76.24	200.99	76.48	200.99	77.44	200.98	77.93	200.98	78.14	200.98
79.29	200.97	83.63	200.98	85.56	200.89	90.53	200.86	91.01	200.84
92.02	200.86	93.31	200.85	93.76	200.75	94.8	200.73	95.74	200.72
96.09	200.75	97.44	200.94	97.89	201	98.71	201	99.51	201
100.21	201	101.54	201	104.1	201	107	201	112.06	201
112.18	201	112.31	201	112.57	201.02	112.67	201.02	112.78	201.03
120.14	201.25	122.78	201.3	126.5	201.4	127.06	201.43	128.11	201.45
128.19	201.45	129.51	201.5	130.84	201.52				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	62.46	.03	67.87	.035

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
62.46	67.87	55.8	55.8	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	62.75	202.5	T
67.25	130.84	202.5	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	200.54	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.030	
W.S. Elev (m)	200.52	Reach Len. (m)	55.80	55.80	55.80
Crit W.S. (m)	200.51	Flow Area (m2)		0.25	
E.G. Slope (m/m)	0.012261	Area (m2)		0.25	
Q Total (m3/s)	0.13	Flow (m3/s)		0.13	
Top Width (m)	4.59	Top Width (m)		4.59	
Vel Total (m/s)	0.53	Avg. Vel. (m/s)		0.53	
Max Chl Dpth (m)	0.05	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	1.2	Conv. (m3/s)		1.2	
Length Wtd. (m)	55.80	Wetted Per. (m)		4.50	
Min Ch El (m)	200.47	Shear (N/m2)		6.55	
Alpha	1.00	Stream Power (N/m s)		3.47	
Frctn Loss (m)		Cum Volume (1000 m3)		0.01	
C & E Loss (m)		Cum SA (1000 m2)		0.26	

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	200.57	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	200.55	Reach Len. (m)	55.80	55.80	55.80
Crit W.S. (m)	200.53	Flow Area (m2)		0.36	
E.G. Slope (m/m)	0.011006	Area (m2)		0.36	
Q Total (m3/s)	0.23	Flow (m3/s)		0.23	
Top Width (m)	4.64	Top Width (m)		4.64	
Vel Total (m/s)	0.65	Avg. Vel. (m/s)		0.65	
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	2.2	Conv. (m3/s)		2.2	
Length Wtd. (m)	55.80	Wetted Per. (m)		4.50	
Min Ch El (m)	200.47	Shear (N/m2)		8.55	
Alpha	1.00	Stream Power (N/m s)		5.52	
Frctn Loss (m)		Cum Volume (1000 m3)		0.02	
C & E Loss (m)		Cum SA (1000 m2)		0.27	

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	200.60	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.030	
W.S. Elev (m)	200.57	Reach Len. (m)	55.80	55.80	55.80
Crit W.S. (m)	200.55	Flow Area (m2)		0.45	
E.G. Slope (m/m)	0.010131	Area (m2)		0.45	
Q Total (m3/s)	0.32	Flow (m3/s)		0.32	
Top Width (m)	4.67	Top Width (m)		4.67	
Vel Total (m/s)	0.72	Avg. Vel. (m/s)		0.72	
Max Chl Dpth (m)	0.10	Hydr. Depth (m)		0.10	
Conv. Total (m3/s)	3.2	Conv. (m3/s)		3.2	
Length Wtd. (m)	55.80	Wetted Per. (m)		4.50	
Min Ch El (m)	200.47	Shear (N/m2)		9.84	
Alpha	1.00	Stream Power (N/m s)		7.07	
Frctn Loss (m)		Cum Volume (1000 m3)		0.03	
C & E Loss (m)		Cum SA (1000 m2)		0.27	

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	200.63	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.030	
W.S. Elev (m)	200.60	Reach Len. (m)	55.80	55.80	55.80
Crit W.S. (m)	200.58	Flow Area (m2)		0.57	
E.G. Slope (m/m)	0.008284	Area (m2)		0.58	
Q Total (m3/s)	0.43	Flow (m3/s)		0.43	
Top Width (m)	4.72	Top Width (m)		4.72	
Vel Total (m/s)	0.76	Avg. Vel. (m/s)		0.76	
Max Chl Dpth (m)	0.13	Hydr. Depth (m)		0.13	
Conv. Total (m3/s)	4.7	Conv. (m3/s)		4.7	
Length Wtd. (m)	55.80	Wetted Per. (m)		4.50	
Min Ch El (m)	200.47	Shear (N/m2)		10.20	
Alpha	1.00	Stream Power (N/m s)		7.76	
Frctn Loss (m)		Cum Volume (1000 m3)		0.03	
C & E Loss (m)		Cum SA (1000 m2)		0.28	

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	200.65	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.030	
W.S. Elev (m)	200.61	Reach Len. (m)	55.80	55.80	55.80
Crit W.S. (m)	200.59	Flow Area (m2)		0.64	
E.G. Slope (m/m)	0.008124	Area (m2)		0.65	
Q Total (m3/s)	0.52	Flow (m3/s)		0.52	
Top Width (m)	4.74	Top Width (m)		4.74	
Vel Total (m/s)	0.82	Avg. Vel. (m/s)		0.82	
Max Chl Dpth (m)	0.14	Hydr. Depth (m)		0.14	
Conv. Total (m3/s)	5.8	Conv. (m3/s)		5.8	
Length Wtd. (m)	55.80	Wetted Per. (m)		4.50	
Min Ch El (m)	200.47	Shear (N/m2)		11.28	

Alpha	1.00	Stream Power (N/m s)	9.21
Frctn Loss (m)		Cum Volume (1000 m3)	0.03
C & E Loss (m)		Cum SA (1000 m2)	0.28

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	200.67	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.030	
W.S. Elev (m)	200.63	Reach Len. (m)	55.80	55.80	55.80
Crit W.S. (m)	200.59	Flow Area (m2)		0.73	
E.G. Slope (m/m)	0.007398	Area (m2)		0.75	
Q Total (m3/s)	0.62	Flow (m3/s)		0.62	
Top Width (m)	4.78	Top Width (m)		4.78	
Vel Total (m/s)	0.85	Avg. Vel. (m/s)		0.85	
Max Chl Dpth (m)	0.16	Hydr. Depth (m)		0.16	
Conv. Total (m3/s)	7.2	Conv. (m3/s)		7.2	
Length Wtd. (m)	55.80	Wetted Per. (m)		4.50	
Min Ch El (m)	200.47	Shear (N/m2)		11.74	
Alpha	1.00	Stream Power (N/m s)		10.00	
Frctn Loss (m)		Cum Volume (1000 m3)		0.04	
C & E Loss (m)		Cum SA (1000 m2)		0.28	

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	200.71	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.030	
W.S. Elev (m)	200.66	Reach Len. (m)	55.80	55.80	55.80
Crit W.S. (m)	200.62	Flow Area (m2)		0.87	
E.G. Slope (m/m)	0.006910	Area (m2)		0.90	
Q Total (m3/s)	0.80	Flow (m3/s)		0.80	
Top Width (m)	4.83	Top Width (m)		4.83	
Vel Total (m/s)	0.92	Avg. Vel. (m/s)		0.92	
Max Chl Dpth (m)	0.19	Hydr. Depth (m)		0.19	
Conv. Total (m3/s)	9.6	Conv. (m3/s)		9.6	
Length Wtd. (m)	55.80	Wetted Per. (m)		4.50	
Min Ch El (m)	200.47	Shear (N/m2)		13.04	
Alpha	1.00	Stream Power (N/m s)		12.05	
Frctn Loss (m)		Cum Volume (1000 m3)		0.05	
C & E Loss (m)		Cum SA (1000 m2)		0.29	

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	200.94	Element	Left OB	Channel	Right OB
Vel Head (m)	0.09	Wt. n-Val.		0.030	
W.S. Elev (m)	200.85	Reach Len. (m)	55.80	55.80	55.80
Crit W.S. (m)	200.76	Flow Area (m2)		1.73	
E.G. Slope (m/m)	0.005491	Area (m2)		1.85	0.35
Q Total (m3/s)	2.25	Flow (m3/s)		2.25	
Top Width (m)	10.11	Top Width (m)		5.16	4.96
Vel Total (m/s)	1.30	Avg. Vel. (m/s)		1.30	
Max Chl Dpth (m)	0.38	Hydr. Depth (m)		0.38	
Conv. Total (m3/s)	30.4	Conv. (m3/s)		30.4	
Length Wtd. (m)	55.80	Wetted Per. (m)		4.50	
Min Ch El (m)	200.47	Shear (N/m2)		20.65	
Alpha	1.00	Stream Power (N/m s)		26.92	
Frctn Loss (m)		Cum Volume (1000 m3)		0.09	
C & E Loss (m)		Cum SA (1000 m2)		0.32	0.93

CULVERT

RIVER: Rouge
REACH: WC21 RS: 150

INPUT
Description: PROPOSED 407 TWY STRUCTURE
Distance from Upstream XS = 25
Deck/Roadway Width = 14
Weir Coefficient = 1.4
Upstream Deck/Roadway Coordinates
num= 3

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0	203.2	61	203.5	131	203.4

Upstream Bridge Cross Section Data
Station Elevation Data num= 93

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	201.16	1.01	201.12	2.28	201.1	2.32	201.1	2.94	201.09
7.65	201.01	7.78	201.01	7.81	201.01	8.11	201	8.15	201
8.76	201.04	11.68	201.11	12.02	201.14	13.56	201.19	14.08	201.22
15.81	201.29	16.95	201.32	18.77	201.42	18.86	201.43	18.99	201.43
19.13	201.42	19.93	201.43	20.54	201.43	21.19	201.4	21.68	201.4
25.36	201.27	26.55	201.23	28.74	201.04	29.12	201.02	29.49	201.01
33.52	201.04	36.07	201.02	38.15	201	40.59	201	43.89	201
45.08	201	46.58	201	46.75	201	46.92	201	52.18	201
52.81	201	52.91	201	56.74	201	56.9	201	59.07	201
61.26	201	62.19	201	62.46	201	62.75	200.47	67.25	200.47
67.87	201	68.75	201.04	70.7	201.09	72.65	201.04	73.84	201
76.24	200.99	76.48	200.99	77.44	200.98	77.93	200.98	78.14	200.98
79.29	200.97	83.63	200.98	85.56	200.89	90.53	200.86	91.01	200.84
92.02	200.86	93.31	200.85	93.76	200.75	94.8	200.73	95.74	200.72
96.09	200.75	97.44	200.94	97.89	201	98.71	201	99.51	201
100.21	201	101.54	201	104.1	201	107	201	112.06	201
112.18	201	112.31	201	112.57	201.02	112.67	201.02	112.78	201.03
120.14	201.25	122.78	201.3	126.5	201.4	127.06	201.43	128.11	201.45
128.19	201.45	129.51	201.5	130.84	201.52				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	62.46	.03	67.87	.035

Bank Sta: Left Right Coeff Contr. Expan.
62.46 67.87 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	62.75	202.5	T
67.25	130.84	202.5	T

Downstream Deck/Roadway Coordinates
num= 3

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0	203.3	80	203.5	166	203.1

Downstream Bridge Cross Section Data
Station Elevation Data num= 64

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	200.75	.3	200.75	.77	200.74	.85	200.74	1.4	200.74
1.44	200.74	3.29	200.72	6.35	200.67	7.66	200.65	8.59	200.65
18.55	200.51	20.97	200.51	21.61	200.51	23.5	200.51	26.99	200.51
27.44	200.51	27.67	200.51	27.7	200.51	28	200.51	28.05	200.51
28.09	200.51	30.92	200.51	34.14	200.51	34.96	200.51	36.33	200.51
37.91	200.51	39.34	200.51	40.69	200.51	42.03	200.51	47.48	200.51
72.83	200.5	74.7	200.389	74.8	200.383	74.84	200.381	75.1	200.366
77.55	200.22	79.75	199.85	84.25	199.85	84.62	200.37	86.96	200.24
90.33	200.23	91.97	200.18	92.22	200.17	92.81	200.16	92.98	200.15
93.47	200.15	93.94	200.14	94.41	200.17	97.22	200.06	100.67	200
101.5	200	134.25	200.22	151.14	200.33	152.91	200.33	153.84	200.34
154.05	200.34	154.27	200.33	156.7	200.33	159.22	200.33	159.23	200.32
159.42	200.32	161.23	200.39	166.07	200.5	166.16	200.5		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	75.1	.03	84.62	.035

Bank Sta: Left Right Coeff Contr. Expan.
75.1 84.62 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	79.75	201.5	T
84.25	166.16	201.5	T

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Upstream Embankment side slope             =       2 horiz. to 1.0 vertical
Downstream Embankment side slope           =       2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins        =
Energy head used in spillway design        =
Spillway height used in design             =
Weir crest shape                           = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1           Box       2     4.5
FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                 13      38     .013     .025        0                   .2               1
Upstream   Elevation =  200.47
           Centerline Station =  65
Downstream Elevation =  200
           Centerline Station =  82

CULVERT OUTPUT  Profile #2-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.13    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         0.58
  Q Barrel (m3/s)           0.13    Culv Vel DS (m/s)         0.66
  E.G. US. (m)            200.54    Culv Inv El Up (m)      200.47
  W.S. US. (m)            200.52    Culv Inv El Dn (m)      200.00
  E.G. DS (m)             199.92    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             199.90    Culv Exit Loss (m)        0.15
  Delta EG (m)              0.62    Culv Entr Loss (m)        0.00
  Delta WS (m)              0.62    Q Weir (m3/s)
  E.G. IC (m)             200.52    Weir Sta Lft (m)
  E.G. OC (m)             200.54    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       200.52    Weir Max Depth (m)
  Culv WS Outlet (m)      200.04    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.05    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.04    Min El Weir Flow (m)    203.20


Note:    During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth.  Therefore, the
         inlet will be at normal depth.

CULVERT OUTPUT  Profile #5-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.23    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         0.74
  Q Barrel (m3/s)           0.23    Culv Vel DS (m/s)         0.79
  E.G. US. (m)            200.57    Culv Inv El Up (m)      200.47
  W.S. US. (m)            200.55    Culv Inv El Dn (m)      200.00
  E.G. DS (m)             199.95    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             199.91    Culv Exit Loss (m)        0.15
  Delta EG (m)              0.63    Culv Entr Loss (m)        0.01
  Delta WS (m)              0.63    Q Weir (m3/s)
  E.G. IC (m)             200.56    Weir Sta Lft (m)
  E.G. OC (m)             200.57    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       200.54    Weir Max Depth (m)
  Culv WS Outlet (m)      200.06    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.07    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.06    Min El Weir Flow (m)    203.20


Note:    During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth.  Therefore, the
         inlet will be at normal depth.

CULVERT OUTPUT  Profile #10-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.32    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         0.84
  Q Barrel (m3/s)           0.32    Culv Vel DS (m/s)         0.89
  E.G. US. (m)            200.60    Culv Inv El Up (m)      200.47
  W.S. US. (m)            200.57    Culv Inv El Dn (m)      200.00
  E.G. DS (m)             199.97    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             199.92    Culv Exit Loss (m)        0.15
  Delta EG (m)              0.63    Culv Entr Loss (m)        0.01
  Delta WS (m)              0.65    Q Weir (m3/s)
  E.G. IC (m)             200.58    Weir Sta Lft (m)
  E.G. OC (m)             200.60    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       200.55    Weir Max Depth (m)
  Culv WS Outlet (m)      200.08    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.08    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.08    Min El Weir Flow (m)    203.20


Note:    During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth.  Therefore, the
         inlet will be at normal depth.

CULVERT OUTPUT  Profile #25-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.43    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         0.95
  Q Barrel (m3/s)           0.43    Culv Vel DS (m/s)         0.98
  E.G. US. (m)            200.63    Culv Inv El Up (m)      200.47
  W.S. US. (m)            200.60    Culv Inv El Dn (m)      200.00
  E.G. DS (m)             200.00    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             199.96    Culv Exit Loss (m)        0.15
  Delta EG (m)              0.63    Culv Entr Loss (m)        0.01
  Delta WS (m)              0.64    Q Weir (m3/s)
  E.G. IC (m)             200.61    Weir Sta Lft (m)
  E.G. OC (m)             200.63    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       200.57    Weir Max Depth (m)
  Culv WS Outlet (m)      200.10    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.10    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.10    Min El Weir Flow (m)    203.20


Note:    During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth.  Therefore, the
         inlet will be at normal depth.

CULVERT OUTPUT  Profile #50-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.52    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         1.03
  Q Barrel (m3/s)           0.52    Culv Vel DS (m/s)         1.04
  E.G. US. (m)            200.65    Culv Inv El Up (m)      200.47
  W.S. US. (m)            200.61    Culv Inv El Dn (m)      200.00
  E.G. DS (m)             200.02    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             199.96    Culv Exit Loss (m)        0.15
  Delta EG (m)              0.63    Culv Entr Loss (m)        0.01
  Delta WS (m)              0.65    Q Weir (m3/s)
  E.G. IC (m)             200.63    Weir Sta Lft (m)
  E.G. OC (m)             200.65    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       200.58    Weir Max Depth (m)
  Culv WS Outlet (m)      200.11    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.11    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.11    Min El Weir Flow (m)    203.20


Note:    During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth.  Therefore, the
         inlet will be at normal depth.

CULVERT OUTPUT  Profile #100-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.62    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         1.10
  Q Barrel (m3/s)           0.62    Culv Vel DS (m/s)         1.11
  E.G. US. (m)            200.67    Culv Inv El Up (m)      200.47
```

W.S. US. (m)	200.63	Culv Inv El Dn (m)	200.00
E.G. DS (m)	200.04	Culv Frctn Ls (m)	0.00
W.S. DS (m)	199.97	Culv Exit Loss (m)	0.15
Delta EG (m)	0.63	Culv Entr Loss (m)	0.01
Delta WS (m)	0.66	Q Weir (m3/s)	
E.G. IC (m)	200.65	Weir Sta Lft (m)	
E.G. OC (m)	200.67	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	200.60	Weir Max Depth (m)	
Culv WS Outlet (m)	200.12	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.13	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.12	Min El Weir Flow (m)	203.20

Note: During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth. Therefore, the inlet will be at normal depth.

CULVERT OUTPUT Profile #Check Flow Culv Group: Culvert #1

Q Culv Group (m3/s)	0.80	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.20
Q Barrel (m3/s)	0.80	Culv Vel DS (m/s)	1.21
E.G. US. (m)	200.71	Culv Inv El Up (m)	200.47
W.S. US. (m)	200.66	Culv Inv El Dn (m)	200.00
E.G. DS (m)	200.07	Culv Frctn Ls (m)	0.00
W.S. DS (m)	200.00	Culv Exit Loss (m)	0.15
Delta EG (m)	0.63	Culv Entr Loss (m)	0.01
Delta WS (m)	0.66	Q Weir (m3/s)	
E.G. IC (m)	200.69	Weir Sta Lft (m)	
E.G. OC (m)	200.71	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	200.62	Weir Max Depth (m)	
Culv WS Outlet (m)	200.15	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.15	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.15	Min El Weir Flow (m)	203.20

Warning: Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross section downstream of the culvert has supercritical flow.
Note: During the supercritical analysis, the water surface at the inlet was within 0.01 feet of normal depth. Therefore, the outlet will be at normal depth.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #Regional Culv Group: Culvert #1

Q Culv Group (m3/s)	2.25	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.70
Q Barrel (m3/s)	2.25	Culv Vel DS (m/s)	1.82
E.G. US. (m)	200.94	Culv Inv El Up (m)	200.47
W.S. US. (m)	200.85	Culv Inv El Dn (m)	200.00
E.G. DS (m)	200.29	Culv Frctn Ls (m)	0.00
W.S. DS (m)	200.14	Culv Exit Loss (m)	0.15
Delta EG (m)	0.65	Culv Entr Loss (m)	0.03
Delta WS (m)	0.71	Q Weir (m3/s)	
E.G. IC (m)	200.92	Weir Sta Lft (m)	
E.G. OC (m)	200.94	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	200.76	Weir Max Depth (m)	
Culv WS Outlet (m)	200.27	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.27	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.29	Min El Weir Flow (m)	203.20

Warning: Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross section downstream of the culvert has supercritical flow.
Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CROSS SECTION

RIVER: Rouge
REACH: WC21 RS: 100

INPUT
Description: ST - 100 (Updated Sept 2016)
Station Elevation Data num= 64

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	200.75	.3	200.75	.77	200.74	.85	200.74	1.4	200.74
1.44	200.74	3.29	200.72	6.35	200.67	7.66	200.65	8.59	200.65
18.55	200.51	20.97	200.51	21.61	200.51	23.5	200.51	26.99	200.51
27.44	200.51	27.67	200.51	27.7	200.51	28	200.51	28.05	200.51
28.09	200.51	30.92	200.51	34.14	200.51	34.96	200.51	36.33	200.51
37.91	200.51	39.34	200.51	40.69	200.51	42.03	200.51	47.48	200.51
72.83	200.5	74.7	200.389	74.8	200.383	74.84	200.381	75.1	200.366
77.55	200.22	79.75	199.85	84.25	199.85	84.62	200.37	86.96	200.24
90.33	200.23	91.97	200.18	92.22	200.17	92.81	200.16	92.98	200.15
93.47	200.15	93.94	200.14	94.41	200.17	97.22	200.06	100.67	200
101.5	200	134.25	200.22	151.14	200.33	152.91	200.33	153.84	200.34
154.05	200.34	154.27	200.33	156.7	200.33	159.22	200.33	159.23	200.32
159.42	200.32	161.23	200.39	166.07	200.5	166.16	200.5		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.035	75.1	.03	84.62	.035

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
75.1 84.62 0 0 0 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	79.75	201.5	T
84.25	166.16	201.5	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	199.92	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.030	
W.S. Elev (m)	199.90	Reach Len. (m)			
Crit W.S. (m)	199.90	Flow Area (m2)		0.23	
E.G. Slope (m/m)	0.015558	Area (m2)		0.24	
Q Total (m3/s)	0.13	Flow (m3/s)		0.13	
Top Width (m)	4.84	Top Width (m)		4.84	
Vel Total (m/s)	0.57	Avg. Vel. (m/s)		0.57	
Max Chl Dpth (m)	0.05	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	1.0	Conv. (m3/s)		1.0	
Length Wtd. (m)		Wetted Per. (m)		4.50	
Min Ch El (m)	199.85	Shear (N/m2)		7.74	
Alpha	1.00	Stream Power (N/m s)		4.41	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	199.95	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.030	
W.S. Elev (m)	199.91	Reach Len. (m)			
Crit W.S. (m)	199.91	Flow Area (m2)		0.29	
E.G. Slope (m/m)	0.022039	Area (m2)		0.30	
Q Total (m3/s)	0.23	Flow (m3/s)		0.23	
Top Width (m)	4.93	Top Width (m)		4.93	
Vel Total (m/s)	0.79	Avg. Vel. (m/s)		0.79	
Max Chl Dpth (m)	0.06	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	1.5	Conv. (m3/s)		1.5	
Length Wtd. (m)		Wetted Per. (m)		4.50	
Min Ch El (m)	199.85	Shear (N/m2)		13.90	
Alpha	1.00	Stream Power (N/m s)		11.05	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	199.97	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.030	
W.S. Elev (m)	199.92	Reach Len. (m)			
Crit W.S. (m)	199.92	Flow Area (m2)		0.33	
E.G. Slope (m/m)	0.027944	Area (m2)		0.35	
Q Total (m3/s)	0.32	Flow (m3/s)		0.32	
Top Width (m)	4.99	Top Width (m)		4.99	
Vel Total (m/s)	0.97	Avg. Vel. (m/s)		0.97	
Max Chl Dpth (m)	0.07	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	1.9	Conv. (m3/s)		1.9	
Length Wtd. (m)		Wetted Per. (m)		4.50	
Min Ch El (m)	199.85	Shear (N/m2)		20.01	
Alpha	1.00	Stream Power (N/m s)		19.49	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	200.00	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.030	
W.S. Elev (m)	199.96	Reach Len. (m)			
Crit W.S. (m)	199.96	Flow Area (m2)		0.47	
E.G. Slope (m/m)	0.014801	Area (m2)		0.51	
Q Total (m3/s)	0.43	Flow (m3/s)		0.43	
Top Width (m)	5.20	Top Width (m)		5.20	
Vel Total (m/s)	0.91	Avg. Vel. (m/s)		0.91	
Max Chl Dpth (m)	0.11	Hydr. Depth (m)		0.11	
Conv. Total (m3/s)	3.5	Conv. (m3/s)		3.5	
Length Wtd. (m)		Wetted Per. (m)		4.50	
Min Ch El (m)	199.85	Shear (N/m2)		15.32	
Alpha	1.00	Stream Power (N/m s)		13.87	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	200.02	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.030	
W.S. Elev (m)	199.96	Reach Len. (m)			
Crit W.S. (m)	199.96	Flow Area (m2)		0.49	
E.G. Slope (m/m)	0.019394	Area (m2)		0.53	
Q Total (m3/s)	0.52	Flow (m3/s)		0.52	
Top Width (m)	5.23	Top Width (m)		5.23	
Vel Total (m/s)	1.06	Avg. Vel. (m/s)		1.06	
Max Chl Dpth (m)	0.11	Hydr. Depth (m)		0.11	
Conv. Total (m3/s)	3.7	Conv. (m3/s)		3.7	
Length Wtd. (m)		Wetted Per. (m)		4.50	
Min Ch El (m)	199.85	Shear (N/m2)		20.74	
Alpha	1.00	Stream Power (N/m s)		21.98	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	200.04	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.030	
W.S. Elev (m)	199.97	Reach Len. (m)			
Crit W.S. (m)	199.97	Flow Area (m2)		0.56	
E.G. Slope (m/m)	0.017696	Area (m2)		0.61	
Q Total (m3/s)	0.62	Flow (m3/s)		0.62	
Top Width (m)	5.33	Top Width (m)		5.33	
Vel Total (m/s)	1.11	Avg. Vel. (m/s)		1.11	
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.12	
Conv. Total (m3/s)	4.7	Conv. (m3/s)		4.7	
Length Wtd. (m)		Wetted Per. (m)		4.50	
Min Ch El (m)	199.85	Shear (N/m2)		21.62	
Alpha	1.00	Stream Power (N/m s)		23.91	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	200.07	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.030	
W.S. Elev (m)	200.00	Reach Len. (m)			
Crit W.S. (m)	200.00	Flow Area (m2)		0.67	
E.G. Slope (m/m)	0.016653	Area (m2)		0.74	
Q Total (m3/s)	0.80	Flow (m3/s)		0.80	
Top Width (m)	5.48	Top Width (m)		5.48	
Vel Total (m/s)	1.20	Avg. Vel. (m/s)		1.20	
Max Chl Dpth (m)	0.15	Hydr. Depth (m)		0.15	
Conv. Total (m3/s)	6.2	Conv. (m3/s)		6.2	
Length Wtd. (m)		Wetted Per. (m)		4.50	
Min Ch El (m)	199.85	Shear (N/m2)		24.14	
Alpha	1.00	Stream Power (N/m s)		29.03	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	200.29	Element	Left OB	Channel	Right OB
Vel Head (m)	0.15	Wt. n-Val.		0.030	
W.S. Elev (m)	200.14	Reach Len. (m)			
Crit W.S. (m)	200.14	Flow Area (m2)		1.33	
E.G. Slope (m/m)	0.013235	Area (m2)		1.61	2.16
Q Total (m3/s)	2.25	Flow (m3/s)		2.25	
Top Width (m)	34.71	Top Width (m)		6.46	28.24
Vel Total (m/s)	1.70	Avg. Vel. (m/s)		1.70	
Max Chl Dpth (m)	0.29	Hydr. Depth (m)		0.29	
Conv. Total (m3/s)	19.6	Conv. (m3/s)		19.6	
Length Wtd. (m)		Wetted Per. (m)		4.50	
Min Ch El (m)	199.85	Shear (N/m2)		38.23	
Alpha	1.00	Stream Power (N/m s)		64.89	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

Warning: Divided flow computed for this cross-section.

SUMMARY OF MANNING'S N VALUES

River:Rouge

Reach	River Sta.	n1	n2	n3
WC21	300	.035	.03	.035
WC21	200	.035	.03	.035
WC21	150	Culvert		
WC21	100	.035	.03	.035

SUMMARY OF REACH LENGTHS

River: Rouge

Reach	River Sta.	Left	Channel	Right
WC21	300	37.8	37.8	37.8
WC21	200	55.8	55.8	55.8
WC21	150	Culvert		
WC21	100	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: Rouge

Reach	River Sta.	Contr.	Expan.
WC21	300	.3	.5
WC21	200	.3	.5
WC21	150	Culvert	
WC21	100	.3	.5

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
WC21	300	2-yr	0.13	200.50	200.69	200.61	200.69	0.001823	0.31	0.42	4.21	0.31
WC21	300	5-yr	0.23	200.50	200.73		200.74	0.002184	0.38	0.61	5.03	0.35
WC21	300	10-yr	0.32	200.50	200.76		200.77	0.002289	0.42	0.76	5.59	0.36
WC21	300	25-yr	0.43	200.50	200.78		200.79	0.002555	0.48	0.90	5.96	0.39
WC21	300	50-yr	0.52	200.50	200.80		200.82	0.002598	0.51	1.03	6.26	0.40
WC21	300	100-yr	0.62	200.50	200.82		200.84	0.002728	0.54	1.14	6.50	0.41
WC21	300	Check Flow	0.80	200.50	200.85		200.87	0.002773	0.59	1.36	6.92	0.42
WC21	300	Regional	2.25	200.50	201.05		201.08	0.002226	0.75	3.24	17.50	0.41
WC21	200	2-yr	0.13	200.47	200.52	200.51	200.54	0.012261	0.53	0.25	4.59	0.73
WC21	200	5-yr	0.23	200.47	200.55	200.53	200.57	0.011006	0.65	0.36	4.64	0.73
WC21	200	10-yr	0.32	200.47	200.57	200.55	200.60	0.010131	0.72	0.45	4.67	0.73
WC21	200	25-yr	0.43	200.47	200.60	200.58	200.63	0.008284	0.76	0.57	4.72	0.69
WC21	200	50-yr	0.52	200.47	200.61	200.59	200.65	0.008124	0.82	0.64	4.74	0.69
WC21	200	100-yr	0.62	200.47	200.63	200.59	200.67	0.007398	0.85	0.73	4.78	0.68
WC21	200	Check Flow	0.80	200.47	200.66	200.62	200.71	0.006910	0.92	0.87	4.83	0.67
WC21	200	Regional	2.25	200.47	200.85	200.76	200.94	0.005491	1.30	1.73	10.11	0.67
WC21	150		Culvert									
WC21	100	2-yr	0.13	199.85	199.90	199.90	199.92	0.015558	0.57	0.23	4.84	0.81
WC21	100	5-yr	0.23	199.85	199.91	199.91	199.95	0.022039	0.79	0.29	4.93	1.00
WC21	100	10-yr	0.32	199.85	199.92	199.92	199.97	0.027944	0.97	0.33	4.99	1.15
WC21	100	25-yr	0.43	199.85	199.96	199.96	200.00	0.014801	0.91	0.47	5.20	0.89
WC21	100	50-yr	0.52	199.85	199.96	199.96	200.02	0.019394	1.06	0.49	5.23	1.02
WC21	100	100-yr	0.62	199.85	199.97	199.97	200.04	0.017696	1.11	0.56	5.33	1.00
WC21	100	Check Flow	0.80	199.85	200.00	200.00	200.07	0.016653	1.20	0.67	5.48	1.00
WC21	100	Regional	2.25	199.85	200.14	200.14	200.29	0.013235	1.70	1.33	34.71	1.00

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (m)	W.S. Elev (m)	Vel Head (m)	Frctn Loss (m)	C & E Loss (m)	Q Left (m3/s)	Q Channel (m3/s)	Q Right (m3/s)	Top Width (m)
WC21	300	2-yr	200.69	200.69	0.00	0.14	0.00		0.13		4.21
WC21	300	5-yr	200.74	200.73	0.01	0.16	0.00		0.23		5.03
WC21	300	10-yr	200.77	200.76	0.01	0.16	0.01		0.32		5.59
WC21	300	25-yr	200.79	200.78	0.01	0.16	0.01		0.43		5.96
WC21	300	50-yr	200.82	200.80	0.01	0.16	0.01		0.52		6.26
WC21	300	100-yr	200.84	200.82	0.01	0.16	0.01		0.62		6.50
WC21	300	Check Flow	200.87	200.85	0.02	0.16	0.01		0.80		6.92
WC21	300	Regional	201.08	201.05	0.03	0.13	0.02	0.01	2.21	0.03	17.50
WC21	200	2-yr	200.54	200.52	0.01				0.13		4.59
WC21	200	5-yr	200.57	200.55	0.02				0.23		4.64
WC21	200	10-yr	200.60	200.57	0.03				0.32		4.67
WC21	200	25-yr	200.63	200.60	0.03				0.43		4.72
WC21	200	50-yr	200.65	200.61	0.03				0.52		4.74
WC21	200	100-yr	200.67	200.63	0.04				0.62		4.78
WC21	200	Check Flow	200.71	200.66	0.04				0.80		4.83
WC21	200	Regional	200.94	200.85	0.09				2.25		10.11
WC21	150		Culvert								
WC21	100	2-yr	199.92	199.90	0.02				0.13		4.84
WC21	100	5-yr	199.95	199.91	0.03				0.23		4.93
WC21	100	10-yr	199.97	199.92	0.05				0.32		4.99
WC21	100	25-yr	200.00	199.96	0.04				0.43		5.20
WC21	100	50-yr	200.02	199.96	0.06				0.52		5.23
WC21	100	100-yr	200.04	199.97	0.06				0.62		5.33
WC21	100	Check Flow	200.07	200.00	0.07				0.80		5.48
WC21	100	Regional	200.29	200.14	0.15				2.25		34.71

Profile Output Table - Four XS Culvert

Reach	River Sta	Profile	E.G. Elev (m)	W.S. Elev (m)	Vel Head (m)	Frctn Loss (m)	C & E Loss (m)	Q Left (m3/s)	Q Channel (m3/s)	Q Right (m3/s)	Top Width (m)
WC21	300	2-yr	200.69	200.69	0.00	0.14	0.00		0.13		4.21
WC21	300	5-yr	200.74	200.73	0.01	0.16	0.00		0.23		5.03
WC21	300	10-yr	200.77	200.76	0.01	0.16	0.01		0.32		5.59
WC21	300	25-yr	200.79	200.78	0.01	0.16	0.01		0.43		5.96
WC21	300	50-yr	200.82	200.80	0.01	0.16	0.01		0.52		6.26
WC21	300	100-yr	200.84	200.82	0.01	0.16	0.01		0.62		6.50
WC21	300	Check Flow	200.87	200.85	0.02	0.16	0.01		0.80		6.92
WC21	300	Regional	201.08	201.05	0.03	0.13	0.02	0.01	2.21	0.03	17.50
WC21	200	2-yr	200.54	200.52	0.01				0.13		4.59
WC21	200	5-yr	200.57	200.55	0.02				0.23		4.64
WC21	200	10-yr	200.60	200.57	0.03				0.32		4.67
WC21	200	25-yr	200.63	200.60	0.03				0.43		4.72
WC21	200	50-yr	200.65	200.61	0.03				0.52		4.74
WC21	200	100-yr	200.67	200.63	0.04				0.62		4.78
WC21	200	Check Flow	200.71	200.66	0.04				0.80		4.83
WC21	200	Regional	200.94	200.85	0.09				2.25		10.11
WC21	150		Culvert								
WC21	100	2-yr	199.92	199.90	0.02				0.13		4.84
WC21	100	5-yr	199.95	199.91	0.03				0.23		4.93
WC21	100	10-yr	199.97	199.92	0.05				0.32		4.99
WC21	100	25-yr	200.00	199.96	0.04				0.43		5.20
WC21	100	50-yr	200.02	199.96	0.06				0.52		5.23
WC21	100	100-yr	200.04	199.97	0.06				0.62		5.33
WC21	100	Check Flow	200.07	200.00	0.07				0.80		5.48
WC21	100	Regional	200.29	200.14	0.15				2.25		34.71

DUFFINS CREEK

HEC-RAS ANALYSIS WC#28&29

ST 11.40 | 179.97 | 178.23 | 179.97 | 178.24

ST 11.39 | 179.83 | 178.13 | 179.83 | 178.13

ST 11.389 | 179.44 | 177.78 | 179.44 | 177.81

ST 11.388 | 178.89 | 177.20 | 178.47 | 177.02

ST 11.382 | 178.36 | 176.85 | 178.33 | 176.85

ST 11.38 | 178.03 | 176.25 | 177.98 | 176.24

ST 11.37 | 177.15 | 175.82 | 177.15 | 175.82

EXISTING 407 ETR BRIDGE SPAN = 136m

EXISTING 407 ETR BRIDGE SPAN = 136m

EXISTING 407 ETR BRIDGE SPAN = 42m

EXISTING 407 ETR BRIDGE SPAN = 42m

EXISTING 407 ETR

PROPOSED 407 TWY

PROPOSED 407 TWY BRIDGE SPAN= 470m

LEGEND

- EXISTING 407 ETR
- PROPOSED 407 TWY
- CREEK FLOW DIRECTION
- EXISTING CULVERT
- PROPOSED BRIDGE
- PROPOSED REGIONAL FLOODLINE
- EXISTING TRCA FLOODLINE
- EXISTING TRCA CROSS SECTION

EX REG / EX 100 | PR REG / PR 100 | HEC ST

- HEC ST: CROSS SECTION NUMBER
- PR REG / PR 100: PROPOSED WL ELEVATION (m)
- EX REG / EX 100: EXISTING UPDATED WL ELEVATION (m)

PARSONS HEC-RAS SECTION

SCALE HORIZONTAL
1:1000

5m 0m 10m 20m 30m

DATE: SEPTEMBER 2016

SCALE: 1:1000

Ontario

PARSONS
625 COCHRANE DRIVE, SUITE 500
MARKHAM, ONTARIO L3R 9R9
TEL: 905-943-0500
FAX: 905-943-0400

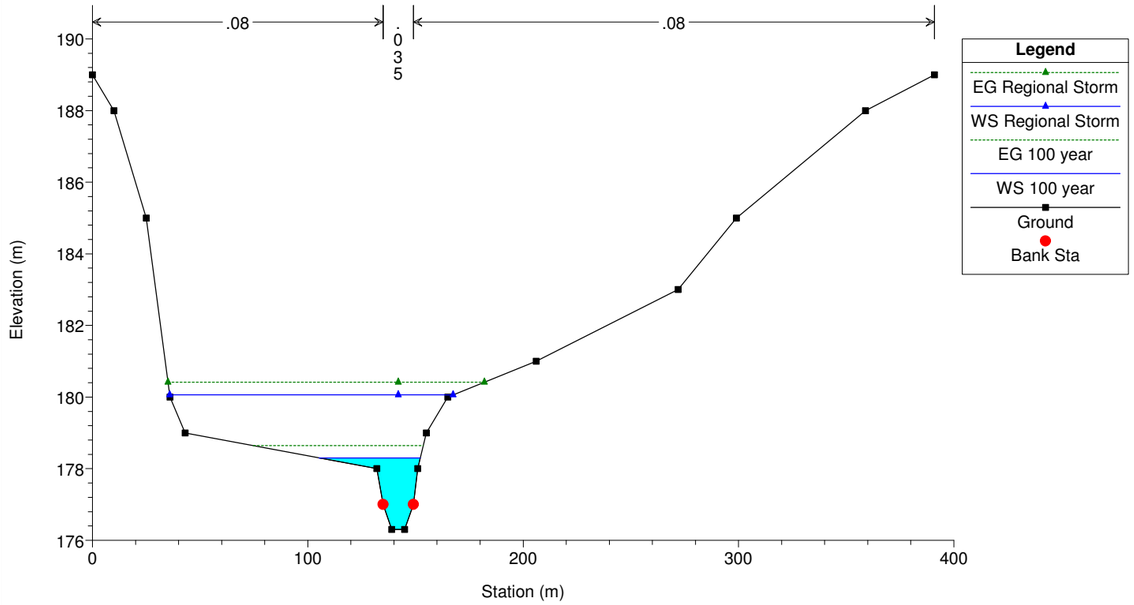
407 TRANSITWAY FROM KENNEDY RD TO BROCK RD

FIGURE 6.16 - PROPOSED FLOODPLAIN MAPPING - DUFFINS CREEK (WC#28&29)

Duffin Creek Catchment 11 Plan: Plan 24

Geom: Duffin Crk Catch 11 (Modif EX) (407 ETR) Flow: Duffin Creek Catchment 11 Updated (2002) Flows

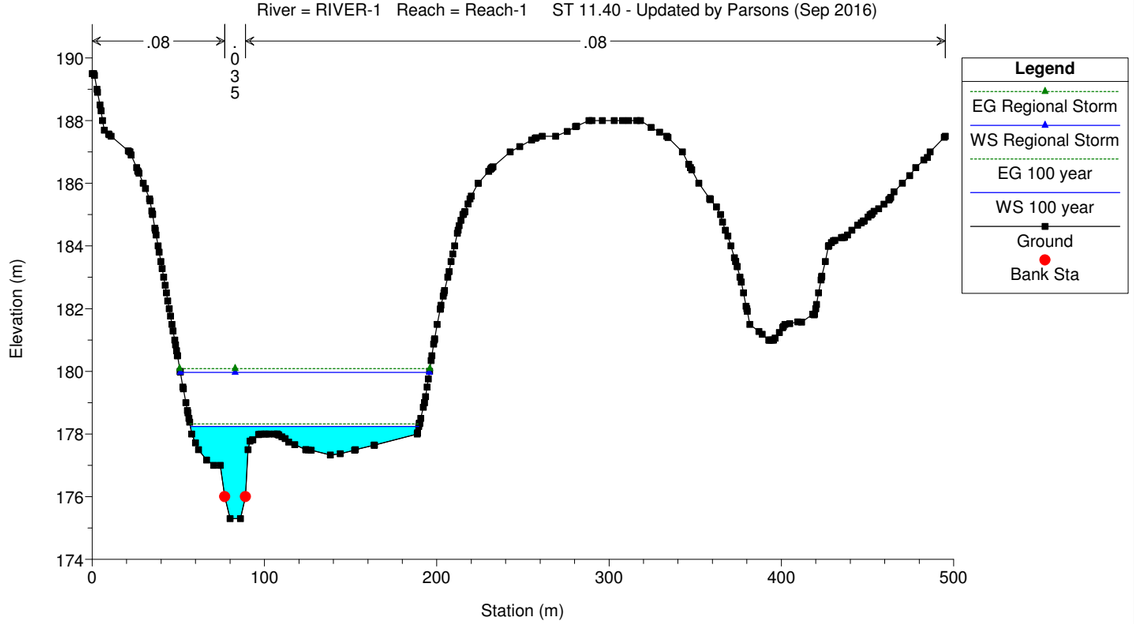
River = RIVER-1 Reach = Reach-1 ST 11.41 - TRCA



Duffin Creek Catchment 11 Plan: Plan 24

Geom: Duffin Crk Catch 11 (Modif EX) (407 ETR) Flow: Duffin Creek Catchment 11 Updated (2002) Flows

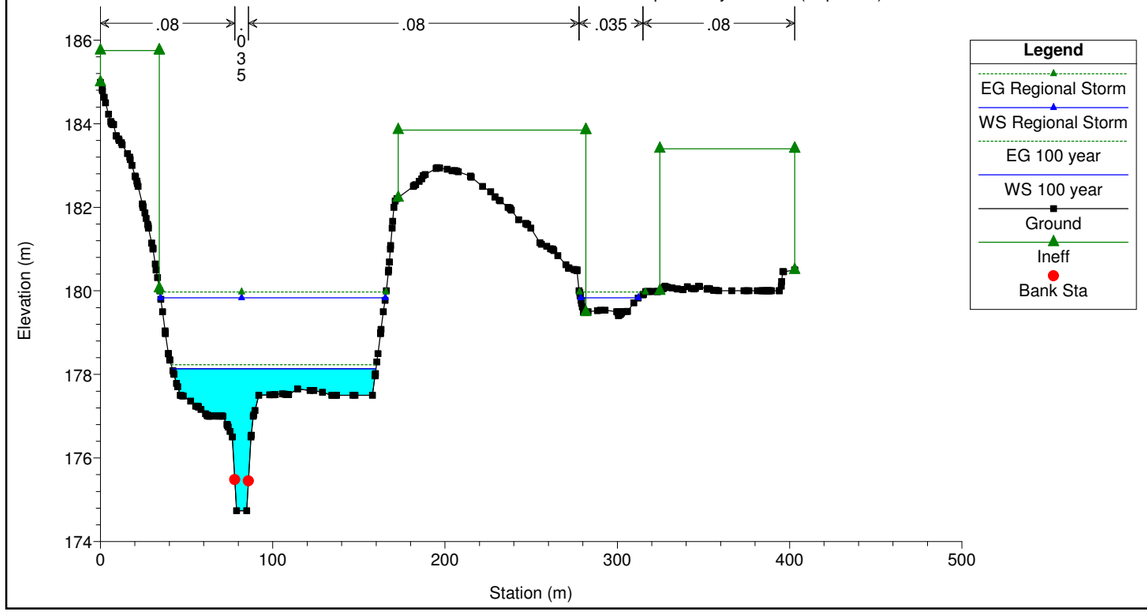
River = RIVER-1 Reach = Reach-1 ST 11.40 - Updated by Parsons (Sep 2016)



Duffin Creek Catchment 11 Plan: Plan 24

Geom: Duffin Crk Catch 11 (Modif EX) (407 ETR) Flow: Duffin Creek Catchment 11 Updated (2002) Flows

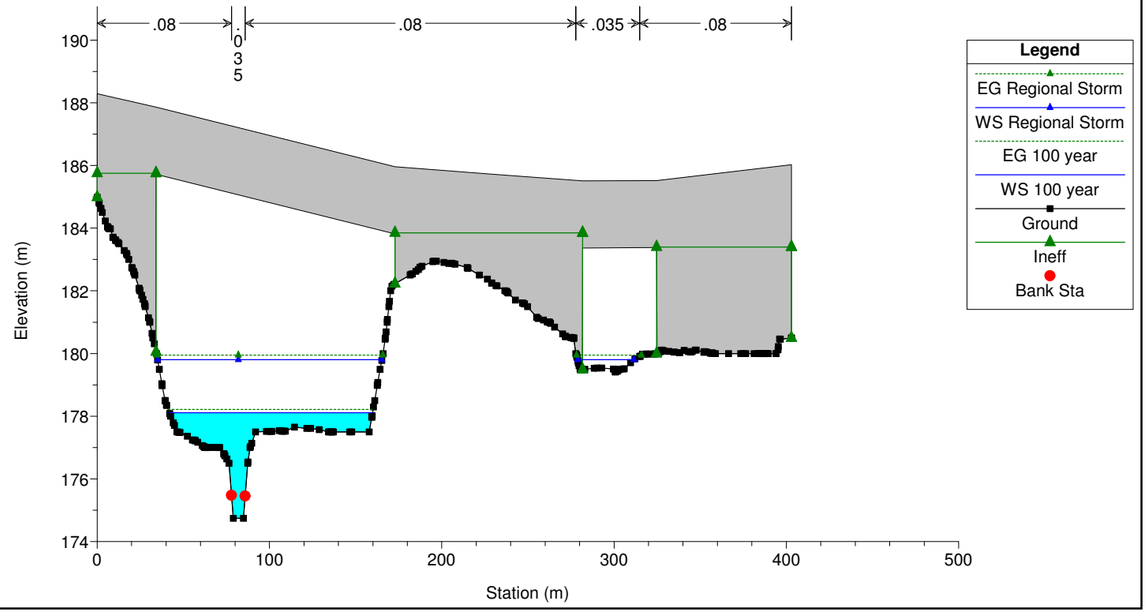
River = RIVER-1 Reach = Reach-1 St 11.39 - Updated by Parsons (Sep 2016)



Duffin Creek Catchment 11 Plan: Plan 24

Geom: Duffin Crk Catch 11 (Modif EX) (407 ETR) Flow: Duffin Creek Catchment 11 Updated (2002) Flows

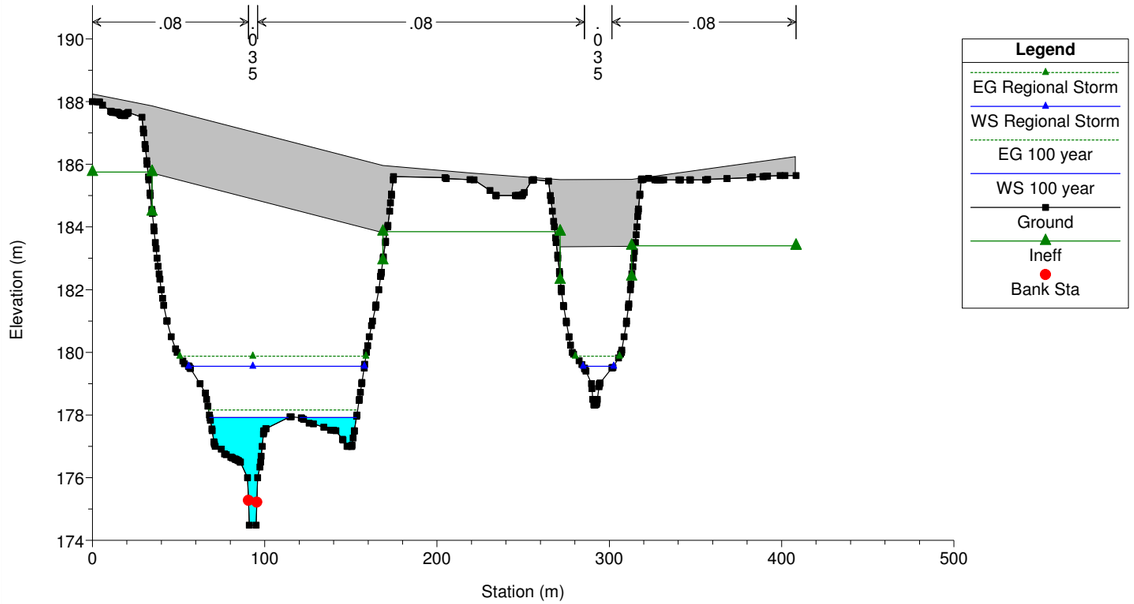
River = RIVER-1 Reach = Reach-1 EX 407 ETR BRIDGE



Duffin Creek Catchment 11 Plan: Plan 24

Geom: Duffin Crk Catch 11 (Modif EX) (407 ETR) Flow: Duffin Creek Catchment 11 Updated (2002) Flows

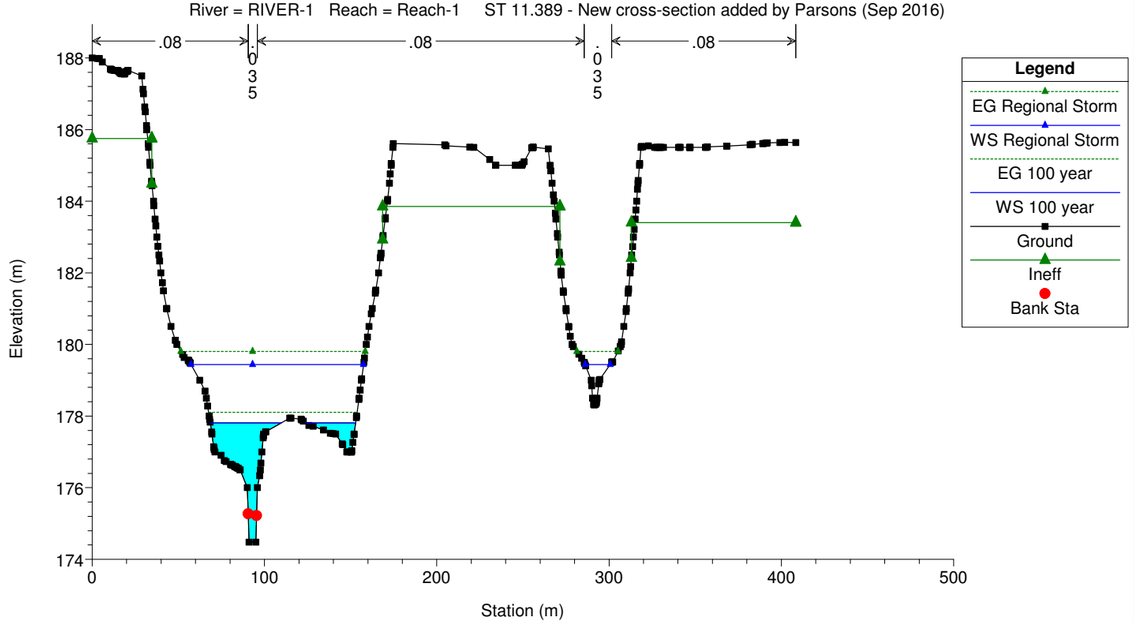
River = RIVER-1 Reach = Reach-1 EX 407 ETR BRIDGE



Duffin Creek Catchment 11 Plan: Plan 24

Geom: Duffin Crk Catch 11 (Modif EX) (407 ETR) Flow: Duffin Creek Catchment 11 Updated (2002) Flows

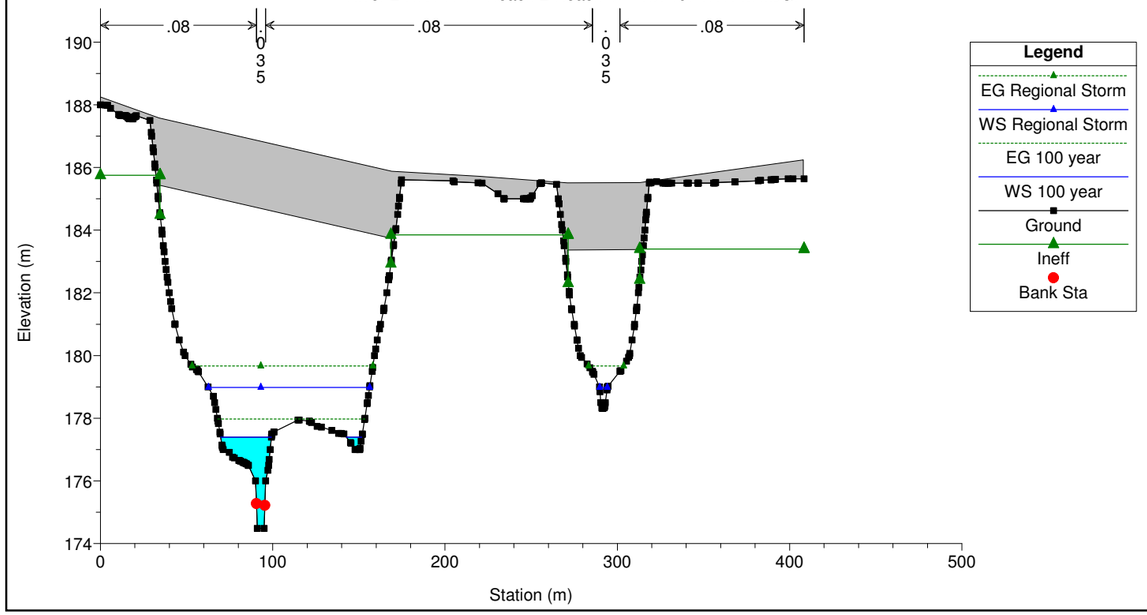
River = RIVER-1 Reach = Reach-1 ST 11.389 - New cross-section added by Parsons (Sep 2016)



Duffin Creek Catchment 11 Plan: Plan 24

Geom: Duffin Crk Catch 11 (Modif EX) (407 ETR) Flow: Duffin Creek Catchment 11 Updated (2002) Flows

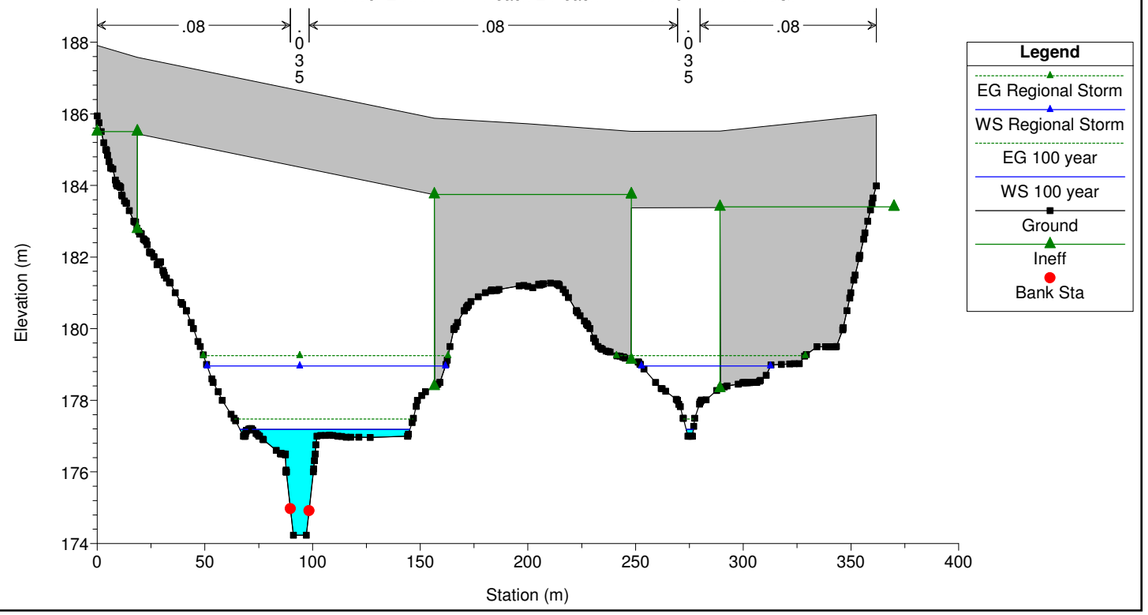
River = RIVER-1 Reach = Reach-1 EX 407 ETR BRIDGE

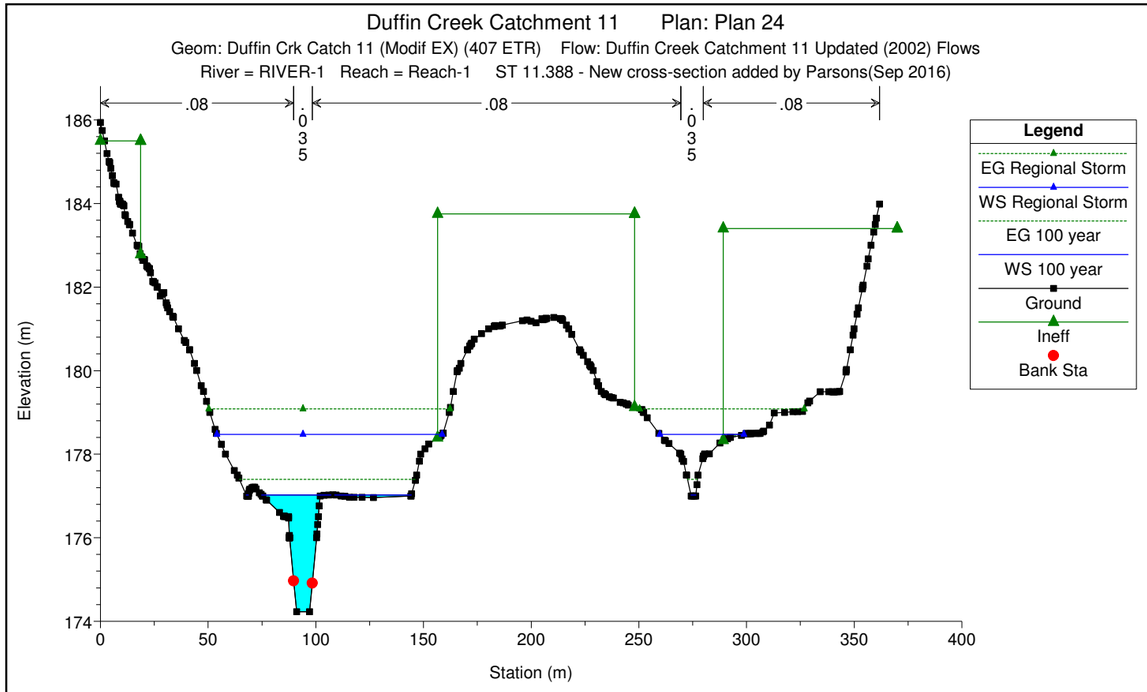


Duffin Creek Catchment 11 Plan: Plan 24

Geom: Duffin Crk Catch 11 (Modif EX) (407 ETR) Flow: Duffin Creek Catchment 11 Updated (2002) Flows

River = RIVER-1 Reach = Reach-1 EX 407 ETR BRIDGE




Duffin Creek Catchment 11 Plan: Plan 24
Geom: Duffin Crk Catch 11 (Modif EX) (407 ETR) Flow: Duffin Creek Catchment 11 Updated (2002) Flows
River = RIVER-1 Reach = Reach-1 ST 11.388 - New cross-section added by Parsons(Sep 2016)
.08
.035
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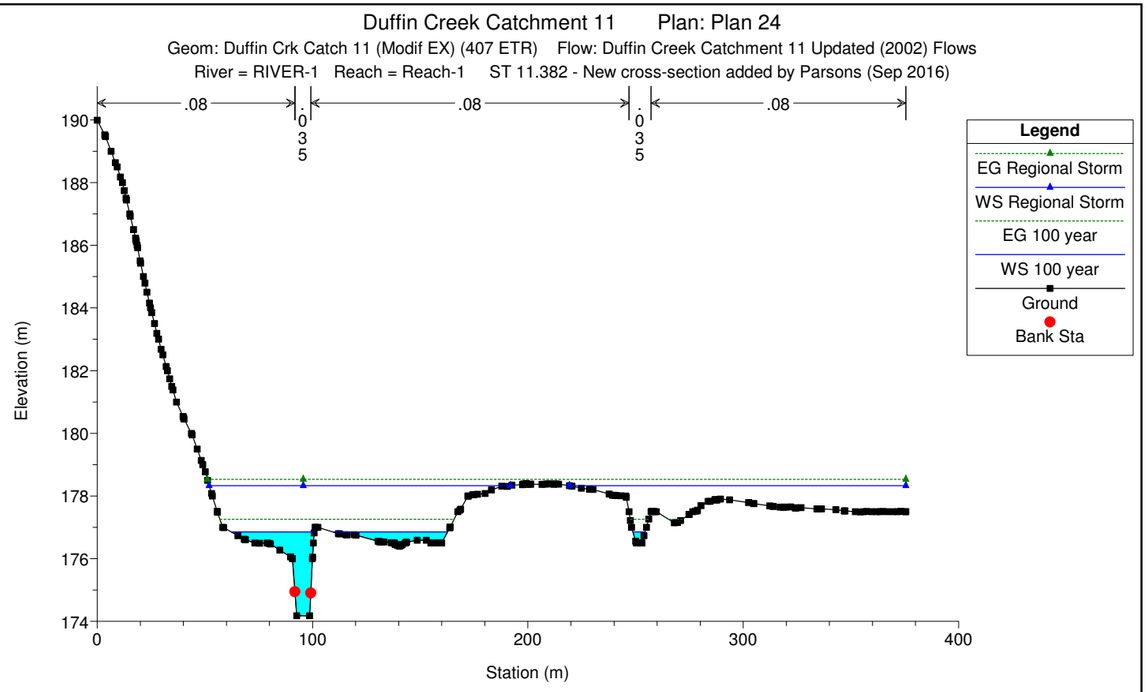
Legend
EG Regional Storm
WS Regional Storm
EG 100 year
WS 100 year
Ground
Ineff
Bank Sta
Elevation (m)
Station (m)


Duffin Creek Catchment 11 Plan: Plan 24
Geom: Duffin Crk Catch 11 (Modif EX) (407 ETR) Flow: Duffin Creek Catchment 11 Updated (2002) Flows
River = RIVER-1 Reach = Reach-1 ST 11.382 - New cross-section added by Parsons (Sep 2016)
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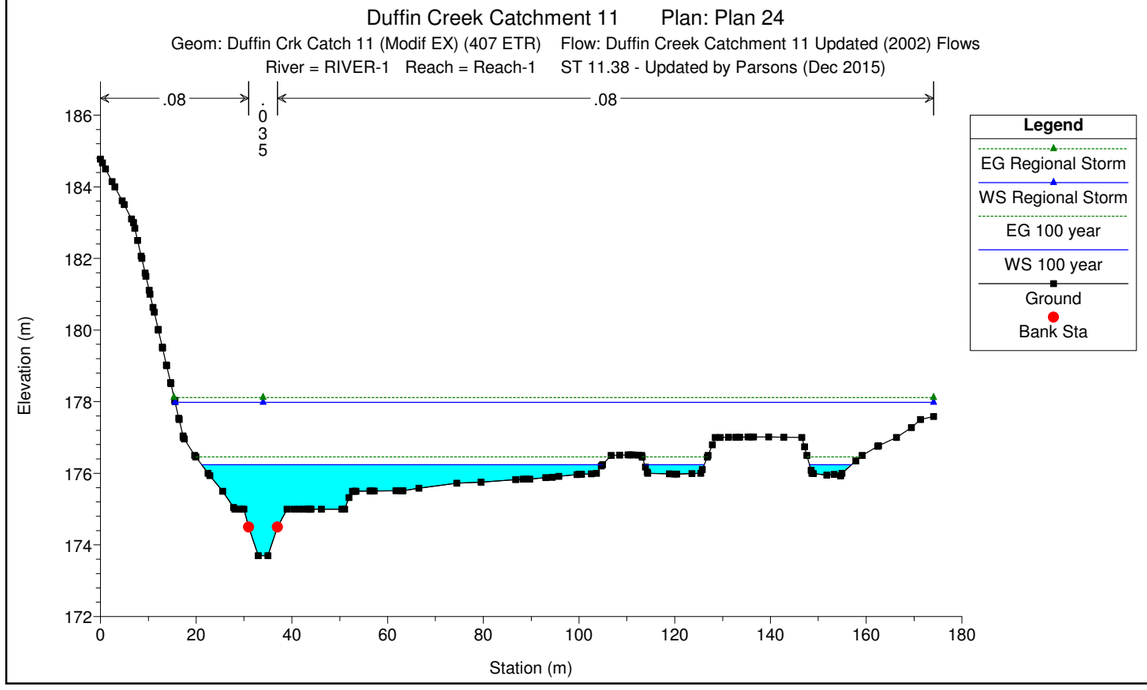
Legend
EG Regional Storm
WS Regional Storm
EG 100 year
WS 100 year
Ground
Bank Sta
Elevation (m)
Station (m)


Duffin Creek Catchment 11 Plan: Plan 24
Geom: Duffin Crk Catch 11 (Modif EX) (407 ETR) Flow: Duffin Creek Catchment 11 Updated (2002) Flows
River = RIVER-1 Reach = Reach-1 ST 11.38 - Updated by Parsons (Dec 2015)
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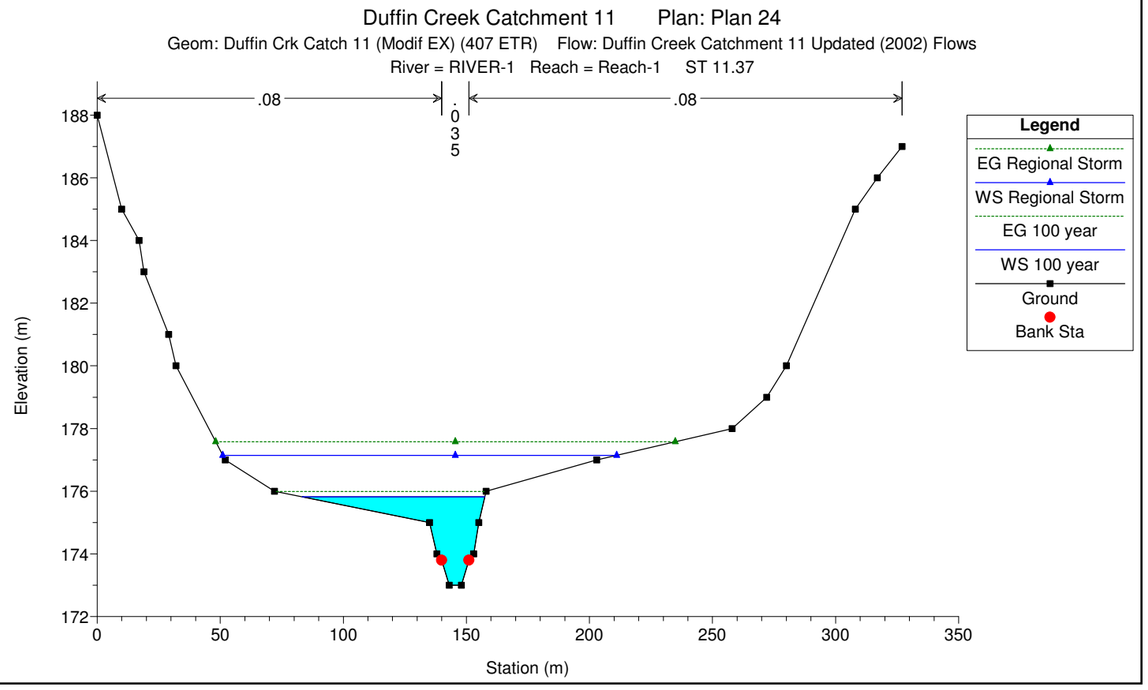
Legend
EG Regional Storm
WS Regional Storm
EG 100 year
WS 100 year
Ground
Bank Sta
Elevation (m)
Station (m)


Duffin Creek Catchment 11 Plan: Plan 24
Geom: Duffin Crk Catch 11 (Modif EX) (407 ETR) Flow: Duffin Creek Catchment 11 Updated (2002) Flows
River = RIVER-1 Reach = Reach-1 ST 11.37
.08
.035
.08
Legend
EG Regional Storm
WS Regional Storm
EG 100 year
WS 100 year
Ground
Bank Sta
Elevation (m)
Station (m)

HEC-RAS Plan: wc28&29 - EX (4hr CH) River: RIVER-1 Reach: Reach-1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Reach-1	11.41	2 year	19.70	176.30	177.17		177.40	0.009101	2.08	9.52	14.87	0.81
Reach-1	11.41	5 year	31.40	176.30	177.56		177.78	0.005005	2.09	15.66	16.81	0.65
Reach-1	11.41	10 year	39.60	176.30	177.81		178.04	0.003876	2.12	20.02	18.06	0.59
Reach-1	11.41	25 year	51.20	176.30	178.04		178.31	0.003762	2.33	24.38	22.88	0.60
Reach-1	11.41	50 year	60.10	176.30	178.18	177.73	178.49	0.003850	2.49	28.41	35.69	0.61
Reach-1	11.41	100 year	69.30	176.30	178.30	177.87	178.64	0.003941	2.64	33.45	47.03	0.63
Reach-1	11.41	Regional Storm	313.10	176.30	180.06		180.41	0.002744	3.47	217.24	131.57	0.59
Reach-1	11.4	2 year	19.70	175.30	176.74		176.83	0.001481	1.28	16.25	14.72	0.36
Reach-1	11.4	5 year	31.40	175.30	177.30		177.39	0.001077	1.39	26.96	25.64	0.33
Reach-1	11.4	10 year	39.60	175.30	177.62		177.71	0.000906	1.42	42.49	72.47	0.31
Reach-1	11.4	25 year	51.20	175.30	177.89		177.99	0.000841	1.48	67.46	106.79	0.30
Reach-1	11.4	50 year	60.10	175.30	178.07		178.16	0.000795	1.51	88.53	131.39	0.30
Reach-1	11.4	100 year	69.30	175.30	178.24		178.32	0.000715	1.49	110.81	132.62	0.29
Reach-1	11.4	Regional Storm	313.10	175.30	179.97		180.09	0.000892	2.30	351.40	144.58	0.35
Reach-1	11.39	2 year	19.70	174.74	176.58	175.69	176.68	0.001217	1.39	15.64	11.82	0.34
Reach-1	11.39	5 year	31.40	174.74	177.13	176.01	177.26	0.001176	1.64	25.38	30.35	0.35
Reach-1	11.39	10 year	39.60	174.74	177.46	176.20	177.59	0.001061	1.71	37.34	42.67	0.34
Reach-1	11.39	25 year	51.20	174.74	177.74	176.44	177.87	0.001043	1.81	63.34	114.06	0.34
Reach-1	11.39	50 year	60.10	174.74	177.95	176.64	178.06	0.000880	1.74	87.94	116.34	0.32
Reach-1	11.39	100 year	69.30	174.74	178.13	176.86	178.23	0.000783	1.71	109.49	118.15	0.30
Reach-1	11.39	Regional Storm	313.10	174.74	179.83	178.74	179.97	0.001113	2.68	329.86	163.91	0.38
Reach-1	11.3895		Bridge									
Reach-1	11.389	2 year	19.70	174.48	176.23	175.74	176.51	0.004214	2.35	9.11	8.68	0.58
Reach-1	11.389	5 year	31.40	174.48	176.70	176.21	177.08	0.004357	2.81	14.88	19.24	0.61
Reach-1	11.389	10 year	39.60	174.48	177.22	176.49	177.48	0.002521	2.47	29.04	34.72	0.48
Reach-1	11.389	25 year	51.20	174.48	177.49	177.08	177.76	0.002504	2.63	39.32	40.57	0.49
Reach-1	11.389	50 year	60.10	174.48	177.63	177.26	177.93	0.002765	2.85	45.71	53.27	0.52
Reach-1	11.389	100 year	69.30	174.48	177.81	177.40	178.10	0.002658	2.90	56.95	70.29	0.51
Reach-1	11.389	Regional Storm	313.10	174.48	179.44	178.98	179.81	0.003513	4.37	209.83	114.69	0.63
Reach-1	11.3885		Bridge									
Reach-1	11.388	2 year	19.70	174.23	176.20		176.27	0.000783	1.18	19.06	13.14	0.28
Reach-1	11.388	5 year	31.40	174.23	176.54		176.66	0.001136	1.58	23.63	16.71	0.34
Reach-1	11.388	10 year	39.60	174.23	176.77		176.93	0.001249	1.78	28.21	21.88	0.36
Reach-1	11.388	25 year	51.20	174.23	176.91		177.13	0.001708	2.16	31.35	24.85	0.43
Reach-1	11.388	50 year	60.10	174.23	176.99	176.05	177.27	0.002079	2.43	34.02	53.43	0.48

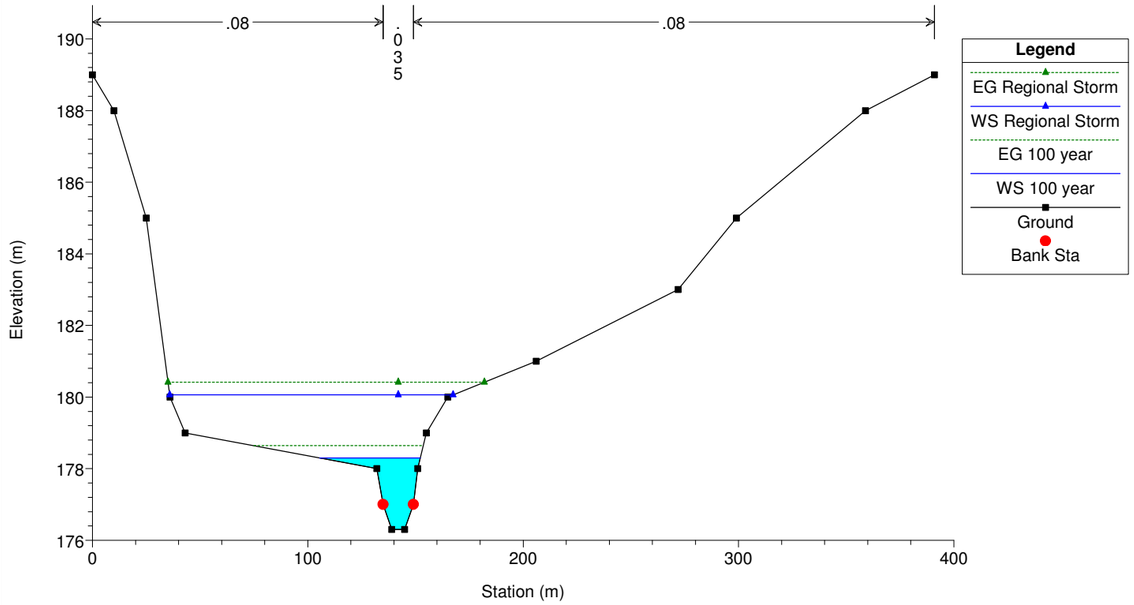
HEC-RAS Plan: wc28&29 - EX (4hr CH) River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Reach-1	11.388	100 year	69.30	174.23	177.02	176.21	177.40	0.002699	2.79	36.15	71.27	0.54
Reach-1	11.388	Regional Storm	313.10	174.23	178.47	178.47	179.08	0.004219	4.65	179.00	143.68	0.73
Reach-1	11.382	2 year	19.70	174.18	176.12		176.22	0.001196	1.42	15.14	11.76	0.33
Reach-1	11.382	5 year	31.40	174.18	176.39		176.58	0.001882	1.94	19.19	18.13	0.42
Reach-1	11.382	10 year	39.60	174.18	176.62	175.69	176.84	0.001982	2.14	28.69	70.33	0.44
Reach-1	11.382	25 year	51.20	174.18	176.72	175.94	177.02	0.002667	2.54	35.99	79.74	0.52
Reach-1	11.382	50 year	60.10	174.18	176.78	176.18	177.14	0.003183	2.83	41.35	90.74	0.57
Reach-1	11.382	100 year	69.30	174.18	176.85	176.44	177.25	0.003582	3.05	47.84	97.45	0.60
Reach-1	11.382	Regional Storm	313.10	174.18	178.33		178.53	0.002358	3.34	324.37	296.08	0.53
Reach-1	11.38	2 year	19.70	173.70	174.98	174.98	175.49	0.013018	3.18	6.77	8.88	1.01
Reach-1	11.38	5 year	31.40	173.70	175.42	175.42	175.81	0.007198	3.01	17.35	26.42	0.80
Reach-1	11.38	10 year	39.60	173.70	175.60	175.47	176.05	0.007217	3.26	23.55	42.97	0.81
Reach-1	11.38	25 year	51.20	173.70	175.92	175.87	176.26	0.005037	3.06	41.30	73.00	0.70
Reach-1	11.38	50 year	60.10	173.70	176.09	176.06	176.36	0.003999	2.89	57.31	100.99	0.63
Reach-1	11.38	100 year	69.30	173.70	176.24		176.46	0.003331	2.76	72.43	105.00	0.58
Reach-1	11.38	Regional Storm	313.10	173.70	177.98		178.12	0.001873	3.02	314.97	158.45	0.48
Reach-1	11.37	2 year	19.70	173.00	174.66		174.72	0.001063	1.17	19.96	18.29	0.31
Reach-1	11.37	5 year	31.40	173.00	175.06		175.16	0.001153	1.44	27.78	23.85	0.34
Reach-1	11.37	10 year	39.60	173.00	175.29		175.41	0.001207	1.59	34.96	38.94	0.35
Reach-1	11.37	25 year	51.20	173.00	175.61		175.73	0.001120	1.69	50.72	59.98	0.35
Reach-1	11.37	50 year	60.10	173.00	175.72		175.87	0.001256	1.84	57.93	67.44	0.37
Reach-1	11.37	100 year	69.30	173.00	175.82		175.99	0.001389	1.99	65.14	74.16	0.39
Reach-1	11.37	Regional Storm	313.10	173.00	177.15		177.58	0.003084	3.90	220.66	159.98	0.63

Duffin Creek Catchment 11 Plan: Plan 23

Geom: Duffin Crk Catch 11 (PROP) (407 ETR) Flow: Duffin Creek Catchment 11 Updated (2002) Flows

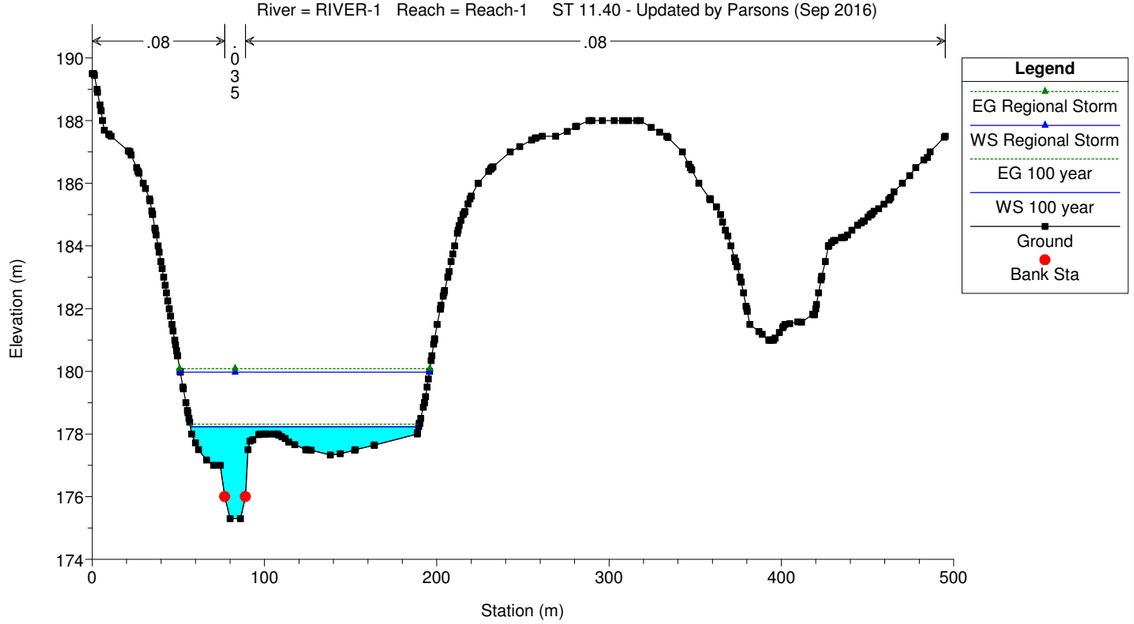
River = RIVER-1 Reach = Reach-1 ST 11.41 - TRCA



Duffin Creek Catchment 11 Plan: Plan 23

Geom: Duffin Crk Catch 11 (PROP) (407 ETR) Flow: Duffin Creek Catchment 11 Updated (2002) Flows

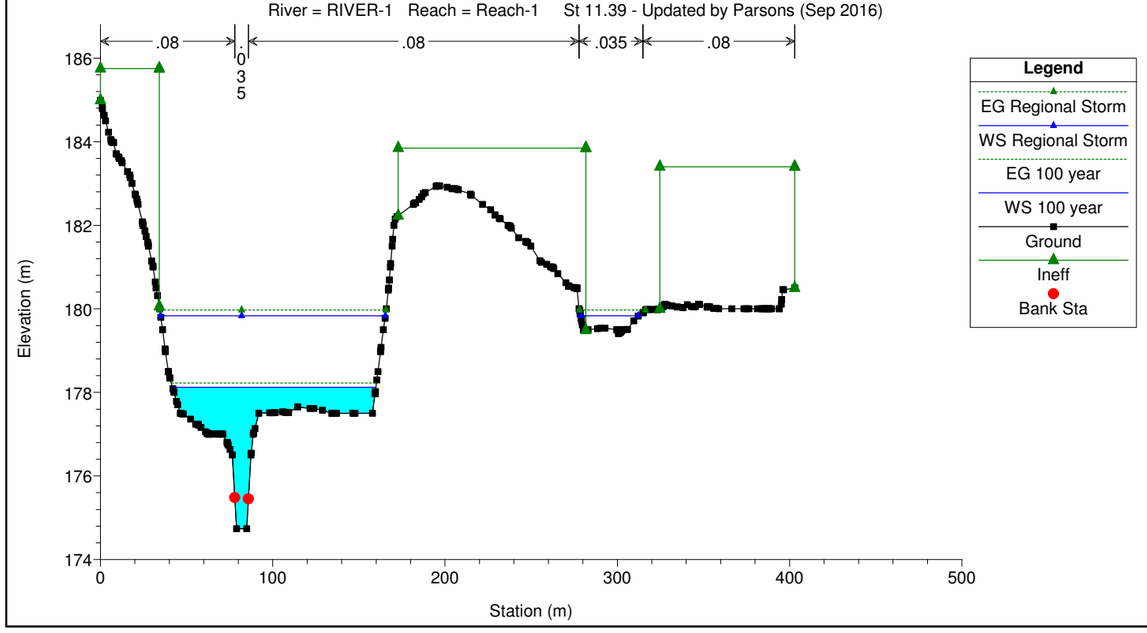
River = RIVER-1 Reach = Reach-1 ST 11.40 - Updated by Parsons (Sep 2016)



Duffin Creek Catchment 11 Plan: Plan 23

Geom: Duffin Crk Catch 11 (PROP) (407 ETR) Flow: Duffin Creek Catchment 11 Updated (2002) Flows

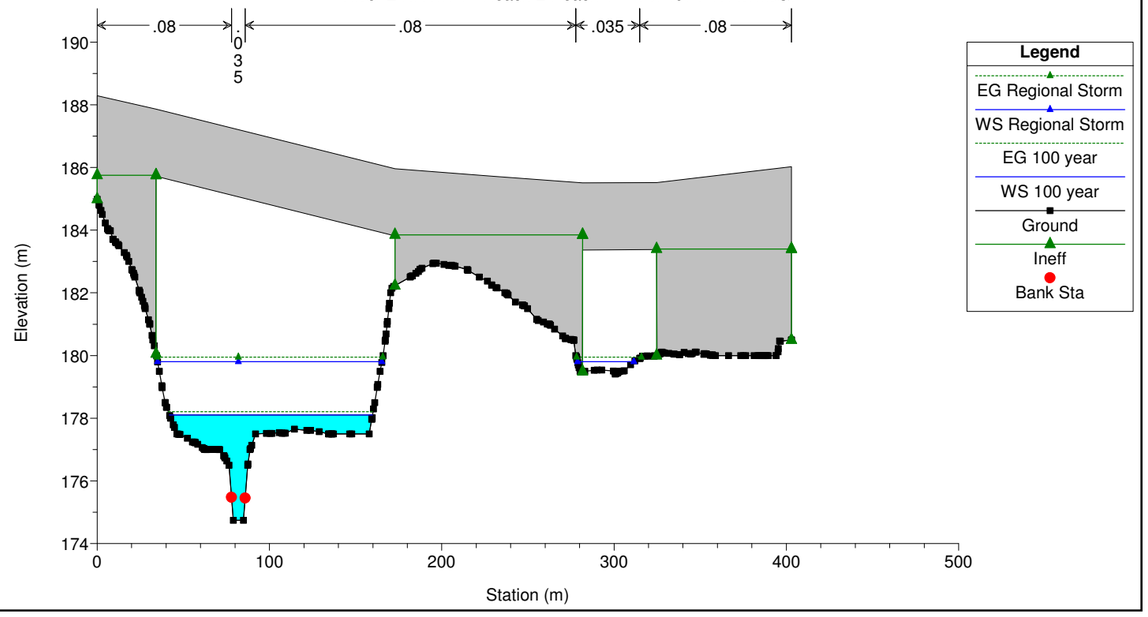
River = RIVER-1 Reach = Reach-1 St 11.39 - Updated by Parsons (Sep 2016)

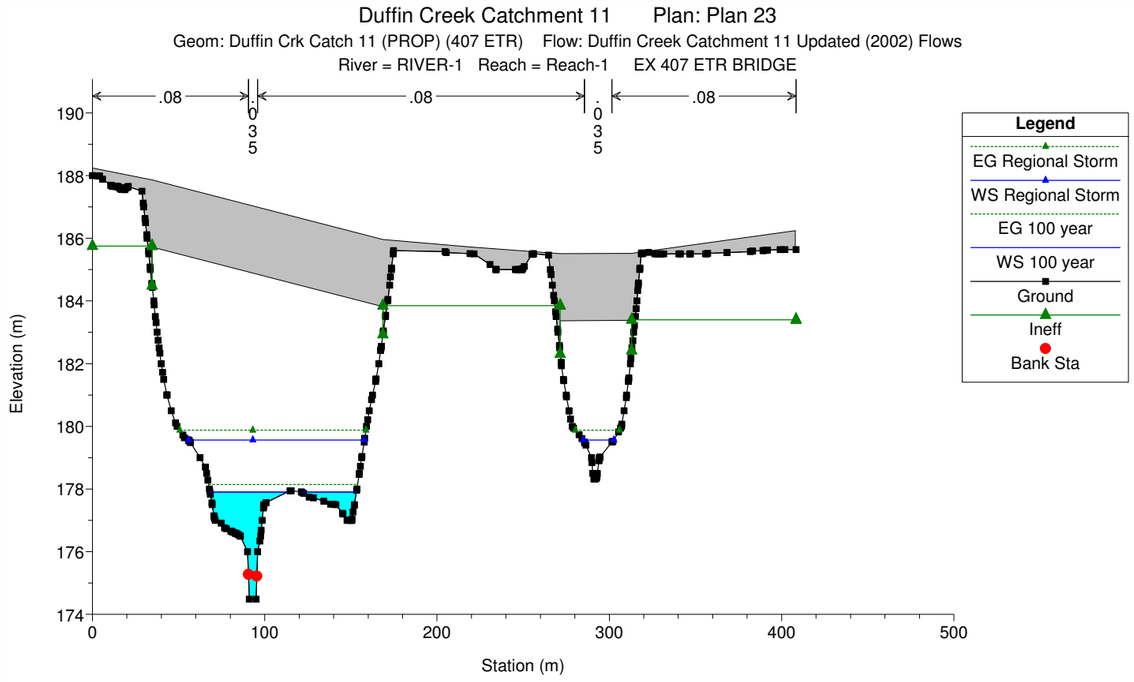


Duffin Creek Catchment 11 Plan: Plan 23

Geom: Duffin Crk Catch 11 (PROP) (407 ETR) Flow: Duffin Creek Catchment 11 Updated (2002) Flows

River = RIVER-1 Reach = Reach-1 EX 407 ETR BRIDGE




Duffin Creek Catchment 11 Plan: Plan 23
Geom: Duffin Crk Catch 11 (PROP) (407 ETR) Flow: Duffin Creek Catchment 11 Updated (2002) Flows
River = RIVER-1 Reach = Reach-1 EX 407 ETR BRIDGE
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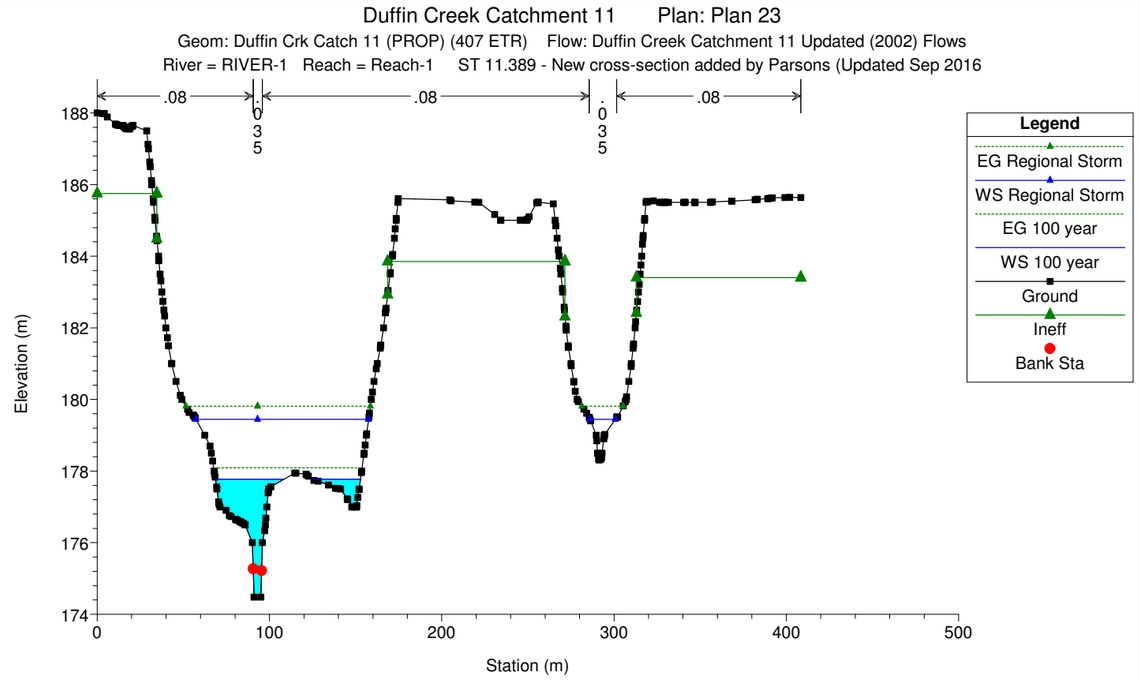
Legend
EG Regional Storm
WS Regional Storm
EG 100 year
WS 100 year
Ground
Ineff
Bank Sta
Elevation (m)
Station (m)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River = RIVER-1 Reach = Reach-1 ST 11.389 - New cross-section added by Parsons (Updated Sep 2016
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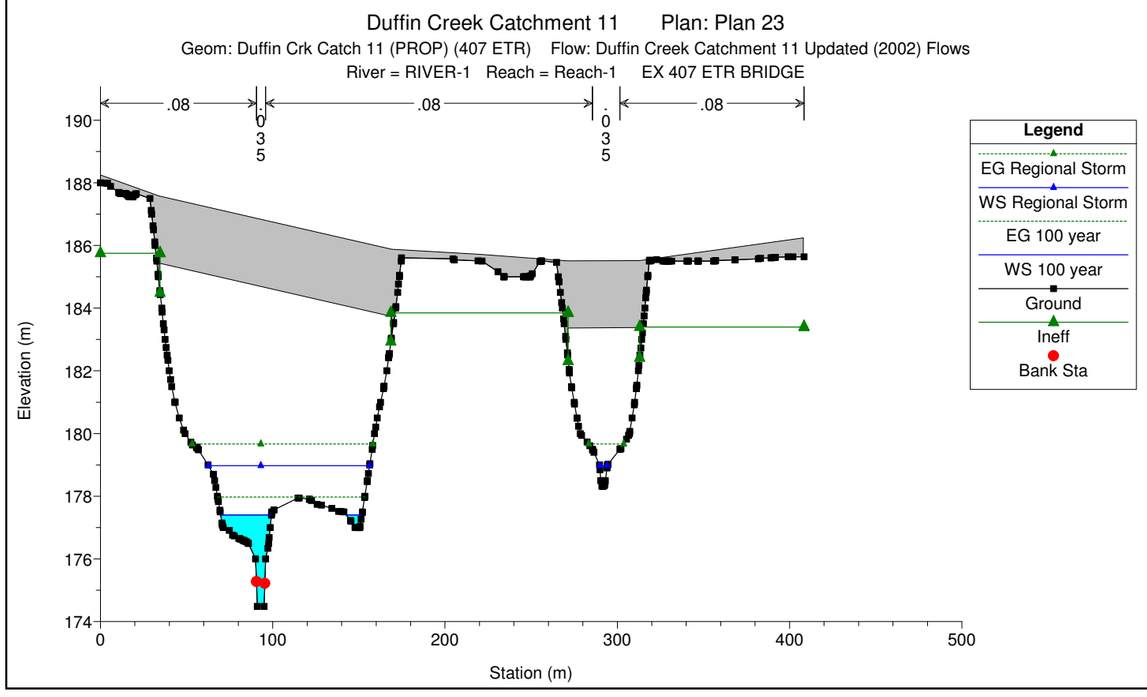
Legend
EG Regional Storm
WS Regional Storm
EG 100 year
WS 100 year
Ground
Ineff
Bank Sta
Elevation (m)
Station (m)


Duffin Creek Catchment 11 Plan: Plan 23
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River = RIVER-1 Reach = Reach-1 EX 407 ETR BRIDGE
.08
.035
.08
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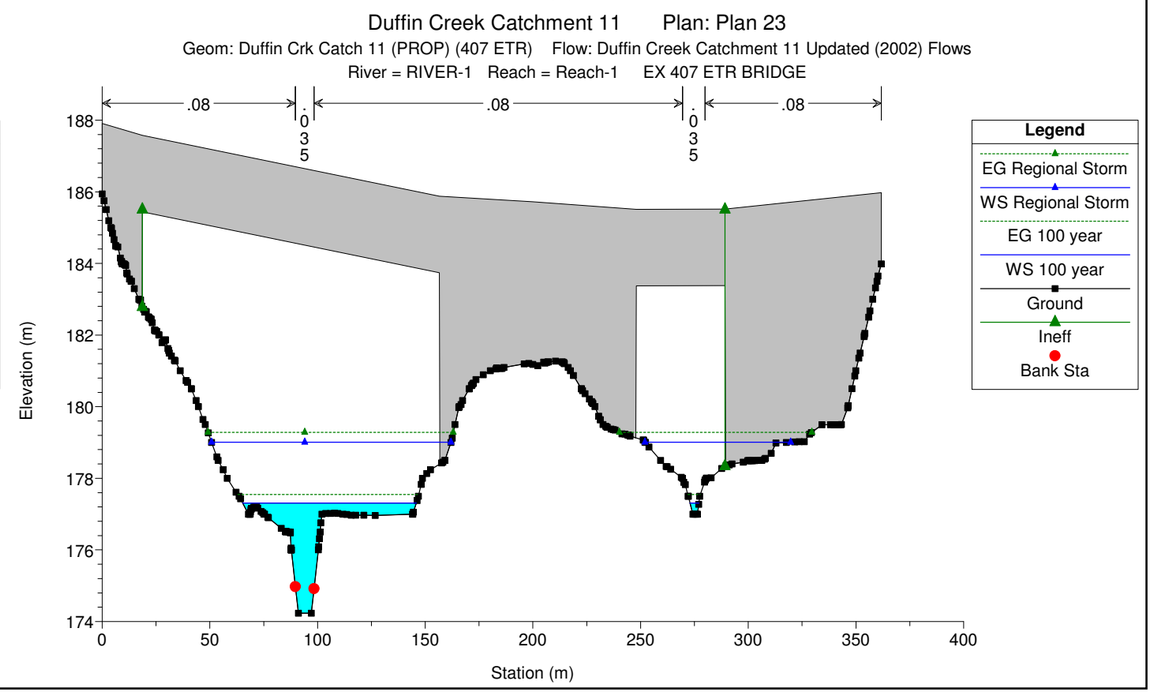
Legend
EG Regional Storm
WS Regional Storm
EG 100 year
WS 100 year
Ground
Ineff
Bank Sta
Elevation (m)
Station (m)


Duffin Creek Catchment 11 Plan: Plan 23
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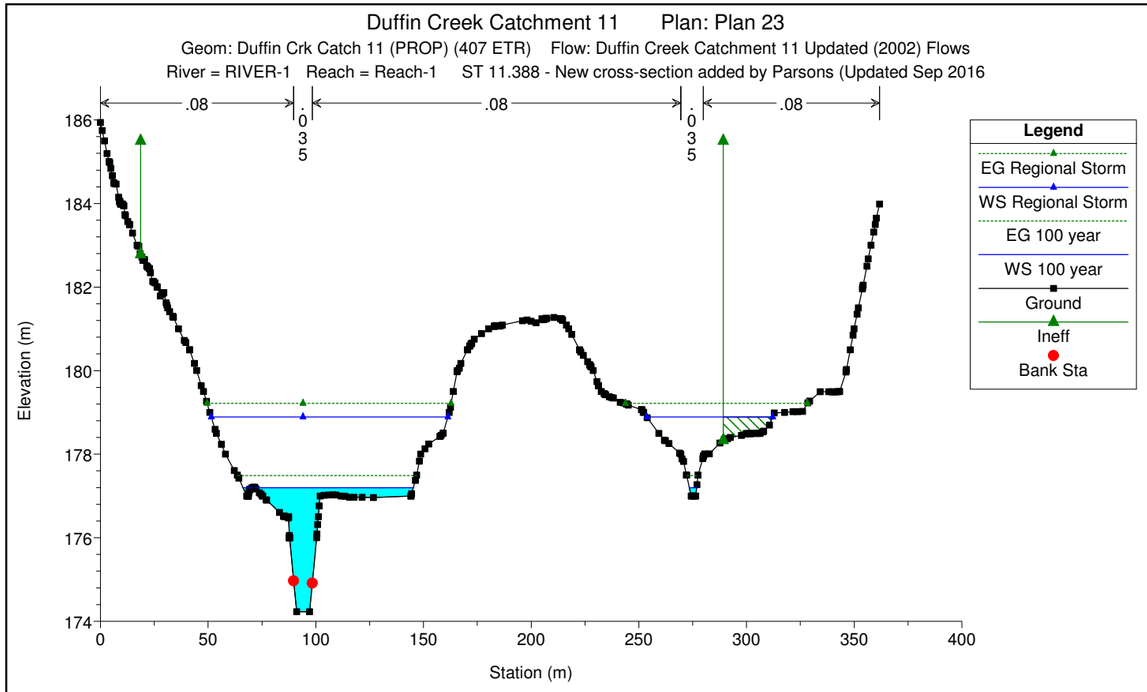
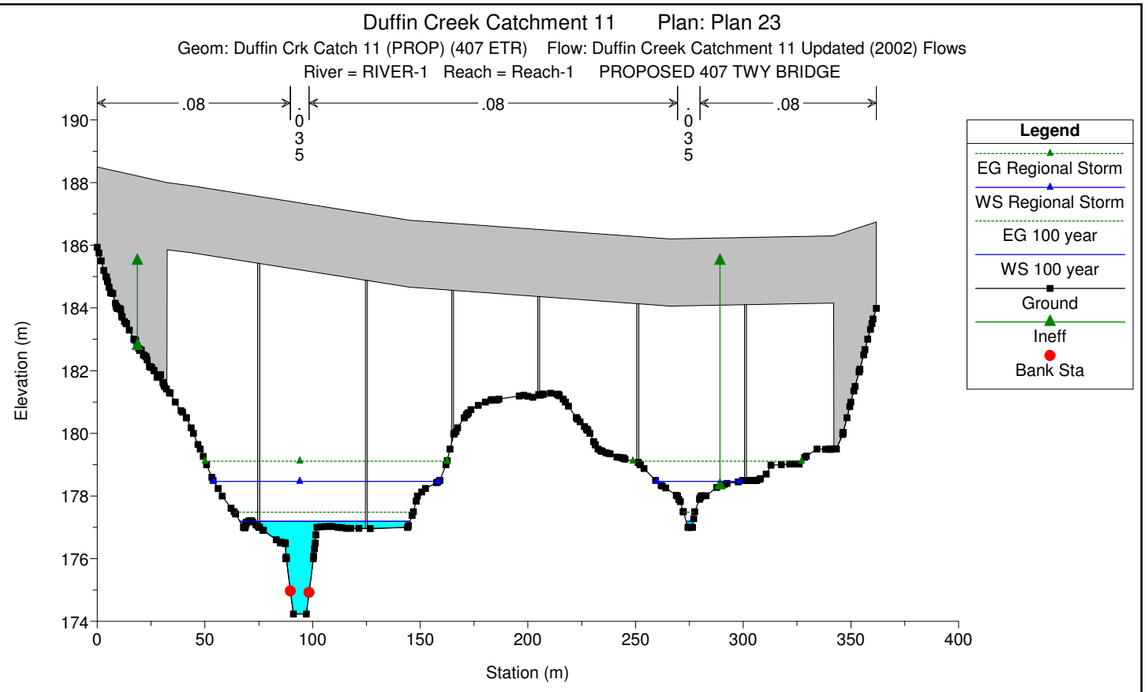
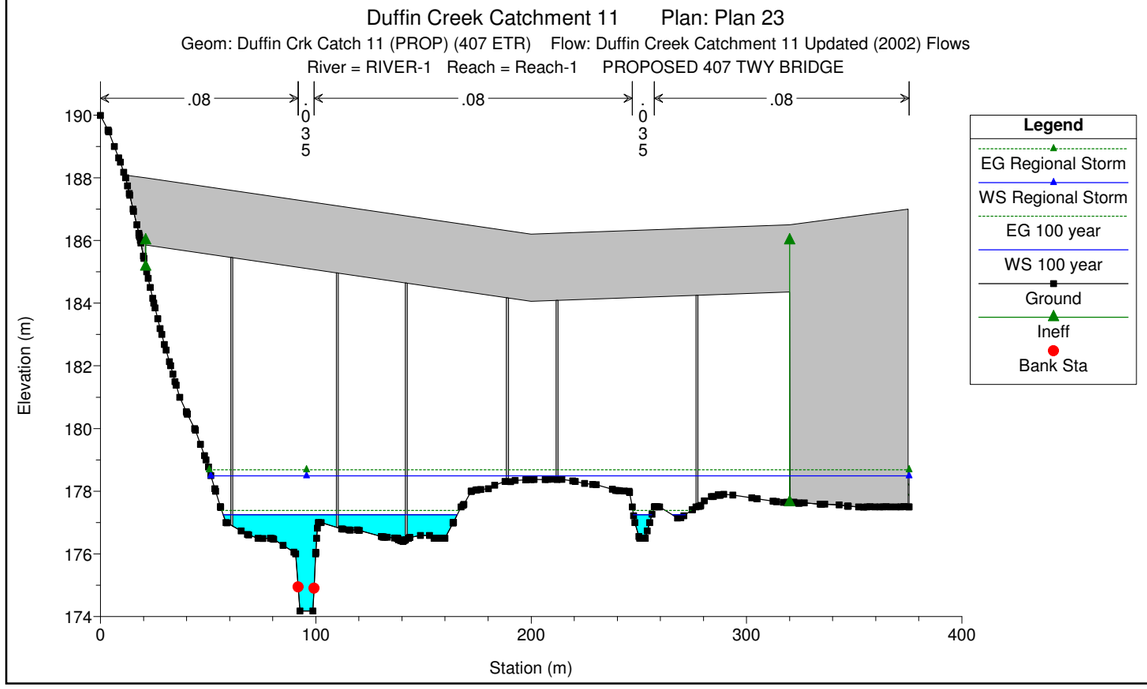
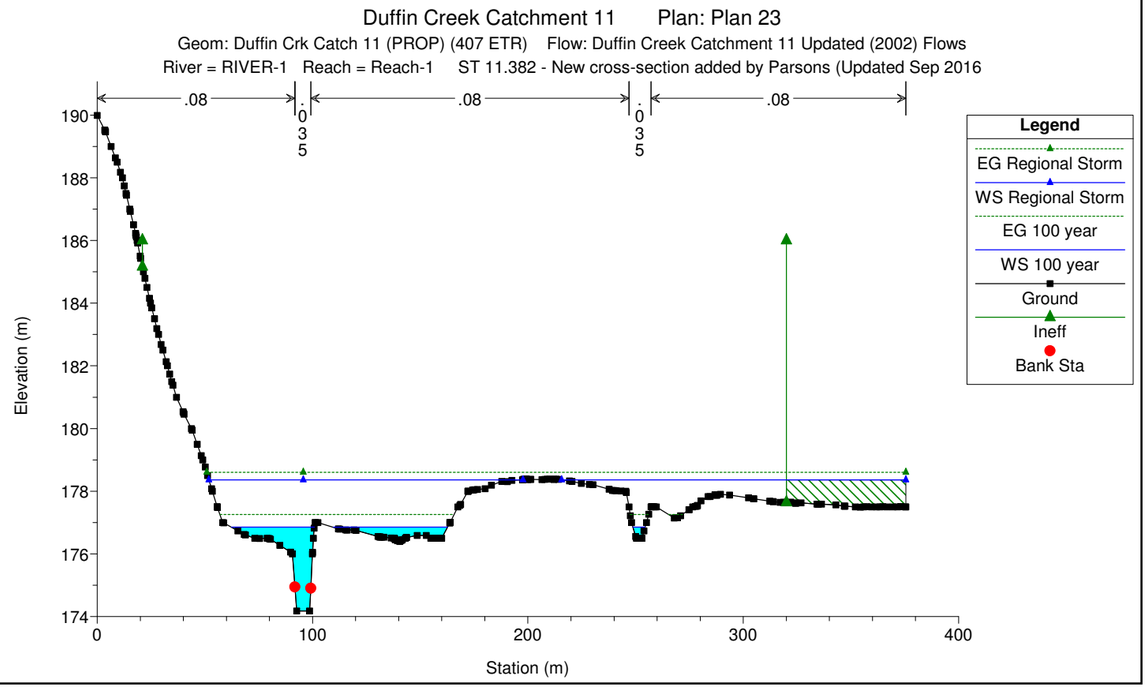
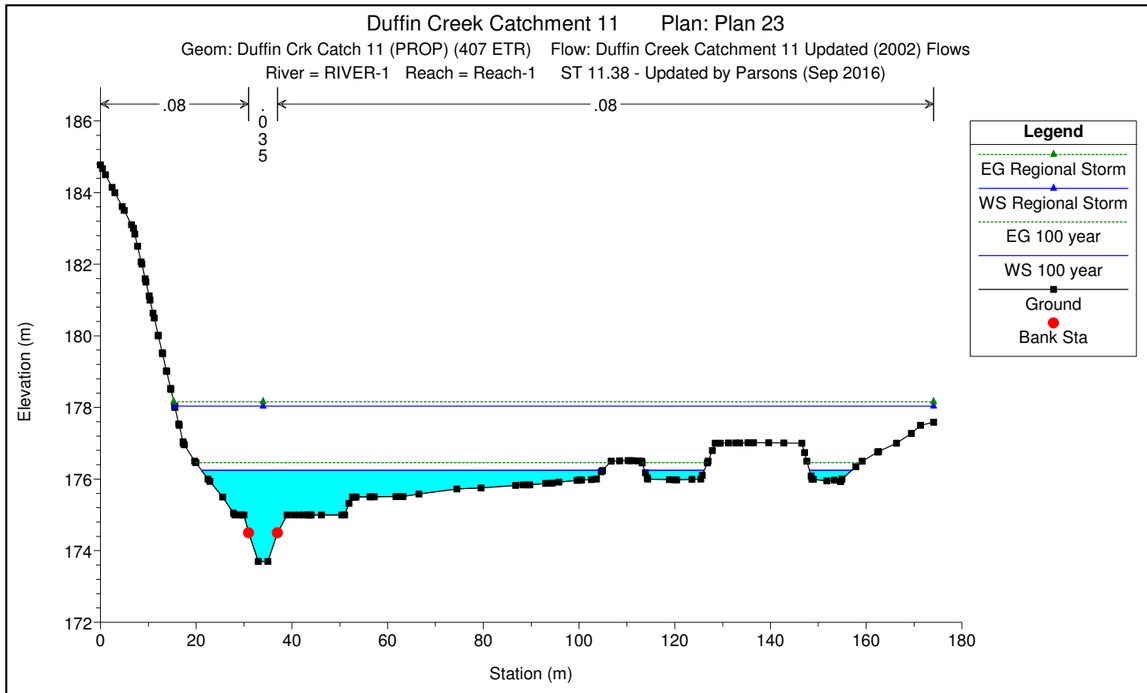
River = RIVER-1 Reach = Reach-1 EX 407 ETR BRIDGE
.08
.035
.08
.035
.08
Legend
EG Regional Storm
WS Regional Storm
EG 100 year
WS 100 year
Ground
Ineff
Bank Sta
Elevation (m)
Station (m)

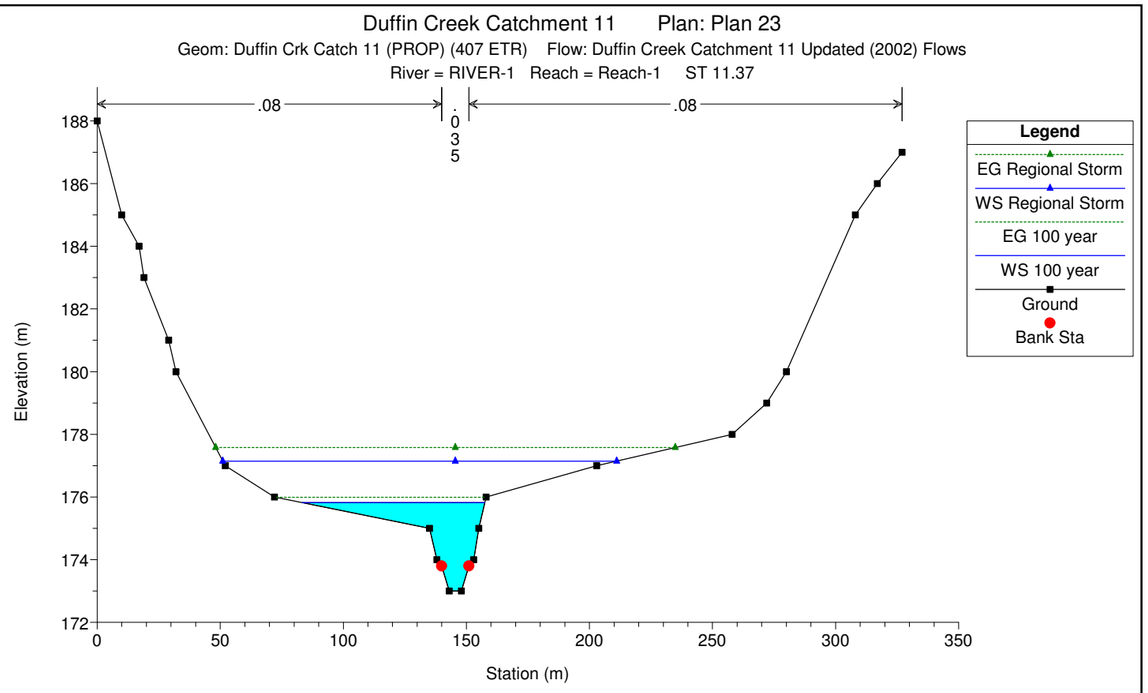

Duffin Creek Catchment 11 Plan: Plan 23
Geom: Duffin Crk Catch 11 (PROP) (407 ETR) Flow: Duffin Creek Catchment 11 Updated (2002) Flows
River = RIVER-1 Reach = Reach-1 ST 11.388 - New cross-section added by Parsons (Updated Sep 2016)
.08
.035
.08
.035
.08
Legend
EG Regional Storm
WS Regional Storm
EG 100 year
WS 100 year
Ground
Ineff
Bank Sta
Elevation (m)
Station (m)


Duffin Creek Catchment 11 Plan: Plan 23
Geom: Duffin Crk Catch 11 (PROP) (407 ETR) Flow: Duffin Creek Catchment 11 Updated (2002) Flows
River = RIVER-1 Reach = Reach-1 PROPOSED 407 TWY BRIDGE
.08
.035
.08
.035
.08
Legend
EG Regional Storm
WS Regional Storm
EG 100 year
WS 100 year
Ground
Ineff
Bank Sta
Elevation (m)
Station (m)


Duffin Creek Catchment 11 Plan: Plan 23
Geom: Duffin Crk Catch 11 (PROP) (407 ETR) Flow: Duffin Creek Catchment 11 Updated (2002) Flows
River = RIVER-1 Reach = Reach-1 PROPOSED 407 TWY BRIDGE
.08
.035
.08
.035
.08
Legend
EG Regional Storm
WS Regional Storm
EG 100 year
WS 100 year
Ground
Ineff
Bank Sta
Elevation (m)
Station (m)


Duffin Creek Catchment 11 Plan: Plan 23
Geom: Duffin Crk Catch 11 (PROP) (407 ETR) Flow: Duffin Creek Catchment 11 Updated (2002) Flows
River = RIVER-1 Reach = Reach-1 ST 11.382 - New cross-section added by Parsons (Updated Sep 2016)
.08
.035
.08
.035
.08
Legend
EG Regional Storm
WS Regional Storm
EG 100 year
WS 100 year
Ground
Ineff
Bank Sta
Elevation (m)
Station (m)


Duffin Creek Catchment 11 Plan: Plan 23
Geom: Duffin Crk Catch 11 (PROP) (407 ETR) Flow: Duffin Creek Catchment 11 Updated (2002) Flows
River = RIVER-1 Reach = Reach-1 ST 11.38 - Updated by Parsons (Sep 2016)
.08
.035
.08
Legend
EG Regional Storm
WS Regional Storm
EG 100 year
WS 100 year
Ground
Bank Sta
Elevation (m)
Station (m)


Duffin Creek Catchment 11 Plan: Plan 23
Geom: Duffin Crk Catch 11 (PROP) (407 ETR) Flow: Duffin Creek Catchment 11 Updated (2002) Flows
River = RIVER-1 Reach = Reach-1 ST 11.37
.08
.035
.08
Legend
EG Regional Storm
WS Regional Storm
EG 100 year
WS 100 year
Ground
Bank Sta
Elevation (m)
Station (m)

HEC-RAS Plan: wc28&29 - PROP (4hr CH) River: RIVER-1 Reach: Reach-1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Reach-1	11.41	2 year	19.70	176.30	177.17		177.40	0.009101	2.08	9.52	14.87	0.81
Reach-1	11.41	5 year	31.40	176.30	177.56		177.78	0.005005	2.09	15.66	16.81	0.65
Reach-1	11.41	10 year	39.60	176.30	177.81		178.04	0.003867	2.12	20.03	18.06	0.59
Reach-1	11.41	25 year	51.20	176.30	178.06		178.33	0.003608	2.30	24.84	24.70	0.59
Reach-1	11.41	50 year	60.10	176.30	178.18	177.73	178.49	0.003860	2.49	28.36	35.58	0.61
Reach-1	11.41	100 year	69.30	176.30	178.30	177.87	178.64	0.003973	2.65	33.27	46.67	0.63
Reach-1	11.41	Regional Storm	313.10	176.30	180.06		180.42	0.002741	3.47	217.36	131.61	0.59
Reach-1	11.4	2 year	19.70	175.30	176.74		176.83	0.001480	1.28	16.25	14.73	0.36
Reach-1	11.4	5 year	31.40	175.30	177.30		177.39	0.001077	1.39	26.96	25.64	0.33
Reach-1	11.4	10 year	39.60	175.30	177.62		177.71	0.000903	1.41	42.62	72.70	0.31
Reach-1	11.4	25 year	51.20	175.30	177.93		178.02	0.000777	1.44	71.53	111.65	0.29
Reach-1	11.4	50 year	60.10	175.30	178.07		178.16	0.000800	1.51	88.19	131.38	0.30
Reach-1	11.4	100 year	69.30	175.30	178.23		178.31	0.000725	1.50	109.96	132.57	0.29
Reach-1	11.4	Regional Storm	313.10	175.30	179.97		180.09	0.000891	2.30	351.54	144.59	0.35
Reach-1	11.39	2 year	19.70	174.74	176.58	175.69	176.68	0.001216	1.39	15.65	11.82	0.34
Reach-1	11.39	5 year	31.40	174.74	177.13	176.01	177.26	0.001176	1.64	25.38	30.35	0.35
Reach-1	11.39	10 year	39.60	174.74	177.46	176.20	177.59	0.001057	1.70	37.44	42.77	0.34
Reach-1	11.39	25 year	51.20	174.74	177.80	176.44	177.92	0.000897	1.70	70.80	114.82	0.32
Reach-1	11.39	50 year	60.10	174.74	177.95	176.64	178.06	0.000888	1.75	87.49	116.30	0.32
Reach-1	11.39	100 year	69.30	174.74	178.13	176.86	178.23	0.000797	1.72	108.47	118.06	0.30
Reach-1	11.39	Regional Storm	313.10	174.74	179.83	178.74	179.97	0.001112	2.68	330.05	163.96	0.38
Reach-1	11.3895		Bridge									
Reach-1	11.389	2 year	19.70	174.48	176.24	175.74	176.51	0.004203	2.35	9.12	8.69	0.58
Reach-1	11.389	5 year	31.40	174.48	176.70	176.21	177.08	0.004358	2.81	14.88	19.24	0.61
Reach-1	11.389	10 year	39.60	174.48	177.23	176.49	177.48	0.002499	2.46	29.19	34.81	0.48
Reach-1	11.389	25 year	51.20	174.48	177.58	177.07	177.81	0.002181	2.50	43.18	48.81	0.46
Reach-1	11.389	50 year	60.10	174.48	177.62	177.25	177.93	0.002803	2.86	45.29	52.48	0.52
Reach-1	11.389	100 year	69.30	174.48	177.78	177.39	178.09	0.002834	2.97	54.60	67.92	0.53
Reach-1	11.389	Regional Storm	313.10	174.48	179.44	178.94	179.81	0.003498	4.36	210.18	114.81	0.63
Reach-1	11.3885		Bridge									
Reach-1	11.388	2 year	19.70	174.23	176.21	175.15	176.27	0.000780	1.18	19.09	13.14	0.28
Reach-1	11.388	5 year	31.40	174.23	176.54	175.45	176.66	0.001132	1.58	23.67	16.75	0.34
Reach-1	11.388	10 year	39.60	174.23	176.75	175.63	176.91	0.001294	1.80	27.71	21.37	0.37
Reach-1	11.388	25 year	51.20	174.23	176.93	175.87	177.15	0.001653	2.13	31.91	25.30	0.42
Reach-1	11.388	50 year	60.10	174.23	177.06	176.05	177.34	0.001933	2.39	39.08	74.66	0.46

HEC-RAS Plan: wc28&29 - PROP (4hr CH) River: RIVER-1 Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
Reach-1	11.388	100 year	69.30	174.23	177.20	176.21	177.49	0.001994	2.50	49.59	81.26	0.47
Reach-1	11.388	Regional Storm	313.10	174.23	178.89	178.46	179.21	0.002244	3.62	237.63	168.36	0.54
Reach-1	11.385		Bridge									
Reach-1	11.382	2 year	19.70	174.18	176.12		176.22	0.001203	1.42	15.10	11.68	0.33
Reach-1	11.382	5 year	31.40	174.18	176.38		176.57	0.001922	1.96	18.98	17.85	0.43
Reach-1	11.382	10 year	39.60	174.18	176.57	175.69	176.81	0.002203	2.22	25.25	59.12	0.46
Reach-1	11.382	25 year	51.20	174.18	176.69	175.94	177.01	0.002863	2.61	33.56	76.73	0.53
Reach-1	11.382	50 year	60.10	174.18	176.77	176.18	177.14	0.003256	2.85	40.48	89.34	0.57
Reach-1	11.382	100 year	69.30	174.18	176.85	176.44	177.25	0.003607	3.06	47.56	97.19	0.61
Reach-1	11.382	Regional Storm	313.10	174.18	178.36		178.60	0.002620	3.54	288.77	305.62	0.56
Reach-1	11.38	2 year	19.70	173.70	175.01	174.98	175.50	0.011882	3.10	7.25	23.05	0.97
Reach-1	11.38	5 year	31.40	173.70	175.44	175.42	175.81	0.006822	2.95	17.81	26.58	0.78
Reach-1	11.38	10 year	39.60	173.70	175.67	175.47	176.04	0.005923	3.04	26.60	47.20	0.74
Reach-1	11.38	25 year	51.20	173.70	175.96	175.87	176.26	0.004440	2.92	44.55	79.43	0.66
Reach-1	11.38	50 year	60.10	173.70	176.11	176.06	176.36	0.003721	2.81	59.53	101.58	0.61
Reach-1	11.38	100 year	69.30	173.70	176.25		176.46	0.003248	2.73	73.30	105.23	0.58
Reach-1	11.38	Regional Storm	313.10	173.70	178.03		178.16	0.001732	2.93	323.27	158.55	0.46
Reach-1	11.37	2 year	19.70	173.00	174.66		174.72	0.001063	1.17	19.96	18.29	0.31
Reach-1	11.37	5 year	31.40	173.00	175.06		175.16	0.001153	1.44	27.78	23.85	0.34
Reach-1	11.37	10 year	39.60	173.00	175.29		175.41	0.001207	1.59	34.96	38.94	0.35
Reach-1	11.37	25 year	51.20	173.00	175.61		175.73	0.001120	1.69	50.72	59.98	0.35
Reach-1	11.37	50 year	60.10	173.00	175.72		175.87	0.001256	1.84	57.93	67.44	0.37
Reach-1	11.37	100 year	69.30	173.00	175.82		175.99	0.001389	1.99	65.14	74.16	0.39
Reach-1	11.37	Regional Storm	313.10	173.00	177.15		177.58	0.003084	3.90	220.66	159.98	0.63

DUFFINS CREEK

HEC-RAS ANALYSIS WC#30

EXISTING 407 ETR

EX CULVERT 3 x (ø1800)CSP

186.60 | 186.11 | ST 300
186.40 | 185.76

12+700 | 12+800 | 12+900 | 13+000

PROPOSED 407 TWY

PROP CULV WC#30
SPAN x RISE=(6 x 2.5)m
L=48.5m, S=1.0%
U/S INV=185.50m
D/S INV=185.00m

185.27 | 185.47 | ST 100
185.15 | 185.20

184.34 | 184.34 | ST 10
184.21 | 184.23

LEGEND

- EXISTING 407 ETR
- PROPOSED 407 TWY
- CREEK FLOW DIRECTION
- EXISTING CULVERT
- PROPOSED CULVERT
- PROPOSED REGIONAL FLOODLINE

EX REG | PR REG | HEC ST
EX 100 | PR 100

CROSS SECTION NUMBER

PARSONS HEC-RAS SECTION

PROPOSED WL ELEVATION (m)

EXISTING UPDATED WL ELEVATION (m)

5m 0m 10m 20m 30m

SCALE HORIZONTAL 1:1000

DATE: SEPTEMBER 2016

SCALE: 1:1000

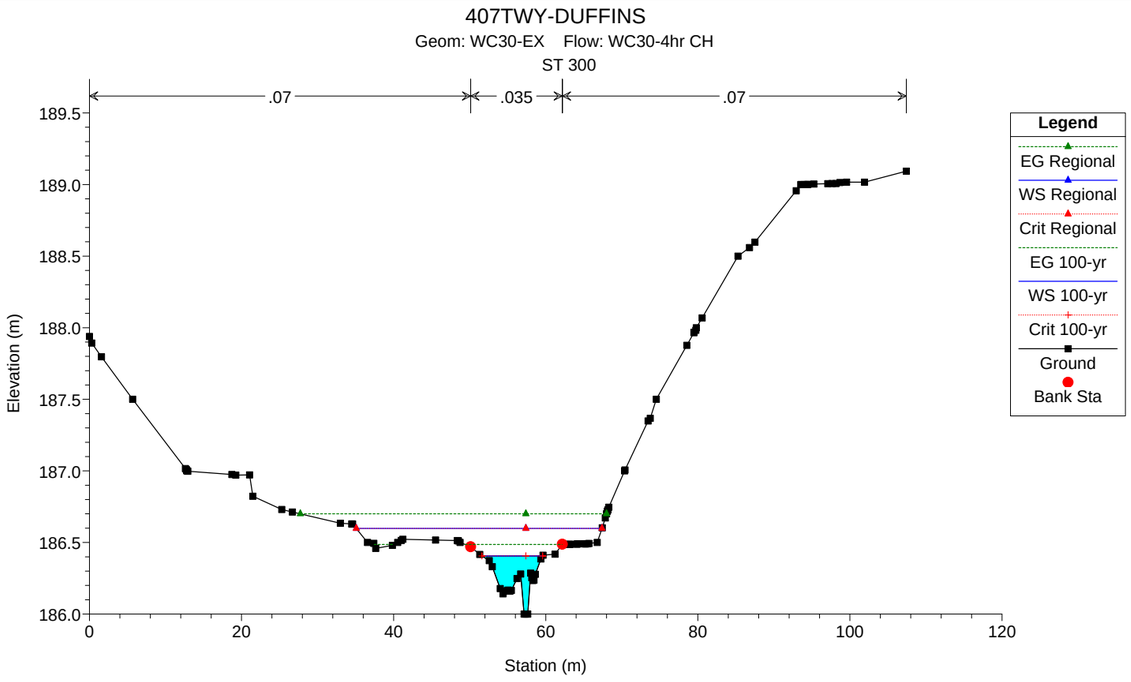
Ontario

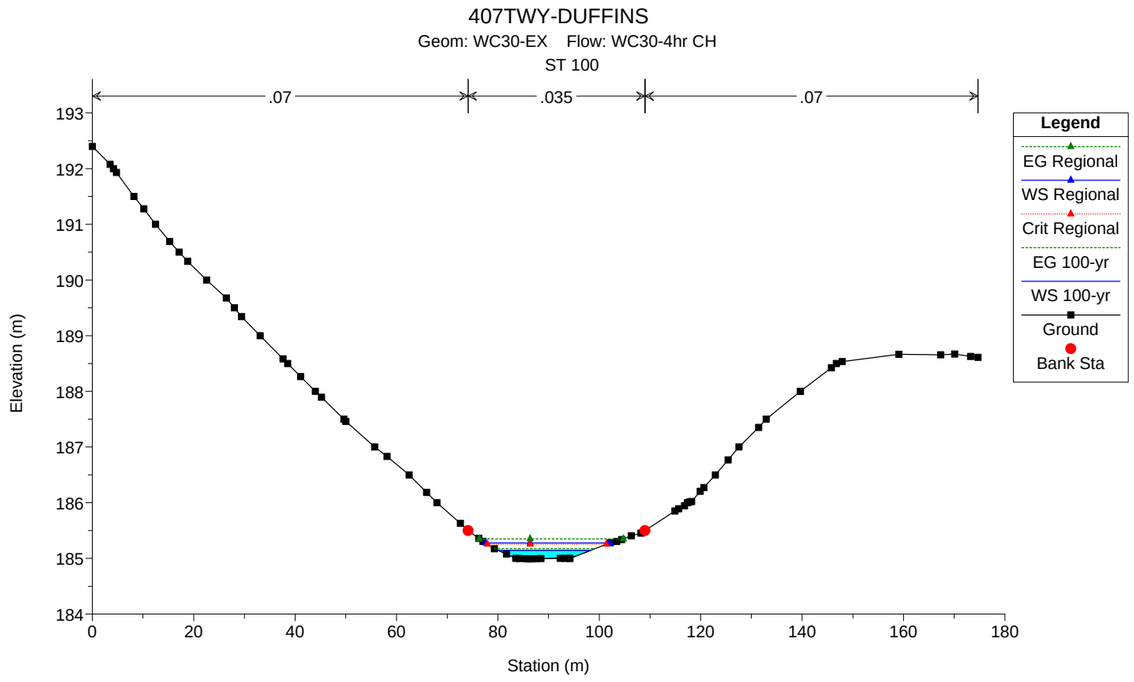
PARSONS

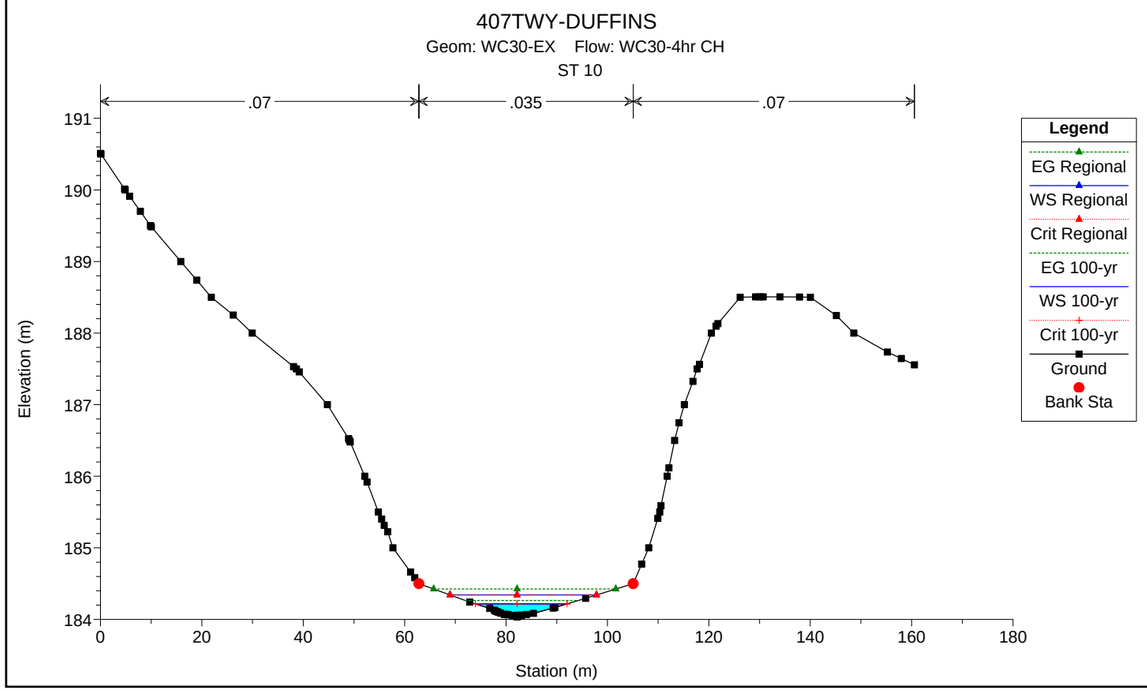
625 COCHRANE DRIVE, SUITE 500
MARKHAM, ONTARIO L3R 9R9
TEL: 905-943-0500
FAX: 905-943-0400

407 TRANSITWAY FROM KENNEDY RD TO BROCK RD

FIGURE 6.17 - HEC-RAS ANALYSIS - DUFFINS CREEK (WC#30)


407TWY-DUFFINS
Geom: WC30-EX Flow: WC30-4hr CH
ST 300
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta


407TWY-DUFFINS
Geom: WC30-EX Flow: WC30-4hr CH
ST 100
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Ground
Bank Sta


407TWY-DUFFINS
Geom: WC30-EX Flow: WC30-4hr CH
ST 10
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta

HEC-RAS Plan: WC30-EX 4hr CH River: DUFFINS Reach: WC30

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC30	300	2-yr	0.55	186.00	186.28	186.28	186.33	0.029067	1.03	0.53	5.27	1.04
WC30	300	5-yr	0.80	186.00	186.32	186.32	186.38	0.021368	1.05	0.76	5.88	0.93
WC30	300	10-yr	0.97	186.00	186.33	186.33	186.40	0.025241	1.18	0.82	6.01	1.02
WC30	300	25-yr	1.27	186.00	186.36	186.36	186.44	0.025570	1.28	0.99	6.45	1.04
WC30	300	50-yr	1.46	186.00	186.38	186.38	186.46	0.022603	1.26	1.16	7.04	0.99
WC30	300	100-yr	1.67	186.00	186.40	186.40	186.49	0.021886	1.26	1.33	7.93	0.98
WC30	300	Check Flow	2.17	186.00	186.45	186.45	186.53	0.021365	1.22	1.78	11.12	0.97
WC30	300	Regional	5.97	186.00	186.60	186.60	186.70	0.013748	1.47	5.54	32.39	0.86
WC30	100	2-yr	0.55	184.99	185.08		185.09	0.011521	0.52	1.05	14.84	0.63
WC30	100	5-yr	0.80	184.99	185.11		185.12	0.009533	0.56	1.44	16.19	0.59
WC30	100	10-yr	0.97	184.99	185.10		185.13	0.014884	0.69	1.41	16.09	0.74
WC30	100	25-yr	1.27	184.99	185.13		185.15	0.011889	0.69	1.83	17.43	0.68
WC30	100	50-yr	1.46	184.99	185.14		185.17	0.011513	0.72	2.04	18.06	0.68
WC30	100	100-yr	1.67	184.99	185.15		185.18	0.011366	0.74	2.25	18.67	0.68
WC30	100	Check Flow	2.17	184.99	185.17		185.21	0.012724	0.84	2.60	19.64	0.73
WC30	100	Regional	5.97	184.99	185.27	185.25	185.35	0.015522	1.22	4.89	24.38	0.87
WC30	10	2-yr	0.55	184.03	184.15	184.15	184.18	0.031582	0.78	0.71	11.82	1.01
WC30	10	5-yr	0.80	184.03	184.16	184.16	184.21	0.044972	0.98	0.82	12.69	1.22
WC30	10	10-yr	0.97	184.03	184.19	184.19	184.22	0.021702	0.78	1.24	15.40	0.88
WC30	10	25-yr	1.27	184.03	184.19	184.19	184.24	0.030329	0.95	1.34	15.97	1.05
WC30	10	50-yr	1.46	184.03	184.20	184.20	184.25	0.032076	1.01	1.45	16.61	1.09
WC30	10	100-yr	1.67	184.03	184.21	184.21	184.27	0.032802	1.05	1.59	17.36	1.11
WC30	10	Check Flow	2.17	184.03	184.24	184.24	184.29	0.026562	1.04	2.09	19.82	1.02
WC30	10	Regional	5.97	184.03	184.34	184.34	184.42	0.021824	1.26	4.74	29.08	1.00

407 TWY KENNEDY RD TO BROCK WC30-EX

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: 407TWY-DUFFINS
Project File : 407TWY-DUFFINS.prj
Run Date and Time: 1/20/2016 12:00:05 AM

Project in SI units

Project Description:
HEC-RAS Model created for 407 TWY project from Kennedy Rd. to Brock Rd. - Duffins Creek Watershed

PLAN DATA

Plan Title: Plan 80
Plan File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.p80

Geometry Title: WC30-EX
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.g01

Flow Title   : WC30-4hr CH
Flow File   : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.f08

Plan Summary Information:
Number of: Cross Sections =   3   Multiple Openings =   0
            Culverts   =   0   Inline Structures =   0
            Bridges   =   0   Lateral Structures =   0

Computational Information
    Water surface calculation tolerance = 0.01
    Critical depth calculation tolerance = 0.01
    Maximum number of iterations   = 20
    Maximum difference tolerance   = 0.3
    Flow tolerance factor   = 0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method: Average Conveyance

Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: WC30-4hr CH
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.f08

Flow Data (m3/s)

River	Reach	RS	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Check Flow	Regional
DUFFINS	WC30	300	.55	.8	.97	1.27	1.46	1.67	2.17	5.97

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
DUFFINS	WC30	2-yr		Critical
DUFFINS	WC30	5-yr		Critical
DUFFINS	WC30	10-yr		Critical
DUFFINS	WC30	25-yr		Critical
DUFFINS	WC30	50-yr		Critical
DUFFINS	WC30	100-yr		Critical
DUFFINS	WC30	Check Flow		Critical
DUFFINS	WC30	Regional		Critical

GEOMETRY DATA

Geometry Title: WC30-EX
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.g01

CROSS SECTION

RIVER: DUFFINS

407 TWY KENNEDY RD TO BROCK WC30-EX

REACH: WC30 RS: 300

INPUT

Description: ST 300

Station Elevation Data num= 114

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	187.939	.307	187.893	1.58	187.797	5.686	187.5	12.623	187.016
12.748	187.008	12.787	187.001	12.85	187	12.938	186.998	18.728	186.975
19.237	186.97	21.057	186.972	21.479	186.823	25.288	186.73	26.68	186.713
32.99	186.634	34.496	186.63	34.525	186.628	34.61	186.629	36.565	186.5
37.389	186.494	37.643	186.459	39.842	186.48	40.529	186.5	40.995	186.514
41.206	186.522	45.505	186.517	48.372	186.513	48.484	186.512	48.498	186.512
48.731	186.5	50.127	186.47	51.32	186.416	52.566	186.373	52.975	186.331
54.016	186.178	54.382	186.141	54.403	186.15	54.428	186.162	55.05	186.167
55.07	186.167	55.275	186.16	55.477	186.165	56.217	186.248	56.702	186.28
57.154	186	57.234	186	57.315	186	57.393	186	57.472	186
57.632	186	58.021	186.286	58.173	186.254	58.298	186.235	58.439	186.236
58.451	186.237	58.637	186.278	59.356	186.385	59.645	186.411	61.214	186.418
62.187	186.488	62.249	186.487	62.254	186.487	62.669	186.486	63.104	186.487
63.132	186.487	63.202	186.487	64.063	186.489	64.128	186.489	64.262	186.49
65.085	186.49	65.19	186.49	65.224	186.49	65.27	186.49	65.364	186.49
65.401	186.491	65.501	186.491	65.685	186.493	66.774	186.5	67.427	186.602
67.823	186.671	67.989	186.7	68.101	186.718	68.181	186.728	68.301	186.746
70.366	187	70.422	187.006	73.465	187.349	73.746	187.367	74.545	187.5
78.548	187.877	79.478	187.965	79.509	187.968	79.736	187.982	79.798	188
80.559	188.068	85.281	188.5	86.792	188.56	87.504	188.598	92.942	188.957
93.547	189	93.574	189	94.004	189	94.377	189	94.38	189
94.459	189.001	95.254	189.003	97.089	189.006	97.654	189.007	98.169	189.007
98.674	189.014	99.553	189.017	101.923	189.017	107.412	189.093		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	50.127	.035	62.187	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
50.127	62.187	49	60	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	186.33	Element	Left OB	Channel
Vel Head (m)	0.05	Wt. n-Val.		0.035
W.S. Elev (m)	186.28	Reach Len. (m)	49.00	60.00
Crit W.S. (m)	186.28	Flow Area (m2)		0.53
E.G. Slope (m/m)	0.029067	Area (m2)		0.53
Q Total (m3/s)	0.55	Flow (m3/s)		0.55
Top Width (m)	5.27	Top Width (m)		5.27
Vel Total (m/s)	1.03	Avg. Vel. (m/s)		1.03
Max Chl Dpth (m)	0.28	Hydr. Depth (m)		0.10
Conv. Total (m3/s)	3.2	Conv. (m3/s)		3.2
Length Wtd. (m)	60.00	Wetted Per. (m)		5.47
Min Ch El (m)	186.00	Shear (N/m2)		27.80

Alpha	1.00	Stream Power (N/m s)	5142.67	0.00
0.00				
Frctn Loss (m)	1.04	Cum Volume (1000 m3)		0.09
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.28

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	186.38	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.035	
W.S. Elev (m)	186.32	Reach Len. (m)	49.00	60.00	60.00
Crit W.S. (m)	186.32	Flow Area (m2)		0.76	
E.G. Slope (m/m)	0.021368	Area (m2)		0.76	
Q Total (m3/s)	0.80	Flow (m3/s)		0.80	
Top Width (m)	5.88	Top Width (m)		5.88	
Vel Total (m/s)	1.05	Avg. Vel. (m/s)		1.05	
Max Chl Dpth (m)	0.32	Hydr. Depth (m)		0.13	
Conv. Total (m3/s)	5.5	Conv. (m3/s)		5.5	
Length Wtd. (m)	60.00	Wetted Per. (m)		6.09	
Min Ch El (m)	186.00	Shear (N/m2)		26.30	
Alpha	1.00	Stream Power (N/m s)	5142.67	0.00	
0.00					
Frctn Loss (m)	0.82	Cum Volume (1000 m3)		0.12	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.40	

Warning: The energy equation could not be balanced within the specified number of

iterations. The program used critical depth
        for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
         This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
        need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
        water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
        defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	186.40	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.035	
W.S. Elev (m)	186.33	Reach Len. (m)	49.00	60.00	60.00
Crit W.S. (m)	186.33	Flow Area (m2)		0.82	
E.G. Slope (m/m)	0.025241	Area (m2)		0.82	
Q Total (m3/s)	0.97	Flow (m3/s)		0.97	
Top Width (m)	6.01	Top Width (m)		6.01	
Vel Total (m/s)	1.18	Avg. Vel. (m/s)		1.18	
Max Chl Dpth (m)	0.33	Hydr. Depth (m)		0.14	
Conv. Total (m3/s)	6.1	Conv. (m3/s)		6.1	
Length Wtd. (m)	60.00	Wetted Per. (m)		6.22	
Min Ch El (m)	186.00	Shear (N/m2)		32.74	
Alpha	1.00	Stream Power (N/m s)	5142.67	0.00	0.00
Frctn Loss (m)	1.14	Cum Volume (1000 m3)		0.13	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.47	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
        for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
        need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
        water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
        defaulted to critical depth.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	186.44	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.		0.035	
W.S. Elev (m)	186.36	Reach Len. (m)	49.00	60.00	60.00
Crit W.S. (m)	186.36	Flow Area (m2)		0.99	
E.G. Slope (m/m)	0.025570	Area (m2)		0.99	
Q Total (m3/s)	1.27	Flow (m3/s)		1.27	
Top Width (m)	6.45	Top Width (m)		6.45	
Vel Total (m/s)	1.28	Avg. Vel. (m/s)		1.28	
Max Chl Dpth (m)	0.36	Hydr. Depth (m)		0.15	
Conv. Total (m3/s)	7.9	Conv. (m3/s)		7.9	
Length Wtd. (m)	60.00	Wetted Per. (m)		6.67	
Min Ch El (m)	186.00	Shear (N/m2)		37.26	
Alpha	1.00	Stream Power (N/m s)	5142.67	0.00	0.00
Frctn Loss (m)	1.01	Cum Volume (1000 m3)		0.17	
C & E Loss (m)	0.02	Cum SA (1000 m2)		1.57	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
        for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
        This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
        need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
        water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
        defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	186.46	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.		0.035	
W.S. Elev (m)	186.38	Reach Len. (m)	49.00	60.00	60.00
Crit W.S. (m)	186.38	Flow Area (m2)		1.16	
E.G. Slope (m/m)	0.022603	Area (m2)		1.16	

Q Total (m3/s)	1.46	Flow (m3/s)			1.46
Top Width (m)	7.04	Top Width (m)			7.04
Vel Total (m/s)	1.26	Avg. Vel. (m/s)			1.26
Max Chl Dpth (m)	0.38	Hydr. Depth (m)			0.16
Conv. Total (m3/s)	9.7	Conv. (m3/s)			9.7
Length Wtd. (m)	60.00	Wetted Per. (m)			7.25
Min Ch El (m)	186.00	Shear (N/m2)			35.34
Alpha	1.00	Stream Power (N/m s)	5142.67		0.00
0.00					
Frctn Loss (m)	0.94	Cum Volume (1000 m3)			0.18
C & E Loss (m)	0.02	Cum SA (1000 m2)			1.64

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	186.49	Element	Left OB	Channel	
Right OB					
Vel Head (m)	0.08	Wt. n-Val.		0.035	
W.S. Elev (m)	186.40	Reach Len. (m)	49.00	60.00	
60.00					
Crit W.S. (m)	186.40	Flow Area (m2)		1.33	
E.G. Slope (m/m)	0.021886	Area (m2)		1.33	
Q Total (m3/s)	1.67	Flow (m3/s)		1.67	
Top Width (m)	7.93	Top Width (m)		7.93	
Vel Total (m/s)	1.26	Avg. Vel. (m/s)		1.26	
Max Chl Dpth (m)	0.40	Hydr. Depth (m)		0.17	
Conv. Total (m3/s)	11.3	Conv. (m3/s)		11.3	
Length Wtd. (m)	60.00	Wetted Per. (m)		8.15	
Min Ch El (m)	186.00	Shear (N/m2)		34.92	
Alpha	1.00	Stream Power (N/m s)	5142.67	0.00	

0.00					
Frctn Loss (m)	0.92	Cum Volume (1000 m3)			0.21
C & E Loss (m)	0.02	Cum SA (1000 m2)			1.72

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	186.53	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.		0.035	
W.S. Elev (m)	186.45	Reach Len. (m)	49.00	60.00	60.00
Crit W.S. (m)	186.45	Flow Area (m2)		1.78	
E.G. Slope (m/m)	0.021365	Area (m2)		1.78	
Q Total (m3/s)	2.17	Flow (m3/s)		2.17	
Top Width (m)	11.12	Top Width (m)		11.12	
Vel Total (m/s)	1.22	Avg. Vel. (m/s)		1.22	
Max Chl Dpth (m)	0.45	Hydr. Depth (m)		0.16	
Conv. Total (m3/s)	14.8	Conv. (m3/s)		14.8	
Length Wtd. (m)	60.00	Wetted Per. (m)		11.34	
Min Ch El (m)	186.00	Shear (N/m2)		32.96	
Alpha	1.00	Stream Power (N/m s)	5142.67	0.00	0.00
Frctn Loss (m)	0.97	Cum Volume (1000 m3)		0.25	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.93	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set

equal to critical depth, the calculated
        water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
        defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	186.70	Element	Left OB	Channel	Right OB
Vel Head (m)	0.10	Wt. n-Val.	0.070	0.035	0.070
W.S. Elev (m)	186.60	Reach Len. (m)	49.00	60.00	60.00
Crit W.S. (m)	186.60	Flow Area (m2)	1.42	3.58	0.54
E.G. Slope (m/m)	0.013748	Area (m2)	1.42	3.58	0.54
Q Total (m3/s)	5.97	Flow (m3/s)	0.49	5.28	0.20
Top Width (m)	32.39	Top Width (m)	15.09	12.06	5.23
Vel Total (m/s)	1.08	Avg. Vel. (m/s)	0.35	1.47	0.37
Max Chl Dpth (m)	0.60	Hydr. Depth (m)	0.09	0.30	0.10
Conv. Total (m3/s)	50.9	Conv. (m3/s)	4.2	45.0	1.7
Length Wtd. (m)	59.55	Wetted Per. (m)	15.10	12.28	5.24
Min Ch El (m)	186.00	Shear (N/m2)	12.64	39.34	13.89
Alpha	1.67	Stream Power (N/m s)	5142.67	0.00	0.00
Frctn Loss (m)	0.87	Cum Volume (1000 m3)	0.03	0.50	0.02
C & E Loss (m)	0.01	Cum SA (1000 m2)	0.37	2.46	0.16

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
        for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
        need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
        water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
        defaulted to critical depth.

CROSS SECTION

RIVER: DUFFINS
REACH: WC30 RS: 100

INPUT
Description: ST 100
Station Elevation Data num= 75

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev

407 TWY KENNEDY RD TO BROCK WC30-EX

0	192.4	3.502	192.077	4.147	192	4.751	191.931	8.199	191.5
10.173	191.279	12.478	191	15.273	190.69	17.112	190.5	18.809	190.335
22.548	190	26.435	189.678	28.018	189.5	29.431	189.341	33.108	189
37.605	188.585	38.534	188.5	41.105	188.265	43.993	188	45.208	187.894
49.602	187.5	50.015	187.461	55.69	187	58.125	186.83	62.48	186.5
65.918	186.187	67.964	186	72.594	185.629	74.126	185.5	76.216	185.358
77.027	185.307	79.312	185.172	81.685	185.078	83.524	185	84.271	184.998
85.603	184.993	85.724	184.993	85.857	184.992	86.204	184.992	86.836	184.992
87.577	184.994	88.488	184.998	92.282	185	93.202	185	94.127	185
94.21	185	102.202	185.282	103.448	185.304	104.41	185.338	106.307	185.407
108.223	185.455	109.015	185.5	114.931	185.851	115.668	185.892	116.82	185.947
117.374	186	117.778	186.014	118.216	186.021	119.898	186.205	120.615	186.273
122.899	186.5	125.396	186.769	127.558	187	131.422	187.353	132.896	187.5
139.64	187.999	139.652	188	145.777	188.423	146.751	188.5	147.913	188.535
159.089	188.665	167.335	188.657	170.081	188.669	173.229	188.628	174.691	188.612

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	74.126	.035	109.015	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
74.126	109.015	46	51	51	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	185.09	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	185.08	Reach Len. (m)	46.00	51.00	51.00
Crit W.S. (m)		Flow Area (m2)		1.05	
E.G. Slope (m/m)	0.011521	Area (m2)		1.05	
Q Total (m3/s)	0.55	Flow (m3/s)		0.55	
Top Width (m)	14.84	Top Width (m)		14.84	
Vel Total (m/s)	0.52	Avg. Vel. (m/s)		0.52	
Max Chl Dpth (m)	0.09	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	5.1	Conv. (m3/s)		5.1	
Length Wtd. (m)	51.00	Wetted Per. (m)		14.84	
Min Ch El (m)	184.99	Shear (N/m2)		7.99	
Alpha	1.00	Stream Power (N/m s)	8363.83	0.00	0.00
Frctn Loss (m)	0.91	Cum Volume (1000 m3)		0.04	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.68	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and

previous cross section. This may indicate the
need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	185.12	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	185.11	Reach Len. (m)	46.00	51.00	51.00
Crit W.S. (m)		Flow Area (m2)		1.44	
E.G. Slope (m/m)	0.009533	Area (m2)		1.44	
Q Total (m3/s)	0.80	Flow (m3/s)		0.80	
Top Width (m)	16.19	Top Width (m)		16.19	
Vel Total (m/s)	0.56	Avg. Vel. (m/s)		0.56	
Max Chl Dpth (m)	0.11	Hydr. Depth (m)		0.09	
Conv. Total (m3/s)	8.2	Conv. (m3/s)		8.2	
Length Wtd. (m)	51.00	Wetted Per. (m)		16.19	
Min Ch El (m)	184.99	Shear (N/m2)		8.31	
Alpha	1.00	Stream Power (N/m s)	8363.83	0.00	0.00
Frctn Loss (m)	0.91	Cum Volume (1000 m3)		0.06	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.74	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	185.13	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	185.10	Reach Len. (m)	46.00	51.00	51.00
Crit W.S. (m)		Flow Area (m2)		1.41	
E.G. Slope (m/m)	0.014884	Area (m2)		1.41	
Q Total (m3/s)	0.97	Flow (m3/s)		0.97	
Top Width (m)	16.09	Top Width (m)		16.09	

Vel Total (m/s)	0.69	Avg. Vel. (m/s)			0.69
Max Chl Dpth (m)	0.11	Hydr. Depth (m)			0.09
Conv. Total (m3/s)	8.0	Conv. (m3/s)			8.0
Length Wtd. (m)	51.00	Wetted Per. (m)			16.09
Min Ch El (m)	184.99	Shear (N/m2)			12.79
Alpha	1.00	Stream Power (N/m s)	8363.83		0.00
0.00					
Frctn Loss (m)	0.91	Cum Volume (1000 m3)			0.07
C & E Loss (m)	0.00	Cum SA (1000 m2)			0.80

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	185.15	Element	Left OB	Channel	
Right OB					
Vel Head (m)	0.02	Wt. n-Val.			0.035
W.S. Elev (m)	185.13	Reach Len. (m)	46.00		51.00
51.00					
Crit W.S. (m)		Flow Area (m2)			1.83
E.G. Slope (m/m)	0.011889	Area (m2)			1.83
Q Total (m3/s)	1.27	Flow (m3/s)			1.27
Top Width (m)	17.43	Top Width (m)			17.43
Vel Total (m/s)	0.69	Avg. Vel. (m/s)			0.69
Max Chl Dpth (m)	0.14	Hydr. Depth (m)			0.11
Conv. Total (m3/s)	11.6	Conv. (m3/s)			11.6
Length Wtd. (m)	51.00	Wetted Per. (m)			17.44
Min Ch El (m)	184.99	Shear (N/m2)			12.24
Alpha	1.00	Stream Power (N/m s)	8363.83		0.00
0.00					
Frctn Loss (m)	0.92	Cum Volume (1000 m3)			0.08
C & E Loss (m)	0.00	Cum SA (1000 m2)			0.85

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and

previous cross section. This may indicate the
need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	185.17	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	185.14	Reach Len. (m)	46.00	51.00	51.00
Crit W.S. (m)		Flow Area (m2)		2.04	
E.G. Slope (m/m)	0.011513	Area (m2)		2.04	
Q Total (m3/s)	1.46	Flow (m3/s)		1.46	
Top Width (m)	18.06	Top Width (m)		18.06	
Vel Total (m/s)	0.72	Avg. Vel. (m/s)		0.72	
Max Chl Dpth (m)	0.15	Hydr. Depth (m)		0.11	
Conv. Total (m3/s)	13.6	Conv. (m3/s)		13.6	
Length Wtd. (m)	51.00	Wetted Per. (m)		18.07	
Min Ch El (m)	184.99	Shear (N/m2)		12.74	
Alpha	1.00	Stream Power (N/m s)	8363.83	0.00	0.00
Frctn Loss (m)	0.92	Cum Volume (1000 m3)		0.09	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.88	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	185.18	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	185.15	Reach Len. (m)	46.00	51.00	51.00
Crit W.S. (m)		Flow Area (m2)		2.25	
E.G. Slope (m/m)	0.011366	Area (m2)		2.25	
Q Total (m3/s)	1.67	Flow (m3/s)		1.67	
Top Width (m)	18.67	Top Width (m)		18.67	

Vel Total (m/s)	0.74	Avg. Vel. (m/s)		0.74
Max Chl Dpth (m)	0.16	Hydr. Depth (m)		0.12
Conv. Total (m3/s)	15.7	Conv. (m3/s)		15.7
Length Wtd. (m)	51.00	Wetted Per. (m)		18.68
Min Ch El (m)	184.99	Shear (N/m2)		13.42
Alpha	1.00	Stream Power (N/m s)	8363.83	0.00
0.00				
Frctn Loss (m)	0.92	Cum Volume (1000 m3)		0.10
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.92

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	185.21	Element	Left OB	Channel
Right OB				
Vel Head (m)	0.04	Wt. n-Val.		0.035
W.S. Elev (m)	185.17	Reach Len. (m)	46.00	51.00
51.00				
Crit W.S. (m)		Flow Area (m2)		2.60
E.G. Slope (m/m)	0.012724	Area (m2)		2.60
Q Total (m3/s)	2.17	Flow (m3/s)		2.17
Top Width (m)	19.64	Top Width (m)		19.64
Vel Total (m/s)	0.84	Avg. Vel. (m/s)		0.84
Max Chl Dpth (m)	0.18	Hydr. Depth (m)		0.13
Conv. Total (m3/s)	19.2	Conv. (m3/s)		19.2
Length Wtd. (m)	51.00	Wetted Per. (m)		19.65
Min Ch El (m)	184.99	Shear (N/m2)		16.49
Alpha	1.00	Stream Power (N/m s)	8363.83	0.00
0.00				
Frctn Loss (m)	0.91	Cum Volume (1000 m3)		0.12
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.01

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance)

is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	185.35	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.		0.035	
W.S. Elev (m)	185.27	Reach Len. (m)	46.00	51.00	51.00
Crit W.S. (m)	185.25	Flow Area (m2)		4.89	
E.G. Slope (m/m)	0.015522	Area (m2)		4.89	
Q Total (m3/s)	5.97	Flow (m3/s)		5.97	
Top Width (m)	24.38	Top Width (m)		24.38	
Vel Total (m/s)	1.22	Avg. Vel. (m/s)		1.22	
Max Chl Dpth (m)	0.28	Hydr. Depth (m)		0.20	
Conv. Total (m3/s)	47.9	Conv. (m3/s)		47.9	
Length Wtd. (m)	51.00	Wetted Per. (m)		24.39	
Min Ch El (m)	184.99	Shear (N/m2)		30.54	
Alpha	1.00	Stream Power (N/m s)	8363.83	0.00	0.00
Frctn Loss (m)	0.93	Cum Volume (1000 m3)		0.25	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.36	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.

CROSS SECTION

RIVER: DUFFINS
REACH: WC30 RS: 10

INPUT
Description: ST 10
Station Elevation Data num= 89

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	190.51	.098	190.5	4.769	190.012	4.89	190	5.763	189.912
7.86	189.7	9.858	189.5	10.031	189.484	15.841	189	18.998	188.739
21.868	188.5	26.2	188.252	29.941	188	38.093	187.532	38.657	187.5
39.199	187.457	44.757	187	48.934	186.524	49.117	186.5	49.277	186.479
52.139	186	52.57	185.919	54.813	185.5	55.47	185.402	55.958	185.315
56.663	185.224	57.675	185	61.179	184.662	61.985	184.583	62.805	184.5
72.861	184.241	76.782	184.153	77.695	184.129	77.911	184.117	78.217	184.11

78.51	184.098	78.955	184.086	79.618	184.071	79.74	184.069	80.254	184.066
80.313	184.066	80.345	184.069	80.383	184.068	81.329	184.053	81.716	184.051
81.815	184.049	82.032	184.045	82.049	184.045	82.082	184.043	82.172	184.034
82.203	184.037	82.24	184.04	82.269	184.058	82.976	184.056	83.082	184.06
84.038	184.068	85.401	184.085	89.295	184.158	89.608	184.165	95.694	184.295
105.083	184.5	106.751	184.772	108.151	185	109.942	185.412	110.305	185.5
110.56	185.588	111.784	186	112.121	186.117	113.259	186.5	114.126	186.746
115.179	187	116.87	187.325	117.693	187.5	118.151	187.563	120.501	188
121.412	188.096	121.793	188.131	126.18	188.5	129.226	188.505	130.033	188.505
130.722	188.505	134.016	188.506	137.885	188.503	140.016	188.5	145.147	188.245
148.595	188	155.22	187.735	157.951	187.644	160.541	187.557		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	62.805	.035	105.083	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
62.805	105.083	0	0	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	184.18	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	184.15	Reach Len. (m)			
Crit W.S. (m)	184.15	Flow Area (m2)		0.71	
E.G. Slope (m/m)	0.031582	Area (m2)		0.71	
Q Total (m3/s)	0.55	Flow (m3/s)		0.55	
Top Width (m)	11.82	Top Width (m)		11.82	
Vel Total (m/s)	0.78	Avg. Vel. (m/s)		0.78	
Max Chl Dpth (m)	0.11	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	3.1	Conv. (m3/s)		3.1	
Length Wtd. (m)		Wetted Per. (m)		11.83	
Min Ch El (m)	184.03	Shear (N/m2)		18.53	
Alpha	1.00	Stream Power (N/m s)	7686.36	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	184.21	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	184.16	Reach Len. (m)			

Crit W.S. (m)	184.16	Flow Area (m2)	0.82
E.G. Slope (m/m)	0.044972	Area (m2)	0.82
Q Total (m3/s)	0.80	Flow (m3/s)	0.80
Top Width (m)	12.69	Top Width (m)	12.69
Vel Total (m/s)	0.98	Avg. Vel. (m/s)	0.98
Max Chl Dpth (m)	0.12	Hydr. Depth (m)	0.06
Conv. Total (m3/s)	3.8	Conv. (m3/s)	3.8
Length Wtd. (m)		Wetted Per. (m)	12.70
Min Ch El (m)	184.03	Shear (N/m2)	28.49
Alpha	1.00	Stream Power (N/m s) 7686.36	0.00
0.00			
Frctn Loss (m)		Cum Volume (1000 m3)	
C & E Loss (m)		Cum SA (1000 m2)	

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	184.22	Element Left OB	Channel
Right OB			
Vel Head (m)	0.03	Wt. n-Val.	0.035
W.S. Elev (m)	184.19	Reach Len. (m)	
Crit W.S. (m)	184.19	Flow Area (m2)	1.24
E.G. Slope (m/m)	0.021702	Area (m2)	1.24
Q Total (m3/s)	0.97	Flow (m3/s)	0.97
Top Width (m)	15.40	Top Width (m)	15.40
Vel Total (m/s)	0.78	Avg. Vel. (m/s)	0.78
Max Chl Dpth (m)	0.15	Hydr. Depth (m)	0.08
Conv. Total (m3/s)	6.6	Conv. (m3/s)	6.6
Length Wtd. (m)		Wetted Per. (m)	15.41
Min Ch El (m)	184.03	Shear (N/m2)	17.10
Alpha	1.00	Stream Power (N/m s) 7686.36	0.00
0.00			
Frctn Loss (m)		Cum Volume (1000 m3)	
C & E Loss (m)		Cum SA (1000 m2)	

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	184.24	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	184.19	Reach Len. (m)			
Crit W.S. (m)	184.19	Flow Area (m2)		1.34	
E.G. Slope (m/m)	0.030329	Area (m2)		1.34	
Q Total (m3/s)	1.27	Flow (m3/s)		1.27	
Top Width (m)	15.97	Top Width (m)		15.97	
Vel Total (m/s)	0.95	Avg. Vel. (m/s)		0.95	
Max Chl Dpth (m)	0.16	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	7.3	Conv. (m3/s)		7.3	
Length Wtd. (m)		Wetted Per. (m)		15.98	
Min Ch El (m)	184.03	Shear (N/m2)		24.86	
Alpha	1.00	Stream Power (N/m s)	7686.36	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	184.25	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	184.20	Reach Len. (m)			
Crit W.S. (m)	184.20	Flow Area (m2)		1.45	
E.G. Slope (m/m)	0.032076	Area (m2)		1.45	
Q Total (m3/s)	1.46	Flow (m3/s)		1.46	
Top Width (m)	16.61	Top Width (m)		16.61	
Vel Total (m/s)	1.01	Avg. Vel. (m/s)		1.01	
Max Chl Dpth (m)	0.17	Hydr. Depth (m)		0.09	
Conv. Total (m3/s)	8.2	Conv. (m3/s)		8.2	
Length Wtd. (m)		Wetted Per. (m)		16.62	
Min Ch El (m)	184.03	Shear (N/m2)		27.44	

Alpha	1.00	Stream Power (N/m s)	7686.36	0.00
0.00				
Frctn Loss (m)		Cum Volume (1000 m3)		
C & E Loss (m)		Cum SA (1000 m2)		

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	184.27	Element	Left OB	Channel
Right OB				
Vel Head (m)	0.06	Wt. n-Val.		0.035
W.S. Elev (m)	184.21	Reach Len. (m)		
Crit W.S. (m)	184.21	Flow Area (m2)		1.59
E.G. Slope (m/m)	0.032802	Area (m2)		1.59
Q Total (m3/s)	1.67	Flow (m3/s)		1.67
Top Width (m)	17.36	Top Width (m)		17.36
Vel Total (m/s)	1.05	Avg. Vel. (m/s)		1.05
Max Chl Dpth (m)	0.17	Hydr. Depth (m)		0.09
Conv. Total (m3/s)	9.2	Conv. (m3/s)		9.2
Length Wtd. (m)		Wetted Per. (m)		17.37
Min Ch El (m)	184.03	Shear (N/m2)		29.43
Alpha	1.00	Stream Power (N/m s)	7686.36	0.00
0.00				
Frctn Loss (m)		Cum Volume (1000 m3)		
C & E Loss (m)		Cum SA (1000 m2)		

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	184.29	Element	Left OB	Channel
Right OB				
Vel Head (m)	0.05	Wt. n-Val.		0.035
W.S. Elev (m)	184.24	Reach Len. (m)		
Crit W.S. (m)	184.24	Flow Area (m2)		2.09
E.G. Slope (m/m)	0.026562	Area (m2)		2.09
Q Total (m3/s)	2.17	Flow (m3/s)		2.17
Top Width (m)	19.82	Top Width (m)		19.82

Vel Total (m/s)	1.04	Avg. Vel. (m/s)			1.04
Max Chl Dpth (m)	0.20	Hydr. Depth (m)			0.11
Conv. Total (m3/s)	13.3	Conv. (m3/s)			13.3
Length Wtd. (m)		Wetted Per. (m)			19.83
Min Ch El (m)	184.03	Shear (N/m2)			27.44
Alpha	1.00	Stream Power (N/m s)	7686.36		0.00
0.00					
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	184.42	Element	Left OB	Channel	
Right OB					
Vel Head (m)	0.08	Wt. n-Val.			0.035
W.S. Elev (m)	184.34	Reach Len. (m)			
Crit W.S. (m)	184.34	Flow Area (m2)			4.74
E.G. Slope (m/m)	0.021824	Area (m2)			4.74
Q Total (m3/s)	5.97	Flow (m3/s)			5.97
Top Width (m)	29.08	Top Width (m)			29.08
Vel Total (m/s)	1.26	Avg. Vel. (m/s)			1.26
Max Chl Dpth (m)	0.31	Hydr. Depth (m)			0.16
Conv. Total (m3/s)	40.4	Conv. (m3/s)			40.4
Length Wtd. (m)		Wetted Per. (m)			29.09
Min Ch El (m)	184.03	Shear (N/m2)			34.87
Alpha	1.00	Stream Power (N/m s)	7686.36		0.00
0.00					
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

SUMMARY OF MANNING'S N VALUES

River:DUFFINS

Reach	River Sta.	n1	n2	n3

407 TWY KENNEDY RD TO BROCK WC30-EX

WC30	300	.07	.035	.07
WC30	100	.07	.035	.07
WC30	10	.07	.035	.07

SUMMARY OF REACH LENGTHS

River: DUFFINS

Reach	River Sta.	Left	Channel	Right
WC30	300	49	60	60
WC30	100	46	51	51
WC30	10	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: DUFFINS

Reach	River Sta.	Contr.	Expan.
WC30	300	.1	.3
WC30	100	.1	.3
WC30	10	.1	.3

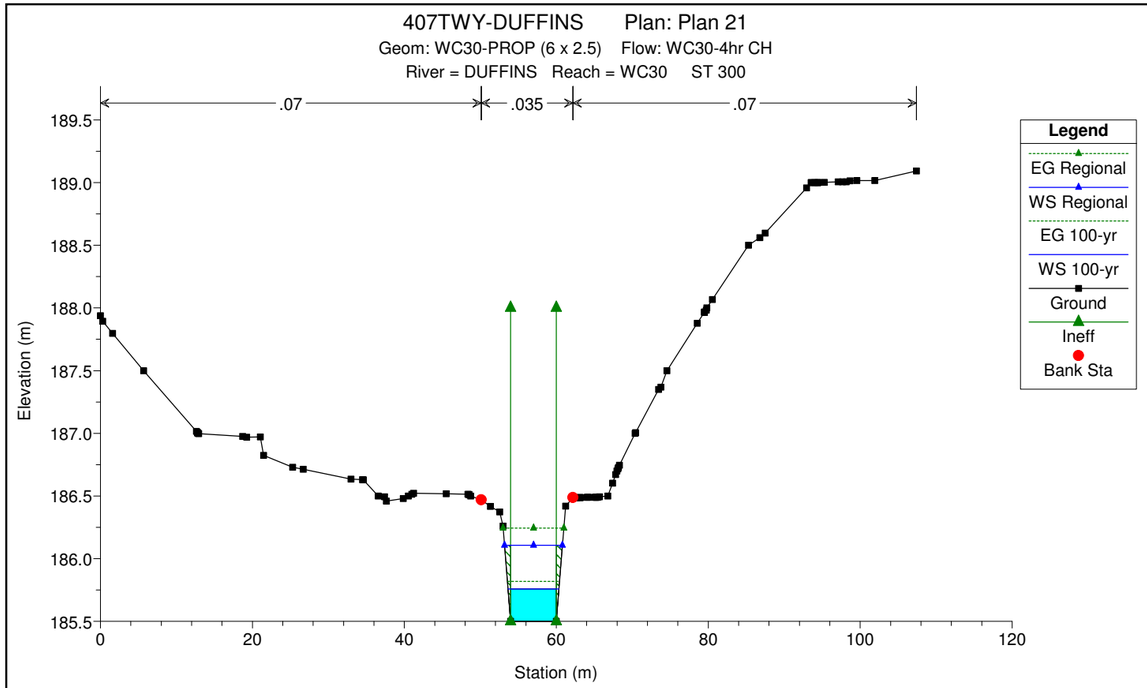
Profile Output Table - Standard Table 1

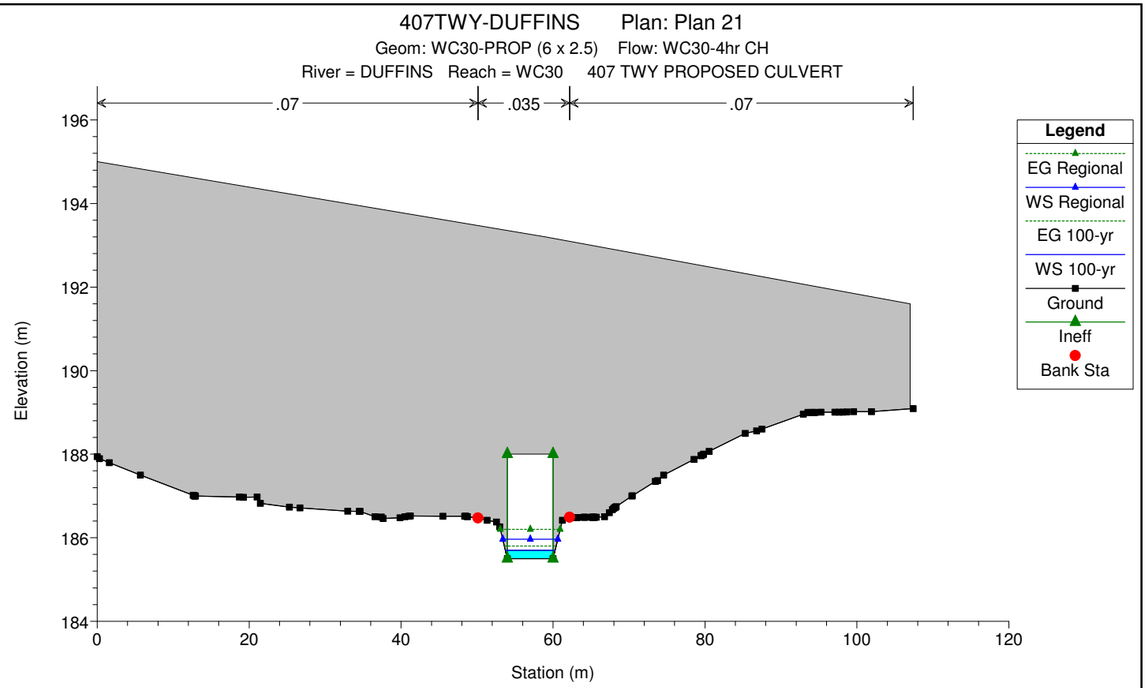
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
WC30	300	2-yr	0.55	186.00	186.28	186.28	186.33	0.029067	1.03	0.53	5.27	1.04
WC30	300	5-yr	0.80	186.00	186.32	186.32	186.38	0.021368	1.05	0.76	5.88	0.93
WC30	300	10-yr	0.97	186.00	186.33	186.33	186.40	0.025241	1.18	0.82	6.01	1.02
WC30	300	25-yr	1.27	186.00	186.36	186.36	186.44	0.025570	1.28	0.99	6.45	1.04
WC30	300	50-yr	1.46	186.00	186.38	186.38	186.46	0.022603	1.26	1.16	7.04	0.99
WC30	300	100-yr	1.67	186.00	186.40	186.40	186.49	0.021886	1.26	1.33	7.93	0.98
WC30	300	Check Flow	2.17	186.00	186.45	186.45	186.53	0.021365	1.22	1.78	11.12	0.97
WC30	300	Regional	5.97	186.00	186.60	186.60	186.70	0.013748	1.47	5.54	32.39	0.86
WC30	100	2-yr	0.55	184.99	185.08	185.09	0.011521	0.52	1.05	14.84	0.63	
WC30	100	5-yr	0.80	184.99	185.11	185.12	0.009533	0.56	1.44	16.19	0.59	
WC30	100	10-yr	0.97	184.99	185.10							

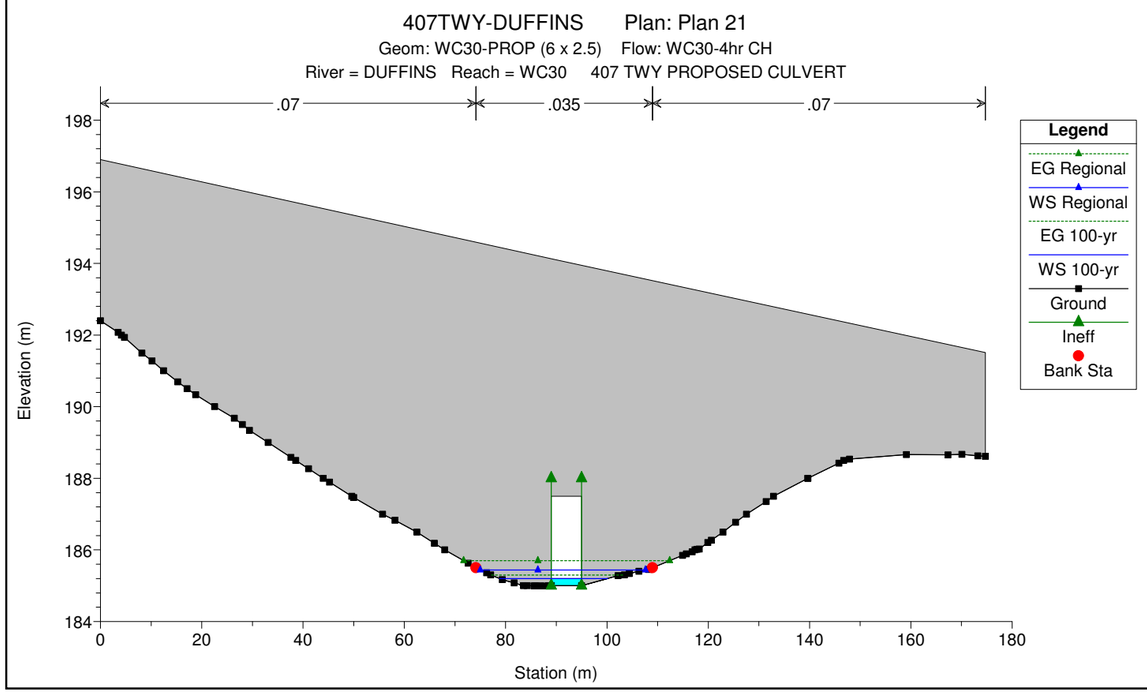
407 TWY KENNEDY RD TO BROCK WC30-EX

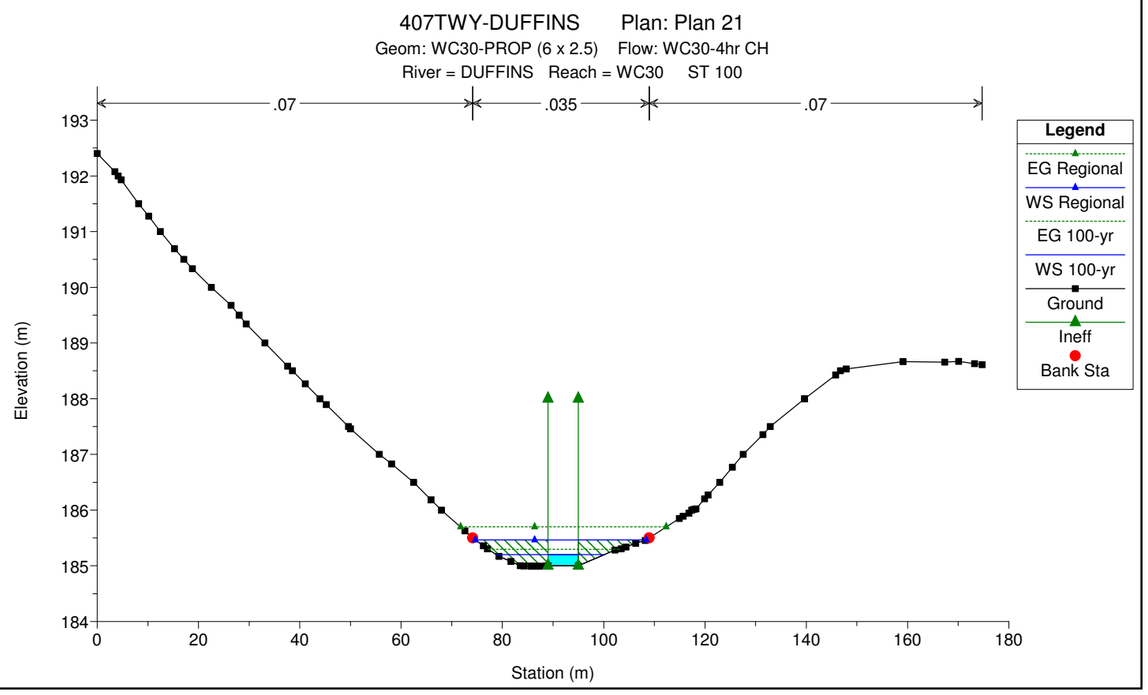
	185.13	0.014884	0.69	1.41	16.09	0.74			
WC30	100	25-yr	1.27	184.99	185.13				
	185.15	0.011889	0.69	1.83	17.43	0.68			
WC30	100	50-yr	1.46	184.99	185.14				
	185.17	0.011513	0.72	2.04	18.06	0.68			
WC30	100	100-yr	1.67	184.99	185.15				
	185.18	0.011366	0.74	2.25	18.67	0.68			
WC30	100	Check Flow	2.17	184.99	185.17				
	185.21	0.012724	0.84	2.60	19.64	0.73			
WC30	100	Regional	5.97	184.99	185.27				
185.25	185.35	0.015522	1.22	4.89	24.38	0.87			

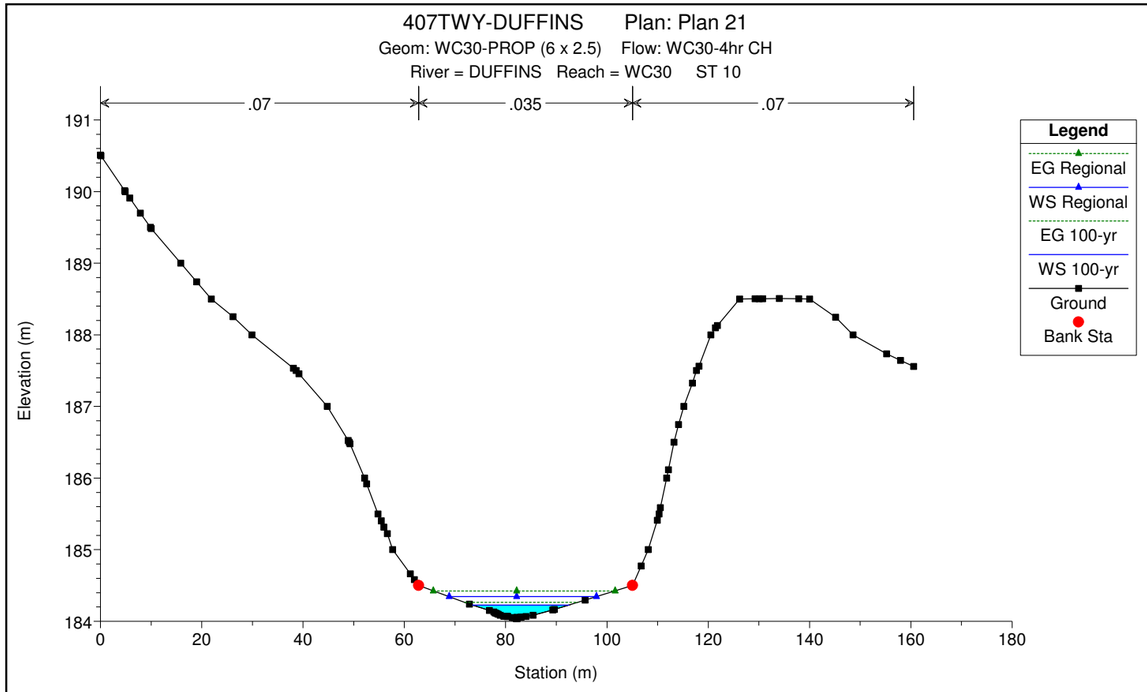
WC30	10	2-yr	0.55	184.03	184.15				
184.15	184.18	0.031582	0.78	0.71	11.82	1.01			
WC30	10	5-yr	0.80	184.03	184.16				
184.16	184.21	0.044972	0.98	0.82	12.69	1.22			
WC30	10	10-yr	0.97	184.03	184.19				
184.19	184.22	0.021702	0.78	1.24	15.40	0.88			
WC30	10	25-yr	1.27	184.03	184.19				
184.19	184.24	0.030329	0.95	1.34	15.97	1.05			
WC30	10	50-yr	1.46	184.03	184.20				
184.20	184.25	0.032076	1.01	1.45	16.61	1.09			
WC30	10	100-yr	1.67	184.03	184.21				
184.21	184.27	0.032802	1.05	1.59	17.36	1.11			
WC30	10	Check Flow	2.17	184.03	184.24				
184.24	184.29	0.026562	1.04	2.09	19.82	1.02			
WC30	10	Regional	5.97	184.03	184.34				
184.34	184.42	0.021824	1.26	4.74	29.08	1.00			


407TWY-DUFFINS Plan: Plan 21
Geom: WC30-PROP (6 x 2.5) Flow: WC30-4hr CH
River = DUFFINS Reach = WC30 ST 300
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


407TWY-DUFFINS Plan: Plan 21
Geom: WC30-PROP (6 x 2.5) Flow: WC30-4hr CH
River = DUFFINS Reach = WC30 407 TWY PROPOSED CULVERT
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


407TWY-DUFFINS Plan: Plan 21
Geom: WC30-PROP (6 x 2.5) Flow: WC30-4hr CH
River = DUFFINS Reach = WC30 407 TWY PROPOSED CULVERT
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


407TWY-DUFFINS Plan: Plan 21
Geom: WC30-PROP (6 x 2.5) Flow: WC30-4hr CH
River = DUFFINS Reach = WC30 ST 100
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


407TWY-DUFFINS Plan: Plan 21
Geom: WC30-PROP (6 x 2.5) Flow: WC30-4hr CH
River = DUFFINS Reach = WC30 ST 10
.07
.035
.07
Elevation (m)
Station (m)
191
190
189
188
187
186
185
184
0
20
40
60
80
100
120
140
160
180
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Bank Sta

HEC-RAS Plan: WC30 - PROP (4hr CH) River: DUFFINS Reach: WC30

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC30	300	2-yr	0.55	185.50	185.62	185.59	185.65	0.011194	0.75	0.74	6.33	0.68
WC30	300	5-yr	0.80	185.50	185.66	185.62	185.69	0.010318	0.85	0.95	6.42	0.68
WC30	300	10-yr	0.97	185.50	185.68	185.63	185.72	0.009894	0.90	1.07	6.48	0.68
WC30	300	25-yr	1.27	185.50	185.71	185.66	185.76	0.009271	0.99	1.29	6.57	0.68
WC30	300	50-yr	1.46	185.50	185.74	185.68	185.79	0.008765	1.03	1.42	6.63	0.67
WC30	300	100-yr	1.67	185.50	185.76	185.70	185.82	0.008590	1.08	1.55	6.69	0.68
WC30	300	Check Flow	2.17	185.50	185.81	185.74	185.88	0.008025	1.17	1.85	6.83	0.67
WC30	300	Regional	5.97	185.50	186.11	185.96	186.24	0.006415	1.64	3.64	7.62	0.67
WC30	150		Culvert									
WC30	100	2-yr	0.55	184.99	185.12		185.15	0.012745	0.78	0.71	17.34	0.72
WC30	100	5-yr	0.80	184.99	185.16		185.19	0.010608	0.85	0.94	19.27	0.69
WC30	100	10-yr	0.97	184.99	185.17		185.21	0.012622	0.97	1.00	19.79	0.76
WC30	100	25-yr	1.27	184.99	185.19	185.18	185.25	0.014818	1.14	1.12	20.69	0.84
WC30	100	50-yr	1.46	184.99	185.21		185.28	0.013315	1.16	1.26	21.66	0.81
WC30	100	100-yr	1.67	184.99	185.20	185.20	185.30	0.019618	1.38	1.21	21.35	0.98
WC30	100	Check Flow	2.17	184.99	185.25	185.24	185.36	0.016143	1.44	1.50	23.41	0.92
WC30	100	Regional	5.97	184.99	185.47	185.47	185.70	0.015514	2.14	2.79	33.77	1.00
WC30	10	2-yr	0.55	184.03	184.15	184.15	184.18	0.031609	0.78	0.71	11.82	1.01
WC30	10	5-yr	0.80	184.03	184.16	184.16	184.21	0.045110	0.98	0.82	12.68	1.23
WC30	10	10-yr	0.97	184.03	184.17	184.17	184.22	0.034226	0.93	1.05	14.21	1.09
WC30	10	25-yr	1.27	184.03	184.20	184.20	184.24	0.027035	0.91	1.39	16.30	1.00
WC30	10	50-yr	1.46	184.03	184.20	184.20	184.25	0.033261	1.02	1.43	16.51	1.11
WC30	10	100-yr	1.67	184.03	184.23	184.23	184.27	0.019981	0.87	1.91	18.98	0.88
WC30	10	Check Flow	2.17	184.03	184.24	184.24	184.29	0.026512	1.04	2.09	19.83	1.02
WC30	10	Regional	5.97	184.03	184.34	184.34	184.42	0.021844	1.26	4.74	29.08	1.00

HEC-RAS HEC-RAS 5.0.1 April 2016
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
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PROJECT DATA
Project Title: 407TWY-DUFFINS
Project File : 407TWY-DUFFINS.prj
Run Date and Time: 9/21/2016 9:09:58 AM

Project in SI units

Project Description:
HEC-RAS Model created for 407 TWY project from Kennedy Rd. to Brock Rd. -
Duffins Creek Watershed

PLAN DATA

Plan Title: Plan 21
Plan File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.p21

Geometry Title: WC30-PROP (6 x 2.5)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.g17

Flow Title   : WC30-4hr CH
Flow File   : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.f08

Plan Summary Information:
Number of: Cross Sections = 3   Multiple Openings = 0
            Culverts   = 1   Inline Structures = 0
            Bridges   = 0   Lateral Structures = 0

Computational Information
    Water surface calculation tolerance = 0.01
    Critical depth calculation tolerance = 0.01
    Maximum number of iterations   = 20
    Maximum difference tolerance   = 0.3
    Flow tolerance factor   = 0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method: Average Conveyance
    Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: WC30-4hr CH
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.f08

Flow Data (m3/s)

River	Reach	RS	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Check Flow	Regional
DUFFINS	WC30	300	.55	.8	.97	1.27	1.46	1.67	2.17	5.97

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
DUFFINS	WC30	2-yr		Critical
DUFFINS	WC30	5-yr		Critical
DUFFINS	WC30	10-yr		Critical
DUFFINS	WC30	25-yr		Critical
DUFFINS	WC30	50-yr		Critical
DUFFINS	WC30	100-yr		Critical
DUFFINS	WC30	Check Flow		Critical
DUFFINS	WC30	Regional		Critical

GEOMETRY DATA

Geometry Title: WC30-PROP (6 x 2.5)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.g17

CROSS SECTION

RIVER: DUFFINS
REACH: WC30   RS: 300

INPUT
Description: ST 300
Station Elevation Data   num=   92

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	187.939	.307	187.893	1.58	187.797	5.686	187.5	12.623	187.016
12.748	187.008	12.787	187.001	12.85	187	12.938	186.998	18.728	186.975
19.237	186.97	21.057	186.972	21.479	186.823	25.288	186.73	26.68	186.713
32.99	186.634	34.496	186.63	34.525	186.628	34.61	186.629	36.565	186.5
37.389	186.494	37.643	186.459	39.842	186.48	40.529	186.5	40.995	186.514
41.206	186.522	45.505	186.517	48.372	186.513	48.484	186.512	48.498	186.512
48.731	186.5	50.127	186.47	51.32	186.416	52.566	186.373	52.975	186.26
54	185.5	60	185.5	61.214	186.418	62.187	186.488	62.249	186.487
62.254	186.487	62.669	186.486	63.104	186.487	63.132	186.487	63.202	186.487
64.063	186.489	64.128	186.489	64.262	186.49	65.085	186.49	65.19	186.49
65.224	186.49	65.27	186.49	65.364	186.49	65.401	186.491	65.501	186.491
65.685	186.493	66.774	186.5	67.427	186.602	67.823	186.671	67.989	186.7
68.101	186.718	68.181	186.728	68.301	186.746	70.366	187	70.422	187.006
73.465	187.349	73.746	187.367	74.545	187.5	78.548	187.877	79.478	187.965
79.509	187.968	79.736	187.982	79.798	188	80.559	188.068	85.281	188.5
86.792	188.56	87.504	188.598	92.942	188.957	93.547	189	93.574	189
94.004	189	94.377	189	94.38	189	94.459	189.001	95.254	189.003
97.089	189.006	97.654	189.007	98.169	189.007	98.674	189.014	99.553	189.017
101.923	189.017	107.412	189.093						

Manning's n Values   num=   3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	50.127	.035	62.187	.07

Bank Sta: Left   Right   Lengths: Left Channel   Right   Coeff Contr.   Expan.
       50.127 62.187   49   60   60   .3   .5
Ineffective Flow   num=   2

Sta L	Sta R	Elev	Permanent
0	54	188	T
60	107.412	188	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	185.65	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.03	Wt. n-Val.		0.035		
W.S. Elev (m)	185.62	Reach Len. (m)	49.00	60.00	60.00	
Crit W.S. (m)	185.59	Flow Area (m2)		0.74		

E.G. Slope (m/m)	0.011194	Area (m2)	0.76
Q Total (m3/s)	0.55	Flow (m3/s)	0.55
Top Width (m)	6.33	Top Width (m)	6.33
Vel Total (m/s)	0.75	Avg. Vel. (m/s)	0.75
Max Chl Dpth (m)	0.12	Hydr. Depth (m)	0.12
Conv. Total (m3/s)	5.2	Conv. (m3/s)	5.2
Length Wtd. (m)	60.00	Wetted Per. (m)	6.00
Min Ch El (m)	185.50	Shear (N/m2)	13.48
Alpha	1.00	Stream Power (N/m s)	10.06
Frctn Loss (m)		Cum Volume (1000 m3)	0.10
C & E Loss (m)		Cum SA (1000 m2)	1.45

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	185.69	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.035	
W.S. Elev (m)	185.66	Reach Len. (m)	49.00	60.00	60.00
Crit W.S. (m)	185.62	Flow Area (m2)		0.95	
E.G. Slope (m/m)	0.010318	Area (m2)		0.98	
Q Total (m3/s)	0.80	Flow (m3/s)		0.80	
Top Width (m)	6.42	Top Width (m)		6.42	
Vel Total (m/s)	0.85	Avg. Vel. (m/s)		0.85	
Max Chl Dpth (m)	0.16	Hydr. Depth (m)		0.16	
Conv. Total (m3/s)	7.9	Conv. (m3/s)		7.9	
Length Wtd. (m)	60.00	Wetted Per. (m)		6.00	
Min Ch El (m)	185.50	Shear (N/m2)		15.94	
Alpha	1.00	Stream Power (N/m s)		13.49	
Frctn Loss (m)		Cum Volume (1000 m3)		0.13	
C & E Loss (m)		Cum SA (1000 m2)		1.59	

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	185.72	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.035	
W.S. Elev (m)	185.68	Reach Len. (m)	49.00	60.00	60.00
Crit W.S. (m)	185.63	Flow Area (m2)		1.07	
E.G. Slope (m/m)	0.009894	Area (m2)		1.12	
Q Total (m3/s)	0.97	Flow (m3/s)		0.97	
Top Width (m)	6.48	Top Width (m)		6.48	
Vel Total (m/s)	0.90	Avg. Vel. (m/s)		0.90	
Max Chl Dpth (m)	0.18	Hydr. Depth (m)		0.18	
Conv. Total (m3/s)	9.8	Conv. (m3/s)		9.8	
Length Wtd. (m)	60.00	Wetted Per. (m)		6.00	
Min Ch El (m)	185.50	Shear (N/m2)		17.37	
Alpha	1.00	Stream Power (N/m s)		15.69	
Frctn Loss (m)		Cum Volume (1000 m3)		0.15	
C & E Loss (m)		Cum SA (1000 m2)		1.66	

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	185.76	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	185.71	Reach Len. (m)	49.00	60.00	60.00
Crit W.S. (m)	185.66	Flow Area (m2)		1.29	
E.G. Slope (m/m)	0.009271	Area (m2)		1.35	
Q Total (m3/s)	1.27	Flow (m3/s)		1.27	
Top Width (m)	6.57	Top Width (m)		6.57	
Vel Total (m/s)	0.99	Avg. Vel. (m/s)		0.99	
Max Chl Dpth (m)	0.21	Hydr. Depth (m)		0.21	
Conv. Total (m3/s)	13.2	Conv. (m3/s)		13.2	
Length Wtd. (m)	60.00	Wetted Per. (m)		6.00	
Min Ch El (m)	185.50	Shear (N/m2)		19.51	
Alpha	1.00	Stream Power (N/m s)		19.24	
Frctn Loss (m)		Cum Volume (1000 m3)		0.18	
C & E Loss (m)		Cum SA (1000 m2)		1.76	

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	185.79	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	185.74	Reach Len. (m)	49.00	60.00	60.00
Crit W.S. (m)	185.68	Flow Area (m2)		1.42	
E.G. Slope (m/m)	0.008765	Area (m2)		1.50	
Q Total (m3/s)	1.46	Flow (m3/s)		1.46	
Top Width (m)	6.63	Top Width (m)		6.63	
Vel Total (m/s)	1.03	Avg. Vel. (m/s)		1.03	
Max Chl Dpth (m)	0.24	Hydr. Depth (m)		0.24	
Conv. Total (m3/s)	15.6	Conv. (m3/s)		15.6	
Length Wtd. (m)	60.00	Wetted Per. (m)		6.00	
Min Ch El (m)	185.50	Shear (N/m2)		20.40	
Alpha	1.00	Stream Power (N/m s)		20.91	
Frctn Loss (m)		Cum Volume (1000 m3)		0.20	
C & E Loss (m)		Cum SA (1000 m2)		1.82	

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	185.82	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.035	
W.S. Elev (m)	185.76	Reach Len. (m)	49.00	60.00	60.00
Crit W.S. (m)	185.70	Flow Area (m2)		1.55	
E.G. Slope (m/m)	0.008590	Area (m2)		1.64	
Q Total (m3/s)	1.67	Flow (m3/s)		1.67	
Top Width (m)	6.69	Top Width (m)		6.69	
Vel Total (m/s)	1.08	Avg. Vel. (m/s)		1.08	
Max Chl Dpth (m)	0.26	Hydr. Depth (m)		0.26	
Conv. Total (m3/s)	18.0	Conv. (m3/s)		18.0	
Length Wtd. (m)	60.00	Wetted Per. (m)		6.00	
Min Ch El (m)	185.50	Shear (N/m2)		21.80	
Alpha	1.00	Stream Power (N/m s)		23.45	
Frctn Loss (m)		Cum Volume (1000 m3)		0.21	
C & E Loss (m)		Cum SA (1000 m2)		1.87	

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	185.88	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.035	
W.S. Elev (m)	185.81	Reach Len. (m)	49.00	60.00	60.00
Crit W.S. (m)	185.74	Flow Area (m2)		1.85	
E.G. Slope (m/m)	0.008025	Area (m2)		1.98	
Q Total (m3/s)	2.17	Flow (m3/s)		2.17	
Top Width (m)	6.83	Top Width (m)		6.83	
Vel Total (m/s)	1.17	Avg. Vel. (m/s)		1.17	
Max Chl Dpth (m)	0.31	Hydr. Depth (m)		0.31	
Conv. Total (m3/s)	24.2	Conv. (m3/s)		24.2	
Length Wtd. (m)	60.00	Wetted Per. (m)		6.00	
Min Ch El (m)	185.50	Shear (N/m2)		24.32	
Alpha	1.00	Stream Power (N/m s)		28.46	
Frctn Loss (m)		Cum Volume (1000 m3)		0.26	
C & E Loss (m)		Cum SA (1000 m2)		2.01	

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	186.24	Element	Left OB	Channel	Right OB
Vel Head (m)	0.14	Wt. n-Val.		0.035	
W.S. Elev (m)	186.11	Reach Len. (m)	49.00	60.00	60.00
Crit W.S. (m)	185.96	Flow Area (m2)		3.64	
E.G. Slope (m/m)	0.006415	Area (m2)		4.13	
Q Total (m3/s)	5.97	Flow (m3/s)		5.97	
Top Width (m)	7.62	Top Width (m)		7.62	
Vel Total (m/s)	1.64	Avg. Vel. (m/s)		1.64	
Max Chl Dpth (m)	0.61	Hydr. Depth (m)		0.61	
Conv. Total (m3/s)	74.5	Conv. (m3/s)		74.5	
Length Wtd. (m)	60.00	Wetted Per. (m)		6.00	
Min Ch El (m)	185.50	Shear (N/m2)		38.17	
Alpha	1.00	Stream Power (N/m s)		62.60	
Frctn Loss (m)		Cum Volume (1000 m3)		0.57	
C & E Loss (m)		Cum SA (1000 m2)		2.84	

CULVERT

RIVER: DUFFINS
REACH: WC30 RS: 150

INPUT
Description: 407 TWY PROPOSED CULVERT
Distance from Upstream XS = 13
Deck/Roadway Width = 13
Weir Coefficient = 1.4
Upstream Deck/Roadway Coordinates
num= 3

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0	195	59	193.2	107	191.6

Upstream Bridge Cross Section Data
Station Elevation Data num= 92

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	187.939	.307	187.893	1.58	187.797	5.686	187.5	12.623	187.016
12.748	187.008	12.787	187.001	12.85	187	12.938	186.998	18.728	186.975
19.237	186.97	21.057	186.972	21.479	186.823	25.288	186.73	26.68	186.713
32.99	186.634	34.496	186.63	34.525	186.628	34.61	186.629	36.565	186.5
37.389	186.494	37.643	186.459	39.842	186.48	40.529	186.5	40.995	186.514
41.206	186.522	45.505	186.517	48.372	186.513	48.484	186.512	48.498	186.512
48.731	186.5	50.127	186.47	51.32	186.416	52.566	186.373	52.975	186.26
54	185.5	60	185.5	61.214	186.418	62.187	186.488	62.249	186.487
62.254	186.487	62.669	186.486	63.104	186.487	63.132	186.487	63.202	186.487
64.063	186.489	64.128	186.489	64.262	186.49	65.085	186.49	65.19	186.49
65.224	186.49	65.27	186.49	65.364	186.49	65.401	186.491	65.501	186.491
65.685	186.493	66.774	186.5	67.427	186.602	67.823	186.671	67.989	186.7
68.101	186.718	68.181	186.728	68.301	186.746	70.366	187	70.422	187.006
73.465	187.349	73.746	187.367	74.545	187.5	78.548	187.877	79.478	187.965
79.509	187.968	79.736	187.982	79.798	188	80.559	188.068	85.281	188.5
86.792	188.56	87.504	188.598	92.942	188.957	93.547	189	93.574	189
94.004	189	94.377	189	94.38	189	94.459	189.001	95.254	189.003
97.089	189.006	97.654	189.007	98.169	189.007	98.674	189.014	99.553	189.017
101.923	189.017	107.412	189.093						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	50.127	.035	62.187	.07

Bank Sta: Left Right Coeff Contr. Expan.
50.127 62.187 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	54	188	T
60	107.412	188	T

Downstream Deck/Roadway Coordinates
num= 3

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0	196.9	90	194.1	175	191.5

Downstream Bridge Cross Section Data
Station Elevation Data num= 73

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	192.4	3.502	192.077	4.147	192	4.751	191.931	8.199	191.5
10.173	191.279	12.478	191	15.273	190.69	17.112	190.5	18.809	190.335
22.548	190	26.435	189.678	28.018	189.5	29.431	189.341	33.108	189
37.605	188.585	38.534	188.5	41.105	188.265	43.993	188	45.208	187.894
49.602	187.5	50.015	187.461	55.69	187	58.125	186.83	62.48	186.5
65.918	186.187	67.964	186	72.594	185.629	74.126	185.5	76.216	185.358
77.027	185.307	79.312	185.172	81.685	185.078	83.524	185	84.271	184.998
85.603	184.993	85.724	184.993	85.857	184.992	86.204	184.992	86.836	184.992
87.577	184.994	88.488	184.998	89	185	95	185	102.202	185.282
103.448	185.304	104.41	185.338	106.307	185.407	108.223	185.455	109.015	185.5
114.931	185.851	115.668	185.892	116.82	185.947	117.374	186	117.778	186.014
118.216	186.021	119.898	186.205	120.615	186.273	122.899	186.5	125.396	186.769
127.558	187	131.422	187.353	132.896	187.5	139.64	187.999	139.652	188
145.777	188.423	146.751	188.5	147.913	188.535	159.089	188.665	167.335	188.657
170.081	188.669	173.229	188.628	174.691	188.612				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	74.126	.035	109.015	.07

Bank Sta: Left Right Coeff Contr. Expan.
74.126 109.015 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	89	188	T
95	174.691	188	T

Upstream Embankment side slope = 4 horiz. to 1.0 vertical
Downstream Embankment side slope = 4 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .98
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name Shape Rise Span
Culvert #1 Box 2.5 6
FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG

Culvert	Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
	7.5	48.5	.013	.025	0	.2	1

Upstream Elevation = 185.5
Centerline Station = 57
Downstream Elevation = 185
Centerline Station = 92

CULVERT OUTPUT Profile #2-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.55	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	0.88
Q Barrel (m3/s)	0.55	Culv Vel DS (m/s)	0.78
E.G. US. (m)	185.65	Culv Inv El Up (m)	185.50
W.S. US. (m)	185.62	Culv Inv El Dn (m)	185.00
E.G. DS (m)	185.15	Culv Frctn Ls (m)	0.00
W.S. DS (m)	185.12	Culv Exit Loss (m)	0.00
Delta EG (m)	0.50	Culv Entr Loss (m)	0.01
Delta WS (m)	0.50	Q Weir (m3/s)	
E.G. IC (m)	185.63	Weir Sta Lft (m)	
E.G. OC (m)	185.65	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	185.60	Weir Max Depth (m)	
Culv WS Outlet (m)	185.12	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.10	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.09	Min El Weir Flow (m)	191.51

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #5-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.80	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.02
Q Barrel (m3/s)	0.80	Culv Vel DS (m/s)	0.85
E.G. US. (m)	185.69	Culv Inv El Up (m)	185.50
W.S. US. (m)	185.66	Culv Inv El Dn (m)	185.00
E.G. DS (m)	185.19	Culv Frctn Ls (m)	0.00
W.S. DS (m)	185.16	Culv Exit Loss (m)	0.00
Delta EG (m)	0.50	Culv Entr Loss (m)	0.01
Delta WS (m)	0.50	Q Weir (m3/s)	
E.G. IC (m)	185.67	Weir Sta Lft (m)	
E.G. OC (m)	185.69	Weir Sta Rgt (m)	

Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	185.63	Weir Max Depth (m)	
Culv WS Outlet (m)	185.16	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.13	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.12	Min El Weir Flow (m)	191.51

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #10-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.97	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.11
Q Barrel (m3/s)	0.97	Culv Vel DS (m/s)	0.97
E.G. US. (m)	185.72	Culv Inv El Up (m)	185.50
W.S. US. (m)	185.68	Culv Inv El Dn (m)	185.00
E.G. DS (m)	185.21	Culv Frctn Ls (m)	0.00
W.S. DS (m)	185.17	Culv Exit Loss (m)	0.00
Delta EG (m)	0.51	Culv Entr Loss (m)	0.01
Delta WS (m)	0.51	Q Weir (m3/s)	
E.G. IC (m)	185.70	Weir Sta Lft (m)	
E.G. OC (m)	185.72	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	185.65	Weir Max Depth (m)	
Culv WS Outlet (m)	185.17	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.15	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.14	Min El Weir Flow (m)	191.51

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #25-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	1.27	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.23
Q Barrel (m3/s)	1.27	Culv Vel DS (m/s)	1.14
E.G. US. (m)	185.76	Culv Inv El Up (m)	185.50
W.S. US. (m)	185.71	Culv Inv El Dn (m)	185.00
E.G. DS (m)	185.25	Culv Frctn Ls (m)	0.00
W.S. DS (m)	185.19	Culv Exit Loss (m)	0.00
Delta EG (m)	0.51	Culv Entr Loss (m)	0.02
Delta WS (m)	0.53	Q Weir (m3/s)	
E.G. IC (m)	185.74	Weir Sta Lft (m)	
E.G. OC (m)	185.76	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	185.67	Weir Max Depth (m)	
Culv WS Outlet (m)	185.19	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.17	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.17	Min El Weir Flow (m)	191.51

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #50-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	1.46	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.34
Q Barrel (m3/s)	1.46	Culv Vel DS (m/s)	1.16
E.G. US. (m)	185.79	Culv Inv El Up (m)	185.50
W.S. US. (m)	185.74	Culv Inv El Dn (m)	185.00
E.G. DS (m)	185.28	Culv Frctn Ls (m)	0.00
W.S. DS (m)	185.21	Culv Exit Loss (m)	0.00
Delta EG (m)	0.51	Culv Entr Loss (m)	0.02
Delta WS (m)	0.53	Q Weir (m3/s)	
E.G. IC (m)	185.77	Weir Sta Lft (m)	
E.G. OC (m)	185.79	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	185.68	Weir Max Depth (m)	
Culv WS Outlet (m)	185.21	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.19	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.18	Min El Weir Flow (m)	191.51

Note: During subcritical analysis, the backwater through the culvert the solution went to critical depth. The program then assumed critical depth at the inlet.

CULVERT OUTPUT Profile #100-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	1.67	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.38
Q Barrel (m3/s)	1.67	Culv Vel DS (m/s)	1.38
E.G. US. (m)	185.82	Culv Inv El Up (m)	185.50
W.S. US. (m)	185.76	Culv Inv El Dn (m)	185.00
E.G. DS (m)	185.30	Culv Frctn Ls (m)	0.00
W.S. DS (m)	185.20	Culv Exit Loss (m)	0.00
Delta EG (m)	0.52	Culv Entr Loss (m)	0.02
Delta WS (m)	0.56	Q Weir (m3/s)	
E.G. IC (m)	185.79	Weir Sta Lft (m)	
E.G. OC (m)	185.82	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	185.70	Weir Max Depth (m)	
Culv WS Outlet (m)	185.20	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.20	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.20	Min El Weir Flow (m)	191.51

Note: During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth. Therefore, the inlet will be at normal depth.

CULVERT OUTPUT Profile #Check Flow Culv Group: Culvert #1

Q Culv Group (m3/s)	2.17	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.53
Q Barrel (m3/s)	2.17	Culv Vel DS (m/s)	1.44
E.G. US. (m)	185.88	Culv Inv El Up (m)	185.50
W.S. US. (m)	185.81	Culv Inv El Dn (m)	185.00
E.G. DS (m)	185.36	Culv Frctn Ls (m)	0.00
W.S. DS (m)	185.25	Culv Exit Loss (m)	0.00
Delta EG (m)	0.52	Culv Entr Loss (m)	0.02
Delta WS (m)	0.56	Q Weir (m3/s)	
E.G. IC (m)	185.85	Weir Sta Lft (m)	
E.G. OC (m)	185.88	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	185.74	Weir Max Depth (m)	
Culv WS Outlet (m)	185.25	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.24	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.24	Min El Weir Flow (m)	191.51

Note: During subcritical analysis, the backwater through the culvert the solution went to critical depth. The program then assumed critical depth at the inlet.

CULVERT OUTPUT Profile #Regional Culv Group: Culvert #1

Q Culv Group (m3/s)	5.97	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	2.14
Q Barrel (m3/s)	5.97	Culv Vel DS (m/s)	2.26
E.G. US. (m)	186.25	Culv Inv El Up (m)	185.50
W.S. US. (m)	186.11	Culv Inv El Dn (m)	185.00
E.G. DS (m)	185.70	Culv Frctn Ls (m)	0.00
W.S. DS (m)	185.47	Culv Exit Loss (m)	0.00
Delta EG (m)	0.55	Culv Entr Loss (m)	0.05
Delta WS (m)	0.64	Q Weir (m3/s)	
E.G. IC (m)	186.22	Weir Sta Lft (m)	
E.G. OC (m)	186.25	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	185.97	Weir Max Depth (m)	
Culv WS Outlet (m)	185.44	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.44	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.47	Min El Weir Flow (m)	191.51

Warning: Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross section downstream of the culvert has supercritical flow.

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CROSS SECTION

RIVER: DUFFINS
REACH: WC30 RS: 100

INPUT
Description: ST 100
Station Elevation Data num= 73

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	192.4	3.502	192.077	4.147	192	4.751	191.931	8.199	191.5
10.173	191.279	12.478	191	15.273	190.69	17.112	190.5	18.809	190.335
22.548	190	26.435	189.678	28.018	189.5	29.431	189.341	33.108	189
37.605	188.585	38.534	188.5	41.105	188.265	43.993	188	45.208	187.894
49.602	187.5	50.015	187.461	55.69	187	58.125	186.83	62.48	186.5
65.918	186.187	67.964	186	72.594	185.629	74.126	185.5	76.216	185.358
77.027	185.307	79.312	185.172	81.685	185.078	83.524	185	84.271	184.998
85.603	184.993	85.724	184.993	85.857	184.992	86.204	184.992	86.836	184.992
87.577	184.994	88.488	184.998	89	185	95	185	102.202	185.282
103.448	185.304	104.41	185.338	106.307	185.407	108.223	185.455	109.015	185.5
114.931	185.851	115.668	185.892	116.82	185.947	117.374	186	117.778	186.014
118.216	186.021	119.898	186.205	120.615	186.273	122.899	186.5	125.396	186.769
127.558	187	131.422	187.353	132.896	187.5	139.64	187.999	139.652	188
145.777	188.423	146.751	188.5	147.913	188.535	159.089	188.665	167.335	188.657
170.081	188.669	173.229	188.628	174.691	188.612				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	74.126	.035	109.015	.07

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
74.126 109.015 46 51 51 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	89	188	T
95	174.691	188	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	185.15	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	185.12	Reach Len. (m)	46.00	51.00	51.00
Crit W.S. (m)		Flow Area (m2)		0.71	
E.G. Slope (m/m)	0.012745	Area (m2)		1.72	
Q Total (m3/s)	0.55	Flow (m3/s)		0.55	
Top Width (m)	17.34	Top Width (m)		17.34	
Vel Total (m/s)	0.78	Avg. Vel. (m/s)		0.78	
Max Chl Dpth (m)	0.13	Hydr. Depth (m)		0.12	
Conv. Total (m3/s)	4.9	Conv. (m3/s)		4.9	
Length Wtd. (m)	51.00	Wetted Per. (m)		6.00	
Min Ch El (m)	184.99	Shear (N/m2)		14.76	
Alpha	1.00	Stream Power (N/m s)		11.46	
Frctn Loss (m)	0.97	Cum Volume (1000 m3)		0.06	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.74	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	185.19	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.035	
W.S. Elev (m)	185.16	Reach Len. (m)	46.00	51.00	51.00
Crit W.S. (m)		Flow Area (m2)		0.94	
E.G. Slope (m/m)	0.010608	Area (m2)		2.42	
Q Total (m3/s)	0.80	Flow (m3/s)		0.80	
Top Width (m)	19.27	Top Width (m)		19.27	
Vel Total (m/s)	0.85	Avg. Vel. (m/s)		0.85	
Max Chl Dpth (m)	0.16	Hydr. Depth (m)		0.16	
Conv. Total (m3/s)	7.8	Conv. (m3/s)		7.8	
Length Wtd. (m)	51.00	Wetted Per. (m)		6.00	
Min Ch El (m)	184.99	Shear (N/m2)		16.25	
Alpha	1.00	Stream Power (N/m s)		13.87	
Frctn Loss (m)	0.98	Cum Volume (1000 m3)		0.08	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.81	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	185.21	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	185.17	Reach Len. (m)	46.00	51.00	51.00
Crit W.S. (m)		Flow Area (m2)		1.00	
E.G. Slope (m/m)	0.012622	Area (m2)		2.62	
Q Total (m3/s)	0.97	Flow (m3/s)		0.97	
Top Width (m)	19.79	Top Width (m)		19.79	
Vel Total (m/s)	0.97	Avg. Vel. (m/s)		0.97	
Max Chl Dpth (m)	0.17	Hydr. Depth (m)		0.17	
Conv. Total (m3/s)	8.6	Conv. (m3/s)		8.6	
Length Wtd. (m)	51.00	Wetted Per. (m)		6.00	
Min Ch El (m)	184.99	Shear (N/m2)		20.60	
Alpha	1.00	Stream Power (N/m s)		20.01	
Frctn Loss (m)	1.00	Cum Volume (1000 m3)		0.09	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.87	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	185.25	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.035	
W.S. Elev (m)	185.19	Reach Len. (m)	46.00	51.00	51.00
Crit W.S. (m)	185.18	Flow Area (m2)		1.12	
E.G. Slope (m/m)	0.014818	Area (m2)		3.03	
Q Total (m3/s)	1.27	Flow (m3/s)		1.27	
Top Width (m)	20.69	Top Width (m)		20.69	
Vel Total (m/s)	1.14	Avg. Vel. (m/s)		1.14	
Max Chl Dpth (m)	0.19	Hydr. Depth (m)		0.19	
Conv. Total (m3/s)	10.4	Conv. (m3/s)		10.4	
Length Wtd. (m)	51.00	Wetted Per. (m)		6.00	
Min Ch El (m)	184.99	Shear (N/m2)		27.10	
Alpha	1.00	Stream Power (N/m s)		30.76	
Frctn Loss (m)	1.00	Cum Volume (1000 m3)		0.11	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.94	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	185.28	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.035	
W.S. Elev (m)	185.21	Reach Len. (m)	46.00	51.00	51.00
Crit W.S. (m)		Flow Area (m2)		1.26	
E.G. Slope (m/m)	0.013315	Area (m2)		3.51	
Q Total (m3/s)	1.46	Flow (m3/s)		1.46	
Top Width (m)	21.66	Top Width (m)		21.66	

Vel Total (m/s)	1.16	Avg. Vel. (m/s)	1.16
Max Chl Dpth (m)	0.22	Hydr. Depth (m)	0.21
Conv. Total (m3/s)	12.7	Conv. (m3/s)	12.7
Length Wtd. (m)	51.00	Wetted Per. (m)	6.00
Min Ch El (m)	184.99	Shear (N/m2)	27.33
Alpha	1.00	Stream Power (N/m s)	31.77
Frctn Loss (m)	1.02	Cum Volume (1000 m3)	0.13
C & E Loss (m)	0.01	Cum SA (1000 m2)	0.97

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	185.30	Element	Left OB	Channel	Right OB
Vel Head (m)	0.10	Wt. n-Val.		0.035	
W.S. Elev (m)	185.20	Reach Len. (m)	46.00	51.00	51.00
Crit W.S. (m)	185.20	Flow Area (m2)		1.21	
E.G. Slope (m/m)	0.019618	Area (m2)		3.35	
Q Total (m3/s)	1.67	Flow (m3/s)		1.67	
Top Width (m)	21.35	Top Width (m)		21.35	
Vel Total (m/s)	1.38	Avg. Vel. (m/s)		1.38	
Max Chl Dpth (m)	0.21	Hydr. Depth (m)		0.20	
Conv. Total (m3/s)	11.9	Conv. (m3/s)		11.9	
Length Wtd. (m)	51.00	Wetted Per. (m)		6.00	
Min Ch El (m)	184.99	Shear (N/m2)		38.86	
Alpha	1.00	Stream Power (N/m s)		53.55	
Frctn Loss (m)	1.01	Cum Volume (1000 m3)		0.13	
C & E Loss (m)	0.03	Cum SA (1000 m2)		1.03	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	185.36	Element	Left OB	Channel	Right OB
Vel Head (m)	0.11	Wt. n-Val.		0.035	
W.S. Elev (m)	185.25	Reach Len. (m)	46.00	51.00	51.00
Crit W.S. (m)	185.24	Flow Area (m2)		1.50	
E.G. Slope (m/m)	0.016143	Area (m2)		4.44	
Q Total (m3/s)	2.17	Flow (m3/s)		2.17	
Top Width (m)	23.41	Top Width (m)		23.41	
Vel Total (m/s)	1.44	Avg. Vel. (m/s)		1.44	
Max Chl Dpth (m)	0.26	Hydr. Depth (m)		0.25	
Conv. Total (m3/s)	17.1	Conv. (m3/s)		17.1	
Length Wtd. (m)	51.00	Wetted Per. (m)		6.00	
Min Ch El (m)	184.99	Shear (N/m2)		39.68	
Alpha	1.00	Stream Power (N/m s)		57.26	
Frctn Loss (m)	1.04	Cum Volume (1000 m3)		0.17	
C & E Loss (m)	0.03	Cum SA (1000 m2)		1.10	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	185.70	Element	Left OB	Channel	Right OB
Vel Head (m)	0.23	Wt. n-Val.		0.035	
W.S. Elev (m)	185.47	Reach Len. (m)	46.00	51.00	51.00
Crit W.S. (m)	185.47	Flow Area (m2)		2.79	
E.G. Slope (m/m)	0.015514	Area (m2)		10.60	
Q Total (m3/s)	5.97	Flow (m3/s)		5.97	
Top Width (m)	33.77	Top Width (m)		33.77	
Vel Total (m/s)	2.14	Avg. Vel. (m/s)		2.14	
Max Chl Dpth (m)	0.47	Hydr. Depth (m)		0.47	
Conv. Total (m3/s)	47.9	Conv. (m3/s)		47.9	
Length Wtd. (m)	51.00	Wetted Per. (m)		6.00	
Min Ch El (m)	184.99	Shear (N/m2)		70.82	
Alpha	1.00	Stream Power (N/m s)		151.38	
Frctn Loss (m)	0.93	Cum Volume (1000 m3)		0.39	
C & E Loss (m)	0.08	Cum SA (1000 m2)		1.60	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: DUFFINS
REACH: WC30 RS: 10

INPUT
Description: ST 10
Station Elevation Data num= 89

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	190.51	.098	190.5	4.769	190.012	4.89	190	5.763	189.912
7.86	189.7	9.858	189.5	10.031	189.484	15.841	189	18.998	188.739
21.868	188.5	26.2	188.252	29.941	188	38.093	187.532	38.657	187.5
39.199	187.457	44.757	187	48.934	186.524	49.117	186.5	49.277	186.479
52.139	186	52.57	185.919	54.813	185.5	55.47	185.402	55.958	185.315
56.663	185.224	57.675	185	61.179	184.662	61.985	184.583	62.805	184.5
72.861	184.241	76.782	184.153	77.695	184.129	77.911	184.117	78.217	184.11
78.51	184.098	78.955	184.086	79.618	184.071	79.74	184.069	80.254	184.066
80.313	184.066	80.345	184.069	80.383	184.068	81.329	184.053	81.716	184.051
81.815	184.049	82.032	184.045	82.049	184.045	82.082	184.043	82.172	184.034
82.203	184.037	82.24	184.04	82.269	184.058	82.976	184.056	83.082	184.06
84.038	184.068	85.401	184.085	89.295	184.158	89.608	184.165	95.694	184.295
105.083	184.5	106.751	184.772	108.151	185	109.942	185.412	110.305	185.5
110.56	185.588	111.784	186	112.121	186.117	113.259	186.5	114.126	186.746
115.179	187	116.87	187.325	117.693	187.5	118.151	187.563	120.501	188
121.412	188.096	121.793	188.131	126.18	188.5	129.226	188.505	130.033	188.505
130.722	188.505	134.016	188.506	137.885	188.503	140.016	188.5	145.147	188.245
148.595	188	155.22	187.735	157.951	187.644	160.541	187.557		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	62.805	.035	105.083	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
62.805	105.083	0	0	.3	.5

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	184.18	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	184.15	Reach Len. (m)			
Crit W.S. (m)	184.15	Flow Area (m2)		0.71	
E.G. Slope (m/m)	0.031609	Area (m2)		0.71	
Q Total (m3/s)	0.55	Flow (m3/s)		0.55	
Top Width (m)	11.82	Top Width (m)		11.82	
Vel Total (m/s)	0.78	Avg. Vel. (m/s)		0.78	
Max Chl Dpth (m)	0.11	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	3.1	Conv. (m3/s)		3.1	
Length Wtd. (m)		Wetted Per. (m)		11.83	
Min Ch El (m)	184.03	Shear (N/m2)		18.54	
Alpha	1.00	Stream Power (N/m s)		14.41	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	184.21	Element	Left OB	Channel	Right OB

Vel Head (m)	0.05	Wt. n-Val.	0.035
W.S. Elev (m)	184.16	Reach Len. (m)	
Crit W.S. (m)	184.16	Flow Area (m2)	0.82
E.G. Slope (m/m)	0.045110	Area (m2)	0.82
Q Total (m3/s)	0.80	Flow (m3/s)	0.80
Top Width (m)	12.68	Top Width (m)	12.68
Vel Total (m/s)	0.98	Avg. Vel. (m/s)	0.98
Max Chl Dpth (m)	0.12	Hydr. Depth (m)	0.06
Conv. Total (m3/s)	3.8	Conv. (m3/s)	3.8
Length Wtd. (m)		Wetted Per. (m)	12.69
Min Ch El (m)	184.03	Shear (N/m2)	28.56
Alpha	1.00	Stream Power (N/m s)	27.89
Frctn Loss (m)		Cum Volume (1000 m3)	
C & E Loss (m)		Cum SA (1000 m2)	

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	184.22	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.035	
W.S. Elev (m)	184.17	Reach Len. (m)			
Crit W.S. (m)	184.17	Flow Area (m2)		1.05	
E.G. Slope (m/m)	0.034226	Area (m2)		1.05	
Q Total (m3/s)	0.97	Flow (m3/s)		0.97	
Top Width (m)	14.21	Top Width (m)		14.21	
Vel Total (m/s)	0.93	Avg. Vel. (m/s)		0.93	
Max Chl Dpth (m)	0.14	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	5.2	Conv. (m3/s)		5.2	
Length Wtd. (m)		Wetted Per. (m)		14.22	
Min Ch El (m)	184.03	Shear (N/m2)		24.68	
Alpha	1.00	Stream Power (N/m s)		22.90	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	184.24	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.035	
W.S. Elev (m)	184.20	Reach Len. (m)			
Crit W.S. (m)	184.20	Flow Area (m2)		1.39	
E.G. Slope (m/m)	0.027035	Area (m2)		1.39	
Q Total (m3/s)	1.27	Flow (m3/s)		1.27	
Top Width (m)	16.30	Top Width (m)		16.30	
Vel Total (m/s)	0.91	Avg. Vel. (m/s)		0.91	
Max Chl Dpth (m)	0.16	Hydr. Depth (m)		0.09	
Conv. Total (m3/s)	7.7	Conv. (m3/s)		7.7	
Length Wtd. (m)		Wetted Per. (m)		16.31	
Min Ch El (m)	184.03	Shear (N/m2)		22.65	
Alpha	1.00	Stream Power (N/m s)		20.65	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	184.25	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	184.20	Reach Len. (m)			
Crit W.S. (m)	184.20	Flow Area (m2)		1.43	
E.G. Slope (m/m)	0.033261	Area (m2)		1.43	
Q Total (m3/s)	1.46	Flow (m3/s)		1.46	
Top Width (m)	16.51	Top Width (m)		16.51	
Vel Total (m/s)	1.02	Avg. Vel. (m/s)		1.02	
Max Chl Dpth (m)	0.17	Hydr. Depth (m)		0.09	
Conv. Total (m3/s)	8.0	Conv. (m3/s)		8.0	
Length Wtd. (m)		Wetted Per. (m)		16.52	
Min Ch El (m)	184.03	Shear (N/m2)		28.26	
Alpha	1.00	Stream Power (N/m s)		28.83	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	184.27	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.035	
W.S. Elev (m)	184.23	Reach Len. (m)			
Crit W.S. (m)	184.23	Flow Area (m2)		1.91	
E.G. Slope (m/m)	0.019981	Area (m2)		1.91	
Q Total (m3/s)	1.67	Flow (m3/s)		1.67	
Top Width (m)	18.98	Top Width (m)		18.98	
Vel Total (m/s)	0.87	Avg. Vel. (m/s)		0.87	
Max Chl Dpth (m)	0.19	Hydr. Depth (m)		0.10	
Conv. Total (m3/s)	11.8	Conv. (m3/s)		11.8	
Length Wtd. (m)		Wetted Per. (m)		19.00	
Min Ch El (m)	184.03	Shear (N/m2)		19.72	
Alpha	1.00	Stream Power (N/m s)		17.23	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	184.29	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	184.24	Reach Len. (m)			
Crit W.S. (m)	184.24	Flow Area (m2)		2.09	
E.G. Slope (m/m)	0.026512	Area (m2)		2.09	
Q Total (m3/s)	2.17	Flow (m3/s)		2.17	
Top Width (m)	19.83	Top Width (m)		19.83	
Vel Total (m/s)	1.04	Avg. Vel. (m/s)		1.04	
Max Chl Dpth (m)	0.20	Hydr. Depth (m)		0.11	
Conv. Total (m3/s)	13.3	Conv. (m3/s)		13.3	
Length Wtd. (m)		Wetted Per. (m)		19.84	
Min Ch El (m)	184.03	Shear (N/m2)		27.40	
Alpha	1.00	Stream Power (N/m s)		28.43	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	184.42	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.		0.035	
W.S. Elev (m)	184.34	Reach Len. (m)			
Crit W.S. (m)	184.34	Flow Area (m2)		4.74	
E.G. Slope (m/m)	0.021844	Area (m2)		4.74	
Q Total (m3/s)	5.97	Flow (m3/s)		5.97	
Top Width (m)	29.08	Top Width (m)		29.08	
Vel Total (m/s)	1.26	Avg. Vel. (m/s)		1.26	
Max Chl Dpth (m)	0.31	Hydr. Depth (m)		0.16	
Conv. Total (m3/s)	40.4	Conv. (m3/s)		40.4	
Length Wtd. (m)		Wetted Per. (m)		29.09	
Min Ch El (m)	184.03	Shear (N/m2)		34.90	
Alpha	1.00	Stream Power (N/m s)		43.96	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

SUMMARY OF MANNING'S N VALUES

River:DUFFINS

Reach	River Sta.	n1	n2	n3
WC30	300	.07	.035	.07
WC30	150	Culvert		
WC30	100	.07	.035	.07
WC30	10	.07	.035	.07

SUMMARY OF REACH LENGTHS

River: DUFFINS

Reach	River Sta.	Left	Channel	Right
WC30	300	49	60	60
WC30	150	Culvert		
WC30	100	46	51	51
WC30	10	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: DUFFINS

Reach	River Sta.	Contr.	Expan.
WC30	300	.3	.5
WC30	150	Culvert	
WC30	100	.3	.5
WC30	10	.3	.5

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
WC30	300	2-yr	0.55	185.50	185.62	185.59	185.65	0.011194	0.75	0.74	6.33	0.68
WC30	300	5-yr	0.80	185.50	185.66	185.62	185.69	0.010318	0.85	0.95	6.42	0.68
WC30	300	10-yr	0.97	185.50	185.68	185.63	185.72	0.009894	0.90	1.07	6.48	0.68
WC30	300	25-yr	1.27	185.50	185.71	185.66	185.76	0.009271	0.99	1.29	6.57	0.68
WC30	300	50-yr	1.46	185.50	185.74	185.68	185.79	0.008765	1.03	1.42	6.63	0.67
WC30	300	100-yr	1.67	185.50	185.76	185.70	185.82	0.008590	1.08	1.55	6.69	0.68
WC30	300	Check Flow	2.17	185.50	185.81	185.74	185.88	0.008025	1.17	1.85	6.83	0.67
WC30	300	Regional	5.97	185.50	186.11	185.96	186.24	0.006415	1.64	3.64	7.62	0.67
WC30	150		Culvert									
WC30	100	2-yr	0.55	184.99	185.12		185.15	0.012745	0.78	0.71	17.34	0.72
WC30	100	5-yr	0.80	184.99	185.16		185.19	0.010608	0.85	0.94	19.27	0.69
WC30	100	10-yr	0.97	184.99	185.17		185.21	0.012622	0.97	1.00	19.79	0.76
WC30	100	25-yr	1.27	184.99	185.19	185.18	185.25	0.014818	1.14	1.12	20.69	0.84
WC30	100	50-yr	1.46	184.99	185.21		185.28	0.013315	1.16	1.26	21.66	0.81
WC30	100	100-yr	1.67	184.99	185.20	185.20	185.30	0.019618	1.38	1.21	21.35	0.98
WC30	100	Check Flow	2.17	184.99	185.25	185.24	185.36	0.016143	1.44	1.50	23.41	0.92
WC30	100	Regional	5.97	184.99	185.47	185.47	185.70	0.015514	2.14	2.79	33.77	1.00
WC30	10	2-yr	0.55	184.03	184.15	184.15	184.18	0.031609	0.78	0.71	11.82	1.01
WC30	10	5-yr	0.80	184.03	184.16	184.16	184.21	0.045110	0.98	0.82	12.68	1.23
WC30	10	10-yr	0.97	184.03	184.17	184.17	184.22	0.034226	0.93	1.05	14.21	1.09
WC30	10	25-yr	1.27	184.03	184.20	184.20	184.24	0.027035	0.91	1.39	16.30	1.00
WC30	10	50-yr	1.46	184.03	184.20	184.20	184.25	0.033261	1.02	1.43	16.51	1.11
WC30	10	100-yr	1.67	184.03	184.23	184.23	184.27	0.019981	0.87	1.91	18.98	0.88
WC30	10	Check Flow	2.17	184.03	184.24	184.24	184.29	0.026512	1.04	2.09	19.83	1.02
WC30	10	Regional	5.97	184.03	184.34	184.34	184.42	0.021844	1.26	4.74	29.08	1.00

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (m)	W.S. Elev (m)	Vel Head (m)	Frctn Loss (m)	C & E Loss (m)	Q Left (m3/s)	Q Channel (m3/s)	Q Right (m3/s)	Top Width (m)
WC30	300	2-yr	185.65	185.62	0.03				0.55		6.33
WC30	300	5-yr	185.69	185.66	0.04				0.80		6.42
WC30	300	10-yr	185.72	185.68	0.04				0.97		6.48
WC30	300	25-yr	185.76	185.71	0.05				1.27		6.57
WC30	300	50-yr	185.79	185.74	0.05				1.46		6.63
WC30	300	100-yr	185.82	185.76	0.06				1.67		6.69
WC30	300	Check Flow	185.88	185.81	0.07				2.17		6.83
WC30	300	Regional	186.24	186.11	0.14				5.97		7.62
WC30	150		Culvert								
WC30	100	2-yr	185.15	185.12	0.03	0.97	0.00		0.55		17.34
WC30	100	5-yr	185.19	185.16	0.04	0.98	0.00		0.80		19.27
WC30	100	10-yr	185.21	185.17	0.05	1.00	0.00		0.97		19.79
WC30	100	25-yr	185.25	185.19	0.07	1.00	0.01		1.27		20.69
WC30	100	50-yr	185.28	185.21	0.07	1.02	0.01		1.46		21.66
WC30	100	100-yr	185.30	185.20	0.10	1.01	0.03		1.67		21.35
WC30	100	Check Flow	185.36	185.25	0.11	1.04	0.03		2.17		23.41
WC30	100	Regional	185.70	185.47	0.23	0.93	0.08		5.97		33.77
WC30	10	2-yr	184.18	184.15	0.03				0.55		11.82
WC30	10	5-yr	184.21	184.16	0.05				0.80		12.68
WC30	10	10-yr	184.22	184.17	0.04				0.97		14.21
WC30	10	25-yr	184.24	184.20	0.04				1.27		16.30
WC30	10	50-yr	184.25	184.20	0.05				1.46		16.51
WC30	10	100-yr	184.27	184.23	0.04				1.67		18.98
WC30	10	Check Flow	184.29	184.24	0.05				2.17		19.83
WC30	10	Regional	184.42	184.34	0.08				5.97		29.08

Profile Output Table - Culvert Only

Reach	River Sta		Profile	E.G. US. (m)	W.S. US. (m)	E.G. IC (m)	E.G. OC (m)	Min El Weir Flow (m)	Q Culv Group (m3/s)	Q Weir (m3/s)	Delta WS (m)	Culv Vel US (m/s)	Culv Vel DS (m/s)
WC30	150	Culvert #1	2-yr	185.65	185.62	185.63	185.65	191.51	0.55		0.50	0.88	0.78
WC30	150	Culvert #1	5-yr	185.69	185.66	185.67	185.69	191.51	0.80		0.50	1.02	0.85
WC30	150	Culvert #1	10-yr	185.72	185.68	185.70	185.72	191.51	0.97		0.51	1.11	0.97
WC30	150	Culvert #1	25-yr	185.76	185.71	185.74	185.76	191.51	1.27		0.53	1.23	1.14
WC30	150	Culvert #1	50-yr	185.79	185.74	185.77	185.79	191.51	1.46		0.53	1.34	1.16
WC30	150	Culvert #1	100-yr	185.82	185.76	185.79	185.82	191.51	1.67		0.56	1.38	1.38
WC30	150	Culvert #1	Check Flow	185.88	185.81	185.85	185.88	191.51	2.17		0.56	1.53	1.44
WC30	150	Culvert #1	Regional	186.25	186.11	186.22	186.25	191.51	5.97		0.64	2.14	2.26

DUFFINS CREEK

HEC-RAS ANALYSIS WC#35

EXISTING 407 ETR

EX. CULVERT 2 x (Ø1500) mm

PROPOSED 407 TWY

14+200 14+300 14+400 14+500

213.74	213.55	ST 300	
213.58	213.52		
213.67	213.37	ST 200	
213.54	213.13		
212.79	212.81	ST 100	
212.66	212.64		
212.21	212.21	ST 10	
212.10	212.10		

PROP CULV WC#35
SPAN x RISE=(6 x 2.5)m
L=33m, S=0.8%
U/S INV=213.00m
D/S INV=212.75m

LEGEND

- EXISTING 407 ETR
- PROPOSED 407 TWY
- CREEK FLOW DIRECTION
- EXISTING CULVERT
- PROPOSED CULVERT
- PROPOSED REGIONAL FLOODLINE

CROSS SECTION NUMBER

EX REG | PR REG | HEC ST

EX 100 | PR 100

PARSONS HEC-RAS SECTION

PROPOSED WL ELEVATION (m)

EXISTING UPDATED WL ELEVATION (m)

5m 0m 10m 20m 30m

SCALE HORIZONTAL 1:1000

DATE: SEPTEMBER 2016

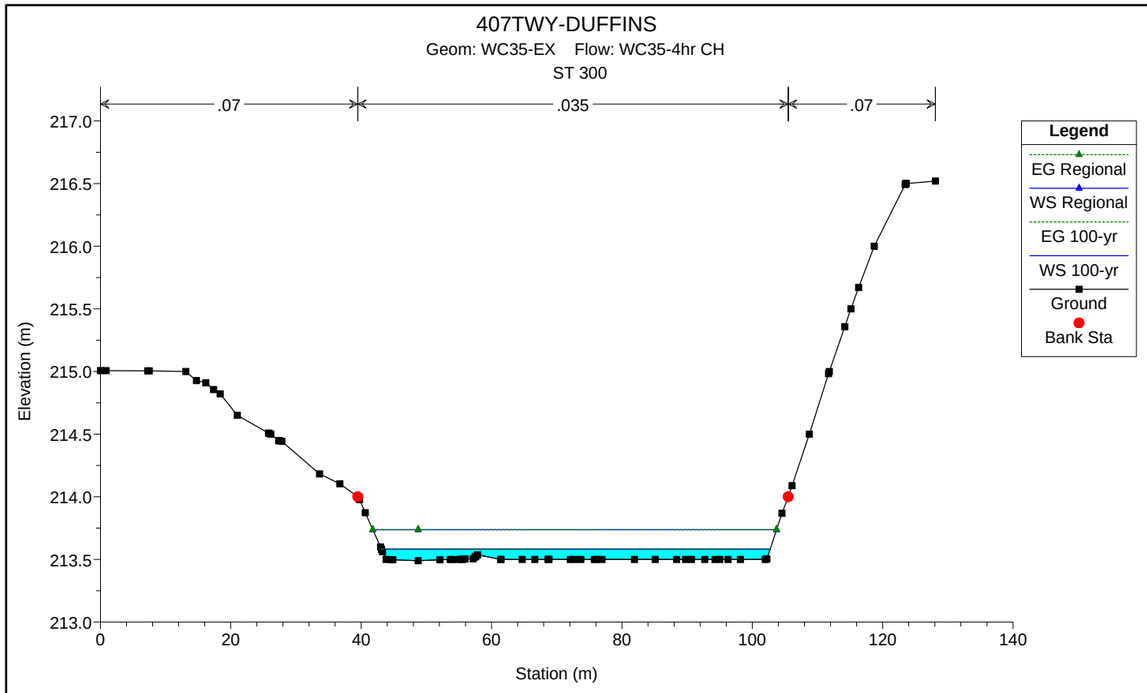
SCALE: 1:1000

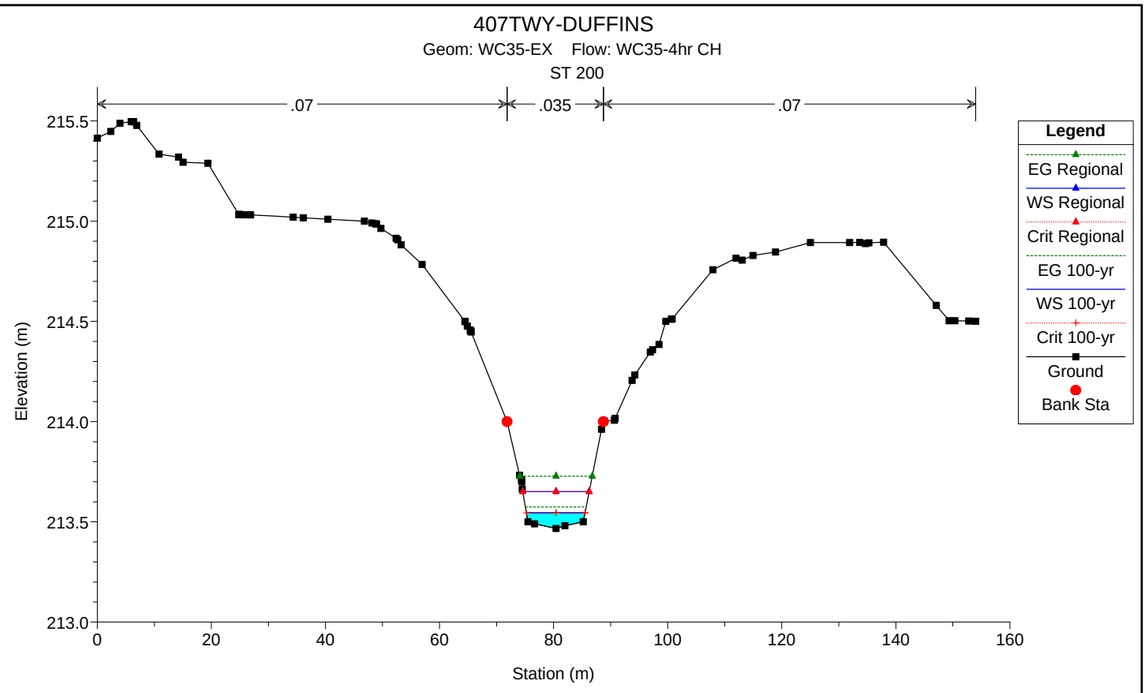
Ontario

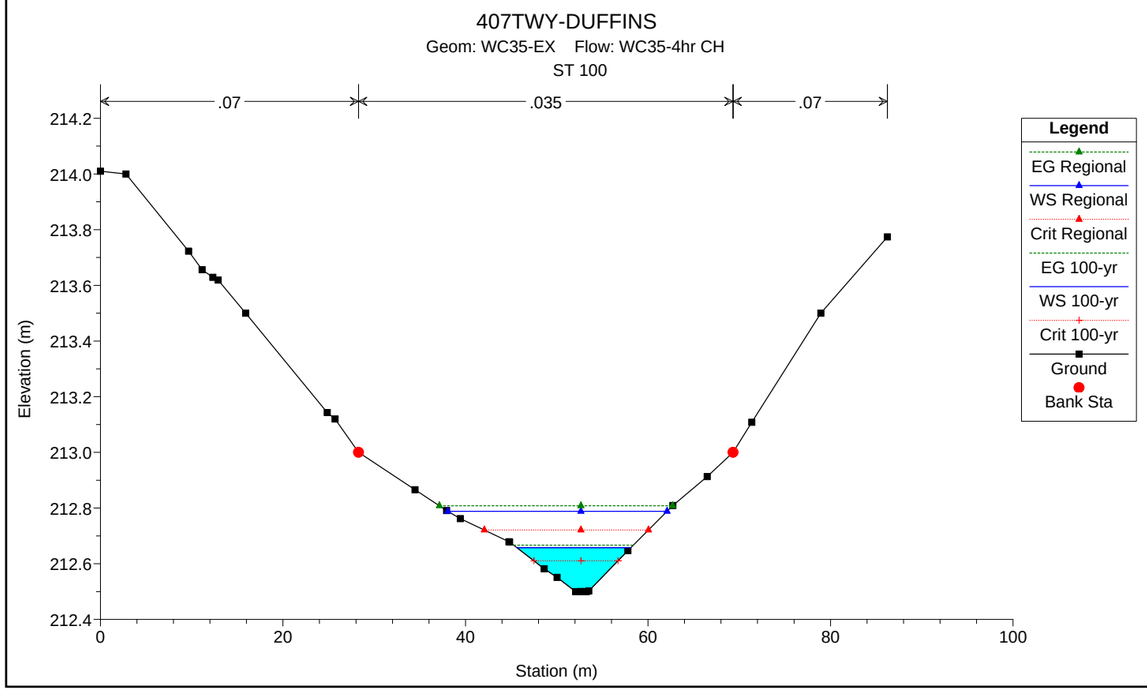
PARSONS
625 COCHRANE DRIVE, SUITE 500
MARKHAM, ONTARIO L3R 9R9
TEL: 905-943-0500
FAX: 905-943-0400

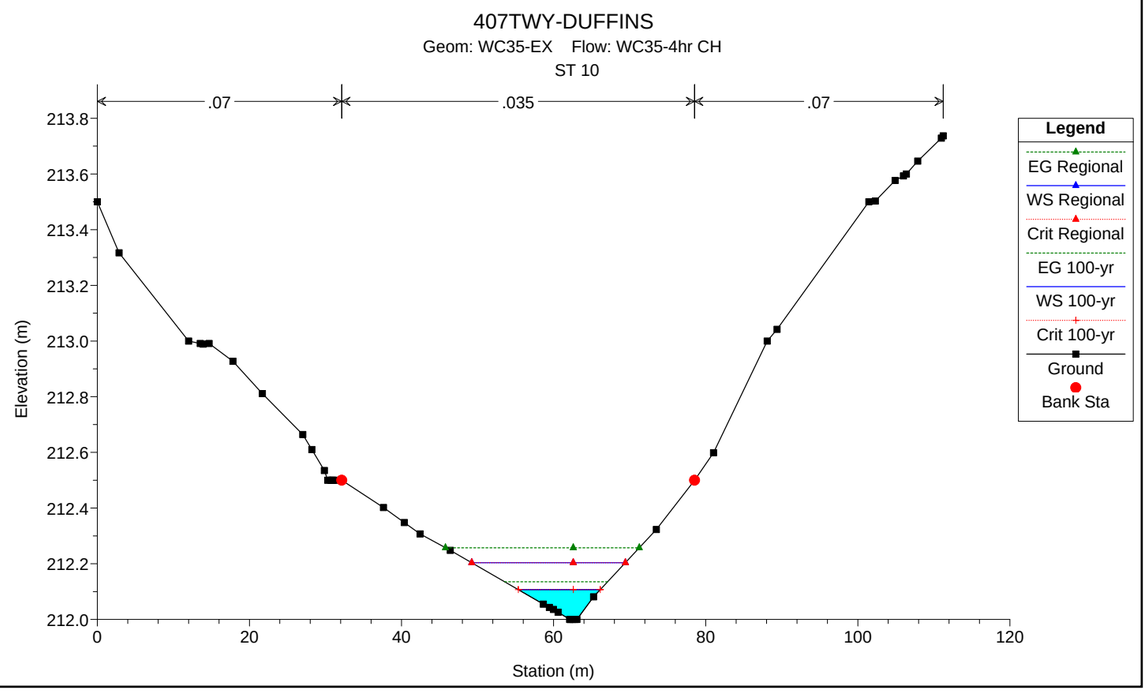
407 TRANSITWAY FROM KENNEDY RD TO BROCK RD

FIGURE 6.18 - HEC-RAS ANALYSIS - DUFFINS CREEK (WC#35)


407TWY-DUFFINS
Geom: WC35-EX Flow: WC35-4hr CH
ST 300
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Bank Sta


407TWY-DUFFINS
Geom: WC35-EX Flow: WC35-4hr CH
ST 200
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta


407TWY-DUFFINS
Geom: WC35-EX Flow: WC35-4hr CH
ST 100
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta


407TWY-DUFFINS
Geom: WC35-EX Flow: WC35-4hr CH
ST 10
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta

HEC-RAS Plan: WC35- EX 4hr CH River: DUFFINS Reach: WC35

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC35	300	2-yr	0.11	213.49	213.53		213.53	0.000487	0.06	1.78	58.25	0.11
WC35	300	5-yr	0.17	213.49	213.54		213.54	0.000417	0.07	2.44	59.04	0.11
WC35	300	10-yr	0.24	213.49	213.55		213.55	0.000385	0.08	3.08	59.20	0.11
WC35	300	25-yr	0.32	213.49	213.56		213.56	0.000361	0.09	3.73	59.37	0.11
WC35	300	50-yr	0.38	213.49	213.57		213.57	0.000344	0.09	4.20	59.48	0.11
WC35	300	100-yr	0.46	213.49	213.58		213.58	0.000327	0.10	4.79	59.63	0.11
WC35	300	Check Flow	0.59	213.49	213.60		213.60	0.000269	0.10	5.90	59.89	0.10
WC35	300	Regional	2.17	213.49	213.74		213.74	0.000200	0.15	14.28	61.95	0.10
WC35	200	2-yr	0.11	213.47	213.51	213.51	213.52	0.050121	0.51	0.22	9.79	1.08
WC35	200	5-yr	0.17	213.47	213.52	213.52	213.53	0.017189	0.43	0.39	10.02	0.70
WC35	200	10-yr	0.24	213.47	213.53	213.53	213.54	0.026289	0.56	0.43	10.06	0.87
WC35	200	25-yr	0.32	213.47	213.53	213.53	213.56	0.035746	0.69	0.46	10.11	1.03
WC35	200	50-yr	0.38	213.47	213.54	213.54	213.56	0.032073	0.71	0.53	10.19	1.00
WC35	200	100-yr	0.46	213.47	213.54	213.54	213.57	0.034644	0.79	0.58	10.26	1.05
WC35	200	Check Flow	0.59	213.47	213.55	213.55	213.59	0.044845	0.94	0.63	10.32	1.21
WC35	200	Regional	2.17	213.47	213.67	213.67	213.73	0.016833	1.11	1.95	11.85	0.87
WC35	100	2-yr	0.11	212.50	212.59	212.56	212.59	0.004897	0.28	0.40	7.69	0.39
WC35	100	5-yr	0.17	212.50	212.61	212.58	212.61	0.004769	0.31	0.55	8.98	0.40
WC35	100	10-yr	0.24	212.50	212.61		212.62	0.007770	0.40	0.60	9.31	0.51
WC35	100	25-yr	0.32	212.50	212.63		212.64	0.005995	0.39	0.81	10.80	0.46
WC35	100	50-yr	0.38	212.50	212.64	212.60	212.65	0.006120	0.41	0.92	11.44	0.47
WC35	100	100-yr	0.46	212.50	212.66	212.61	212.67	0.005223	0.41	1.12	12.63	0.44
WC35	100	Check Flow	0.59	212.50	212.67	212.62	212.68	0.005569	0.45	1.32	13.68	0.46
WC35	100	Regional	2.17	212.50	212.79	212.72	212.81	0.006334	0.63	3.47	24.02	0.53
WC35	10	2-yr	0.11	212.00	212.06	212.06	212.07	0.038528	0.57	0.19	6.02	1.01
WC35	10	5-yr	0.17	212.00	212.07	212.07	212.09	0.042970	0.66	0.26	6.91	1.09
WC35	10	10-yr	0.24	212.00	212.10	212.10	212.11	0.015017	0.48	0.50	9.62	0.68
WC35	10	25-yr	0.32	212.00	212.10	212.10	212.12	0.024266	0.62	0.51	9.81	0.87
WC35	10	50-yr	0.38	212.00	212.10	212.10	212.13	0.024571	0.65	0.58	10.47	0.88
WC35	10	100-yr	0.46	212.00	212.10	212.10	212.14	0.035753	0.79	0.58	10.48	1.07
WC35	10	Check Flow	0.59	212.00	212.12	212.12	212.15	0.030140	0.78	0.75	11.94	1.00
WC35	10	Regional	2.17	212.00	212.21	212.21	212.26	0.025209	1.01	2.14	20.35	1.00

407 TWY KENNEDY RD TO BROCK WC35-EX

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
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PROJECT DATA
Project Title: 407TWY-DUFFINS
Project File : 407TWY-DUFFINS.prj
Run Date and Time: 1/20/2016 12:11:30 AM

Project in SI units

Project Description:
HEC-RAS Model created for 407 TWY project from Kennedy Rd. to Brock Rd. - Duffins Creek Watershed

PLAN DATA

Plan Title: Plan 81
Plan File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.p81

Geometry Title: WC35-EX
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.g03

Flow Title   : WC35-4hr CH
Flow File   : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.f09

Plan Summary Information:

Number of:	Cross Sections	= 4	Multiple Openings	=	0
	Culverts	= 0	Inline Structures	=	0
	Bridges	= 0	Lateral Structures	=	0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance

Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: WC35-4hr CH
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.f09

Flow Data (m3/s)

River	Reach	RS	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Check Flow	Regional
DUFFINS	WC35	300	.11	.17	.24	.32	.38	.46	.59	2.17

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
DUFFINS	WC35	2-yr		Critical
DUFFINS	WC35	5-yr		Critical
DUFFINS	WC35	10-yr		Critical
DUFFINS	WC35	25-yr		Critical
DUFFINS	WC35	50-yr		Critical
DUFFINS	WC35	100-yr		Critical
DUFFINS	WC35	Check Flow		Critical
DUFFINS	WC35	Regional		Critical

GEOMETRY DATA

Geometry Title: WC35-EX
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.g03

CROSS SECTION

RIVER: DUFFINS

407 TWY KENNEDY RD TO BROCK WC35-EX

REACH: WC35 RS: 300

INPUT

Description: ST 300

Station Elevation Data num= 89

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	215.007	.874	215.007	7.271	215.005	7.47	215.005	13.09	215
14.723	214.927	16.148	214.91	17.349	214.856	18.372	214.822	21	214.65
25.788	214.508	25.841	214.507	25.88	214.506	26.14	214.5	27.324	214.448
27.459	214.448	27.815	214.443	33.604	214.182	36.72	214.104	39.488	214
39.548	213.995	39.586	213.993	39.595	213.992	39.616	213.991	39.65	213.988
39.719	213.982	39.748	213.978	40.617	213.873	42.964	213.6	43.109	213.581
43.279	213.561	43.811	213.5	44.474	213.498	44.847	213.497	48.733	213.49
52.086	213.497	53.659	213.5	54.014	213.499	55.097	213.5	55.428	213.5
55.487	213.5	55.491	213.5	55.816	213.504	55.922	213.503	57.168	213.504
57.462	213.519	57.555	213.523	57.568	213.524	57.859	213.536	61.416	213.5
61.45	213.5	64.693	213.5	66.635	213.5	68.66	213.5	68.769	213.5
68.811	213.5	72.086	213.5	72.814	213.5	73.696	213.5	75.76	213.5
76.025	213.5	76.937	213.5	81.916	213.5	85.11	213.5	88.403	213.5
89.769	213.5	90.654	213.5	92.696	213.5	94.29	213.5	94.999	213.5
96.282	213.5	98.172	213.5	101.991	213.5	102.235	213.503	104.549	213.868
105.526	214	106.09	214.089	108.758	214.5	111.703	214.983	111.808	215
114.195	215.358	115.131	215.5	116.305	215.67	118.701	216	123.452	216.493
123.518	216.5	123.556	216.5	123.604	216.5	128.081	216.52		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	39.488	.035	105.526	.07

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.

39.488 105.526 6 5 7 .1 .3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	213.53	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	213.53	Reach Len. (m)	6.00	5.00	7.00
Crit W.S. (m)		Flow Area (m2)		1.78	
E.G. Slope (m/m)	0.000487	Area (m2)		1.78	
Q Total (m3/s)	0.11	Flow (m3/s)		0.11	
Top Width (m)	58.25	Top Width (m)		58.25	
Vel Total (m/s)	0.06	Avg. Vel. (m/s)		0.06	
Max Chl Dpth (m)	0.04	Hydr. Depth (m)		0.03	
Conv. Total (m3/s)	5.0	Conv. (m3/s)		5.0	
Length Wtd. (m)	5.00	Wetted Per. (m)		58.25	
Min Ch El (m)	213.49	Shear (N/m2)		0.15	
Alpha	1.00	Stream Power (N/m s)	6132.24	0.00	0.00
Frctn Loss (m)	0.01	Cum Volume (1000 m3)		0.03	

C & E Loss (m)	0.00	Cum SA (1000 m2)	0.87

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	213.54	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	213.54	Reach Len. (m)	6.00	5.00	7.00
Crit W.S. (m)		Flow Area (m2)		2.44	
E.G. Slope (m/m)	0.000417	Area (m2)		2.44	
Q Total (m3/s)	0.17	Flow (m3/s)		0.17	
Top Width (m)	59.04	Top Width (m)		59.04	
Vel Total (m/s)	0.07	Avg. Vel. (m/s)		0.07	
Max Chl Dpth (m)	0.05	Hydr. Depth (m)		0.04	
Conv. Total (m3/s)	8.3	Conv. (m3/s)		8.3	
Length Wtd. (m)	5.00	Wetted Per. (m)		59.05	
Min Ch El (m)	213.49	Shear (N/m2)		0.17	
Alpha	1.00	Stream Power (N/m s)	6132.24	0.00	0.00
Frctn Loss (m)	0.01	Cum Volume (1000 m3)		0.05	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.96	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	213.55	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	213.55	Reach Len. (m)	6.00	5.00	7.00
Crit W.S. (m)		Flow Area (m2)		3.08	
E.G. Slope (m/m)	0.000385	Area (m2)		3.08	

Q Total (m3/s)	0.24	Flow (m3/s)		0.24
Top Width (m)	59.20	Top Width (m)		59.20
Vel Total (m/s)	0.08	Avg. Vel. (m/s)		0.08
Max Chl Dpth (m)	0.06	Hydr. Depth (m)		0.05
Conv. Total (m3/s)	12.2	Conv. (m3/s)		12.2
Length Wtd. (m)	5.00	Wetted Per. (m)		59.21
Min Ch El (m)	213.49	Shear (N/m2)		0.20
Alpha	1.00	Stream Power (N/m s)	6132.24	0.00
0.00				
Frctn Loss (m)	0.01	Cum Volume (1000 m3)		0.06
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.04

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	213.56	Element	Left OB	Channel
Right OB				
Vel Head (m)	0.00	Wt. n-Val.		0.035
W.S. Elev (m)	213.56	Reach Len. (m)	6.00	5.00
7.00				
Crit W.S. (m)		Flow Area (m2)		3.73
E.G. Slope (m/m)	0.000361	Area (m2)		3.73
Q Total (m3/s)	0.32	Flow (m3/s)		0.32
Top Width (m)	59.37	Top Width (m)		59.37
Vel Total (m/s)	0.09	Avg. Vel. (m/s)		0.09
Max Chl Dpth (m)	0.07	Hydr. Depth (m)		0.06
Conv. Total (m3/s)	16.8	Conv. (m3/s)		16.8
Length Wtd. (m)	5.00	Wetted Per. (m)		59.38
Min Ch El (m)	213.49	Shear (N/m2)		0.22
Alpha	1.00	Stream Power (N/m s)	6132.24	0.00
0.00				
Frctn Loss (m)	0.01	Cum Volume (1000 m3)		0.07
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.12

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	213.57	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	213.57	Reach Len. (m)	6.00	5.00	7.00
Crit W.S. (m)		Flow Area (m2)		4.20	
E.G. Slope (m/m)	0.000344	Area (m2)		4.20	
Q Total (m3/s)	0.38	Flow (m3/s)		0.38	
Top Width (m)	59.48	Top Width (m)		59.48	
Vel Total (m/s)	0.09	Avg. Vel. (m/s)		0.09	
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	20.5	Conv. (m3/s)		20.5	
Length Wtd. (m)	5.00	Wetted Per. (m)		59.49	
Min Ch El (m)	213.49	Shear (N/m2)		0.24	
Alpha	1.00	Stream Power (N/m s)	6132.24	0.00	0.00
Frctn Loss (m)	0.01	Cum Volume (1000 m3)		0.08	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.17	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	213.58	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	213.58	Reach Len. (m)	6.00	5.00	7.00
Crit W.S. (m)		Flow Area (m2)		4.79	
E.G. Slope (m/m)	0.000327	Area (m2)		4.79	
Q Total (m3/s)	0.46	Flow (m3/s)		0.46	
Top Width (m)	59.63	Top Width (m)		59.63	
Vel Total (m/s)	0.10	Avg. Vel. (m/s)		0.10	

Max Chl Dpth (m)	0.09	Hydr. Depth (m)		0.08
Conv. Total (m3/s)	25.4	Conv. (m3/s)		25.4
Length Wtd. (m)	5.00	Wetted Per. (m)		59.64
Min Ch El (m)	213.49	Shear (N/m2)		0.26
Alpha	1.00	Stream Power (N/m s)	6132.24	0.00
0.00				
Frctn Loss (m)	0.01	Cum Volume (1000 m3)		0.09
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.22

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	213.60	Element	Left OB	Channel
Right OB				
Vel Head (m)	0.00	Wt. n-Val.		0.035
W.S. Elev (m)	213.60	Reach Len. (m)	6.00	5.00
7.00				
Crit W.S. (m)		Flow Area (m2)		5.90
E.G. Slope (m/m)	0.000269	Area (m2)		5.90
Q Total (m3/s)	0.59	Flow (m3/s)		0.59
Top Width (m)	59.89	Top Width (m)		59.89
Vel Total (m/s)	0.10	Avg. Vel. (m/s)		0.10
Max Chl Dpth (m)	0.11	Hydr. Depth (m)		0.10
Conv. Total (m3/s)	36.0	Conv. (m3/s)		36.0
Length Wtd. (m)	5.00	Wetted Per. (m)		59.91
Min Ch El (m)	213.49	Shear (N/m2)		0.26
Alpha	1.00	Stream Power (N/m s)	6132.24	0.00
0.00				
Frctn Loss (m)	0.00	Cum Volume (1000 m3)		0.11
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.31

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	213.74	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	213.74	Reach Len. (m)	6.00	5.00	7.00
Crit W.S. (m)		Flow Area (m2)		14.28	
E.G. Slope (m/m)	0.000200	Area (m2)		14.28	
Q Total (m3/s)	2.17	Flow (m3/s)		2.17	
Top Width (m)	61.95	Top Width (m)		61.95	
Vel Total (m/s)	0.15	Avg. Vel. (m/s)		0.15	
Max Chl Dpth (m)	0.25	Hydr. Depth (m)		0.23	
Conv. Total (m3/s)	153.4	Conv. (m3/s)		153.4	
Length Wtd. (m)	5.00	Wetted Per. (m)		61.98	
Min Ch El (m)	213.49	Shear (N/m2)		0.45	
Alpha	1.00	Stream Power (N/m s)	6132.24	0.00	0.00
Frctn Loss (m)	0.00	Cum Volume (1000 m3)		0.29	
C & E Loss (m)	0.01	Cum SA (1000 m2)		2.02	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: DUFFINS
REACH: WC35 RS: 200

INPUT
Description: ST 200
Station Elevation Data num= 78

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	215.414	2.375	215.448	3.97	215.488	5.944	215.497	6.209	215.496
6.279	215.496	6.379	215.496	6.914	215.478	10.835	215.334	14.228	215.32
15.039	215.294	19.385	215.289	24.791	215.033	24.896	215.033	25.125	215.033
25.665	215.032	25.683	215.032	26.562	215.032	26.867	215.031	34.341	215.02
36.099	215.017	40.418	215.01	46.835	215	48.158	214.991	48.778	214.987
48.952	214.986	49.718	214.964	52.385	214.915	52.676	214.907	53.257	214.882
56.936	214.784	64.457	214.5	64.482	214.499	64.875	214.476	65.37	214.457
65.459	214.453	65.479	214.451	65.536	214.447	71.844	214	74.038	213.732
74.361	213.71	74.399	213.701	74.507	213.664	75.49	213.5	76.678	213.49
80.436	213.467	81.987	213.481	85.195	213.5	88.405	213.962	88.739	214
88.937	214.002	90.64	214.007	90.788	214.016	93.759	214.206	94.244	214.233
96.953	214.347	97.343	214.359	98.48	214.385	99.668	214.5	100.638	214.511
100.741	214.512	100.781	214.512	107.935	214.758	111.989	214.815	113.046	214.806
114.941	214.829	118.903	214.846	125.01	214.893	131.895	214.893	133.683	214.894
134.67	214.888	135.281	214.892	137.863	214.895	147.077	214.58	149.351	214.503

407 TWY KENNEDY RD TO BROCK WC35-EX
150.349 214.503 152.782 214.502 154.003 214.501

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	71.844	.035	88.739	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
71.844	88.739	38	43	44	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	213.52	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	213.51	Reach Len. (m)	38.00	43.00	44.00
Crit W.S. (m)	213.51	Flow Area (m2)		0.22	
E.G. Slope (m/m)	0.050121	Area (m2)		0.22	
Q Total (m3/s)	0.11	Flow (m3/s)		0.11	
Top Width (m)	9.79	Top Width (m)		9.79	
Vel Total (m/s)	0.51	Avg. Vel. (m/s)		0.51	
Max Chl Dpth (m)	0.04	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	0.5	Conv. (m3/s)		0.5	
Length Wtd. (m)	43.00	Wetted Per. (m)		9.79	
Min Ch El (m)	213.47	Shear (N/m2)		10.92	
Alpha	1.00	Stream Power (N/m s)	7373.33	0.00	0.00
Frctn Loss (m)	0.49	Cum Volume (1000 m3)		0.03	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.70	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	213.53	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	213.52	Reach Len. (m)	38.00	43.00	44.00
Crit W.S. (m)	213.52	Flow Area (m2)		0.39	
E.G. Slope (m/m)	0.017189	Area (m2)		0.39	
Q Total (m3/s)	0.17	Flow (m3/s)		0.17	
Top Width (m)	10.02	Top Width (m)		10.02	
Vel Total (m/s)	0.43	Avg. Vel. (m/s)		0.43	
Max Chl Dpth (m)	0.06	Hydr. Depth (m)		0.04	
Conv. Total (m3/s)	1.3	Conv. (m3/s)		1.3	
Length Wtd. (m)	43.00	Wetted Per. (m)		10.02	
Min Ch El (m)	213.47	Shear (N/m2)		6.61	
Alpha	1.00	Stream Power (N/m s)	7373.33	0.00	0.00
Frctn Loss (m)	0.35	Cum Volume (1000 m3)		0.04	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.79	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
        for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
         This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
        need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
        water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
        defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	213.54	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	213.53	Reach Len. (m)	38.00	43.00	44.00
Crit W.S. (m)	213.53	Flow Area (m2)		0.43	
E.G. Slope (m/m)	0.026289	Area (m2)		0.43	
Q Total (m3/s)	0.24	Flow (m3/s)		0.24	

Top Width (m)	10.06	Top Width (m)			10.06
Vel Total (m/s)	0.56	Avg. Vel. (m/s)			0.56
Max Chl Dpth (m)	0.06	Hydr. Depth (m)			0.04
Conv. Total (m3/s)	1.5	Conv. (m3/s)			1.5
Length Wtd. (m)	43.00	Wetted Per. (m)			10.06
Min Ch El (m)	213.47	Shear (N/m2)			10.92
Alpha	1.00	Stream Power (N/m s)	7373.33		0.00
0.00					
Frctn Loss (m)	0.56	Cum Volume (1000 m3)			0.05
C & E Loss (m)	0.00	Cum SA (1000 m2)			0.87

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	213.56	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	213.53	Reach Len. (m)	38.00	43.00	44.00
Crit W.S. (m)	213.53	Flow Area (m2)		0.46	
E.G. Slope (m/m)	0.035746	Area (m2)		0.46	
Q Total (m3/s)	0.32	Flow (m3/s)		0.32	
Top Width (m)	10.11	Top Width (m)		10.11	
Vel Total (m/s)	0.69	Avg. Vel. (m/s)		0.69	
Max Chl Dpth (m)	0.06	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	1.7	Conv. (m3/s)		1.7	
Length Wtd. (m)	43.00	Wetted Per. (m)		10.11	
Min Ch El (m)	213.47	Shear (N/m2)		16.05	

Alpha	1.00	Stream Power (N/m s)	7373.33	0.00
0.00				
Frctn Loss (m)	0.52	Cum Volume (1000 m3)		0.06
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.94

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	213.56	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	213.54	Reach Len. (m)	38.00	43.00	44.00
Crit W.S. (m)	213.54	Flow Area (m2)		0.53	
E.G. Slope (m/m)	0.032073	Area (m2)		0.53	
Q Total (m3/s)	0.38	Flow (m3/s)		0.38	
Top Width (m)	10.19	Top Width (m)		10.19	
Vel Total (m/s)	0.71	Avg. Vel. (m/s)		0.71	
Max Chl Dpth (m)	0.07	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	2.1	Conv. (m3/s)		2.1	
Length Wtd. (m)	43.00	Wetted Per. (m)		10.20	
Min Ch El (m)	213.47	Shear (N/m2)		16.41	
Alpha	1.00	Stream Power (N/m s)	7373.33	0.00	0.00
Frctn Loss (m)	0.51	Cum Volume (1000 m3)		0.07	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.99	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	213.57	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	213.54	Reach Len. (m)	38.00	43.00	44.00
Crit W.S. (m)	213.54	Flow Area (m2)		0.58	
E.G. Slope (m/m)	0.034644	Area (m2)		0.58	
Q Total (m3/s)	0.46	Flow (m3/s)		0.46	
Top Width (m)	10.26	Top Width (m)		10.26	
Vel Total (m/s)	0.79	Avg. Vel. (m/s)		0.79	
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	2.5	Conv. (m3/s)		2.5	
Length Wtd. (m)	43.00	Wetted Per. (m)		10.27	
Min Ch El (m)	213.47	Shear (N/m2)		19.34	
Alpha	1.00	Stream Power (N/m s)	7373.33	0.00	0.00
Frctn Loss (m)	0.47	Cum Volume (1000 m3)		0.08	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.05	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	213.59	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.035	
W.S. Elev (m)	213.55	Reach Len. (m)	38.00	43.00	44.00
Crit W.S. (m)	213.55	Flow Area (m2)		0.63	
E.G. Slope (m/m)	0.044845	Area (m2)		0.63	
Q Total (m3/s)	0.59	Flow (m3/s)		0.59	
Top Width (m)	10.32	Top Width (m)		10.32	
Vel Total (m/s)	0.94	Avg. Vel. (m/s)		0.94	
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	2.8	Conv. (m3/s)		2.8	
Length Wtd. (m)	43.00	Wetted Per. (m)		10.32	
Min Ch El (m)	213.47	Shear (N/m2)		26.81	
Alpha	1.00	Stream Power (N/m s)	7373.33	0.00	0.00
Frctn Loss (m)	0.52	Cum Volume (1000 m3)		0.09	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.13	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
        for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
         This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
        need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
        water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
        defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	213.73	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.035	
W.S. Elev (m)	213.67	Reach Len. (m)	38.00	43.00	44.00
Crit W.S. (m)	213.67	Flow Area (m2)		1.95	
E.G. Slope (m/m)	0.016833	Area (m2)		1.95	

Q Total (m3/s)	2.17	Flow (m3/s)			2.17
Top Width (m)	11.85	Top Width (m)			11.85
Vel Total (m/s)	1.11	Avg. Vel. (m/s)			1.11
Max Chl Dpth (m)	0.20	Hydr. Depth (m)			0.16
Conv. Total (m3/s)	16.7	Conv. (m3/s)			16.7
Length Wtd. (m)	43.00	Wetted Per. (m)			11.88
Min Ch El (m)	213.47	Shear (N/m2)			27.12
Alpha	1.00	Stream Power (N/m s)	7373.33		0.00
0.00					
Frctn Loss (m)	0.42	Cum Volume (1000 m3)			0.25
C & E Loss (m)	0.01	Cum SA (1000 m2)			1.84

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth
for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program
defaulted to critical depth.

CROSS SECTION

RIVER: DUFFINS
REACH: WC35 RS: 100

INPUT
Description: ST 100
Station Elevation Data num= 31

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	214.01	2.799	214	9.653	213.723	11.142	213.656	12.31	213.629
12.897	213.619	15.914	213.5	24.847	213.143	25.715	213.12	28.286	213
34.463	212.866	37.932	212.791	39.439	212.762	44.767	212.679	44.825	212.678
48.624	212.582	50.038	212.551	52.065	212.5	52.596	212.5	52.602	212.5
52.627	212.5	53.044	212.5	53.244	212.5	53.506	212.502	57.8	212.647
62.718	212.809	66.484	212.913	69.327	213	71.374	213.108	78.944	213.5
86.227	213.774								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	28.286	.035	69.327	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
28.286	69.327	60	48	42	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	212.59	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	212.59	Reach Len. (m)	60.00	48.00	42.00
Crit W.S. (m)	212.56	Flow Area (m2)		0.40	
E.G. Slope (m/m)	0.004897	Area (m2)		0.40	
Q Total (m3/s)	0.11	Flow (m3/s)		0.11	
Top Width (m)	7.69	Top Width (m)		7.69	
Vel Total (m/s)	0.28	Avg. Vel. (m/s)		0.28	
Max Chl Dpth (m)	0.09	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	1.6	Conv. (m3/s)		1.6	
Length Wtd. (m)	48.00	Wetted Per. (m)		7.69	
Min Ch El (m)	212.50	Shear (N/m2)		2.48	
Alpha	1.00	Stream Power (N/m s)	4128.37	0.00	0.00
Frctn Loss (m)	0.51	Cum Volume (1000 m3)		0.01	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.33	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	212.61	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	212.61	Reach Len. (m)	60.00	48.00	42.00
Crit W.S. (m)	212.58	Flow Area (m2)		0.55	
E.G. Slope (m/m)	0.004769	Area (m2)		0.55	
Q Total (m3/s)	0.17	Flow (m3/s)		0.17	
Top Width (m)	8.98	Top Width (m)		8.98	
Vel Total (m/s)	0.31	Avg. Vel. (m/s)		0.31	

Max Chl Dpth (m)	0.11	Hydr. Depth (m)		0.06
Conv. Total (m3/s)	2.5	Conv. (m3/s)		2.5
Length Wtd. (m)	48.00	Wetted Per. (m)		8.99
Min Ch El (m)	212.50	Shear (N/m2)		2.88
Alpha	1.00	Stream Power (N/m s)	4128.37	0.00
0.00				
Frctn Loss (m)	0.52	Cum Volume (1000 m3)		0.02
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.38

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	212.62	Element	Left OB	Channel	
Right OB					
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	212.61	Reach Len. (m)	60.00	48.00	
42.00					
Crit W.S. (m)		Flow Area (m2)		0.60	
E.G. Slope (m/m)	0.007770	Area (m2)		0.60	
Q Total (m3/s)	0.24	Flow (m3/s)		0.24	
Top Width (m)	9.31	Top Width (m)		9.31	
Vel Total (m/s)	0.40	Avg. Vel. (m/s)		0.40	
Max Chl Dpth (m)	0.11	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	2.7	Conv. (m3/s)		2.7	
Length Wtd. (m)	48.00	Wetted Per. (m)		9.31	
Min Ch El (m)	212.50	Shear (N/m2)		4.87	
Alpha	1.00	Stream Power (N/m s)	4128.37	0.00	
0.00					
Frctn Loss (m)	0.50	Cum Volume (1000 m3)		0.03	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.45	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	212.64	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	212.63	Reach Len. (m)	60.00	48.00	42.00
Crit W.S. (m)		Flow Area (m2)		0.81	
E.G. Slope (m/m)	0.005995	Area (m2)		0.81	
Q Total (m3/s)	0.32	Flow (m3/s)		0.32	
Top Width (m)	10.80	Top Width (m)		10.80	
Vel Total (m/s)	0.39	Avg. Vel. (m/s)		0.39	
Max Chl Dpth (m)	0.13	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	4.1	Conv. (m3/s)		4.1	
Length Wtd. (m)	48.00	Wetted Per. (m)		10.80	
Min Ch El (m)	212.50	Shear (N/m2)		4.42	
Alpha	1.00	Stream Power (N/m s)	4128.37	0.00	0.00
Frctn Loss (m)	0.51	Cum Volume (1000 m3)		0.03	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.49	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	212.65	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	212.64	Reach Len. (m)	60.00	48.00	42.00
Crit W.S. (m)	212.60	Flow Area (m2)		0.92	
E.G. Slope (m/m)	0.006120	Area (m2)		0.92	
Q Total (m3/s)	0.38	Flow (m3/s)		0.38	
Top Width (m)	11.44	Top Width (m)		11.44	
Vel Total (m/s)	0.41	Avg. Vel. (m/s)		0.41	

Max Chl Dpth (m)	0.14	Hydr. Depth (m)		0.08
Conv. Total (m3/s)	4.9	Conv. (m3/s)		4.9
Length Wtd. (m)	48.00	Wetted Per. (m)		11.45
Min Ch El (m)	212.50	Shear (N/m2)		4.80
Alpha	1.00	Stream Power (N/m s)	4128.37	0.00
0.00				
Frctn Loss (m)	0.52	Cum Volume (1000 m3)		0.04
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.53

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	212.67	Element	Left OB	Channel	
Right OB					
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	212.66	Reach Len. (m)	60.00	48.00	
42.00					
Crit W.S. (m)	212.61	Flow Area (m2)		1.12	
E.G. Slope (m/m)	0.005223	Area (m2)		1.12	
Q Total (m3/s)	0.46	Flow (m3/s)		0.46	
Top Width (m)	12.63	Top Width (m)		12.63	
Vel Total (m/s)	0.41	Avg. Vel. (m/s)		0.41	
Max Chl Dpth (m)	0.16	Hydr. Depth (m)		0.09	
Conv. Total (m3/s)	6.4	Conv. (m3/s)		6.4	
Length Wtd. (m)	48.00	Wetted Per. (m)		12.64	
Min Ch El (m)	212.50	Shear (N/m2)		4.54	
Alpha	1.00	Stream Power (N/m s)	4128.37	0.00	
0.00					
Frctn Loss (m)	0.52	Cum Volume (1000 m3)		0.04	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.55	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	212.68	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	212.67	Reach Len. (m)	60.00	48.00	42.00
Crit W.S. (m)	212.62	Flow Area (m2)		1.32	
E.G. Slope (m/m)	0.005569	Area (m2)		1.32	
Q Total (m3/s)	0.59	Flow (m3/s)		0.59	
Top Width (m)	13.68	Top Width (m)		13.68	
Vel Total (m/s)	0.45	Avg. Vel. (m/s)		0.45	
Max Chl Dpth (m)	0.17	Hydr. Depth (m)		0.10	
Conv. Total (m3/s)	7.9	Conv. (m3/s)		7.9	
Length Wtd. (m)	48.00	Wetted Per. (m)		13.69	
Min Ch El (m)	212.50	Shear (N/m2)		5.26	
Alpha	1.00	Stream Power (N/m s)	4128.37	0.00	0.00
Frctn Loss (m)	0.52	Cum Volume (1000 m3)		0.05	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.61	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	212.81	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	212.79	Reach Len. (m)	60.00	48.00	42.00
Crit W.S. (m)	212.72	Flow Area (m2)		3.47	
E.G. Slope (m/m)	0.006334	Area (m2)		3.47	
Q Total (m3/s)	2.17	Flow (m3/s)		2.17	
Top Width (m)	24.02	Top Width (m)		24.02	

Vel Total (m/s)	0.63	Avg. Vel. (m/s)			0.63
Max Chl Dpth (m)	0.29	Hydr. Depth (m)			0.14
Conv. Total (m3/s)	27.3	Conv. (m3/s)			27.3
Length Wtd. (m)	48.00	Wetted Per. (m)			24.02
Min Ch El (m)	212.50	Shear (N/m2)			8.97
Alpha	1.00	Stream Power (N/m s)	4128.37		0.00
0.00					
Frctn Loss (m)	0.54	Cum Volume (1000 m3)			0.13
C & E Loss (m)	0.00	Cum SA (1000 m2)			1.06

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the
need for additional cross sections.

CROSS SECTION

RIVER: DUFFINS
REACH: WC35 RS: 10

INPUT
Description: ST 10
Station Elevation Data num= 45

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	213.5	2.862	213.317	12.011	213	13.53	212.991	13.909	212.989
14.689	212.991	17.826	212.927	21.7	212.811	27.021	212.664	28.211	212.61
29.859	212.535	30.308	212.5	30.723	212.5	30.857	212.5	30.995	212.5
31.615	212.5	32.138	212.5	37.621	212.402	40.357	212.348	42.449	212.307
46.414	212.248	58.65	212.055	59.449	212.043	59.971	212.036	60.592	212.026
62.109	212	62.127	212	62.234	212	62.553	212	62.853	212
63.069	212	65.256	212.081	73.5	212.323	78.545	212.5	81.022	212.599
88.083	213	89.383	213.042	101.451	213.5	102.296	213.503	104.91	213.577
106.002	213.593	106.392	213.6	107.881	213.646	110.984	213.729	111.225	213.737

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	32.138	.035	78.545	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
32.138	78.545	0	0	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	212.07	Element		Left OB	Channel
Right OB					
Vel Head (m)	0.02	Wt. n-Val.			0.035
W.S. Elev (m)	212.06	Reach Len. (m)			

Crit W.S. (m)	212.06	Flow Area (m2)		0.19
E.G. Slope (m/m)	0.038528	Area (m2)		0.19
Q Total (m3/s)	0.11	Flow (m3/s)		0.11
Top Width (m)	6.02	Top Width (m)		6.02
Vel Total (m/s)	0.57	Avg. Vel. (m/s)		0.57
Max Chl Dpth (m)	0.06	Hydr. Depth (m)		0.03
Conv. Total (m3/s)	0.6	Conv. (m3/s)		0.6
Length Wtd. (m)		Wetted Per. (m)		6.03
Min Ch El (m)	212.00	Shear (N/m2)		12.16
Alpha	1.00	Stream Power (N/m s)	5325.21	0.00
0.00				
Frctn Loss (m)		Cum Volume (1000 m3)		
C & E Loss (m)		Cum SA (1000 m2)		

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	212.09	Element	Left OB	Channel
Right OB				
Vel Head (m)	0.02	Wt. n-Val.		0.035
W.S. Elev (m)	212.07	Reach Len. (m)		
Crit W.S. (m)	212.07	Flow Area (m2)		0.26
E.G. Slope (m/m)	0.042970	Area (m2)		0.26
Q Total (m3/s)	0.17	Flow (m3/s)		0.17
Top Width (m)	6.91	Top Width (m)		6.91
Vel Total (m/s)	0.66	Avg. Vel. (m/s)		0.66
Max Chl Dpth (m)	0.07	Hydr. Depth (m)		0.04
Conv. Total (m3/s)	0.8	Conv. (m3/s)		0.8
Length Wtd. (m)		Wetted Per. (m)		6.91
Min Ch El (m)	212.00	Shear (N/m2)		15.69
Alpha	1.00	Stream Power (N/m s)	5325.21	0.00
0.00				
Frctn Loss (m)		Cum Volume (1000 m3)		
C & E Loss (m)		Cum SA (1000 m2)		

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	212.11	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	212.10	Reach Len. (m)			
Crit W.S. (m)	212.10	Flow Area (m2)		0.50	
E.G. Slope (m/m)	0.015017	Area (m2)		0.50	
Q Total (m3/s)	0.24	Flow (m3/s)		0.24	
Top Width (m)	9.62	Top Width (m)		9.62	
Vel Total (m/s)	0.48	Avg. Vel. (m/s)		0.48	
Max Chl Dpth (m)	0.10	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	2.0	Conv. (m3/s)		2.0	
Length Wtd. (m)		Wetted Per. (m)		9.62	
Min Ch El (m)	212.00	Shear (N/m2)		7.58	
Alpha	1.00	Stream Power (N/m s)	5325.21	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	212.12	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	212.10	Reach Len. (m)			
Crit W.S. (m)	212.10	Flow Area (m2)		0.51	
E.G. Slope (m/m)	0.024266	Area (m2)		0.51	
Q Total (m3/s)	0.32	Flow (m3/s)		0.32	
Top Width (m)	9.81	Top Width (m)		9.81	
Vel Total (m/s)	0.62	Avg. Vel. (m/s)		0.62	
Max Chl Dpth (m)	0.10	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	2.1	Conv. (m3/s)		2.1	
Length Wtd. (m)		Wetted Per. (m)		9.81	
Min Ch El (m)	212.00	Shear (N/m2)		12.46	

Alpha	1.00	Stream Power (N/m s)	5325.21	0.00
0.00				
Frctn Loss (m)		Cum Volume (1000 m3)		
C & E Loss (m)		Cum SA (1000 m2)		

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	212.13	Element	Left OB	Channel
Right OB				
Vel Head (m)	0.02	Wt. n-Val.		0.035
W.S. Elev (m)	212.10	Reach Len. (m)		
Crit W.S. (m)	212.10	Flow Area (m2)		0.58
E.G. Slope (m/m)	0.024571	Area (m2)		0.58
Q Total (m3/s)	0.38	Flow (m3/s)		0.38
Top Width (m)	10.47	Top Width (m)		10.47
Vel Total (m/s)	0.65	Avg. Vel. (m/s)		0.65
Max Chl Dpth (m)	0.10	Hydr. Depth (m)		0.06
Conv. Total (m3/s)	2.4	Conv. (m3/s)		2.4
Length Wtd. (m)		Wetted Per. (m)		10.47
Min Ch El (m)	212.00	Shear (N/m2)		13.40
Alpha	1.00	Stream Power (N/m s)	5325.21	0.00
0.00				
Frctn Loss (m)		Cum Volume (1000 m3)		
C & E Loss (m)		Cum SA (1000 m2)		

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	212.14	Element	Left OB	Channel
Right OB				
Vel Head (m)	0.03	Wt. n-Val.		0.035
W.S. Elev (m)	212.10	Reach Len. (m)		
Crit W.S. (m)	212.10	Flow Area (m2)		0.58
E.G. Slope (m/m)	0.035753	Area (m2)		0.58
Q Total (m3/s)	0.46	Flow (m3/s)		0.46
Top Width (m)	10.48	Top Width (m)		10.48
Vel Total (m/s)	0.79	Avg. Vel. (m/s)		0.79

Max Chl Dpth (m)	0.10	Hydr. Depth (m)		0.06
Conv. Total (m3/s)	2.4	Conv. (m3/s)		2.4
Length Wtd. (m)		Wetted Per. (m)		10.48
Min Ch El (m)	212.00	Shear (N/m2)		19.53
Alpha	1.00	Stream Power (N/m s)	5325.21	0.00
0.00				
Frctn Loss (m)		Cum Volume (1000 m3)		
C & E Loss (m)		Cum SA (1000 m2)		

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	212.15	Element	Left OB	Channel
Right OB				
Vel Head (m)	0.03	Wt. n-Val.		0.035
W.S. Elev (m)	212.12	Reach Len. (m)		
Crit W.S. (m)	212.12	Flow Area (m2)		0.75
E.G. Slope (m/m)	0.030140	Area (m2)		0.75
Q Total (m3/s)	0.59	Flow (m3/s)		0.59
Top Width (m)	11.94	Top Width (m)		11.94
Vel Total (m/s)	0.78	Avg. Vel. (m/s)		0.78
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.06
Conv. Total (m3/s)	3.4	Conv. (m3/s)		3.4
Length Wtd. (m)		Wetted Per. (m)		11.94
Min Ch El (m)	212.00	Shear (N/m2)		18.60
Alpha	1.00	Stream Power (N/m s)	5325.21	0.00
0.00				
Frctn Loss (m)		Cum Volume (1000 m3)		
C & E Loss (m)		Cum SA (1000 m2)		

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	212.26	Element	Left OB	Channel
Right OB				
Vel Head (m)	0.05	Wt. n-Val.		0.035
W.S. Elev (m)	212.21	Reach Len. (m)		

Crit W.S. (m)	212.21	Flow Area (m2)			2.14
E.G. Slope (m/m)	0.025209	Area (m2)			2.14
Q Total (m3/s)	2.17	Flow (m3/s)			2.17
Top Width (m)	20.35	Top Width (m)			20.35
Vel Total (m/s)	1.01	Avg. Vel. (m/s)			1.01
Max Chl Dpth (m)	0.21	Hydr. Depth (m)			0.11
Conv. Total (m3/s)	13.7	Conv. (m3/s)			13.7
Length Wtd. (m)		Wetted Per. (m)			20.35
Min Ch El (m)	212.00	Shear (N/m2)			26.05
Alpha	1.00	Stream Power (N/m s)	5325.21		0.00
0.00					
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

SUMMARY OF MANNING'S N VALUES

River:DUFFINS

Reach	River Sta.	n1	n2	n3
WC35	300	.07	.035	.07
WC35	200	.07	.035	.07
WC35	100	.07	.035	.07
WC35	10	.07	.035	.07

SUMMARY OF REACH LENGTHS

River: DUFFINS

Reach	River Sta.	Left	Channel	Right
WC35	300	6	5	7
WC35	200	38	43	44
WC35	100	60	48	42
WC35	10	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: DUFFINS

Reach	River Sta.	Contr.	Expan.

407 TWY KENNEDY RD TO BROCK WC35-EX

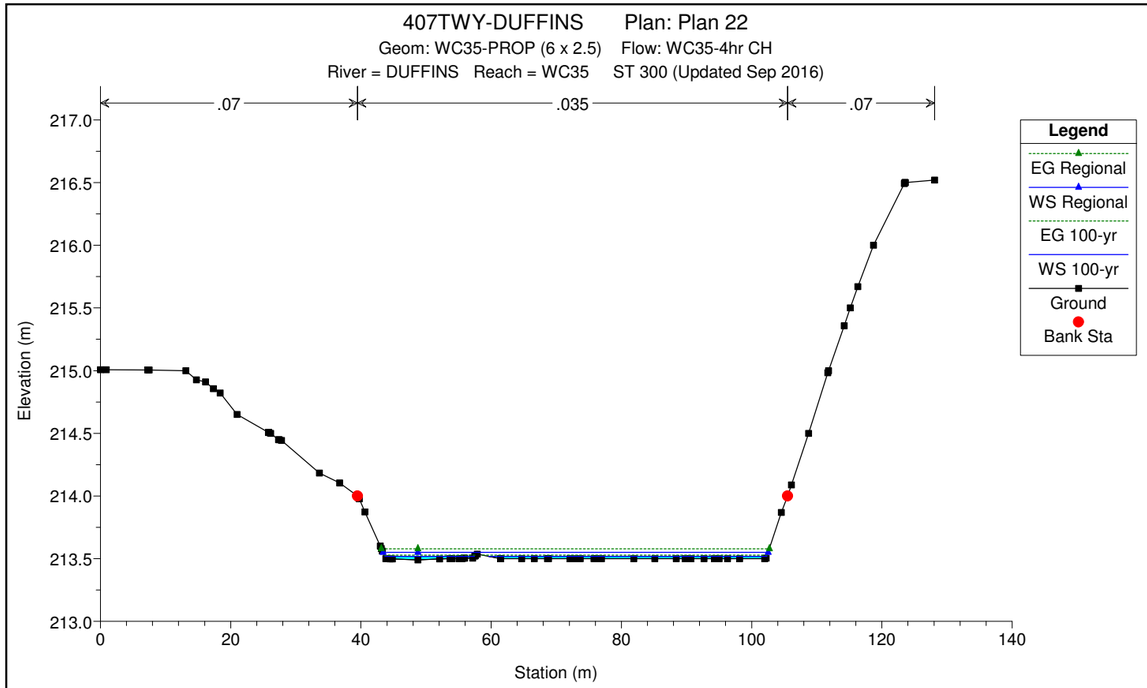
WC35	300	.1	.3
WC35	200	.1	.3
WC35	100	.1	.3
WC35	10	.1	.3

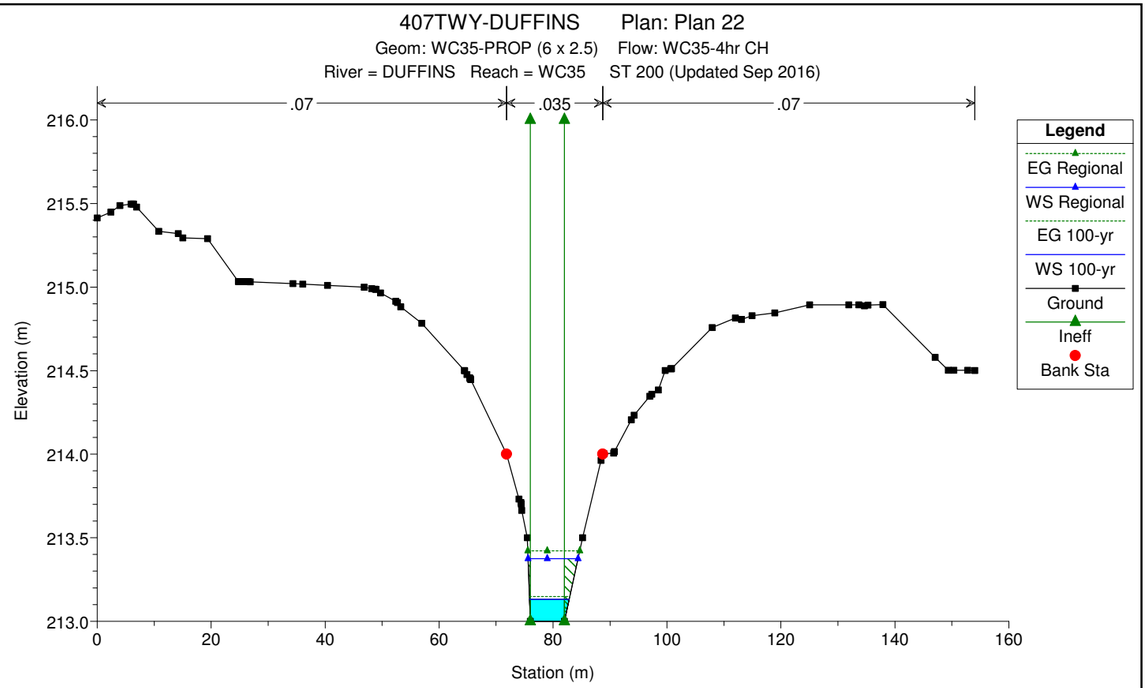
Profile Output Table - Standard Table 1

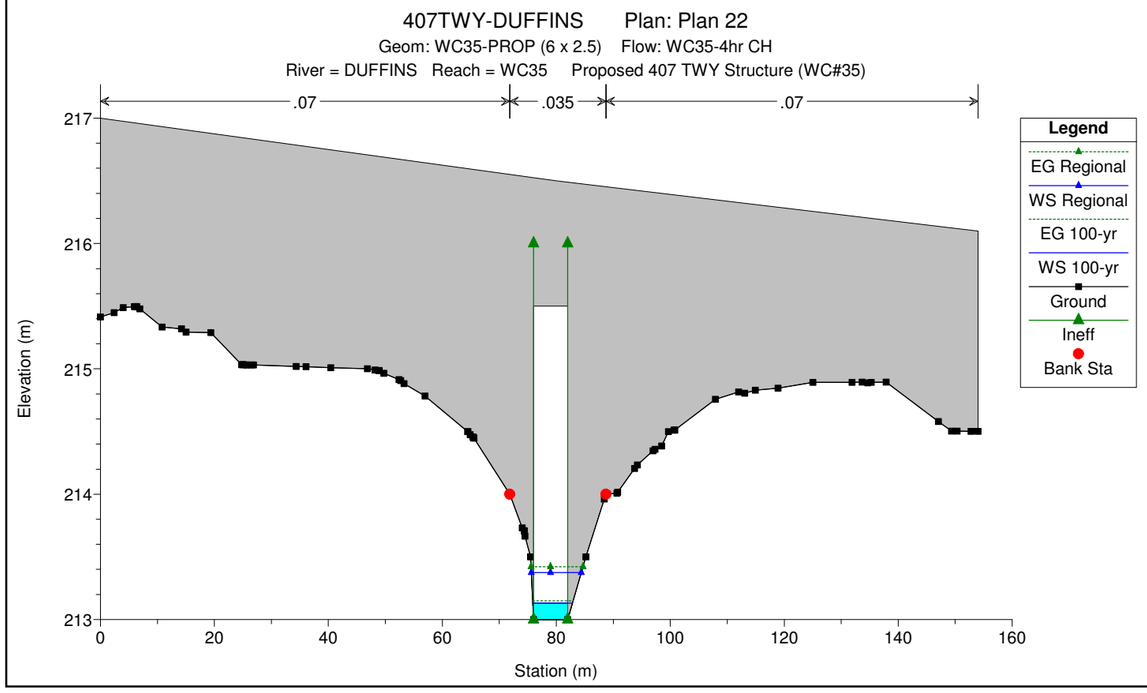
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
WC35	300	2-yr	0.11	213.49	213.53		213.53	0.000487	0.06	1.78	58.25	0.11
WC35	300	5-yr	0.17	213.49	213.54		213.54	0.000417	0.07	2.44	59.04	0.11
WC35	300	10-yr	0.24	213.49	213.55		213.55	0.000385	0.08	3.08	59.20	0.11
WC35	300	25-yr	0.32	213.49	213.56		213.56	0.000361	0.09	3.73	59.37	0.11
WC35	300	50-yr	0.38	213.49	213.57		213.57	0.000344	0.09	4.20	59.48	0.11
WC35	300	100-yr	0.46	213.49	213.58		213.58	0.000327	0.10	4.79	59.63	0.11
WC35	300	Check Flow	0.59	213.49	213.60		213.60	0.000269	0.10	5.90	59.89	0.10
WC35	300	Regional	2.17	213.49	213.74		213.74	0.000200	0.15	14.28	61.95	0.10
WC35	200	2-yr	0.11	213.47	213.51	213.51	213.52	0.050121	0.51	0.22	9.79	1.08
WC35	200	5-yr	0.17	213.47	213.52	213.52	213.53	0.017189	0.43	0.39	10.02	0.70
WC35	200	10-yr	0.24	213.47	213.53	213.53	213.54	0.026289	0.56	0.43	10.06	0.87
WC35	200	25-yr	0.32	213.47	213.53	213.53	213.56	0.035746	0.69	0.46	10.11	1.03
WC35	200	50-yr	0.38	213.47	213.54	213.54	213.56	0.032073	0.71	0.53	10.19	1.00
WC35	200	100-yr	0.46	213.47	213.54	213.54	213.57	0.034644	0.79	0.58	10.26	1.05
WC35	200	Check Flow	0.59	213.47	213.55	213.55	213.59	0.044845	0.94	0.63	10.32	1.21
WC35	200	Regional	2.17	213.47	213.67	213.67	213.73	0.016833	1.11	1.95	11.85	0.87
WC35	100	2-yr	0.11	212.50	212.59	212.56	212.59	0.004897	0.28	0.40	7.69	0.39
WC35	100	5-yr	0.17	212.50	212.61	212.58	212.61	0.004769	0.31	0.55	8.98	0.40
WC35	100	10-yr	0.24	212.50	212.61		212.62	0.007770	0.40	0.60	9.31	0.51
WC35	100	25-yr	0.32	212.50	212.63		212.64	0.005995	0.39	0.81	10.80	0.46
WC35	100	50-yr	0.38	212.50	212.64	212.60	212.65	0.006120	0.41	0.92	11.44	0.47
WC35	100	100-yr	0.46	212.50	212.66	212.61	212.67	0.005223	0.41	1.12	12.63	0.44

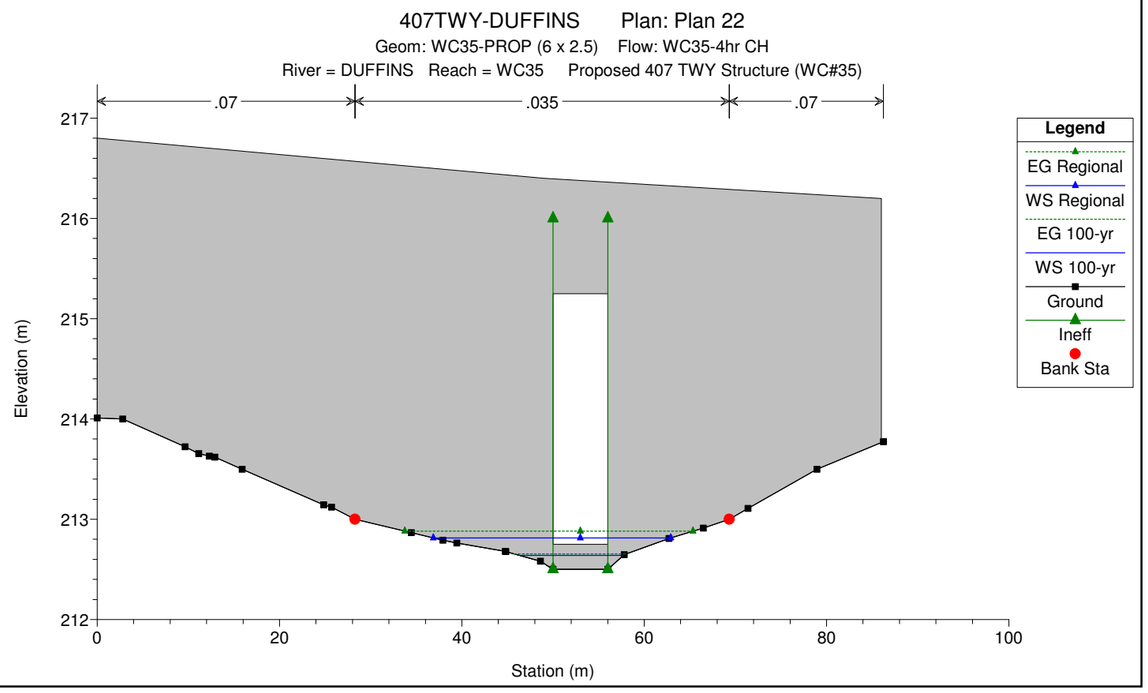
407 TWY KENNEDY RD TO BROCK WC35-EX

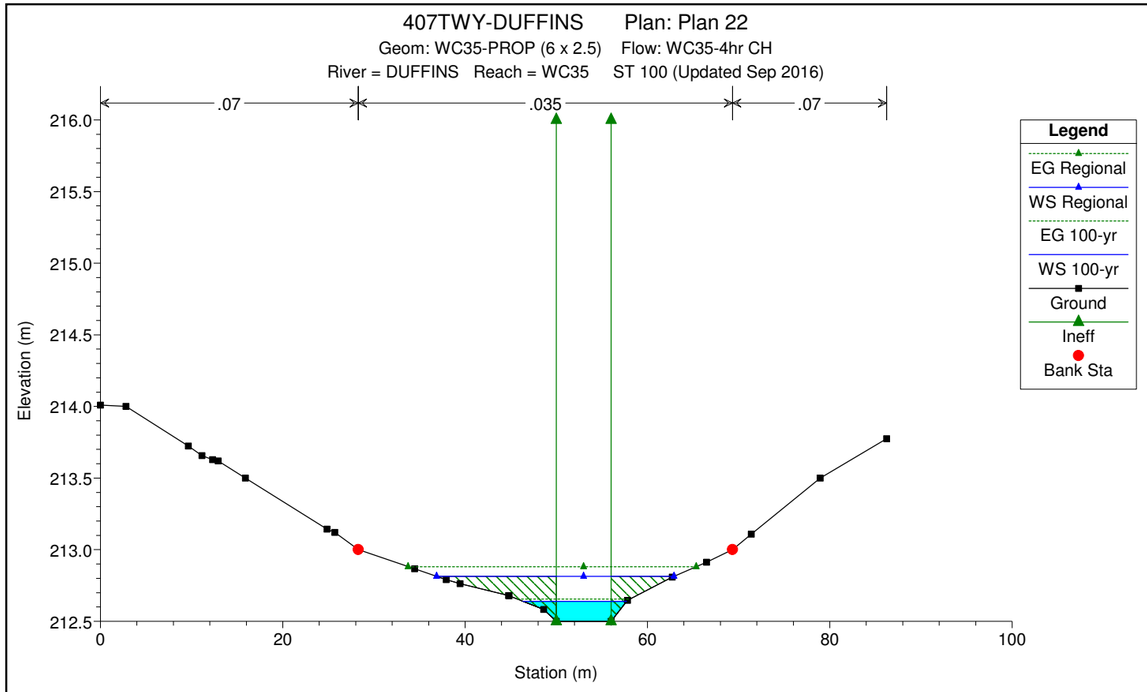
WC35	100	Check Flow	0.59	212.50	212.67			
212.62	212.68	0.005569	0.45	1.32	13.68			0.46
WC35	100	Regional	2.17	212.50	212.79			
212.72	212.81	0.006334	0.63	3.47	24.02			0.53
WC35	10	2-yr	0.11	212.00	212.06			
212.06	212.07	0.038528	0.57	0.19	6.02			1.01
WC35	10	5-yr	0.17	212.00	212.07			
212.07	212.09	0.042970	0.66	0.26	6.91			1.09
WC35	10	10-yr	0.24	212.00	212.10			
212.10	212.11	0.015017	0.48	0.50	9.62			0.68
WC35	10	25-yr	0.32	212.00	212.10			
212.10	212.12	0.024266	0.62	0.51	9.81			0.87
WC35	10	50-yr	0.38	212.00	212.10			
212.10	212.13	0.024571	0.65	0.58	10.47			0.88
WC35	10	100-yr	0.46	212.00	212.10			
212.10	212.14	0.035753	0.79	0.58	10.48			1.07
WC35	10	Check Flow	0.59	212.00	212.12			
212.12	212.15	0.030140	0.78	0.75	11.94			1.00
WC35	10	Regional	2.17	212.00	212.21			
212.21	212.26	0.025209	1.01	2.14	20.35			1.00

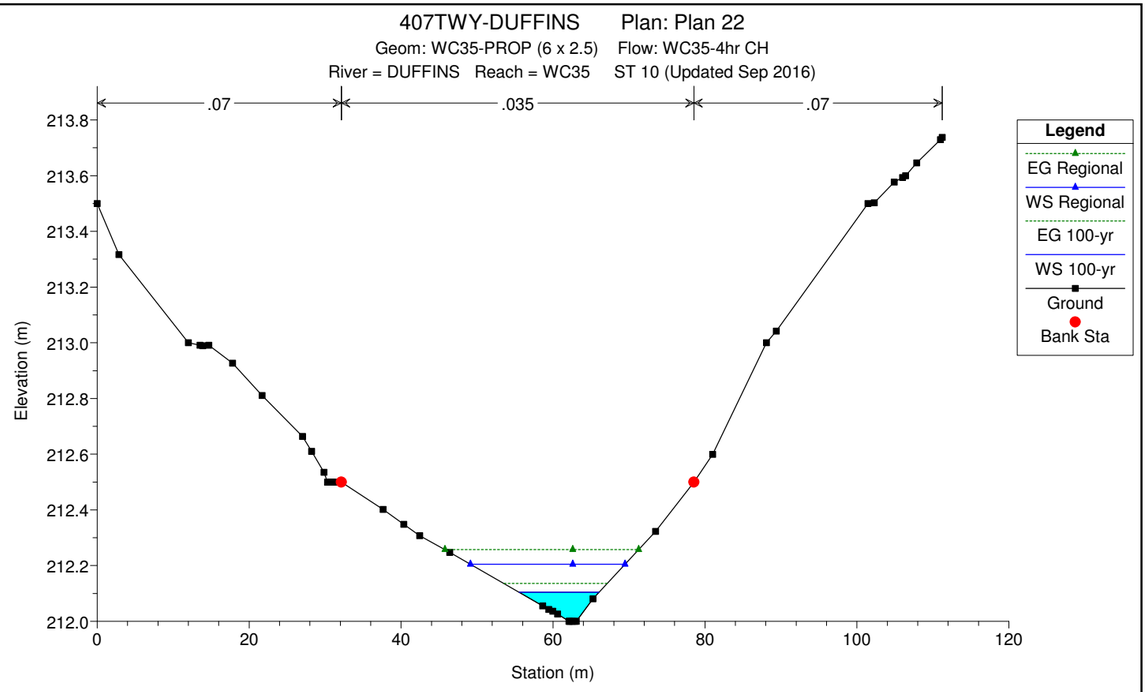

407TWY-DUFFINS Plan: Plan 22
Geom: WC35-PROP (6 x 2.5) Flow: WC35-4hr CH
River = DUFFINS Reach = WC35 ST 300 (Updated Sep 2016)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Bank Sta


407TWY-DUFFINS Plan: Plan 22
Geom: WC35-PROP (6 x 2.5) Flow: WC35-4hr CH
River = DUFFINS Reach = WC35 ST 200 (Updated Sep 2016)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


407TWY-DUFFINS Plan: Plan 22
Geom: WC35-PROP (6 x 2.5) Flow: WC35-4hr CH
River = DUFFINS Reach = WC35 Proposed 407 TWY Structure (WC#35)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


407TWY-DUFFINS Plan: Plan 22
Geom: WC35-PROP (6 x 2.5) Flow: WC35-4hr CH
River = DUFFINS Reach = WC35 Proposed 407 TWY Structure (WC#35)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


407TWY-DUFFINS Plan: Plan 22
Geom: WC35-PROP (6 x 2.5) Flow: WC35-4hr CH
River = DUFFINS Reach = WC35 ST 100 (Updated Sep 2016)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


407TWY-DUFFINS Plan: Plan 22
Geom: WC35-PROP (6 x 2.5) Flow: WC35-4hr CH
River = DUFFINS Reach = WC35 ST 10 (Updated Sep 2016)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Bank Sta

HEC-RAS Plan: WC35 - PROP (4hr CH) River: DUFFINS Reach: WC35

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC35	300	2-yr	0.11	213.49	213.51	213.51	213.51	0.130941	0.34	0.32	54.76	1.40
WC35	300	5-yr	0.17	213.49	213.51	213.51	213.52	0.312744	0.52	0.32	54.76	2.17
WC35	300	10-yr	0.24	213.49	213.51	213.51	213.52	0.034255	0.31	0.78	55.86	0.83
WC35	300	25-yr	0.32	213.49	213.51	213.51	213.52	0.058561	0.40	0.79	55.89	1.09
WC35	300	50-yr	0.38	213.49	213.52	213.52	213.52	0.050601	0.41	0.92	56.19	1.03
WC35	300	100-yr	0.46	213.49	213.52	213.52	213.53	0.044727	0.43	1.07	56.55	1.00
WC35	300	Check Flow	0.59	213.49	213.52	213.52	213.53	0.051666	0.49	1.19	56.85	1.09
WC35	300	Regional	2.17	213.49	213.55	213.55	213.58	0.039684	0.76	2.87	59.15	1.10
WC35	200	2-yr	0.11	213.00	213.05	213.04	213.06	0.008477	0.36	0.30	6.38	0.51
WC35	200	5-yr	0.17	213.00	213.07	213.04	213.08	0.007827	0.42	0.41	6.50	0.52
WC35	200	10-yr	0.24	213.00	213.08	213.05	213.10	0.007382	0.47	0.51	6.63	0.52
WC35	200	25-yr	0.32	213.00	213.10	213.06	213.12	0.006830	0.52	0.62	6.76	0.52
WC35	200	50-yr	0.38	213.00	213.12	213.07	213.13	0.006617	0.55	0.69	6.85	0.52
WC35	200	100-yr	0.46	213.00	213.13	213.08	213.15	0.006264	0.58	0.79	6.97	0.51
WC35	200	Check Flow	0.59	213.00	213.15	213.10	213.18	0.005988	0.64	0.93	7.14	0.52
WC35	200	Regional	2.17	213.00	213.37	213.24	213.42	0.004230	0.97	2.25	8.78	0.50
WC35	150		Culvert									
WC35	100	2-yr	0.11	212.50	212.56		212.57	0.004557	0.30	0.37	7.77	0.39
WC35	100	5-yr	0.17	212.50	212.58	212.54	212.59	0.004557	0.36	0.48	8.30	0.40
WC35	100	10-yr	0.24	212.50	212.59	212.55	212.60	0.007211	0.47	0.51	8.53	0.51
WC35	100	25-yr	0.32	212.50	212.61		212.62	0.005959	0.50	0.64	9.67	0.49
WC35	100	50-yr	0.38	212.50	212.62		212.63	0.005728	0.53	0.72	10.35	0.49
WC35	100	100-yr	0.46	212.50	212.64		212.65	0.005115	0.55	0.84	11.35	0.47
WC35	100	Check Flow	0.59	212.50	212.66		212.68	0.005654	0.63	0.94	12.45	0.50
WC35	100	Regional	2.17	212.50	212.81		212.88	0.007599	1.15	1.89	26.04	0.66
WC35	10	2-yr	0.11	212.00	212.06	212.06	212.07	0.038829	0.57	0.19	6.02	1.01
WC35	10	5-yr	0.17	212.00	212.07	212.07	212.09	0.043259	0.66	0.26	6.90	1.10
WC35	10	10-yr	0.24	212.00	212.10	212.10	212.11	0.015017	0.48	0.50	9.62	0.68
WC35	10	25-yr	0.32	212.00	212.10	212.10	212.12	0.023398	0.61	0.52	9.88	0.85
WC35	10	50-yr	0.38	212.00	212.10	212.10	212.13	0.024163	0.65	0.59	10.50	0.88
WC35	10	100-yr	0.46	212.00	212.10	212.10	212.14	0.035753	0.79	0.58	10.48	1.07
WC35	10	Check Flow	0.59	212.00	212.12	212.12	212.15	0.030046	0.78	0.75	11.95	1.00
WC35	10	Regional	2.17	212.00	212.21	212.21	212.26	0.025197	1.01	2.14	20.35	1.00

HEC-RAS HEC-RAS 5.0.1 April 2016
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
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PROJECT DATA
Project Title: 407TWY-DUFFINS
Project File : 407TWY-DUFFINS.prj
Run Date and Time: 9/21/2016 11:43:26 AM

Project in SI units

Project Description:
HEC-RAS Model created for 407 TWY project from Kennedy Rd. to Brock Rd. -
Duffins Creek Watershed

PLAN DATA

Plan Title: Plan 22
Plan File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.p22

Geometry Title: WC35-PROP (6 x 2.5)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.g20

Flow Title   : WC35-4hr CH
Flow File   : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.f09

Plan Summary Information:
Number of: Cross Sections = 4   Multiple Openings = 0
            Culverts   = 1   Inline Structures = 0
            Bridges   = 0   Lateral Structures = 0

Computational Information
    Water surface calculation tolerance = 0.01
    Critical depth calculation tolerance = 0.01
    Maximum number of iterations   = 20
    Maximum difference tolerance   = 0.3
    Flow tolerance factor   = 0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method: Average Conveyance
    Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: WC35-4hr CH
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.f09

Flow Data (m3/s)

River	Reach	RS	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Check Flow	Regional
DUFFINS	WC35	300	.11	.17	.24	.32	.38	.46	.59	2.17

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
DUFFINS	WC35	2-yr		Critical
DUFFINS	WC35	5-yr		Critical
DUFFINS	WC35	10-yr		Critical
DUFFINS	WC35	25-yr		Critical
DUFFINS	WC35	50-yr		Critical
DUFFINS	WC35	100-yr		Critical
DUFFINS	WC35	Check Flow		Critical
DUFFINS	WC35	Regional		Critical

GEOMETRY DATA

Geometry Title: WC35-PROP (6 x 2.5)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.g20

CROSS SECTION

RIVER: DUFFINS
REACH: WC35 RS: 300

INPUT
Description: ST 300 (Updated Sep 2016)
Station Elevation Data num= 89

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	215.007	.874	215.007	7.271	215.005	7.47	215.005	13.09	215
14.723	214.927	16.148	214.91	17.349	214.856	18.372	214.822	21	214.65
25.788	214.508	25.841	214.507	25.88	214.506	26.14	214.5	27.324	214.448
27.459	214.448	27.815	214.443	33.604	214.182	36.72	214.104	39.488	214
39.548	213.995	39.586	213.993	39.595	213.992	39.616	213.991	39.65	213.988
39.719	213.982	39.748	213.978	40.617	213.873	42.964	213.6	43.109	213.581
43.279	213.561	43.811	213.5	44.474	213.498	44.847	213.497	48.733	213.49
52.086	213.497	53.659	213.5	54.014	213.499	55.097	213.5	55.428	213.5
55.487	213.5	55.491	213.5	55.816	213.504	55.922	213.503	57.168	213.504
57.462	213.519	57.555	213.523	57.568	213.524	57.859	213.536	61.416	213.5
61.45	213.5	64.693	213.5	66.635	213.5	68.66	213.5	68.769	213.5
68.811	213.5	72.086	213.5	72.814	213.5	73.696	213.5	75.76	213.5
76.025	213.5	76.937	213.5	81.916	213.5	85.11	213.5	88.403	213.5
89.769	213.5	90.654	213.5	92.696	213.5	94.29	213.5	94.999	213.5
96.282	213.5	98.172	213.5	101.991	213.5	102.235	213.503	104.549	213.868
105.526	214	106.09	214.089	108.758	214.5	111.703	214.983	111.808	215
114.195	215.358	115.131	215.5	116.305	215.67	118.701	216	123.452	216.493
123.518	216.5	123.556	216.5	123.604	216.5	128.081	216.52		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	39.488	.035	105.526	.07

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
39.488 105.526 6 5 7 .3 .5

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	213.51	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	213.51	Reach Len. (m)	6.00	5.00	7.00
Crit W.S. (m)	213.51	Flow Area (m2)		0.32	
E.G. Slope (m/m)	0.130941	Area (m2)		0.32	
Q Total (m3/s)	0.11	Flow (m3/s)		0.11	
Top Width (m)	54.76	Top Width (m)		54.76	
Vel Total (m/s)	0.34	Avg. Vel. (m/s)		0.34	
Max Chl Dpth (m)	0.01	Hydr. Depth (m)		0.01	

Conv. Total (m3/s)	0.3	Conv. (m3/s)	0.3
Length Wtd. (m)	5.00	Wetted Per. (m)	54.76
Min Ch El (m)	213.49	Shear (N/m2)	7.61
Alpha	1.00	Stream Power (N/m s)	2.58
Frctn Loss (m)	0.11	Cum Volume (1000 m3)	0.03
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.79

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	213.52	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	213.51	Reach Len. (m)	6.00	5.00	7.00
Crit W.S. (m)	213.51	Flow Area (m2)		0.32	
E.G. Slope (m/m)	0.312744	Area (m2)		0.32	
Q Total (m3/s)	0.17	Flow (m3/s)		0.17	
Top Width (m)	54.76	Top Width (m)		54.76	
Vel Total (m/s)	0.52	Avg. Vel. (m/s)		0.52	
Max Chl Dpth (m)	0.01	Hydr. Depth (m)		0.01	
Conv. Total (m3/s)	0.3	Conv. (m3/s)		0.3	
Length Wtd. (m)	5.00	Wetted Per. (m)		54.76	
Min Ch El (m)	213.49	Shear (N/m2)		18.19	
Alpha	1.00	Stream Power (N/m s)		9.52	
Frctn Loss (m)	0.12	Cum Volume (1000 m3)		0.04	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.84	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	213.52	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	213.51	Reach Len. (m)	6.00	5.00	7.00
Crit W.S. (m)	213.51	Flow Area (m2)		0.78	
E.G. Slope (m/m)	0.034255	Area (m2)		0.78	
Q Total (m3/s)	0.24	Flow (m3/s)		0.24	
Top Width (m)	55.86	Top Width (m)		55.86	
Vel Total (m/s)	0.31	Avg. Vel. (m/s)		0.31	
Max Chl Dpth (m)	0.02	Hydr. Depth (m)		0.01	
Conv. Total (m3/s)	1.3	Conv. (m3/s)		1.3	
Length Wtd. (m)	5.00	Wetted Per. (m)		55.87	
Min Ch El (m)	213.49	Shear (N/m2)		4.70	
Alpha	1.00	Stream Power (N/m s)		1.44	
Frctn Loss (m)	0.07	Cum Volume (1000 m3)		0.05	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.92	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	213.52	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	213.51	Reach Len. (m)	6.00	5.00	7.00
Crit W.S. (m)	213.51	Flow Area (m2)		0.79	
E.G. Slope (m/m)	0.058561	Area (m2)		0.79	
Q Total (m3/s)	0.32	Flow (m3/s)		0.32	
Top Width (m)	55.89	Top Width (m)		55.89	
Vel Total (m/s)	0.40	Avg. Vel. (m/s)		0.40	
Max Chl Dpth (m)	0.02	Hydr. Depth (m)		0.01	
Conv. Total (m3/s)	1.3	Conv. (m3/s)		1.3	
Length Wtd. (m)	5.00	Wetted Per. (m)		55.89	
Min Ch El (m)	213.49	Shear (N/m2)		8.13	
Alpha	1.00	Stream Power (N/m s)		3.29	
Frctn Loss (m)	0.08	Cum Volume (1000 m3)		0.06	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.98	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	213.52	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	213.52	Reach Len. (m)	6.00	5.00	7.00
Crit W.S. (m)	213.52	Flow Area (m2)		0.92	
E.G. Slope (m/m)	0.050601	Area (m2)		0.92	
Q Total (m3/s)	0.38	Flow (m3/s)		0.38	
Top Width (m)	56.19	Top Width (m)		56.19	
Vel Total (m/s)	0.41	Avg. Vel. (m/s)		0.41	
Max Chl Dpth (m)	0.03	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	1.7	Conv. (m3/s)		1.7	
Length Wtd. (m)	5.00	Wetted Per. (m)		56.19	
Min Ch El (m)	213.49	Shear (N/m2)		8.11	
Alpha	1.00	Stream Power (N/m s)		3.36	
Frctn Loss (m)	0.07	Cum Volume (1000 m3)		0.07	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.03	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	213.53	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	213.52	Reach Len. (m)	6.00	5.00	7.00

Crit W.S. (m)	213.52	Flow Area (m2)	1.07
E.G. Slope (m/m)	0.044727	Area (m2)	1.07
Q Total (m3/s)	0.46	Flow (m3/s)	0.46
Top Width (m)	56.55	Top Width (m)	56.55
Vel Total (m/s)	0.43	Avg. Vel. (m/s)	0.43
Max Chl Dpth (m)	0.03	Hydr. Depth (m)	0.02
Conv. Total (m3/s)	2.2	Conv. (m3/s)	2.2
Length Wtd. (m)	5.00	Wetted Per. (m)	56.55
Min Ch El (m)	213.49	Shear (N/m2)	8.31
Alpha	1.00	Stream Power (N/m s)	3.57
Frctn Loss (m)	0.07	Cum Volume (1000 m3)	0.07
C & E Loss (m)	0.00	Cum SA (1000 m2)	1.08

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	213.53	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	213.52	Reach Len. (m)	6.00	5.00	7.00
Crit W.S. (m)	213.52	Flow Area (m2)		1.19	
E.G. Slope (m/m)	0.051666	Area (m2)		1.19	
Q Total (m3/s)	0.59	Flow (m3/s)		0.59	
Top Width (m)	56.85	Top Width (m)		56.85	
Vel Total (m/s)	0.49	Avg. Vel. (m/s)		0.49	
Max Chl Dpth (m)	0.03	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	2.6	Conv. (m3/s)		2.6	
Length Wtd. (m)	5.00	Wetted Per. (m)		56.85	
Min Ch El (m)	213.49	Shear (N/m2)		10.64	
Alpha	1.00	Stream Power (N/m s)		5.26	
Frctn Loss (m)	0.07	Cum Volume (1000 m3)		0.09	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.17	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	213.58	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	213.55	Reach Len. (m)	6.00	5.00	7.00
Crit W.S. (m)	213.55	Flow Area (m2)		2.87	
E.G. Slope (m/m)	0.039684	Area (m2)		2.87	
Q Total (m3/s)	2.17	Flow (m3/s)		2.17	
Top Width (m)	59.15	Top Width (m)		59.15	
Vel Total (m/s)	0.76	Avg. Vel. (m/s)		0.76	
Max Chl Dpth (m)	0.06	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	10.9	Conv. (m3/s)		10.9	
Length Wtd. (m)	5.00	Wetted Per. (m)		59.16	
Min Ch El (m)	213.49	Shear (N/m2)		18.87	
Alpha	1.00	Stream Power (N/m s)		14.28	
Frctn Loss (m)	0.05	Cum Volume (1000 m3)		0.25	
C & E Loss (m)	0.01	Cum SA (1000 m2)		2.03	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: DUFFINS
REACH: WC35 RS: 200

INPUT
Description: ST 200 (Updated Sep 2016)
Station Elevation Data num= 77

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	215.414	2.375	215.448	3.97	215.488	5.944	215.497	6.209	215.496
6.279	215.496	6.379	215.496	6.914	215.478	10.835	215.334	14.228	215.32
15.039	215.294	19.385	215.289	24.791	215.033	24.896	215.033	25.125	215.033
25.665	215.032	25.683	215.032	26.562	215.032	26.867	215.031	34.341	215.02
36.099	215.017	40.418	215.01	46.835	215	48.158	214.991	48.778	214.987
48.952	214.986	49.718	214.964	52.385	214.915	52.676	214.907	53.257	214.882
56.936	214.784	64.457	214.5	64.482	214.499	64.875	214.476	65.37	214.457
65.459	214.453	65.479	214.451	65.536	214.447	71.844	214	74.038	213.732
74.361	213.71	74.399	213.701	74.507	213.664	75.49	213.5	76	213
82	213	85.195	213.5	88.405	213.962	88.739	214	88.937	214.002
90.64	214.007	90.788	214.016	93.759	214.206	94.244	214.233	96.953	214.347
97.343	214.359	98.48	214.385	99.668	214.5	100.638	214.511	100.741	214.512
100.781	214.512	107.935	214.758	111.989	214.815	113.046	214.806	114.941	214.829
118.903	214.846	125.01	214.893	131.895	214.893	133.683	214.894	134.67	214.888
135.281	214.892	137.863	214.895	147.077	214.58	149.351	214.503	150.349	214.503
152.782	214.502	154.003	214.501						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	71.844	.035	88.739	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
71.844	88.739	38	43	44	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	76	216	T
82	154.003	216	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	213.06	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	213.05	Reach Len. (m)	38.00	43.00	44.00
Crit W.S. (m)	213.04	Flow Area (m2)		0.30	
E.G. Slope (m/m)	0.008477	Area (m2)		0.31	
Q Total (m3/s)	0.11	Flow (m3/s)		0.11	
Top Width (m)	6.38	Top Width (m)		6.38	
Vel Total (m/s)	0.36	Avg. Vel. (m/s)		0.36	
Max Chl Dpth (m)	0.05	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	1.2	Conv. (m3/s)		1.2	
Length Wtd. (m)	43.00	Wetted Per. (m)		6.00	
Min Ch El (m)	213.00	Shear (N/m2)		4.22	
Alpha	1.00	Stream Power (N/m s)		1.52	
Frctn Loss (m)		Cum Volume (1000 m3)		0.03	
C & E Loss (m)		Cum SA (1000 m2)		0.64	

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	213.08	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	213.07	Reach Len. (m)	38.00	43.00	44.00

Crit W.S. (m)	213.04	Flow Area (m2)	0.41
E.G. Slope (m/m)	0.007827	Area (m2)	0.42
Q Total (m3/s)	0.17	Flow (m3/s)	0.17
Top Width (m)	6.50	Top Width (m)	6.50
Vel Total (m/s)	0.42	Avg. Vel. (m/s)	0.42
Max Chl Dpth (m)	0.07	Hydr. Depth (m)	0.07
Conv. Total (m3/s)	1.9	Conv. (m3/s)	1.9
Length Wtd. (m)	43.00	Wetted Per. (m)	6.00
Min Ch El (m)	213.00	Shear (N/m2)	5.19
Alpha	1.00	Stream Power (N/m s)	2.17
Frctn Loss (m)		Cum Volume (1000 m3)	0.03
C & E Loss (m)		Cum SA (1000 m2)	0.68

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	213.10	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	213.08	Reach Len. (m)	38.00	43.00	44.00
Crit W.S. (m)	213.05	Flow Area (m2)		0.51	
E.G. Slope (m/m)	0.007382	Area (m2)		0.53	
Q Total (m3/s)	0.24	Flow (m3/s)		0.24	
Top Width (m)	6.63	Top Width (m)		6.63	
Vel Total (m/s)	0.47	Avg. Vel. (m/s)		0.47	
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	2.8	Conv. (m3/s)		2.8	
Length Wtd. (m)	43.00	Wetted Per. (m)		6.00	
Min Ch El (m)	213.00	Shear (N/m2)		6.12	
Alpha	1.00	Stream Power (N/m s)		2.90	
Frctn Loss (m)		Cum Volume (1000 m3)		0.05	
C & E Loss (m)		Cum SA (1000 m2)		0.76	

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	213.12	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	213.10	Reach Len. (m)	38.00	43.00	44.00
Crit W.S. (m)	213.06	Flow Area (m2)		0.62	
E.G. Slope (m/m)	0.006830	Area (m2)		0.66	
Q Total (m3/s)	0.32	Flow (m3/s)		0.32	
Top Width (m)	6.76	Top Width (m)		6.76	
Vel Total (m/s)	0.52	Avg. Vel. (m/s)		0.52	
Max Chl Dpth (m)	0.10	Hydr. Depth (m)		0.10	
Conv. Total (m3/s)	3.9	Conv. (m3/s)		3.9	
Length Wtd. (m)	43.00	Wetted Per. (m)		6.00	
Min Ch El (m)	213.00	Shear (N/m2)		6.89	
Alpha	1.00	Stream Power (N/m s)		3.57	
Frctn Loss (m)		Cum Volume (1000 m3)		0.05	
C & E Loss (m)		Cum SA (1000 m2)		0.82	

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	213.13	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	213.12	Reach Len. (m)	38.00	43.00	44.00
Crit W.S. (m)	213.07	Flow Area (m2)		0.69	
E.G. Slope (m/m)	0.006617	Area (m2)		0.74	
Q Total (m3/s)	0.38	Flow (m3/s)		0.38	
Top Width (m)	6.85	Top Width (m)		6.85	
Vel Total (m/s)	0.55	Avg. Vel. (m/s)		0.55	
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.12	
Conv. Total (m3/s)	4.7	Conv. (m3/s)		4.7	
Length Wtd. (m)	43.00	Wetted Per. (m)		6.00	
Min Ch El (m)	213.00	Shear (N/m2)		7.47	
Alpha	1.00	Stream Power (N/m s)		4.11	
Frctn Loss (m)		Cum Volume (1000 m3)		0.06	
C & E Loss (m)		Cum SA (1000 m2)		0.87	

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	213.15	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	213.13	Reach Len. (m)	38.00	43.00	44.00
Crit W.S. (m)	213.08	Flow Area (m2)		0.79	
E.G. Slope (m/m)	0.006264	Area (m2)		0.85	
Q Total (m3/s)	0.46	Flow (m3/s)		0.46	
Top Width (m)	6.97	Top Width (m)		6.97	
Vel Total (m/s)	0.58	Avg. Vel. (m/s)		0.58	
Max Chl Dpth (m)	0.13	Hydr. Depth (m)		0.13	
Conv. Total (m3/s)	5.8	Conv. (m3/s)		5.8	
Length Wtd. (m)	43.00	Wetted Per. (m)		6.00	
Min Ch El (m)	213.00	Shear (N/m2)		8.06	
Alpha	1.00	Stream Power (N/m s)		4.71	
Frctn Loss (m)		Cum Volume (1000 m3)		0.07	
C & E Loss (m)		Cum SA (1000 m2)		0.92	

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	213.18	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	213.15	Reach Len. (m)	38.00	43.00	44.00
Crit W.S. (m)	213.10	Flow Area (m2)		0.93	
E.G. Slope (m/m)	0.005988	Area (m2)		1.02	
Q Total (m3/s)	0.59	Flow (m3/s)		0.59	
Top Width (m)	7.14	Top Width (m)		7.14	
Vel Total (m/s)	0.64	Avg. Vel. (m/s)		0.64	
Max Chl Dpth (m)	0.15	Hydr. Depth (m)		0.15	
Conv. Total (m3/s)	7.6	Conv. (m3/s)		7.6	
Length Wtd. (m)	43.00	Wetted Per. (m)		6.00	
Min Ch El (m)	213.00	Shear (N/m2)		9.07	
Alpha	1.00	Stream Power (N/m s)		5.77	
Frctn Loss (m)		Cum Volume (1000 m3)		0.08	
C & E Loss (m)		Cum SA (1000 m2)		1.01	

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	213.42	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	213.37	Reach Len. (m)	38.00	43.00	44.00
Crit W.S. (m)	213.24	Flow Area (m2)		2.25	
E.G. Slope (m/m)	0.004230	Area (m2)		2.77	
Q Total (m3/s)	2.17	Flow (m3/s)		2.17	
Top Width (m)	8.78	Top Width (m)		8.78	
Vel Total (m/s)	0.97	Avg. Vel. (m/s)		0.97	
Max Chl Dpth (m)	0.37	Hydr. Depth (m)		0.37	
Conv. Total (m3/s)	33.4	Conv. (m3/s)		33.4	
Length Wtd. (m)	43.00	Wetted Per. (m)		6.00	
Min Ch El (m)	213.00	Shear (N/m2)		15.54	
Alpha	1.00	Stream Power (N/m s)		15.00	
Frctn Loss (m)		Cum Volume (1000 m3)		0.23	
C & E Loss (m)		Cum SA (1000 m2)		1.86	

CULVERT

RIVER: DUFFINS
REACH: WC35 RS: 150

INPUT
Description: Proposed 407 TWY Structure (WC#35)
Distance from Upstream XS = 14
Deck/Roadway Width = 13
Weir Coefficient = 1.4
Upstream Deck/Roadway Coordinates
num= 3

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0	217	80	216.5	154	216.1

```
Upstream Bridge Cross Section Data
Station Elevation Data    num=      77
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 215.414   2.375 215.448    3.97 215.488   5.944 215.497   6.209 215.496
   6.279 215.496   6.379 215.496   6.914 215.478  10.835 215.334  14.228  215.32
  15.039 215.294  19.385 215.289  24.791 215.033  24.896 215.033  25.125 215.033
  25.665 215.032  25.683 215.032  26.562 215.032  26.867 215.031  34.341  215.02
  36.099 215.017  40.418  215.01  46.835     215  48.158 214.991  48.778 214.987
  48.952 214.986  49.718 214.964  52.385 214.915  52.676 214.907  53.257 214.882
  56.936 214.784  64.457   214.5  64.482 214.499  64.875 214.476   65.37 214.457
  65.459 214.453  65.479 214.451  65.536 214.447  71.844     214  74.038 213.732
  74.361  213.71  74.399 213.701  74.507 213.664   75.49   213.5      76     213
      82     213  85.195   213.5  88.405 213.962  88.739     214  88.937 214.002
   90.64 214.007  90.788 214.016  93.759 214.206  94.244 214.233  96.953 214.347
  97.343 214.359   98.48 214.385  99.668   214.5 100.638 214.511 100.741 214.512
 100.781 214.512 107.935 214.758 111.989 214.815 113.046 214.806 114.941 214.829
 118.903 214.846  125.01 214.893 131.895 214.893 133.683 214.894  134.67 214.888
 135.281 214.892 137.863 214.895 147.077  214.58 149.351 214.503 150.349 214.503
 152.782 214.502 154.003 214.501

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .07  71.844    .035  88.739     .07

Bank Sta: Left   Right    Coeff Contr.   Expan.
        71.844  88.739           .3         .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0      76     216       T
      82 154.003     216       T

Downstream  Deck/Roadway Coordinates
    num=       3
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0   216.8              49   216.4              86   216.2

Downstream Bridge Cross Section Data
Station Elevation Data    num=      25
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  214.01   2.799     214   9.653 213.723  11.142 213.656  12.31 213.629
  12.897 213.619  15.914   213.5  24.847 213.143  25.715  213.12  28.286     213
  34.463 212.866  37.932 212.791  39.439 212.762  44.767 212.679  44.825 212.678
  48.624 212.582      50   212.5      56   212.5    57.8 212.647  62.718 212.809
  66.484 212.913  69.327     213  71.374 213.108  78.944   213.5  86.227 213.774

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .07  28.286    .035  69.327     .07

Bank Sta: Left   Right    Coeff Contr.   Expan.
        28.286  69.327           .3         .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0      50     216       T
      56  86.227     216       T

Upstream Embankment side slope              =       2 horiz. to 1.0 vertical
Downstream Embankment side slope            =       2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1           Box     2.5       6
FHWA Chart # 58- Rectangular concrete
FHWA Scale # 2 - Side tapered; More favorable edges
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
               5.5      33     .013     .025        0                    .5                1
Upstream   Elevation =  213
           Centerline Station =  79
Downstream Elevation =  212.75
           Centerline Station =  53

CULVERT OUTPUT  Profile #2-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.11    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         0.43
  Q Barrel (m3/s)           0.11    Culv Vel DS (m/s)         0.56
  E.G. US. (m)            213.06    Culv Inv El Up (m)      213.00
  W.S. US. (m)            213.05    Culv Inv El Dn (m)      212.75
  E.G. DS (m)             212.57    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             212.56    Culv Exit Loss (m)        0.23
  Delta EG (m)              0.49    Culv Entr Loss (m)        0.01
  Delta WS (m)              0.49    Q Weir (m3/s)
  E.G. IC (m)             213.06    Weir Sta Lft (m)
  E.G. OC (m)             213.06    Weir Sta Rgt (m)
  Culvert Control          Inlet    Weir Submerg
  Culv WS Inlet (m)       213.04    Weir Max Depth (m)
  Culv WS Outlet (m)      212.78    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.04    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.03    Min El Weir Flow (m)    216.00


Note:    During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT  Profile #5-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.17    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         0.52
  Q Barrel (m3/s)           0.17    Culv Vel DS (m/s)         0.65
  E.G. US. (m)            213.08    Culv Inv El Up (m)      213.00
  W.S. US. (m)            213.07    Culv Inv El Dn (m)      212.75
  E.G. DS (m)             212.59    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             212.58    Culv Exit Loss (m)        0.23
  Delta EG (m)              0.49    Culv Entr Loss (m)        0.01
  Delta WS (m)              0.49    Q Weir (m3/s)
  E.G. IC (m)             213.08    Weir Sta Lft (m)
  E.G. OC (m)             213.08    Weir Sta Rgt (m)
  Culvert Control          Inlet    Weir Submerg
  Culv WS Inlet (m)       213.05    Weir Max Depth (m)
  Culv WS Outlet (m)      212.79    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.05    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.04    Min El Weir Flow (m)    216.00


Note:    During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT  Profile #10-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.24    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         0.58
  Q Barrel (m3/s)           0.24    Culv Vel DS (m/s)         0.73
  E.G. US. (m)            213.10    Culv Inv El Up (m)      213.00
  W.S. US. (m)            213.08    Culv Inv El Dn (m)      212.75
  E.G. DS (m)             212.60    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             212.59    Culv Exit Loss (m)        0.24
  Delta EG (m)              0.50    Culv Entr Loss (m)        0.01
  Delta WS (m)              0.50    Q Weir (m3/s)
  E.G. IC (m)             213.10    Weir Sta Lft (m)
  E.G. OC (m)             213.09    Weir Sta Rgt (m)
  Culvert Control          Inlet    Weir Submerg
  Culv WS Inlet (m)       213.07    Weir Max Depth (m)
  Culv WS Outlet (m)      212.80    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.07    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.05    Min El Weir Flow (m)    216.00


Note:    During subcritical analysis, the culvert direct step method, the solution went to normal depth.
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CULVERT OUTPUT Profile #25-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.32	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	0.65
Q Barrel (m3/s)	0.32	Culv Vel DS (m/s)	0.81
E.G. US. (m)	213.12	Culv Inv El Up (m)	213.00
W.S. US. (m)	213.10	Culv Inv El Dn (m)	212.75
E.G. DS (m)	212.62	Culv Frctn Ls (m)	0.00
W.S. DS (m)	212.61	Culv Exit Loss (m)	0.23
Delta EG (m)	0.50	Culv Entr Loss (m)	0.01
Delta WS (m)	0.50	Q Weir (m3/s)	
E.G. IC (m)	213.12	Weir Sta Lft (m)	
E.G. OC (m)	213.11	Weir Sta Rgt (m)	
Culvert Control	Inlet	Weir Submerg	
Culv WS Inlet (m)	213.08	Weir Max Depth (m)	
Culv WS Outlet (m)	212.82	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.08	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.07	Min El Weir Flow (m)	216.00

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #50-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.38	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	0.69
Q Barrel (m3/s)	0.38	Culv Vel DS (m/s)	0.85
E.G. US. (m)	213.13	Culv Inv El Up (m)	213.00
W.S. US. (m)	213.12	Culv Inv El Dn (m)	212.75
E.G. DS (m)	212.63	Culv Frctn Ls (m)	0.00
W.S. DS (m)	212.62	Culv Exit Loss (m)	0.23
Delta EG (m)	0.50	Culv Entr Loss (m)	0.02
Delta WS (m)	0.50	Q Weir (m3/s)	
E.G. IC (m)	213.13	Weir Sta Lft (m)	
E.G. OC (m)	213.13	Weir Sta Rgt (m)	
Culvert Control	Inlet	Weir Submerg	
Culv WS Inlet (m)	213.09	Weir Max Depth (m)	
Culv WS Outlet (m)	212.82	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.09	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.07	Min El Weir Flow (m)	216.00

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #100-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.46	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	0.76
Q Barrel (m3/s)	0.46	Culv Vel DS (m/s)	0.91
E.G. US. (m)	213.15	Culv Inv El Up (m)	213.00
W.S. US. (m)	213.13	Culv Inv El Dn (m)	212.75
E.G. DS (m)	212.65	Culv Frctn Ls (m)	0.00
W.S. DS (m)	212.64	Culv Exit Loss (m)	0.22
Delta EG (m)	0.50	Culv Entr Loss (m)	0.02
Delta WS (m)	0.49	Q Weir (m3/s)	
E.G. IC (m)	213.15	Weir Sta Lft (m)	
E.G. OC (m)	213.15	Weir Sta Rgt (m)	
Culvert Control	Inlet	Weir Submerg	
Culv WS Inlet (m)	213.10	Weir Max Depth (m)	
Culv WS Outlet (m)	212.83	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.10	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.08	Min El Weir Flow (m)	216.00

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #Check Flow Culv Group: Culvert #1

Q Culv Group (m3/s)	0.59	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	0.83
Q Barrel (m3/s)	0.59	Culv Vel DS (m/s)	0.99
E.G. US. (m)	213.18	Culv Inv El Up (m)	213.00
W.S. US. (m)	213.15	Culv Inv El Dn (m)	212.75
E.G. DS (m)	212.68	Culv Frctn Ls (m)	0.00
W.S. DS (m)	212.66	Culv Exit Loss (m)	0.22
Delta EG (m)	0.50	Culv Entr Loss (m)	0.02
Delta WS (m)	0.50	Q Weir (m3/s)	
E.G. IC (m)	213.18	Weir Sta Lft (m)	
E.G. OC (m)	213.17	Weir Sta Rgt (m)	
Culvert Control	Inlet	Weir Submerg	
Culv WS Inlet (m)	213.12	Weir Max Depth (m)	
Culv WS Outlet (m)	212.85	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.12	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.10	Min El Weir Flow (m)	216.00

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #Regional Culv Group: Culvert #1

Q Culv Group (m3/s)	2.17	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.39
Q Barrel (m3/s)	2.17	Culv Vel DS (m/s)	1.53
E.G. US. (m)	213.42	Culv Inv El Up (m)	213.00
W.S. US. (m)	213.37	Culv Inv El Dn (m)	212.75
E.G. DS (m)	212.88	Culv Frctn Ls (m)	0.00
W.S. DS (m)	212.81	Culv Exit Loss (m)	0.22
Delta EG (m)	0.54	Culv Entr Loss (m)	0.06
Delta WS (m)	0.56	Q Weir (m3/s)	
E.G. IC (m)	213.42	Weir Sta Lft (m)	
E.G. OC (m)	213.41	Weir Sta Rgt (m)	
Culvert Control	Inlet	Weir Submerg	
Culv WS Inlet (m)	213.26	Weir Max Depth (m)	
Culv WS Outlet (m)	212.99	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.26	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.24	Min El Weir Flow (m)	216.00

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CROSS SECTION

RIVER: DUFFINS
REACH: WC35 RS: 100

INPUT
Description: ST 100 (Updated Sep 2016)
Station Elevation Data num= 25

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	214.01	2.799	214	9.653	213.723	11.142	213.656	12.31	213.629
12.897	213.619	15.914	213.5	24.847	213.143	25.715	213.12	28.286	213
34.463	212.866	37.932	212.791	39.439	212.762	44.767	212.679	44.825	212.678
48.624	212.582	50	212.5	56	212.5	57.8	212.647	62.718	212.809
66.484	212.913	69.327	213	71.374	213.108	78.944	213.5	86.227	213.774

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	28.286	.035	69.327	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
28.286	69.327	60	48	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	50	216	T
56	86.227	216	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	212.57	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	212.56	Reach Len. (m)	60.00	48.00	42.00
Crit W.S. (m)		Flow Area (m2)		0.37	
E.G. Slope (m/m)	0.004557	Area (m2)		0.42	

Q Total (m3/s)	0.11	Flow (m3/s)	0.11
Top Width (m)	7.77	Top Width (m)	7.77
Vel Total (m/s)	0.30	Avg. Vel. (m/s)	0.30
Max Chl Dpth (m)	0.06	Hydr. Depth (m)	0.06
Conv. Total (m3/s)	1.6	Conv. (m3/s)	1.6
Length Wtd. (m)	48.00	Wetted Per. (m)	6.00
Min Ch El (m)	212.50	Shear (N/m2)	2.73
Alpha	1.00	Stream Power (N/m s)	0.82
Frctn Loss (m)	0.49	Cum Volume (1000 m3)	0.01
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.33

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	212.59	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	212.58	Reach Len. (m)	60.00	48.00	42.00
Crit W.S. (m)	212.54	Flow Area (m2)		0.48	
E.G. Slope (m/m)	0.004557	Area (m2)		0.57	
Q Total (m3/s)	0.17	Flow (m3/s)		0.17	
Top Width (m)	8.30	Top Width (m)		8.30	
Vel Total (m/s)	0.36	Avg. Vel. (m/s)		0.36	
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	2.5	Conv. (m3/s)		2.5	
Length Wtd. (m)	48.00	Wetted Per. (m)		6.00	
Min Ch El (m)	212.50	Shear (N/m2)		3.55	
Alpha	1.00	Stream Power (N/m s)		1.27	
Frctn Loss (m)	0.50	Cum Volume (1000 m3)		0.02	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.36	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	212.60	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	212.59	Reach Len. (m)	60.00	48.00	42.00
Crit W.S. (m)	212.55	Flow Area (m2)		0.51	
E.G. Slope (m/m)	0.007211	Area (m2)		0.62	
Q Total (m3/s)	0.24	Flow (m3/s)		0.24	
Top Width (m)	8.53	Top Width (m)		8.53	
Vel Total (m/s)	0.47	Avg. Vel. (m/s)		0.47	
Max Chl Dpth (m)	0.09	Hydr. Depth (m)		0.09	
Conv. Total (m3/s)	2.8	Conv. (m3/s)		2.8	
Length Wtd. (m)	48.00	Wetted Per. (m)		6.00	
Min Ch El (m)	212.50	Shear (N/m2)		6.02	
Alpha	1.00	Stream Power (N/m s)		2.83	
Frctn Loss (m)	0.48	Cum Volume (1000 m3)		0.03	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.44	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	212.62	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	212.61	Reach Len. (m)	60.00	48.00	42.00
Crit W.S. (m)		Flow Area (m2)		0.64	
E.G. Slope (m/m)	0.005959	Area (m2)		0.82	
Q Total (m3/s)	0.32	Flow (m3/s)		0.32	
Top Width (m)	9.67	Top Width (m)		9.67	
Vel Total (m/s)	0.50	Avg. Vel. (m/s)		0.50	
Max Chl Dpth (m)	0.11	Hydr. Depth (m)		0.11	
Conv. Total (m3/s)	4.1	Conv. (m3/s)		4.1	
Length Wtd. (m)	48.00	Wetted Per. (m)		6.00	
Min Ch El (m)	212.50	Shear (N/m2)		6.26	
Alpha	1.00	Stream Power (N/m s)		3.12	
Frctn Loss (m)	0.51	Cum Volume (1000 m3)		0.03	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.47	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	212.63	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	212.62	Reach Len. (m)	60.00	48.00	42.00
Crit W.S. (m)		Flow Area (m2)		0.72	
E.G. Slope (m/m)	0.005728	Area (m2)		0.95	
Q Total (m3/s)	0.38	Flow (m3/s)		0.38	
Top Width (m)	10.35	Top Width (m)		10.35	
Vel Total (m/s)	0.53	Avg. Vel. (m/s)		0.53	
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.12	
Conv. Total (m3/s)	5.0	Conv. (m3/s)		5.0	
Length Wtd. (m)	48.00	Wetted Per. (m)		6.00	
Min Ch El (m)	212.50	Shear (N/m2)		6.75	
Alpha	1.00	Stream Power (N/m s)		3.56	
Frctn Loss (m)	0.50	Cum Volume (1000 m3)		0.04	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.50	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	212.65	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	212.64	Reach Len. (m)	60.00	48.00	42.00
Crit W.S. (m)		Flow Area (m2)		0.84	
E.G. Slope (m/m)	0.005115	Area (m2)		1.16	
Q Total (m3/s)	0.46	Flow (m3/s)		0.46	
Top Width (m)	11.35	Top Width (m)		11.35	
Vel Total (m/s)	0.55	Avg. Vel. (m/s)		0.55	
Max Chl Dpth (m)	0.14	Hydr. Depth (m)		0.14	
Conv. Total (m3/s)	6.4	Conv. (m3/s)		6.4	
Length Wtd. (m)	48.00	Wetted Per. (m)		6.00	
Min Ch El (m)	212.50	Shear (N/m2)		7.00	
Alpha	1.00	Stream Power (N/m s)		3.85	
Frctn Loss (m)	0.52	Cum Volume (1000 m3)		0.04	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.52	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	212.68	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	212.66	Reach Len. (m)	60.00	48.00	42.00
Crit W.S. (m)		Flow Area (m2)		0.94	
E.G. Slope (m/m)	0.005654	Area (m2)		1.37	

Q Total (m3/s)	0.59	Flow (m3/s)	0.59
Top Width (m)	12.45	Top Width (m)	12.45
Vel Total (m/s)	0.63	Avg. Vel. (m/s)	0.63
Max Chl Dpth (m)	0.16	Hydr. Depth (m)	0.16
Conv. Total (m3/s)	7.8	Conv. (m3/s)	7.8
Length Wtd. (m)	48.00	Wetted Per. (m)	6.00
Min Ch El (m)	212.50	Shear (N/m2)	8.71
Alpha	1.00	Stream Power (N/m s)	5.45
Frctn Loss (m)	0.53	Cum Volume (1000 m3)	0.05
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.59

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	212.88	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.035	
W.S. Elev (m)	212.81	Reach Len. (m)	60.00	48.00	42.00
Crit W.S. (m)		Flow Area (m2)		1.89	
E.G. Slope (m/m)	0.007599	Area (m2)		4.39	
Q Total (m3/s)	2.17	Flow (m3/s)		2.17	
Top Width (m)	26.04	Top Width (m)		26.04	
Vel Total (m/s)	1.15	Avg. Vel. (m/s)		1.15	
Max Chl Dpth (m)	0.31	Hydr. Depth (m)		0.31	
Conv. Total (m3/s)	24.9	Conv. (m3/s)		24.9	
Length Wtd. (m)	48.00	Wetted Per. (m)		6.00	
Min Ch El (m)	212.50	Shear (N/m2)		23.41	
Alpha	1.00	Stream Power (N/m s)		26.95	
Frctn Loss (m)	0.61	Cum Volume (1000 m3)		0.16	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.11	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: DUFFINS
REACH: WC35 RS: 10

INPUT
Description: ST 10 (Updated Sep 2016)
Station Elevation Data num= 45

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	213.5	2.862	213.317	12.011	213	13.53	212.991	13.909	212.989
14.689	212.991	17.826	212.927	21.7	212.811	27.021	212.664	28.211	212.61
29.859	212.535	30.308	212.5	30.723	212.5	30.857	212.5	30.995	212.5
31.615	212.5	32.138	212.5	37.621	212.402	40.357	212.348	42.449	212.307
46.414	212.248	58.65	212.055	59.449	212.043	59.971	212.036	60.592	212.026
62.109	212	62.127	212	62.234	212	62.553	212	62.853	212
63.069	212	65.256	212.081	73.5	212.323	78.545	212.5	81.022	212.599
88.083	213	89.383	213.042	101.451	213.5	102.296	213.503	104.91	213.577
106.002	213.593	106.392	213.6	107.881	213.646	110.984	213.729	111.225	213.737

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	32.138	.035	78.545	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
32.138	78.545	0	0	.3	.5

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	212.07	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	212.06	Reach Len. (m)			
Crit W.S. (m)	212.06	Flow Area (m2)		0.19	
E.G. Slope (m/m)	0.038829	Area (m2)		0.19	
Q Total (m3/s)	0.11	Flow (m3/s)		0.11	
Top Width (m)	6.02	Top Width (m)		6.02	
Vel Total (m/s)	0.57	Avg. Vel. (m/s)		0.57	
Max Chl Dpth (m)	0.06	Hydr. Depth (m)		0.03	
Conv. Total (m3/s)	0.6	Conv. (m3/s)		0.6	
Length Wtd. (m)		Wetted Per. (m)		6.02	
Min Ch El (m)	212.00	Shear (N/m2)		12.23	
Alpha	1.00	Stream Power (N/m s)		6.96	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	212.09	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	212.07	Reach Len. (m)			
Crit W.S. (m)	212.07	Flow Area (m2)		0.26	
E.G. Slope (m/m)	0.043259	Area (m2)		0.26	
Q Total (m3/s)	0.17	Flow (m3/s)		0.17	
Top Width (m)	6.90	Top Width (m)		6.90	
Vel Total (m/s)	0.66	Avg. Vel. (m/s)		0.66	
Max Chl Dpth (m)	0.07	Hydr. Depth (m)		0.04	
Conv. Total (m3/s)	0.8	Conv. (m3/s)		0.8	
Length Wtd. (m)		Wetted Per. (m)		6.91	
Min Ch El (m)	212.00	Shear (N/m2)		15.77	
Alpha	1.00	Stream Power (N/m s)		10.44	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	212.11	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	212.10	Reach Len. (m)			
Crit W.S. (m)	212.10	Flow Area (m2)		0.50	
E.G. Slope (m/m)	0.015017	Area (m2)		0.50	
Q Total (m3/s)	0.24	Flow (m3/s)		0.24	
Top Width (m)	9.62	Top Width (m)		9.62	
Vel Total (m/s)	0.48	Avg. Vel. (m/s)		0.48	
Max Chl Dpth (m)	0.10	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	2.0	Conv. (m3/s)		2.0	
Length Wtd. (m)		Wetted Per. (m)		9.62	
Min Ch El (m)	212.00	Shear (N/m2)		7.58	
Alpha	1.00	Stream Power (N/m s)		3.67	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	212.12	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	212.10	Reach Len. (m)			
Crit W.S. (m)	212.10	Flow Area (m2)		0.52	
E.G. Slope (m/m)	0.023398	Area (m2)		0.52	
Q Total (m3/s)	0.32	Flow (m3/s)		0.32	
Top Width (m)	9.88	Top Width (m)		9.88	
Vel Total (m/s)	0.61	Avg. Vel. (m/s)		0.61	
Max Chl Dpth (m)	0.10	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	2.1	Conv. (m3/s)		2.1	
Length Wtd. (m)		Wetted Per. (m)		9.88	
Min Ch El (m)	212.00	Shear (N/m2)		12.10	
Alpha	1.00	Stream Power (N/m s)		7.43	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	212.13	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	212.10	Reach Len. (m)			
Crit W.S. (m)	212.10	Flow Area (m2)		0.59	
E.G. Slope (m/m)	0.024163	Area (m2)		0.59	
Q Total (m3/s)	0.38	Flow (m3/s)		0.38	
Top Width (m)	10.50	Top Width (m)		10.50	
Vel Total (m/s)	0.65	Avg. Vel. (m/s)		0.65	
Max Chl Dpth (m)	0.10	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	2.4	Conv. (m3/s)		2.4	
Length Wtd. (m)		Wetted Per. (m)		10.50	
Min Ch El (m)	212.00	Shear (N/m2)		13.22	
Alpha	1.00	Stream Power (N/m s)		8.57	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	212.14	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	212.10	Reach Len. (m)			
Crit W.S. (m)	212.10	Flow Area (m2)		0.58	
E.G. Slope (m/m)	0.035753	Area (m2)		0.58	
Q Total (m3/s)	0.46	Flow (m3/s)		0.46	
Top Width (m)	10.48	Top Width (m)		10.48	
Vel Total (m/s)	0.79	Avg. Vel. (m/s)		0.79	
Max Chl Dpth (m)	0.10	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	2.4	Conv. (m3/s)		2.4	
Length Wtd. (m)		Wetted Per. (m)		10.48	
Min Ch El (m)	212.00	Shear (N/m2)		19.53	
Alpha	1.00	Stream Power (N/m s)		15.39	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	212.15	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	212.12	Reach Len. (m)			
Crit W.S. (m)	212.12	Flow Area (m2)		0.75	
E.G. Slope (m/m)	0.030046	Area (m2)		0.75	
Q Total (m3/s)	0.59	Flow (m3/s)		0.59	
Top Width (m)	11.95	Top Width (m)		11.95	
Vel Total (m/s)	0.78	Avg. Vel. (m/s)		0.78	
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	3.4	Conv. (m3/s)		3.4	
Length Wtd. (m)		Wetted Per. (m)		11.95	
Min Ch El (m)	212.00	Shear (N/m2)		18.56	
Alpha	1.00	Stream Power (N/m s)		14.55	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	212.26	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	212.21	Reach Len. (m)			
Crit W.S. (m)	212.21	Flow Area (m2)		2.14	
E.G. Slope (m/m)	0.025197	Area (m2)		2.14	
Q Total (m3/s)	2.17	Flow (m3/s)		2.17	
Top Width (m)	20.35	Top Width (m)		20.35	
Vel Total (m/s)	1.01	Avg. Vel. (m/s)		1.01	
Max Chl Dpth (m)	0.21	Hydr. Depth (m)		0.11	
Conv. Total (m3/s)	13.7	Conv. (m3/s)		13.7	
Length Wtd. (m)		Wetted Per. (m)		20.36	
Min Ch El (m)	212.00	Shear (N/m2)		26.04	
Alpha	1.00	Stream Power (N/m s)		26.34	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

SUMMARY OF MANNING'S N VALUES

River:DUFFINS

Reach	River Sta.	n1	n2	n3
WC35	300	.07	.035	.07
WC35	200	.07	.035	.07
WC35	150	Culvert		
WC35	100	.07	.035	.07
WC35	10	.07	.035	.07

SUMMARY OF REACH LENGTHS

River: DUFFINS

Reach	River Sta.	Left	Channel	Right
WC35	300	6	5	7
WC35	200	38	43	44
WC35	150	Culvert		
WC35	100	60	48	42
WC35	10	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: DUFFINS

Reach	River Sta.	Contr.	Expan.
WC35	300	.3	.5
WC35	200	.3	.5
WC35	150	Culvert	
WC35	100	.3	.5
WC35	10	.3	.5

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
WC35	300	2-yr	0.11	213.49	213.51	213.51	213.51	0.130941	0.34	0.32	54.76	1.40
WC35	300	5-yr	0.17	213.49	213.51	213.51	213.52	0.312744	0.52	0.32	54.76	2.17
WC35	300	10-yr	0.24	213.49	213.51	213.51	213.52	0.034255	0.31	0.78	55.86	0.83
WC35	300	25-yr	0.32	213.49	213.51	213.51	213.52	0.058561	0.40	0.79	55.89	1.09
WC35	300	50-yr	0.38	213.49	213.52	213.52	213.52	0.050601	0.41	0.92	56.19	1.03
WC35	300	100-yr	0.46	213.49	213.52	213.52	213.53	0.044727	0.43	1.07	56.55	1.00
WC35	300	Check Flow	0.59	213.49	213.52	213.52	213.53	0.051666	0.49	1.19	56.85	1.09
WC35	300	Regional	2.17	213.49	213.55	213.55	213.58	0.039684	0.76	2.87	59.15	1.10
WC35	200	2-yr	0.11	213.00	213.05	213.04	213.06	0.008477	0.36	0.30	6.38	0.51
WC35	200	5-yr	0.17	213.00	213.07	213.04	213.08	0.007827	0.42	0.41	6.50	0.52
WC35	200	10-yr	0.24	213.00	213.08	213.05	213.10	0.007382	0.47	0.51	6.63	0.52
WC35	200	25-yr	0.32	213.00	213.10	213.06	213.12	0.006830	0.52	0.62	6.76	0.52
WC35	200	50-yr	0.38	213.00	213.12	213.07	213.13	0.006617	0.55	0.69	6.85	0.52
WC35	200	100-yr	0.46	213.00	213.13	213.08	213.15	0.006264	0.58	0.79	6.97	0.51
WC35	200	Check Flow	0.59	213.00	213.15	213.10	213.18	0.005988	0.64	0.93	7.14	0.52
WC35	200	Regional	2.17	213.00	213.37	213.24	213.42	0.004230	0.97	2.25	8.78	0.50

WC35	150		Culvert									
WC35	100	2-yr	0.11	212.50	212.56		212.57	0.004557	0.30	0.37	7.77	0.39
WC35	100	5-yr	0.17	212.50	212.58	212.54	212.59	0.004557	0.36	0.48	8.30	0.40
WC35	100	10-yr	0.24	212.50	212.59	212.55	212.60	0.007211	0.47	0.51	8.53	0.51
WC35	100	25-yr	0.32	212.50	212.61		212.62	0.005959	0.50	0.64	9.67	0.49
WC35	100	50-yr	0.38	212.50	212.62		212.63	0.005728	0.53	0.72	10.35	0.49
WC35	100	100-yr	0.46	212.50	212.64		212.65	0.005115	0.55	0.84	11.35	0.47
WC35	100	Check Flow	0.59	212.50	212.66		212.68	0.005654	0.63	0.94	12.45	0.50
WC35	100	Regional	2.17	212.50	212.81		212.88	0.007599	1.15	1.89	26.04	0.66
WC35	10	2-yr	0.11	212.00	212.06	212.06	212.07	0.038829	0.57	0.19	6.02	1.01
WC35	10	5-yr	0.17	212.00	212.07	212.07	212.09	0.043259	0.66	0.26	6.90	1.10
WC35	10	10-yr	0.24	212.00	212.10	212.10	212.11	0.015017	0.48	0.50	9.62	0.68
WC35	10	25-yr	0.32	212.00	212.10	212.10	212.12	0.023398	0.61	0.52	9.88	0.85
WC35	10	50-yr	0.38	212.00	212.10	212.10	212.13	0.024163	0.65	0.59	10.50	0.88
WC35	10	100-yr	0.46	212.00	212.10	212.10	212.14	0.035753	0.79	0.58	10.48	1.07
WC35	10	Check Flow	0.59	212.00	212.12	212.12	212.15	0.030046	0.78	0.75	11.95	1.00
WC35	10	Regional	2.17	212.00	212.21	212.21	212.26	0.025197	1.01	2.14	20.35	1.00

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (m)	W.S. Elev (m)	Vel Head (m)	Frctn Loss (m)	C & E Loss (m)	Q Left (m3/s)	Q Channel (m3/s)	Q Right (m3/s)	Top Width (m)
WC35	300	2-yr	213.51	213.51	0.01	0.11	0.00		0.11		54.76
WC35	300	5-yr	213.52	213.51	0.01	0.12	0.00		0.17		54.76
WC35	300	10-yr	213.52	213.51	0.00	0.07	0.00		0.24		55.86
WC35	300	25-yr	213.52	213.51	0.01	0.08	0.00		0.32		55.89
WC35	300	50-yr	213.52	213.52	0.01	0.07	0.00		0.38		56.19
WC35	300	100-yr	213.53	213.52	0.01	0.07	0.00		0.46		56.55
WC35	300	Check Flow	213.53	213.52	0.01	0.07	0.00		0.59		56.85
WC35	300	Regional	213.58	213.55	0.03	0.05	0.01		2.17		59.15
WC35	200	2-yr	213.06	213.05	0.01				0.11		6.38
WC35	200	5-yr	213.08	213.07	0.01				0.17		6.50
WC35	200	10-yr	213.10	213.08	0.01				0.24		6.63
WC35	200	25-yr	213.12	213.10	0.01				0.32		6.76
WC35	200	50-yr	213.13	213.12	0.02				0.38		6.85
WC35	200	100-yr	213.15	213.13	0.02				0.46		6.97
WC35	200	Check Flow	213.18	213.15	0.02				0.59		7.14
WC35	200	Regional	213.42	213.37	0.05				2.17		8.78
WC35	150		Culvert								
WC35	100	2-yr	212.57	212.56	0.00	0.49	0.00		0.11		7.77
WC35	100	5-yr	212.59	212.58	0.01	0.50	0.00		0.17		8.30
WC35	100	10-yr	212.60	212.59	0.01	0.48	0.00		0.24		8.53
WC35	100	25-yr	212.62	212.61	0.01	0.51	0.00		0.32		9.67
WC35	100	50-yr	212.63	212.62	0.01	0.50	0.00		0.38		10.35
WC35	100	100-yr	212.65	212.64	0.02	0.52	0.00		0.46		11.35
WC35	100	Check Flow	212.68	212.66	0.02	0.53	0.00		0.59		12.45
WC35	100	Regional	212.88	212.81	0.07	0.61	0.01		2.17		26.04
WC35	10	2-yr	212.07	212.06	0.02				0.11		6.02
WC35	10	5-yr	212.09	212.07	0.02				0.17		6.90
WC35	10	10-yr	212.11	212.10	0.01				0.24		9.62
WC35	10	25-yr	212.12	212.10	0.02				0.32		9.88
WC35	10	50-yr	212.13	212.10	0.02				0.38		10.50
WC35	10	100-yr	212.14	212.10	0.03				0.46		10.48
WC35	10	Check Flow	212.15	212.12	0.03				0.59		11.95
WC35	10	Regional	212.26	212.21	0.05				2.17		20.35

Profile Output Table - Culvert Only

Reach	River Sta		Profile	E.G. US. (m)	W.S. US. (m)	E.G. IC (m)	E.G. OC (m)	Min El Weir Flow (m)	Q Culv Group (m3/s)	Q Weir (m3/s)	Delta WS (m)	Culv Vel US (m/s)	Culv Vel DS (m/s)
WC35	150	Culvert #1	2-yr	213.06	213.05	213.06	213.06	216.00	0.11		0.49	0.43	0.56
WC35	150	Culvert #1	5-yr	213.08	213.07	213.08	213.08	216.00	0.17		0.49	0.52	0.65
WC35	150	Culvert #1	10-yr	213.10	213.08	213.10	213.09	216.00	0.24		0.50	0.58	0.73
WC35	150	Culvert #1	25-yr	213.12	213.10	213.12	213.11	216.00	0.32		0.50	0.65	0.81
WC35	150	Culvert #1	50-yr	213.13	213.12	213.13	213.13	216.00	0.38		0.50	0.69	0.85
WC35	150	Culvert #1	100-yr	213.15	213.13	213.15	213.15	216.00	0.46		0.49	0.76	0.91
WC35	150	Culvert #1	Check Flow	213.18	213.15	213.18	213.17	216.00	0.59		0.50	0.83	0.99
WC35	150	Culvert #1	Regional	213.42	213.37	213.42	213.41	216.00	2.17		0.56	1.39	1.53

DUFFINS CREEK

HEC-RAS ANALYSIS WC#36

218.65 | 218.65 | ST 500
218.00 | 218.00

EXISTING 407 ETR

215.39 | 215.39 | ST 400
215.14 | 215.14

PROP CULV 1 WC#36
SPAN x RISE=(6 x 1.75)m
L=29m, S=0.8%
U/S INV=214.32m
D/S INV=214.10m

214.71 | 214.86 | ST 300
214.60 | 214.59

214.67 | 214.72 | ST 200
214.58 | 214.47

PROPOSED 407 TWY

14+400 14+500 14+600 14+700 15+000 15+100 15+200

ST 100 | 214.41 | 214.56
214.41 | 214.51

ST 10 | 213.93 | 214.14
213.66 | 214.04

PROP CULV 2 WC#36
SPAN x RISE=(6 x 2)m
L=41m, S=0.5%
U/S INV=213.51m
D/S INV=213.3m

FUTURE COLLECTOR ROAD

ST 5 | 213.47 | 213.47
213.39 | 213.28

ST 1 | 212.15 | 212.15
212.32 | 212.32

21 ACCESSIBLE SPACES

PPUDO
180 m (LINEAR)

BUS LOOP

SWM

652 PARKING SPACES

SWM

FUTURE WHITES ROAD

SOUTH EMPL

215.80 216.00 216.40 216.50 217.00 217.30 218.50 219.10 214.50 214.60 214.70 214.90 216.00 216.50 217.00

LEGEND

- EXISTING 407 ETR
- PROPOSED 407 TWY
- CREEK FLOW DIRECTION
- EXISTING CULVERT
- PROPOSED CULVERT
- PROPOSED REGIONAL FLOODLINE

EX REG / EX 100 — PR REG / PR 100 — HEC ST

- HEC ST: CROSS SECTION NUMBER
- PARSONS HEC-RAS SECTION
- PR REG / PR 100: PROPOSED WL ELEVATION (m)
- EX REG / EX 100: EXISTING UPDATED WL ELEVATION (m)

SCALE HORIZONTAL
1:1000

5m 0m 10m 20m 30m

DATE: SEPTEMBER 2016

SCALE: 1:1000

Ontario

PARSONS
625 COCHRANE DRIVE, SUITE 500
MARKHAM, ONTARIO L3R 9R9
TEL: 905-943-0500
FAX: 905-943-0400

407 TRANSITWAY FROM KENNEDY RD TO BROCK RD

FIGURE 6.19 - HEC-RAS ANALYSIS - DUFFINS CREEK (WC#36)

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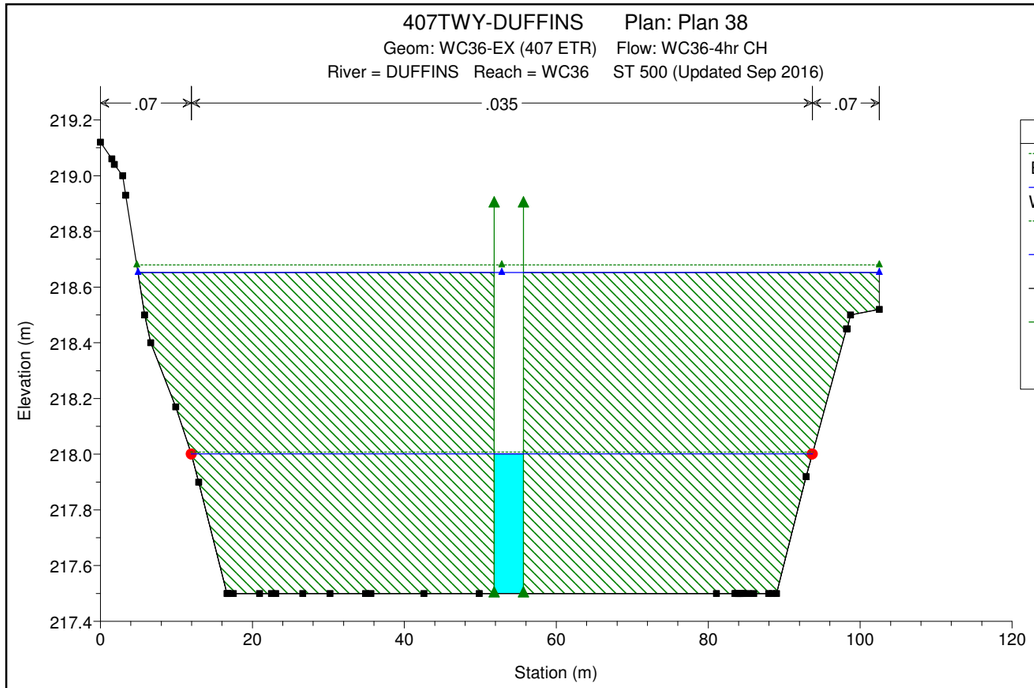
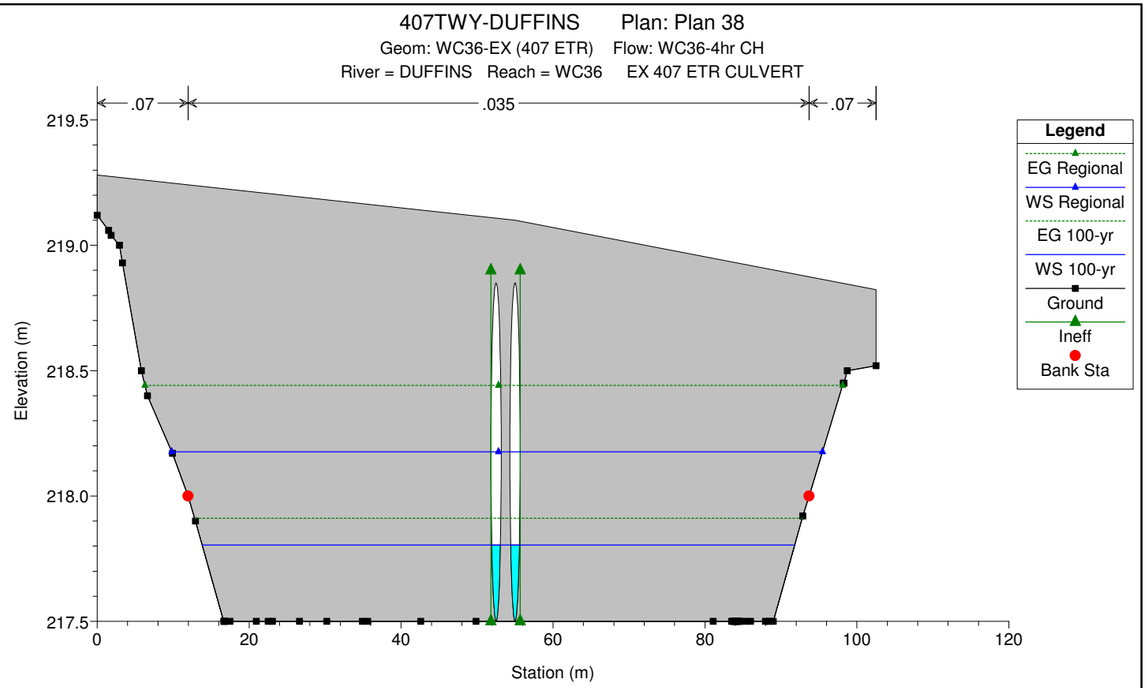
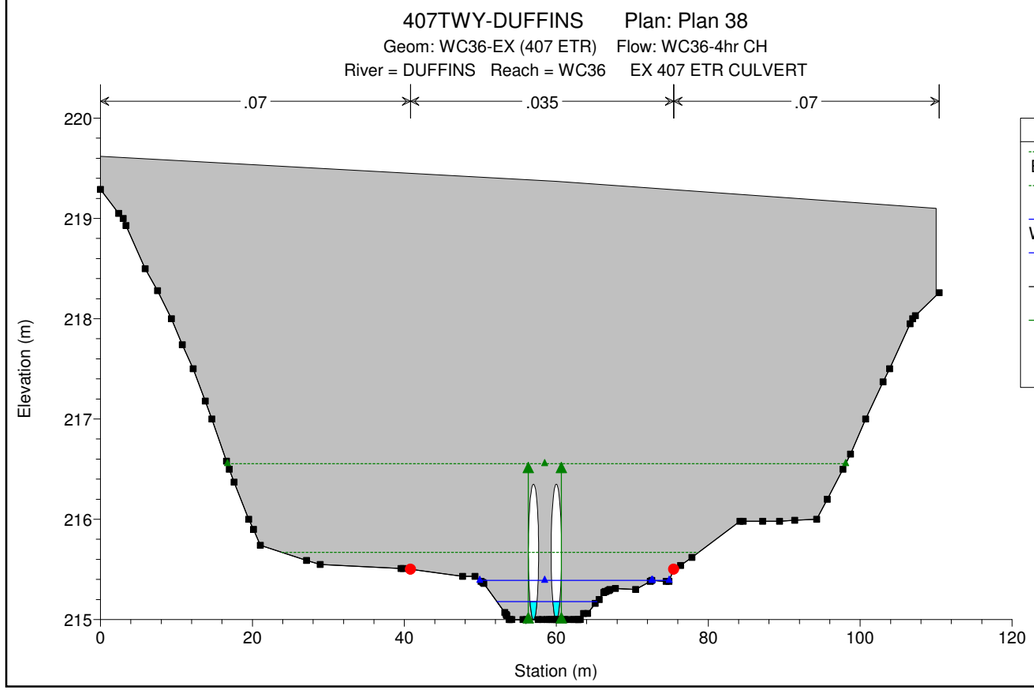
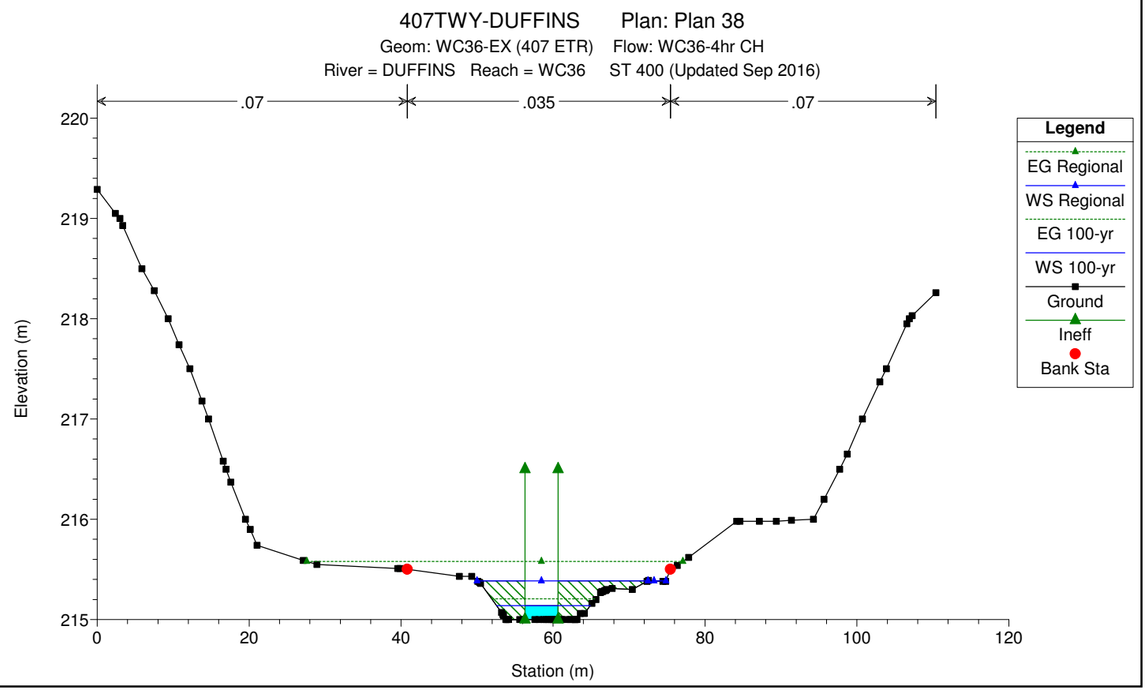
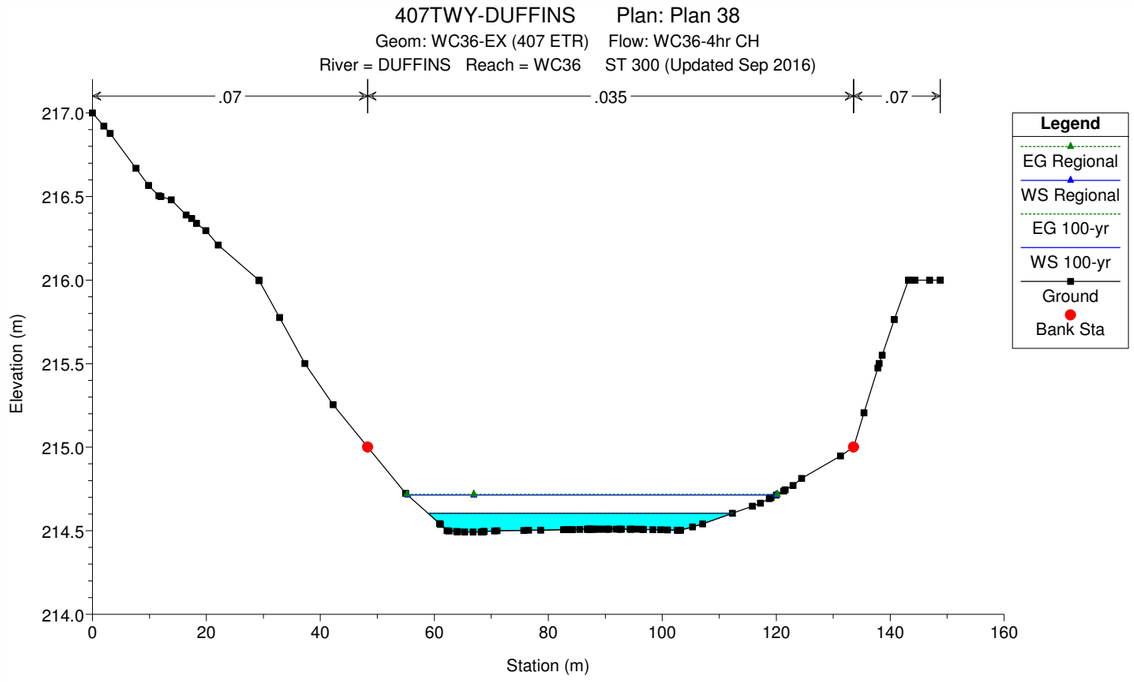
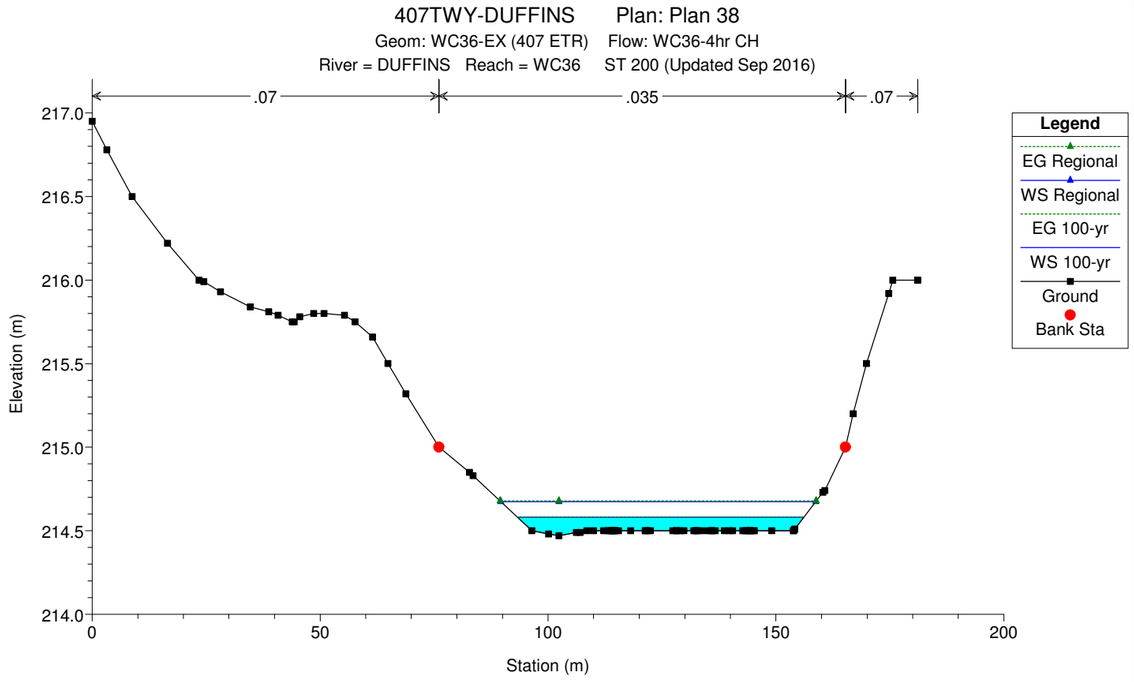

407TWY-DUFFINS Plan: Plan 38
Geom: WC36-EX (407 ETR) Flow: WC36-4hr CH
River = DUFFINS Reach = WC36 ST 500 (Updated Sep 2016)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta

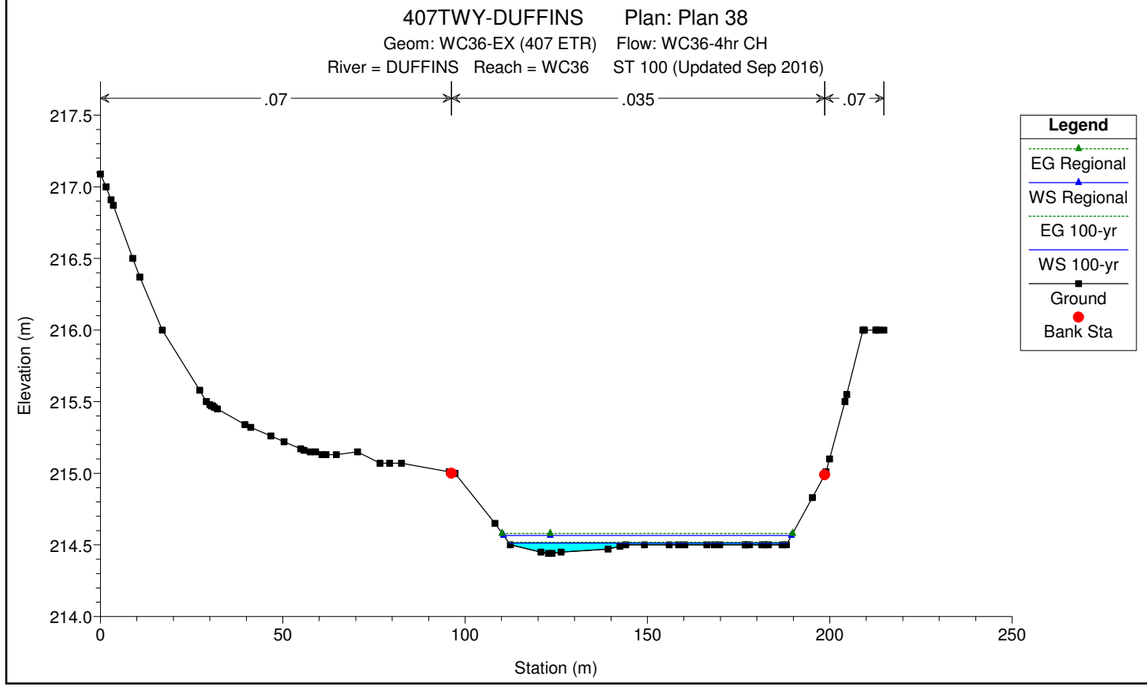

407TWY-DUFFINS Plan: Plan 38
Geom: WC36-EX (407 ETR) Flow: WC36-4hr CH
River = DUFFINS Reach = WC36 EX 407 ETR CULVERT
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta

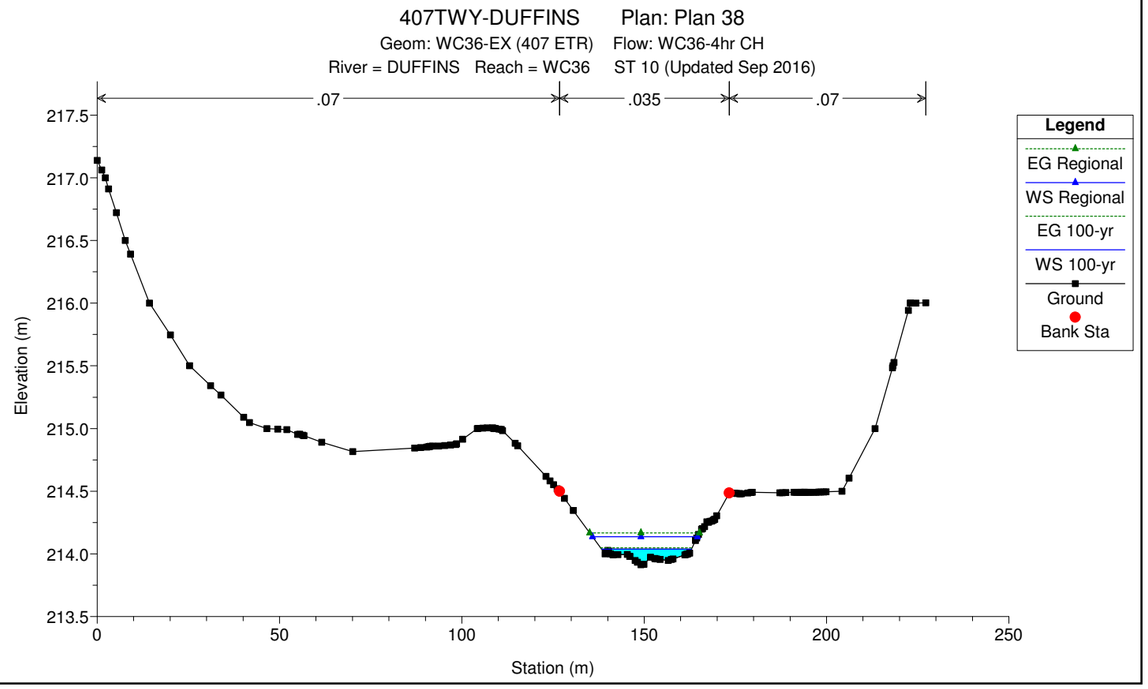

407TWY-DUFFINS Plan: Plan 38
Geom: WC36-EX (407 ETR) Flow: WC36-4hr CH
River = DUFFINS Reach = WC36 EX 407 ETR CULVERT
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
EG 100-yr
WS Regional
WS 100-yr
Ground
Ineff
Bank Sta

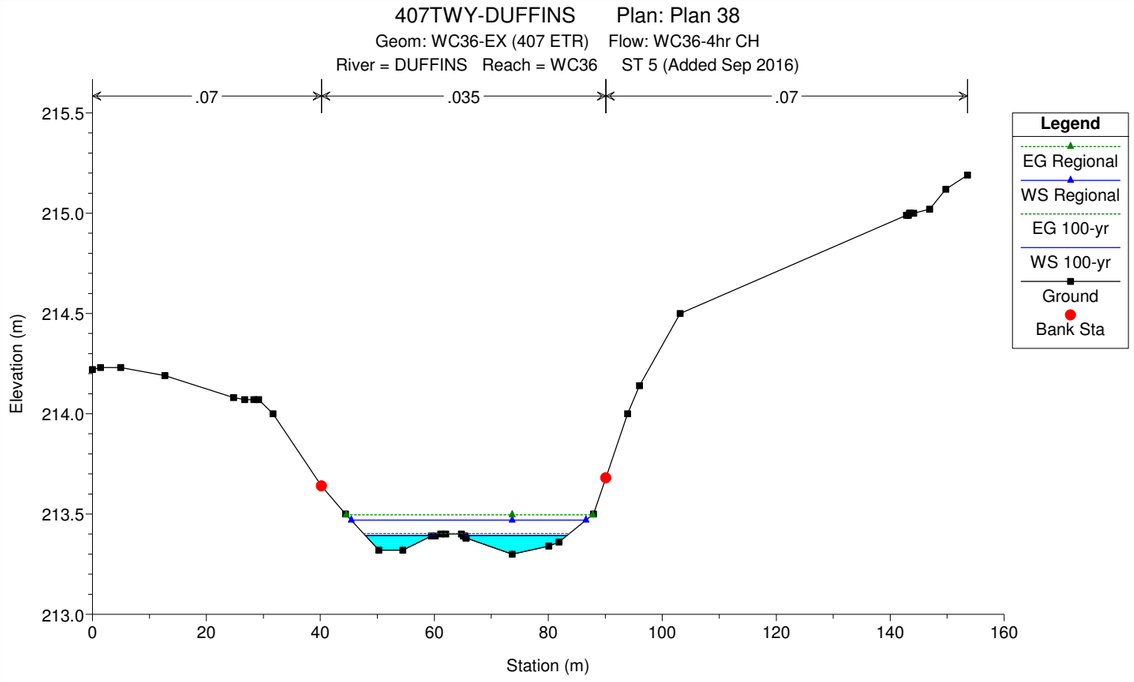

407TWY-DUFFINS Plan: Plan 38
Geom: WC36-EX (407 ETR) Flow: WC36-4hr CH
River = DUFFINS Reach = WC36 ST 400 (Updated Sep 2016)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta

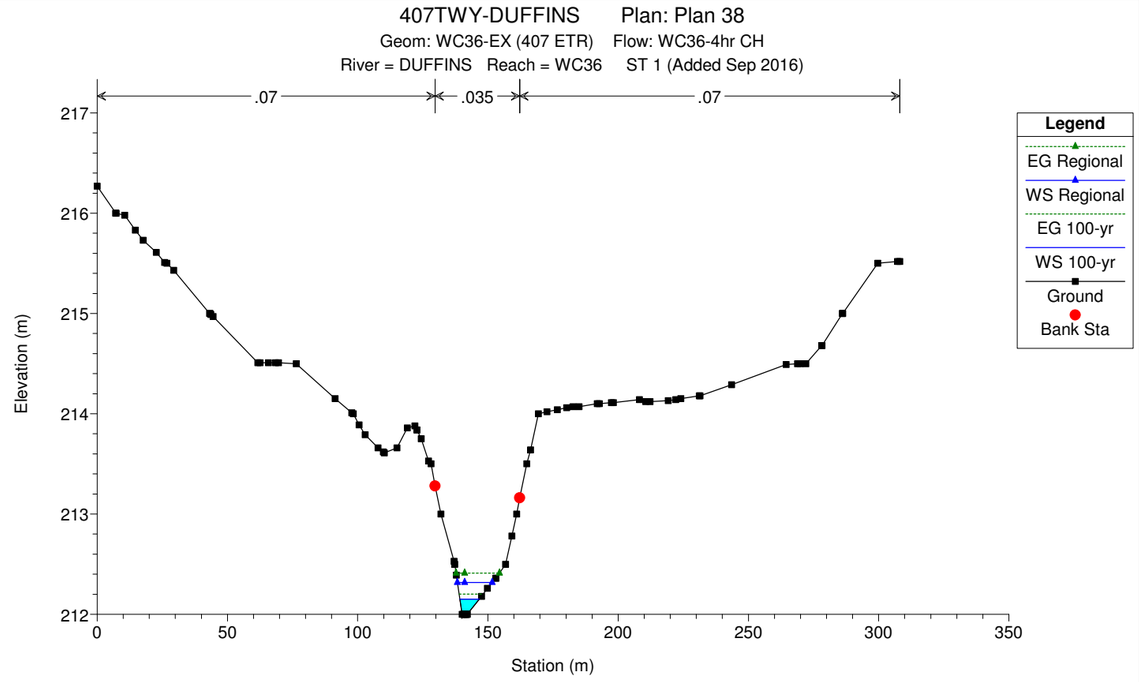

407TWY-DUFFINS Plan: Plan 38
Geom: WC36-EX (407 ETR) Flow: WC36-4hr CH
River = DUFFINS Reach = WC36 ST 300 (Updated Sep 2016)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Bank Sta


407TWY-DUFFINS Plan: Plan 38
Geom: WC36-EX (407 ETR) Flow: WC36-4hr CH
River = DUFFINS Reach = WC36 ST 200 (Updated Sep 2016)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Bank Sta


407TWY-DUFFINS Plan: Plan 38
Geom: WC36-EX (407 ETR) Flow: WC36-4hr CH
River = DUFFINS Reach = WC36 ST 100 (Updated Sep 2016)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Bank Sta


407TWY-DUFFINS Plan: Plan 38
Geom: WC36-EX (407 ETR) Flow: WC36-4hr CH
River = DUFFINS Reach = WC36 ST 10 (Updated Sep 2016)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Bank Sta


407TWY-DUFFINS Plan: Plan 38
Geom: WC36-EX (407 ETR) Flow: WC36-4hr CH
River = DUFFINS Reach = WC36 ST 5 (Added Sep 2016)
.07
.035
.07
Elevation (m)
Station (m)
215.5
215.0
214.5
214.0
213.5
213.0
0
20
40
60
80
100
120
140
160
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Bank Sta


407TWY-DUFFINS Plan: Plan 38
Geom: WC36-EX (407 ETR) Flow: WC36-4hr CH
River = DUFFINS Reach = WC36 ST 1 (Added Sep 2016)
.07
.035
.07
Elevation (m)
Station (m)
217
216
215
214
213
212
0
50
100
150
200
250
300
350
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Bank Sta

HEC-RAS Plan: WC36 - EX (4hr CH) River: DUFFINS Reach: WC36

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC36	500	2-yr	0.18	217.50	217.75	217.56	217.75	0.000273	0.19	0.96	76.97	0.12
WC36	500	5-yr	0.27	217.50	217.81	217.59	217.81	0.000309	0.23	1.18	78.04	0.13
WC36	500	10-yr	0.36	217.50	217.86	217.59	217.86	0.000337	0.26	1.37	78.94	0.14
WC36	500	25-yr	0.49	217.50	217.92	217.62	217.92	0.000368	0.31	1.60	80.09	0.15
WC36	500	50-yr	0.59	217.50	217.96	217.63	217.96	0.000387	0.33	1.76	80.93	0.16
WC36	500	100-yr	0.70	217.50	218.00	217.65	218.01	0.000406	0.36	1.93	81.78	0.16
WC36	500	Check Flow	0.91	217.50	218.07	217.68	218.08	0.000435	0.41	2.21	83.40	0.17
WC36	500	Regional	3.27	217.50	218.65	217.92	218.68	0.000552	0.74	4.43	97.59	0.22
WC36	450		Culvert									
WC36	400	2-yr	0.18	215.00	215.06	215.06	215.08	0.023496	0.68	0.27	10.85	0.88
WC36	400	5-yr	0.27	215.00	215.07	215.07	215.11	0.028635	0.85	0.32	11.07	1.00
WC36	400	10-yr	0.36	215.00	215.08	215.08	215.13	0.032019	0.98	0.37	11.28	1.08
WC36	400	25-yr	0.49	215.00	215.12	215.12	215.17	0.018410	0.94	0.52	11.96	0.87
WC36	400	50-yr	0.59	215.00	215.12	215.12	215.19	0.024041	1.10	0.54	12.03	1.00
WC36	400	100-yr	0.70	215.00	215.14	215.14	215.21	0.023366	1.17	0.60	12.31	1.00
WC36	400	Check Flow	0.91	215.00	215.16	215.16	215.25	0.021833	1.27	0.72	12.85	1.00
WC36	400	Regional	3.27	215.00	215.39	215.39	215.58	0.016524	1.95	1.68	24.07	1.00
WC36	300	2-yr	0.18	214.49	214.56		214.56	0.000410	0.08	2.33	47.84	0.11
WC36	300	5-yr	0.27	214.49	214.57		214.57	0.000482	0.09	2.86	49.11	0.12
WC36	300	10-yr	0.36	214.49	214.58		214.58	0.000525	0.11	3.35	50.24	0.13
WC36	300	25-yr	0.49	214.49	214.59		214.59	0.000572	0.12	3.97	51.65	0.14
WC36	300	50-yr	0.59	214.49	214.60		214.60	0.000599	0.13	4.41	52.63	0.15
WC36	300	100-yr	0.70	214.49	214.60		214.61	0.000651	0.15	4.79	53.47	0.16
WC36	300	Check Flow	0.91	214.49	214.62		214.62	0.000729	0.17	5.48	54.93	0.17
WC36	300	Regional	3.27	214.49	214.71		214.72	0.001077	0.29	11.21	64.66	0.22
WC36	200	2-yr	0.18	214.47	214.54		214.54	0.000499	0.07	2.41	59.95	0.12
WC36	200	5-yr	0.27	214.47	214.55		214.55	0.000477	0.09	3.13	60.75	0.12
WC36	200	10-yr	0.36	214.47	214.56		214.56	0.000581	0.10	3.51	61.18	0.14
WC36	200	25-yr	0.49	214.47	214.57		214.57	0.000543	0.11	4.34	62.08	0.14
WC36	200	50-yr	0.59	214.47	214.58		214.58	0.000560	0.12	4.82	62.60	0.14
WC36	200	100-yr	0.70	214.47	214.58		214.58	0.000661	0.14	5.09	62.89	0.15
WC36	200	Check Flow	0.91	214.47	214.59		214.59	0.000811	0.16	5.63	63.45	0.17
WC36	200	Regional	3.27	214.47	214.67		214.68	0.001182	0.29	11.20	69.10	0.23
WC36	100	2-yr	0.18	214.44	214.48		214.49	0.015899	0.30	0.61	25.97	0.62
WC36	100	5-yr	0.27	214.44	214.49	214.48	214.50	0.013144	0.31	0.86	28.99	0.58

HEC-RAS Plan: WC36 - EX (4hr CH) River: DUFFINS Reach: WC36 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC36	100	10-yr	0.36	214.44	214.49	214.49	214.50	0.020055	0.40	0.91	29.52	0.72
WC36	100	25-yr	0.49	214.44	214.51	214.49	214.51	0.013388	0.27	1.80	76.16	0.57
WC36	100	50-yr	0.59	214.44	214.51	214.49	214.52	0.014847	0.30	1.95	76.26	0.60
WC36	100	100-yr	0.70	214.44	214.51	214.51	214.52	0.015327	0.33	2.14	76.38	0.62
WC36	100	Check Flow	0.91	214.44	214.52	214.51	214.53	0.014494	0.36	2.55	76.65	0.62
WC36	100	Regional	3.27	214.44	214.57	214.54	214.58	0.010371	0.53	6.16	78.96	0.61
WC36	10	2-yr	0.18	213.91	214.00	213.97	214.00	0.008833	0.27	0.66	20.64	0.48
WC36	10	5-yr	0.27	213.91	214.00	214.00	214.01	0.010497	0.33	0.82	21.94	0.54
WC36	10	10-yr	0.36	213.91	214.02	214.00	214.02	0.007346	0.32	1.11	23.23	0.47
WC36	10	25-yr	0.49	213.91	214.02	214.01	214.03	0.009644	0.39	1.25	23.78	0.55
WC36	10	50-yr	0.59	213.91	214.03	214.00	214.04	0.008688	0.41	1.45	24.42	0.53
WC36	10	100-yr	0.70	213.91	214.04	214.01	214.05	0.008684	0.43	1.62	24.70	0.54
WC36	10	Check Flow	0.91	213.91	214.05		214.06	0.008445	0.47	1.93	25.20	0.55
WC36	10	Regional	3.27	213.91	214.14		214.17	0.009538	0.78	4.22	28.76	0.65
WC36	5	2-yr	0.18	213.30	213.36		213.36	0.012191	0.30	0.61	21.28	0.56
WC36	5	5-yr	0.27	213.30	213.37		213.37	0.010059	0.31	0.87	24.29	0.53
WC36	5	10-yr	0.36	213.30	213.37	213.36	213.38	0.015594	0.40	0.91	24.73	0.66
WC36	5	25-yr	0.49	213.30	213.38	213.37	213.39	0.011355	0.39	1.27	27.97	0.58
WC36	5	50-yr	0.59	213.30	213.39	213.37	213.40	0.012895	0.43	1.38	28.59	0.62
WC36	5	100-yr	0.70	213.30	213.39	213.37	213.40	0.012633	0.44	1.58	30.80	0.63
WC36	5	Check Flow	0.91	213.30	213.40	213.40	213.42	0.013017	0.47	1.96	36.23	0.64
WC36	5	Regional	3.27	213.30	213.47	213.45	213.50	0.012515	0.73	4.49	41.20	0.71
WC36	1	2-yr	0.18	212.00	212.08	212.08	212.10	0.032132	0.72	0.25	4.69	1.00
WC36	1	5-yr	0.27	212.00	212.09	212.09	212.13	0.043721	0.90	0.30	5.06	1.19
WC36	1	10-yr	0.36	212.00	212.12	212.12	212.15	0.021297	0.75	0.48	6.23	0.87
WC36	1	25-yr	0.49	212.00	212.12	212.12	212.17	0.032238	0.95	0.52	6.44	1.07
WC36	1	50-yr	0.59	212.00	212.14	212.14	212.18	0.026852	0.93	0.63	7.07	1.00
WC36	1	100-yr	0.70	212.00	212.15	212.15	212.20	0.027122	0.98	0.71	7.48	1.01
WC36	1	Check Flow	0.91	212.00	212.17	212.17	212.23	0.025241	1.02	0.89	8.29	1.00
WC36	1	Regional	3.27	212.00	212.32	212.32	212.41	0.021147	1.34	2.44	13.35	1.00

HEC-RAS HEC-RAS 5.0.1 April 2016
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X    X
X     X  X        X           X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X           X  X     X    X        X
X     X  X        X    X      X   X    X    X        X
X     X  XXXXXX    XXXX       X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: 407TWY-DUFFINS
Project File : 407TWY-DUFFINS.prj
Run Date and Time: 9/30/2016 2:18:34 PM

Project in SI units

Project Description:
HEC-RAS Model created for 407 TWY project from Kennedy Rd. to Brock Rd. -
Duffins Creek Watershed

PLAN DATA

Plan Title: Plan 38
Plan File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.p38

Geometry Title: WC36-EX (407 ETR)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.g11

Flow Title   : WC36-4hr CH
Flow File   : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.f10

Plan Summary Information:
Number of: Cross Sections = 8 Multiple Openings = 0
            Culverts   = 1 Inline Structures = 0
            Bridges   = 0 Lateral Structures = 0

Computational Information
    Water surface calculation tolerance = 0.01
    Critical depth calculation tolerance = 0.01
    Maximum number of iterations   = 20
    Maximum difference tolerance   = 0.3
    Flow tolerance factor   = 0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method: Average Conveyance
    Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: WC36-4hr CH
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.f10

Flow Data (m3/s)

River	Reach	RS	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Check Flow	Regional
DUFFINS	WC36	500	.18	.27	.36	.49	.59	.7	.91	3.27

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
DUFFINS	WC36	2-yr		Critical
DUFFINS	WC36	5-yr		Critical
DUFFINS	WC36	10-yr		Critical
DUFFINS	WC36	25-yr		Critical
DUFFINS	WC36	50-yr		Critical
DUFFINS	WC36	100-yr		Critical
DUFFINS	WC36	Check Flow		Critical
DUFFINS	WC36	Regional		Critical

GEOMETRY DATA

Geometry Title: WC36-EX (407 ETR)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.g11

CROSS SECTION

RIVER: DUFFINS
REACH: WC36 RS: 500

INPUT
Description: ST 500 (Updated Sep 2016)
Station Elevation Data num= 45

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	219.12	1.51	219.06	1.84	219.04	2.94	219	3.34	218.93
5.82	218.5	6.62	218.4	9.9	218.17	11.96	218	12.93	217.9
16.67	217.5	16.74	217.5	16.76	217.5	17.48	217.5	20.95	217.5
22.5	217.5	23.06	217.5	26.64	217.5	30.22	217.5	34.91	217.5
35.6	217.5	42.57	217.5	49.86	217.5	81.08	217.5	83.49	217.5
83.63	217.5	83.83	217.5	83.9	217.5	83.98	217.5	84.18	217.5
84.21	217.5	84.34	217.5	84.47	217.5	84.55	217.5	85.25	217.5
86.01	217.5	87.97	217.5	88.43	217.5	88.98	217.5	92.89	217.92
93.72	218	98.21	218.45	98.28	218.45	98.73	218.5	102.53	218.52

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	11.96	.035	93.72	.07

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
          11.96 93.72   86.7   86.7   86.7   .3   .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	51.825	218.9	T
55.675	102.53	218.9	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	217.75	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	217.75	Reach Len. (m)	86.70	86.70	86.70
Crit W.S. (m)	217.56	Flow Area (m2)		0.96	
E.G. Slope (m/m)	0.000273	Area (m2)		18.63	
Q Total (m3/s)	0.18	Flow (m3/s)		0.18	
Top Width (m)	76.97	Top Width (m)		76.97	
Vel Total (m/s)	0.19	Avg. Vel. (m/s)		0.19	
Max Chl Dpth (m)	0.25	Hydr. Depth (m)		0.25	
Conv. Total (m3/s)	10.9	Conv. (m3/s)		10.9	
Length Wtd. (m)	86.70	Wetted Per. (m)		3.85	
Min Ch El (m)	217.50	Shear (N/m2)		0.67	
Alpha	1.00	Stream Power (N/m s)		0.13	
Frctn Loss (m)		Cum Volume (1000 m3)		0.43	

C & E Loss (m)		Cum SA (1000 m2)	13.89

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	217.81	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	217.81	Reach Len. (m)	86.70	86.70	86.70
Crit W.S. (m)	217.59	Flow Area (m2)		1.18	
E.G. Slope (m/m)	0.000309	Area (m2)		23.07	
Q Total (m3/s)	0.27	Flow (m3/s)		0.27	
Top Width (m)	78.04	Top Width (m)		78.04	
Vel Total (m/s)	0.23	Avg. Vel. (m/s)		0.23	
Max Chl Dpth (m)	0.31	Hydr. Depth (m)		0.31	
Conv. Total (m3/s)	15.4	Conv. (m3/s)		15.4	
Length Wtd. (m)	86.70	Wetted Per. (m)		3.85	
Min Ch El (m)	217.50	Shear (N/m2)		0.93	
Alpha	1.00	Stream Power (N/m s)		0.21	
Frctn Loss (m)		Cum Volume (1000 m3)		0.54	
C & E Loss (m)		Cum SA (1000 m2)		14.48	

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	217.86	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	217.86	Reach Len. (m)	86.70	86.70	86.70
Crit W.S. (m)	217.59	Flow Area (m2)		1.37	
E.G. Slope (m/m)	0.000337	Area (m2)		26.88	
Q Total (m3/s)	0.36	Flow (m3/s)		0.36	
Top Width (m)	78.94	Top Width (m)		78.94	
Vel Total (m/s)	0.26	Avg. Vel. (m/s)		0.26	
Max Chl Dpth (m)	0.36	Hydr. Depth (m)		0.36	
Conv. Total (m3/s)	19.6	Conv. (m3/s)		19.6	
Length Wtd. (m)	86.70	Wetted Per. (m)		3.85	
Min Ch El (m)	217.50	Shear (N/m2)		1.17	
Alpha	1.00	Stream Power (N/m s)		0.31	
Frctn Loss (m)		Cum Volume (1000 m3)		0.63	
C & E Loss (m)		Cum SA (1000 m2)		14.80	

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	217.92	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	217.92	Reach Len. (m)	86.70	86.70	86.70
Crit W.S. (m)	217.62	Flow Area (m2)		1.60	
E.G. Slope (m/m)	0.000368	Area (m2)		31.73	
Q Total (m3/s)	0.49	Flow (m3/s)		0.49	
Top Width (m)	80.09	Top Width (m)		80.09	
Vel Total (m/s)	0.31	Avg. Vel. (m/s)		0.31	
Max Chl Dpth (m)	0.42	Hydr. Depth (m)		0.42	
Conv. Total (m3/s)	25.5	Conv. (m3/s)		25.5	
Length Wtd. (m)	86.70	Wetted Per. (m)		3.85	
Min Ch El (m)	217.50	Shear (N/m2)		1.50	
Alpha	1.00	Stream Power (N/m s)		0.46	
Frctn Loss (m)		Cum Volume (1000 m3)		0.81	
C & E Loss (m)		Cum SA (1000 m2)		17.10	

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	217.96	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	217.96	Reach Len. (m)	86.70	86.70	86.70
Crit W.S. (m)	217.63	Flow Area (m2)		1.76	
E.G. Slope (m/m)	0.000387	Area (m2)		35.11	
Q Total (m3/s)	0.59	Flow (m3/s)		0.59	
Top Width (m)	80.93	Top Width (m)		80.93	
Vel Total (m/s)	0.33	Avg. Vel. (m/s)		0.33	
Max Chl Dpth (m)	0.46	Hydr. Depth (m)		0.46	
Conv. Total (m3/s)	30.0	Conv. (m3/s)		30.0	
Length Wtd. (m)	86.70	Wetted Per. (m)		3.85	
Min Ch El (m)	217.50	Shear (N/m2)		1.74	
Alpha	1.00	Stream Power (N/m s)		0.58	
Frctn Loss (m)		Cum Volume (1000 m3)		0.89	
C & E Loss (m)		Cum SA (1000 m2)		17.34	

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	218.01	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	218.00	Reach Len. (m)	86.70	86.70	86.70
Crit W.S. (m)	217.65	Flow Area (m2)		1.93	
E.G. Slope (m/m)	0.000406	Area (m2)	0.00	38.56	0.00
Q Total (m3/s)	0.70	Flow (m3/s)		0.70	
Top Width (m)	81.78	Top Width (m)	0.01	81.76	0.01
Vel Total (m/s)	0.36	Avg. Vel. (m/s)		0.36	
Max Chl Dpth (m)	0.50	Hydr. Depth (m)		0.50	
Conv. Total (m3/s)	34.7	Conv. (m3/s)		34.7	
Length Wtd. (m)	86.70	Wetted Per. (m)		3.85	
Min Ch El (m)	217.50	Shear (N/m2)		1.99	
Alpha	1.00	Stream Power (N/m s)		0.72	
Frctn Loss (m)		Cum Volume (1000 m3)		0.98	
C & E Loss (m)		Cum SA (1000 m2)	0.00	17.66	0.00

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	218.08	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	218.07	Reach Len. (m)	86.70	86.70	86.70
Crit W.S. (m)	217.68	Flow Area (m2)		2.21	
E.G. Slope (m/m)	0.000435	Area (m2)	0.03	44.57	0.03
Q Total (m3/s)	0.91	Flow (m3/s)		0.91	
Top Width (m)	83.40	Top Width (m)	0.90	81.76	0.74
Vel Total (m/s)	0.41	Avg. Vel. (m/s)		0.41	
Max Chl Dpth (m)	0.57	Hydr. Depth (m)		0.57	
Conv. Total (m3/s)	43.6	Conv. (m3/s)		43.6	
Length Wtd. (m)	86.70	Wetted Per. (m)		3.85	
Min Ch El (m)	217.50	Shear (N/m2)		2.45	
Alpha	1.00	Stream Power (N/m s)		1.01	
Frctn Loss (m)		Cum Volume (1000 m3)		1.14	
C & E Loss (m)		Cum SA (1000 m2)	0.04	18.26	0.03

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	218.68	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	218.65	Reach Len. (m)	86.70	86.70	86.70
Crit W.S. (m)	217.92	Flow Area (m2)		4.43	
E.G. Slope (m/m)	0.000552	Area (m2)	2.60	91.79	2.55
Q Total (m3/s)	3.27	Flow (m3/s)		3.27	
Top Width (m)	97.59	Top Width (m)	7.02	81.76	8.81
Vel Total (m/s)	0.74	Avg. Vel. (m/s)		0.74	
Max Chl Dpth (m)	1.15	Hydr. Depth (m)		1.15	
Conv. Total (m3/s)	139.2	Conv. (m3/s)		139.2	
Length Wtd. (m)	86.70	Wetted Per. (m)		3.85	
Min Ch El (m)	217.50	Shear (N/m2)		6.23	
Alpha	1.00	Stream Power (N/m s)		4.59	
Frctn Loss (m)		Cum Volume (1000 m3)		2.56	
C & E Loss (m)		Cum SA (1000 m2)	0.30	21.16	0.38

CULVERT

RIVER: DUFFINS
REACH: WC36 RS: 450

INPUT
Description: EX 407 ETR CULVERT

```
Distance from Upstream XS =      14
Deck/Roadway Width        =      59
Weir Coefficient          =     1.4
Upstream  Deck/Roadway Coordinates
    num=           3
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0  219.28              55   219.1              103  218.82

Upstream Bridge Cross Section Data
Station Elevation Data    num=      45
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  219.12    1.51  219.06    1.84  219.04    2.94     219    3.34  218.93
    5.82   218.5    6.62   218.4     9.9  218.17   11.96     218   12.93   217.9
   16.67   217.5   16.74   217.5   16.76   217.5   17.48   217.5   20.95   217.5
    22.5   217.5   23.06   217.5   26.64   217.5   30.22   217.5   34.91   217.5
    35.6   217.5   42.57   217.5   49.86   217.5   81.08   217.5   83.49   217.5
   83.63   217.5   83.83   217.5    83.9   217.5   83.98   217.5   84.18   217.5
   84.21   217.5   84.34   217.5   84.47   217.5   84.55   217.5   85.25   217.5
   86.01   217.5   87.97   217.5   88.43   217.5   88.98   217.5   92.89  217.92
   93.72     218   98.21  218.45   98.28  218.45   98.73   218.5  102.53  218.52

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .07   11.96    .035   93.72     .07

Bank Sta: Left   Right    Coeff Contr.   Expan.
         11.96   93.72           .3        .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0  51.825   218.9       T
  55.675  102.53   218.9       T

Downstream  Deck/Roadway Coordinates
    num=           3
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0  219.62              60  219.37              110   219.1

Downstream Bridge Cross Section Data
Station Elevation Data    num=      89
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  219.29    2.39  219.05    2.98     219    3.36  218.93    5.89   218.5
    7.52  218.28    9.33     218   10.78  217.74   12.19   217.5    13.8  217.18
   14.67     217    16.6  216.58   16.94   216.5   17.58  216.37   19.51     216
   20.14   215.9   21.04  215.74   27.13  215.59   28.93  215.55   39.57  215.51
   39.84  215.51   40.82   215.5   47.67  215.43   49.28  215.43   50.08  215.38
   50.33  215.37   50.47  215.36   53.23  215.07   53.37  215.05    53.5  215.04
    53.8     215   53.85     215   53.94     215   54.16     215   55.61     215
   56.08     215   57.62     215   58.15     215   58.76     215   59.06     215
   59.39     215   59.73     215   59.95     215   60.01     215    60.2     215
   60.92     215   61.12     215   61.64     215   62.27     215   62.41     215
   62.89     215    62.9     215   62.95     215   63.15     215   63.59  215.06
   64.13  215.06   65.11  215.16   65.64   215.2   66.24  215.27    66.4  215.28
   66.55  215.28   66.81  215.29   66.94  215.29   67.06   215.3   67.79  215.31
   70.44   215.3   72.36  215.38   72.57  215.39   74.47  215.38   74.81  215.38
   75.47   215.5   76.37  215.54   77.84  215.62   84.18  215.98   84.61  215.98
   87.15  215.98   89.39  215.98   91.39  215.99   94.28     216   95.66   216.2
   97.72   216.5   98.71  216.65  100.73     217     103  217.37  103.89   217.5
  106.58  217.95  106.91     218  107.28  218.03  110.39  218.26

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .07   40.82    .035   75.47     .07

Bank Sta: Left   Right    Coeff Contr.   Expan.
         40.82   75.47           .3        .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0  56.325   216.5       T
  60.675  110.39   216.5       T

Upstream Embankment side slope              =       2 horiz. to 1.0 vertical
Downstream Embankment side slope            =       2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  2

Culvert Name     Shape      Rise    Span
Culvert #2      Circular    1.35
FHWA Chart # 2 - Corrugated Metal Pipe Culvert
FHWA Scale # 3 - Pipe projecting from fill
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length     Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                 .6     84.5      .013      .013        0                   .9               1
Upstream   Elevation =  217.5
           Centerline Station =  52.5
Downstream Elevation =  215
           Centerline Station =  57

Culvert Name     Shape      Rise    Span
Culvert #1      Circular    1.35
FHWA Chart # 2 - Corrugated Metal Pipe Culvert
FHWA Scale # 3 - Pipe projecting from fill
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length     Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                1.2     84.5      .013      .013        0                   .9               1
Upstream   Elevation =  217.5
           Centerline Station =  55
Downstream Elevation =  215
           Centerline Station =  60

CULVERT OUTPUT  Profile #2-yr  Culv Group:  Culvert #2

  Q Culv Group (m3/s)       0.09    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         1.01
  Q Barrel (m3/s)           0.09    Culv Vel DS (m/s)         2.02
  E.G. US. (m)            217.75    Culv Inv El Up (m)      217.50
  W.S. US. (m)            217.75    Culv Inv El Dn (m)      215.00
  E.G. DS (m)             215.08    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             215.06    Culv Exit Loss (m)        0.22
  Delta EG (m)              2.67    Culv Entr Loss (m)        0.05
  Delta WS (m)              2.69    Q Weir (m3/s)
  E.G. IC (m)             217.69    Weir Sta Lft (m)
  E.G. OC (m)             217.75    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       217.65    Weir Max Depth (m)
  Culv WS Outlet (m)      215.10    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.10    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.15    Min El Weir Flow (m)    218.90


Note:    During supercritical analysis, the culvert direct step method went to normal depth.  The program then assumed
         normal depth at the outlet.
Note:    The flow in the culvert is entirely supercritical.

CULVERT OUTPUT  Profile #5-yr  Culv Group:  Culvert #2

  Q Culv Group (m3/s)       0.14    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         1.12
  Q Barrel (m3/s)           0.14    Culv Vel DS (m/s)         2.29
  E.G. US. (m)            217.81    Culv Inv El Up (m)      217.50
  W.S. US. (m)            217.81    Culv Inv El Dn (m)      215.00
  E.G. DS (m)             215.11    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             215.07    Culv Exit Loss (m)        0.27
  Delta EG (m)              2.70    Culv Entr Loss (m)        0.06
  Delta WS (m)              2.73    Q Weir (m3/s)
  E.G. IC (m)             217.73    Weir Sta Lft (m)
  E.G. OC (m)             217.81    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       217.69    Weir Max Depth (m)
  Culv WS Outlet (m)      215.12    Weir Avg Depth (m)
```

Culv Nml Depth (m)	0.12	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.19	Min El Weir Flow (m)	218.90

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #10-yr Culv Group: Culvert #2

Q Culv Group (m3/s)	0.18	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.21
Q Barrel (m3/s)	0.18	Culv Vel DS (m/s)	2.56
E.G. US. (m)	217.86	Culv Inv El Up (m)	217.50
W.S. US. (m)	217.86	Culv Inv El Dn (m)	215.00
E.G. DS (m)	215.13	Culv Frctn Ls (m)	0.00
W.S. DS (m)	215.08	Culv Exit Loss (m)	0.33
Delta EG (m)	2.73	Culv Entr Loss (m)	0.07
Delta WS (m)	2.77	Q Weir (m3/s)	
E.G. IC (m)	217.78	Weir Sta Lft (m)	
E.G. OC (m)	217.86	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	217.72	Weir Max Depth (m)	
Culv WS Outlet (m)	215.13	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.13	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.22	Min El Weir Flow (m)	218.90

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #25-yr Culv Group: Culvert #2

Q Culv Group (m3/s)	0.25	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.32
Q Barrel (m3/s)	0.25	Culv Vel DS (m/s)	2.76
E.G. US. (m)	217.92	Culv Inv El Up (m)	217.50
W.S. US. (m)	217.92	Culv Inv El Dn (m)	215.00
E.G. DS (m)	215.17	Culv Frctn Ls (m)	0.00
W.S. DS (m)	215.12	Culv Exit Loss (m)	0.38
Delta EG (m)	2.76	Culv Entr Loss (m)	0.08
Delta WS (m)	2.80	Q Weir (m3/s)	
E.G. IC (m)	217.83	Weir Sta Lft (m)	
E.G. OC (m)	217.92	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	217.75	Weir Max Depth (m)	
Culv WS Outlet (m)	215.15	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.15	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.25	Min El Weir Flow (m)	218.90

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #50-yr Culv Group: Culvert #2

Q Culv Group (m3/s)	0.29	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.38
Q Barrel (m3/s)	0.29	Culv Vel DS (m/s)	2.90
E.G. US. (m)	217.96	Culv Inv El Up (m)	217.50
W.S. US. (m)	217.96	Culv Inv El Dn (m)	215.00
E.G. DS (m)	215.19	Culv Frctn Ls (m)	0.00
W.S. DS (m)	215.12	Culv Exit Loss (m)	0.41
Delta EG (m)	2.78	Culv Entr Loss (m)	0.09
Delta WS (m)	2.83	Q Weir (m3/s)	
E.G. IC (m)	217.86	Weir Sta Lft (m)	
E.G. OC (m)	217.96	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	217.78	Weir Max Depth (m)	
Culv WS Outlet (m)	215.17	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.17	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.28	Min El Weir Flow (m)	218.90

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #100-yr Culv Group: Culvert #2

Q Culv Group (m3/s)	0.35	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.45
Q Barrel (m3/s)	0.35	Culv Vel DS (m/s)	3.10
E.G. US. (m)	218.01	Culv Inv El Up (m)	217.50
W.S. US. (m)	218.00	Culv Inv El Dn (m)	215.00
E.G. DS (m)	215.21	Culv Frctn Ls (m)	0.00
W.S. DS (m)	215.14	Culv Exit Loss (m)	0.46
Delta EG (m)	2.80	Culv Entr Loss (m)	0.10
Delta WS (m)	2.86	Q Weir (m3/s)	
E.G. IC (m)	217.90	Weir Sta Lft (m)	
E.G. OC (m)	218.01	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	217.80	Weir Max Depth (m)	
Culv WS Outlet (m)	215.18	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.18	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.30	Min El Weir Flow (m)	218.90

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #Check Flow Culv Group: Culvert #2

Q Culv Group (m3/s)	0.46	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.56
Q Barrel (m3/s)	0.46	Culv Vel DS (m/s)	3.34
E.G. US. (m)	218.08	Culv Inv El Up (m)	217.50
W.S. US. (m)	218.07	Culv Inv El Dn (m)	215.00
E.G. DS (m)	215.25	Culv Frctn Ls (m)	0.00
W.S. DS (m)	215.16	Culv Exit Loss (m)	0.53
Delta EG (m)	2.84	Culv Entr Loss (m)	0.11
Delta WS (m)	2.91	Q Weir (m3/s)	
E.G. IC (m)	217.97	Weir Sta Lft (m)	
E.G. OC (m)	218.08	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	217.85	Weir Max Depth (m)	
Culv WS Outlet (m)	215.20	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.20	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.35	Min El Weir Flow (m)	218.90

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #Regional Culv Group: Culvert #2

Q Culv Group (m3/s)	1.64	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	2.28
Q Barrel (m3/s)	1.64	Culv Vel DS (m/s)	4.78
E.G. US. (m)	218.68	Culv Inv El Up (m)	217.50
W.S. US. (m)	218.65	Culv Inv El Dn (m)	215.00
E.G. DS (m)	215.58	Culv Frctn Ls (m)	0.00
W.S. DS (m)	215.39	Culv Exit Loss (m)	0.98
Delta EG (m)	3.10	Culv Entr Loss (m)	0.24
Delta WS (m)	3.27	Q Weir (m3/s)	
E.G. IC (m)	218.53	Weir Sta Lft (m)	
E.G. OC (m)	218.68	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	218.18	Weir Max Depth (m)	
Culv WS Outlet (m)	215.39	Weir Avg Depth (m)	

Culv Nml Depth (m)	0.38	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.68	Min El Weir Flow (m)	218.90

Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #2-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.09	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.01
Q Barrel (m3/s)	0.09	Culv Vel DS (m/s)	2.02
E.G. US. (m)	217.75	Culv Inv El Up (m)	217.50
W.S. US. (m)	217.75	Culv Inv El Dn (m)	215.00
E.G. DS (m)	215.08	Culv Frctn Ls (m)	0.00
W.S. DS (m)	215.06	Culv Exit Loss (m)	0.22
Delta EG (m)	2.67	Culv Entr Loss (m)	0.05
Delta WS (m)	2.69	Q Weir (m3/s)	
E.G. IC (m)	217.69	Weir Sta Lft (m)	
E.G. OC (m)	217.75	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	217.65	Weir Max Depth (m)	
Culv WS Outlet (m)	215.10	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.10	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.15	Min El Weir Flow (m)	218.90

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #5-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.14	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.12
Q Barrel (m3/s)	0.14	Culv Vel DS (m/s)	2.29
E.G. US. (m)	217.81	Culv Inv El Up (m)	217.50
W.S. US. (m)	217.81	Culv Inv El Dn (m)	215.00
E.G. DS (m)	215.11	Culv Frctn Ls (m)	0.00
W.S. DS (m)	215.07	Culv Exit Loss (m)	0.27
Delta EG (m)	2.70	Culv Entr Loss (m)	0.06
Delta WS (m)	2.73	Q Weir (m3/s)	
E.G. IC (m)	217.73	Weir Sta Lft (m)	
E.G. OC (m)	217.81	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	217.69	Weir Max Depth (m)	
Culv WS Outlet (m)	215.12	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.12	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.19	Min El Weir Flow (m)	218.90

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #10-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.18	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.21
Q Barrel (m3/s)	0.18	Culv Vel DS (m/s)	2.56
E.G. US. (m)	217.86	Culv Inv El Up (m)	217.50
W.S. US. (m)	217.86	Culv Inv El Dn (m)	215.00
E.G. DS (m)	215.13	Culv Frctn Ls (m)	0.00
W.S. DS (m)	215.08	Culv Exit Loss (m)	0.33
Delta EG (m)	2.73	Culv Entr Loss (m)	0.07
Delta WS (m)	2.77	Q Weir (m3/s)	
E.G. IC (m)	217.78	Weir Sta Lft (m)	
E.G. OC (m)	217.86	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	217.72	Weir Max Depth (m)	
Culv WS Outlet (m)	215.13	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.13	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.22	Min El Weir Flow (m)	218.90

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #25-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.25	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.32
Q Barrel (m3/s)	0.25	Culv Vel DS (m/s)	2.76
E.G. US. (m)	217.92	Culv Inv El Up (m)	217.50
W.S. US. (m)	217.92	Culv Inv El Dn (m)	215.00
E.G. DS (m)	215.17	Culv Frctn Ls (m)	0.00
W.S. DS (m)	215.12	Culv Exit Loss (m)	0.38
Delta EG (m)	2.76	Culv Entr Loss (m)	0.08
Delta WS (m)	2.80	Q Weir (m3/s)	
E.G. IC (m)	217.83	Weir Sta Lft (m)	
E.G. OC (m)	217.92	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	217.75	Weir Max Depth (m)	
Culv WS Outlet (m)	215.15	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.15	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.25	Min El Weir Flow (m)	218.90

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #50-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.29	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.38
Q Barrel (m3/s)	0.29	Culv Vel DS (m/s)	2.90
E.G. US. (m)	217.96	Culv Inv El Up (m)	217.50
W.S. US. (m)	217.96	Culv Inv El Dn (m)	215.00
E.G. DS (m)	215.19	Culv Frctn Ls (m)	0.00
W.S. DS (m)	215.12	Culv Exit Loss (m)	0.41
Delta EG (m)	2.78	Culv Entr Loss (m)	0.09
Delta WS (m)	2.83	Q Weir (m3/s)	
E.G. IC (m)	217.86	Weir Sta Lft (m)	
E.G. OC (m)	217.96	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	217.78	Weir Max Depth (m)	
Culv WS Outlet (m)	215.17	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.17	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.28	Min El Weir Flow (m)	218.90

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #100-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.35	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.45
Q Barrel (m3/s)	0.35	Culv Vel DS (m/s)	3.10
E.G. US. (m)	218.01	Culv Inv El Up (m)	217.50
W.S. US. (m)	218.00	Culv Inv El Dn (m)	215.00
E.G. DS (m)	215.21	Culv Frctn Ls (m)	0.00
W.S. DS (m)	215.14	Culv Exit Loss (m)	0.46
Delta EG (m)	2.80	Culv Entr Loss (m)	0.10
Delta WS (m)	2.86	Q Weir (m3/s)	
E.G. IC (m)	217.90	Weir Sta Lft (m)	
E.G. OC (m)	218.01	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	217.80	Weir Max Depth (m)	
Culv WS Outlet (m)	215.18	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.18	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.30	Min El Weir Flow (m)	218.90

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #Check Flow Culv Group: Culvert #1

Q Culv Group (m3/s)	0.46	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.56
Q Barrel (m3/s)	0.46	Culv Vel DS (m/s)	3.34
E.G. US. (m)	218.08	Culv Inv El Up (m)	217.50
W.S. US. (m)	218.07	Culv Inv El Dn (m)	215.00
E.G. DS (m)	215.25	Culv Frctn Ls (m)	0.00
W.S. DS (m)	215.16	Culv Exit Loss (m)	0.53
Delta EG (m)	2.84	Culv Entr Loss (m)	0.11
Delta WS (m)	2.91	Q Weir (m3/s)	
E.G. IC (m)	217.97	Weir Sta Lft (m)	
E.G. OC (m)	218.08	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	217.85	Weir Max Depth (m)	
Culv WS Outlet (m)	215.20	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.20	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.35	Min El Weir Flow (m)	218.90

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #Regional Culv Group: Culvert #1

Q Culv Group (m3/s)	1.64	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	2.28
Q Barrel (m3/s)	1.64	Culv Vel DS (m/s)	4.78
E.G. US. (m)	218.68	Culv Inv El Up (m)	217.50
W.S. US. (m)	218.65	Culv Inv El Dn (m)	215.00
E.G. DS (m)	215.58	Culv Frctn Ls (m)	0.00
W.S. DS (m)	215.39	Culv Exit Loss (m)	0.98
Delta EG (m)	3.10	Culv Entr Loss (m)	0.24
Delta WS (m)	3.27	Q Weir (m3/s)	
E.G. IC (m)	218.53	Weir Sta Lft (m)	
E.G. OC (m)	218.68	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	218.18	Weir Max Depth (m)	
Culv WS Outlet (m)	215.39	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.38	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.68	Min El Weir Flow (m)	218.90

Note: The flow in the culvert is entirely supercritical.

CROSS SECTION

RIVER: DUFFINS
REACH: WC36 RS: 400

INPUT
Description: ST 400 (Updated Sep 2016)
Station Elevation Data num= 89

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	219.29	2.39	219.05	2.98	219	3.36	218.93	5.89	218.5
7.52	218.28	9.33	218	10.78	217.74	12.19	217.5	13.8	217.18
14.67	217	16.6	216.58	16.94	216.5	17.58	216.37	19.51	216
20.14	215.9	21.04	215.74	27.13	215.59	28.93	215.55	39.57	215.51
39.84	215.51	40.82	215.5	47.67	215.43	49.28	215.43	50.08	215.38
50.33	215.37	50.47	215.36	53.23	215.07	53.37	215.05	53.5	215.04
53.8	215	53.85	215	53.94	215	54.16	215	55.61	215
56.08	215	57.62	215	58.15	215	58.76	215	59.06	215
59.39	215	59.73	215	59.95	215	60.01	215	60.2	215
60.92	215	61.12	215	61.64	215	62.27	215	62.41	215
62.89	215	62.9	215	62.95	215	63.15	215	63.59	215.06
64.13	215.06	65.11	215.16	65.64	215.2	66.24	215.27	66.4	215.28
66.55	215.28	66.81	215.29	66.94	215.29	67.06	215.3	67.79	215.31
70.44	215.3	72.36	215.38	72.57	215.39	74.47	215.38	74.81	215.38
75.47	215.5	76.37	215.54	77.84	215.62	84.18	215.98	84.61	215.98
87.15	215.98	89.39	215.98	91.39	215.99	94.28	216	95.66	216.2
97.72	216.5	98.71	216.65	100.73	217	103	217.37	103.89	217.5
106.58	217.95	106.91	218	107.28	218.03	110.39	218.26		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	40.82	.035	75.47	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
40.82	75.47	122.3	122.3	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	56.325	216.5	T
60.675	110.39	216.5	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	215.08	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	215.06	Reach Len. (m)	122.30	122.30	122.30
Crit W.S. (m)	215.06	Flow Area (m2)		0.27	
E.G. Slope (m/m)	0.023496	Area (m2)		0.60	
Q Total (m3/s)	0.18	Flow (m3/s)		0.18	
Top Width (m)	10.85	Top Width (m)		10.85	
Vel Total (m/s)	0.68	Avg. Vel. (m/s)		0.68	
Max Chl Dpth (m)	0.06	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	1.2	Conv. (m3/s)		1.2	
Length Wtd. (m)	122.30	Wetted Per. (m)		4.35	
Min Ch El (m)	215.00	Shear (N/m2)		14.05	
Alpha	1.00	Stream Power (N/m s)		9.53	
Frctn Loss (m)	0.16	Cum Volume (1000 m3)		0.41	
C & E Loss (m)	0.01	Cum SA (1000 m2)		10.09	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	215.11	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.035	
W.S. Elev (m)	215.07	Reach Len. (m)	122.30	122.30	122.30
Crit W.S. (m)	215.07	Flow Area (m2)		0.32	
E.G. Slope (m/m)	0.028635	Area (m2)		0.73	
Q Total (m3/s)	0.27	Flow (m3/s)		0.27	
Top Width (m)	11.07	Top Width (m)		11.07	
Vel Total (m/s)	0.85	Avg. Vel. (m/s)		0.85	
Max Chl Dpth (m)	0.07	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	1.6	Conv. (m3/s)		1.6	
Length Wtd. (m)	122.30	Wetted Per. (m)		4.35	
Min Ch El (m)	215.00	Shear (N/m2)		20.58	
Alpha	1.00	Stream Power (N/m s)		17.43	
Frctn Loss (m)	0.18	Cum Volume (1000 m3)		0.52	
C & E Loss (m)	0.02	Cum SA (1000 m2)		10.62	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	215.13	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	215.08	Reach Len. (m)	122.30	122.30	122.30
Crit W.S. (m)	215.08	Flow Area (m2)		0.37	
E.G. Slope (m/m)	0.032019	Area (m2)		0.86	
Q Total (m3/s)	0.36	Flow (m3/s)		0.36	
Top Width (m)	11.28	Top Width (m)		11.28	
Vel Total (m/s)	0.98	Avg. Vel. (m/s)		0.98	
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	2.0	Conv. (m3/s)		2.0	
Length Wtd. (m)	122.30	Wetted Per. (m)		4.35	
Min Ch El (m)	215.00	Shear (N/m2)		26.45	
Alpha	1.00	Stream Power (N/m s)		25.98	
Frctn Loss (m)	0.20	Cum Volume (1000 m3)		0.60	
C & E Loss (m)	0.02	Cum SA (1000 m2)		10.89	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	215.17	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	215.12	Reach Len. (m)	122.30	122.30	122.30
Crit W.S. (m)	215.12	Flow Area (m2)		0.52	
E.G. Slope (m/m)	0.018410	Area (m2)		1.27	
Q Total (m3/s)	0.49	Flow (m3/s)		0.49	
Top Width (m)	11.96	Top Width (m)		11.96	
Vel Total (m/s)	0.94	Avg. Vel. (m/s)		0.94	
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.12	
Conv. Total (m3/s)	3.6	Conv. (m3/s)		3.6	
Length Wtd. (m)	122.30	Wetted Per. (m)		4.35	
Min Ch El (m)	215.00	Shear (N/m2)		21.60	
Alpha	1.00	Stream Power (N/m s)		20.34	
Frctn Loss (m)	0.20	Cum Volume (1000 m3)		0.77	
C & E Loss (m)	0.02	Cum SA (1000 m2)		13.11	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	215.19	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.035	
W.S. Elev (m)	215.12	Reach Len. (m)	122.30	122.30	122.30
Crit W.S. (m)	215.12	Flow Area (m2)		0.54	
E.G. Slope (m/m)	0.024041	Area (m2)		1.31	
Q Total (m3/s)	0.59	Flow (m3/s)		0.59	
Top Width (m)	12.03	Top Width (m)		12.03	
Vel Total (m/s)	1.10	Avg. Vel. (m/s)		1.10	
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.12	
Conv. Total (m3/s)	3.8	Conv. (m3/s)		3.8	
Length Wtd. (m)	122.30	Wetted Per. (m)		4.35	
Min Ch El (m)	215.00	Shear (N/m2)		29.11	
Alpha	1.00	Stream Power (N/m s)		31.98	
Frctn Loss (m)	0.22	Cum Volume (1000 m3)		0.85	
C & E Loss (m)	0.03	Cum SA (1000 m2)		13.31	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	215.21	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.035	
W.S. Elev (m)	215.14	Reach Len. (m)	122.30	122.30	122.30
Crit W.S. (m)	215.14	Flow Area (m2)		0.60	
E.G. Slope (m/m)	0.023366	Area (m2)		1.49	
Q Total (m3/s)	0.70	Flow (m3/s)		0.70	
Top Width (m)	12.31	Top Width (m)		12.31	
Vel Total (m/s)	1.17	Avg. Vel. (m/s)		1.17	
Max Chl Dpth (m)	0.14	Hydr. Depth (m)		0.14	
Conv. Total (m3/s)	4.6	Conv. (m3/s)		4.6	
Length Wtd. (m)	122.30	Wetted Per. (m)		4.35	
Min Ch El (m)	215.00	Shear (N/m2)		31.62	
Alpha	1.00	Stream Power (N/m s)		36.87	
Frctn Loss (m)	0.23	Cum Volume (1000 m3)		0.93	
C & E Loss (m)	0.03	Cum SA (1000 m2)		13.58	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	215.25	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.		0.035	
W.S. Elev (m)	215.16	Reach Len. (m)	122.30	122.30	122.30
Crit W.S. (m)	215.16	Flow Area (m2)		0.72	
E.G. Slope (m/m)	0.021833	Area (m2)		1.83	
Q Total (m3/s)	0.91	Flow (m3/s)		0.91	
Top Width (m)	12.85	Top Width (m)		12.85	
Vel Total (m/s)	1.27	Avg. Vel. (m/s)		1.27	
Max Chl Dpth (m)	0.16	Hydr. Depth (m)		0.16	
Conv. Total (m3/s)	6.2	Conv. (m3/s)		6.2	
Length Wtd. (m)	122.30	Wetted Per. (m)		4.35	
Min Ch El (m)	215.00	Shear (N/m2)		35.29	
Alpha	1.00	Stream Power (N/m s)		44.79	
Frctn Loss (m)	0.25	Cum Volume (1000 m3)		1.09	
C & E Loss (m)	0.04	Cum SA (1000 m2)		14.16	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than

1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	215.58	Element	Left OB	Channel	Right OB
Vel Head (m)	0.19	Wt. n-Val.		0.035	
W.S. Elev (m)	215.39	Reach Len. (m)	122.30	122.30	122.30
Crit W.S. (m)	215.39	Flow Area (m2)		1.68	
E.G. Slope (m/m)	0.016524	Area (m2)		5.54	
Q Total (m3/s)	3.27	Flow (m3/s)		3.27	
Top Width (m)	24.07	Top Width (m)		24.07	
Vel Total (m/s)	1.95	Avg. Vel. (m/s)		1.95	
Max Chl Dpth (m)	0.39	Hydr. Depth (m)		0.39	
Conv. Total (m3/s)	25.4	Conv. (m3/s)		25.4	
Length Wtd. (m)	122.30	Wetted Per. (m)		4.35	
Min Ch El (m)	215.00	Shear (N/m2)		62.56	
Alpha	1.00	Stream Power (N/m s)		121.81	
Frctn Loss (m)	0.33	Cum Volume (1000 m3)		2.43	
C & E Loss (m)	0.09	Cum SA (1000 m2)		16.57	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: DUFFINS
REACH: WC36 RS: 300

INPUT
Description: ST 300 (Updated Sep 2016)
Station Elevation Data num= 102

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	217	2.008	216.921	3.091	216.878	7.617	216.669	9.848	216.566
11.643	216.504	11.998	216.5	13.833	216.48	16.457	216.389	17.397	216.368
18.281	216.339	19.909	216.295	22.084	216.209	29.186	216	29.243	215.997
32.845	215.776	37.255	215.5	42.231	215.255	48.299	215	54.954	214.724
60.936	214.543	61.096	214.538	62.226	214.5	62.575	214.499	63.924	214.495
64.032	214.494	64.072	214.494	65.347	214.493	66.778	214.493	68.209	214.493
68.515	214.493	68.643	214.495	68.723	214.495	70.54	214.499	70.992	214.5
75.679	214.502	76.56	214.503	78.692	214.504	82.674	214.506	83.099	214.507
83.789	214.507	84.198	214.507	84.207	214.507	85.5	214.508	86.808	214.509
86.862	214.509	86.943	214.509	87.035	214.509	87.167	214.509	87.641	214.51
87.838	214.51	88.085	214.51	88.101	214.51	89.094	214.51	89.241	214.51
90.331	214.51	90.337	214.51	90.662	214.51	91.97	214.51	92.479	214.51
92.776	214.51	92.812	214.51	94.349	214.51	94.383	214.51	94.558	214.51
95.294	214.509	96.388	214.509	96.569	214.508	96.695	214.508	98.353	214.507
99.744	214.506	100.905	214.505	102.67	214.504	102.691	214.504	103.062	214.504
103.227	214.504	105.301	214.523	107.099	214.541	112.296	214.604	115.805	214.647
117.232	214.665	118.793	214.692	119.106	214.698	120.043	214.714	121.29	214.738
121.582	214.745	122.926	214.771	124.441	214.813	131.284	214.948	133.594	215
135.418	215.206	137.854	215.474	138.082	215.5	138.593	215.551	140.736	215.764
143.193	216	143.373	216	143.699	216	144.341	216	146.908	216
148.777	216	148.796	216						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	48.299	.035	133.594	.07

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
48.299 133.594 33 34 22 .3 .5

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	214.56	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	214.56	Reach Len. (m)	33.00	34.00	22.00
Crit W.S. (m)		Flow Area (m2)		2.33	
E.G. Slope (m/m)	0.000410	Area (m2)		2.33	
Q Total (m3/s)	0.18	Flow (m3/s)		0.18	
Top Width (m)	47.84	Top Width (m)		47.84	
Vel Total (m/s)	0.08	Avg. Vel. (m/s)		0.08	
Max Chl Dpth (m)	0.06	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	8.9	Conv. (m3/s)		8.9	
Length Wtd. (m)	34.00	Wetted Per. (m)		47.84	
Min Ch El (m)	214.49	Shear (N/m2)		0.20	
Alpha	1.00	Stream Power (N/m s)		0.02	
Frctn Loss (m)	0.02	Cum Volume (1000 m3)		0.23	
C & E Loss (m)	0.00	Cum SA (1000 m2)		6.50	

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	214.57	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	214.57	Reach Len. (m)	33.00	34.00	22.00
Crit W.S. (m)		Flow Area (m2)		2.86	
E.G. Slope (m/m)	0.000482	Area (m2)		2.86	
Q Total (m3/s)	0.27	Flow (m3/s)		0.27	
Top Width (m)	49.11	Top Width (m)		49.11	
Vel Total (m/s)	0.09	Avg. Vel. (m/s)		0.09	
Max Chl Dpth (m)	0.07	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	12.3	Conv. (m3/s)		12.3	
Length Wtd. (m)	34.00	Wetted Per. (m)		49.11	
Min Ch El (m)	214.49	Shear (N/m2)		0.28	
Alpha	1.00	Stream Power (N/m s)		0.03	
Frctn Loss (m)	0.02	Cum Volume (1000 m3)		0.30	
C & E Loss (m)	0.00	Cum SA (1000 m2)		6.94	

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	214.58	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	214.58	Reach Len. (m)	33.00	34.00	22.00
Crit W.S. (m)		Flow Area (m2)		3.35	
E.G. Slope (m/m)	0.000525	Area (m2)		3.35	
Q Total (m3/s)	0.36	Flow (m3/s)		0.36	
Top Width (m)	50.24	Top Width (m)		50.24	
Vel Total (m/s)	0.11	Avg. Vel. (m/s)		0.11	
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	15.7	Conv. (m3/s)		15.7	
Length Wtd. (m)	34.00	Wetted Per. (m)		50.24	
Min Ch El (m)	214.49	Shear (N/m2)		0.34	
Alpha	1.00	Stream Power (N/m s)		0.04	
Frctn Loss (m)	0.02	Cum Volume (1000 m3)		0.35	
C & E Loss (m)	0.00	Cum SA (1000 m2)		7.13	

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	214.59	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	214.59	Reach Len. (m)	33.00	34.00	22.00
Crit W.S. (m)		Flow Area (m2)		3.97	
E.G. Slope (m/m)	0.000572	Area (m2)		3.97	
Q Total (m3/s)	0.49	Flow (m3/s)		0.49	
Top Width (m)	51.65	Top Width (m)		51.65	

Vel Total (m/s)	0.12	Avg. Vel. (m/s)	0.12
Max Chl Dpth (m)	0.10	Hydr. Depth (m)	0.08
Conv. Total (m3/s)	20.5	Conv. (m3/s)	20.5
Length Wtd. (m)	34.00	Wetted Per. (m)	51.65
Min Ch El (m)	214.49	Shear (N/m2)	0.43
Alpha	1.00	Stream Power (N/m s)	0.05
Frctn Loss (m)	0.02	Cum Volume (1000 m3)	0.45
C & E Loss (m)	0.00	Cum SA (1000 m2)	9.22

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	214.60	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	214.60	Reach Len. (m)	33.00	34.00	22.00
Crit W.S. (m)		Flow Area (m2)		4.41	
E.G. Slope (m/m)	0.000599	Area (m2)		4.41	
Q Total (m3/s)	0.59	Flow (m3/s)		0.59	
Top Width (m)	52.63	Top Width (m)		52.63	
Vel Total (m/s)	0.13	Avg. Vel. (m/s)		0.13	
Max Chl Dpth (m)	0.10	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	24.1	Conv. (m3/s)		24.1	
Length Wtd. (m)	34.00	Wetted Per. (m)		52.63	
Min Ch El (m)	214.49	Shear (N/m2)		0.49	
Alpha	1.00	Stream Power (N/m s)		0.07	
Frctn Loss (m)	0.02	Cum Volume (1000 m3)		0.50	
C & E Loss (m)	0.00	Cum SA (1000 m2)		9.36	

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	214.61	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	214.60	Reach Len. (m)	33.00	34.00	22.00
Crit W.S. (m)		Flow Area (m2)		4.79	
E.G. Slope (m/m)	0.000651	Area (m2)		4.79	
Q Total (m3/s)	0.70	Flow (m3/s)		0.70	
Top Width (m)	53.47	Top Width (m)		53.47	
Vel Total (m/s)	0.15	Avg. Vel. (m/s)		0.15	
Max Chl Dpth (m)	0.11	Hydr. Depth (m)		0.09	
Conv. Total (m3/s)	27.4	Conv. (m3/s)		27.4	
Length Wtd. (m)	34.00	Wetted Per. (m)		53.47	
Min Ch El (m)	214.49	Shear (N/m2)		0.57	
Alpha	1.00	Stream Power (N/m s)		0.08	
Frctn Loss (m)	0.02	Cum Volume (1000 m3)		0.55	
C & E Loss (m)	0.00	Cum SA (1000 m2)		9.56	

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	214.62	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	214.62	Reach Len. (m)	33.00	34.00	22.00
Crit W.S. (m)		Flow Area (m2)		5.48	
E.G. Slope (m/m)	0.000729	Area (m2)		5.48	
Q Total (m3/s)	0.91	Flow (m3/s)		0.91	
Top Width (m)	54.93	Top Width (m)		54.93	
Vel Total (m/s)	0.17	Avg. Vel. (m/s)		0.17	
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.10	
Conv. Total (m3/s)	33.7	Conv. (m3/s)		33.7	
Length Wtd. (m)	34.00	Wetted Per. (m)		54.93	
Min Ch El (m)	214.49	Shear (N/m2)		0.71	
Alpha	1.00	Stream Power (N/m s)		0.12	
Frctn Loss (m)	0.03	Cum Volume (1000 m3)		0.64	
C & E Loss (m)	0.00	Cum SA (1000 m2)		10.02	

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	214.72	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	214.71	Reach Len. (m)	33.00	34.00	22.00
Crit W.S. (m)		Flow Area (m2)		11.21	
E.G. Slope (m/m)	0.001077	Area (m2)		11.21	
Q Total (m3/s)	3.27	Flow (m3/s)		3.27	
Top Width (m)	64.66	Top Width (m)		64.66	
Vel Total (m/s)	0.29	Avg. Vel. (m/s)		0.29	
Max Chl Dpth (m)	0.22	Hydr. Depth (m)		0.17	
Conv. Total (m3/s)	99.6	Conv. (m3/s)		99.6	
Length Wtd. (m)	34.00	Wetted Per. (m)		64.66	
Min Ch El (m)	214.49	Shear (N/m2)		1.83	
Alpha	1.00	Stream Power (N/m s)		0.53	
Frctn Loss (m)	0.04	Cum Volume (1000 m3)		1.41	
C & E Loss (m)	0.00	Cum SA (1000 m2)		11.15	

CROSS SECTION

RIVER: DUFFINS
REACH: WC36 RS: 200

INPUT
Description: ST 200 (Updated Sep 2016)
Station Elevation Data num= 84

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	216.95	3.24	216.78	8.73	216.5	16.52	216.22	23.43	216
24.51	215.99	28.15	215.93	34.68	215.84	38.74	215.81	40.79	215.79
43.88	215.75	44.33	215.75	45.54	215.78	48.59	215.8	50.84	215.8
55.35	215.79	57.66	215.75	61.47	215.66	64.88	215.5	68.83	215.32
76.07	215	82.76	214.85	83.53	214.83	96.43	214.5	100.1	214.48
102.36	214.47	106.2	214.49	107.04	214.49	108.55	214.5	109.98	214.5
112.19	214.5	113.17	214.5	113.49	214.5	113.91	214.5	114.04	214.5
114.14	214.5	114.38	214.5	114.72	214.5	114.78	214.5	115.43	214.5
118.12	214.5	121.32	214.5	121.34	214.5	121.88	214.5	122.44	214.5
127.39	214.5	128.15	214.5	128.19	214.5	128.98	214.5	129.78	214.5
131.99	214.5	132.29	214.5	132.55	214.5	132.79	214.5	133.94	214.5
135.32	214.5	135.81	214.5	136.11	214.5	136.67	214.5	138.66	214.5
139.76	214.5	140.48	214.5	142.73	214.5	143.24	214.5	143.57	214.5
144.07	214.5	144.32	214.5	144.37	214.5	145.12	214.5	145.28	214.5
149.09	214.5	153.81	214.5	153.91	214.5	154.08	214.51	154.12	214.51
160.3	214.73	160.71	214.74	165.29	215	166.92	215.2	169.88	215.5
174.71	215.92	175.63	216	181.05	216	181.09	216		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	76.07	.035	165.29	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
76.07	165.29	40	35	41	.3	.5

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	214.54	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	214.54	Reach Len. (m)	40.00	35.00	41.00
Crit W.S. (m)		Flow Area (m2)		2.41	
E.G. Slope (m/m)	0.000499	Area (m2)		2.41	
Q Total (m3/s)	0.18	Flow (m3/s)		0.18	
Top Width (m)	59.95	Top Width (m)		59.95	
Vel Total (m/s)	0.07	Avg. Vel. (m/s)		0.07	
Max Chl Dpth (m)	0.07	Hydr. Depth (m)		0.04	
Conv. Total (m3/s)	8.1	Conv. (m3/s)		8.1	
Length Wtd. (m)	35.00	Wetted Per. (m)		59.95	
Min Ch El (m)	214.47	Shear (N/m2)		0.20	
Alpha	1.00	Stream Power (N/m s)		0.01	
Frctn Loss (m)	0.05	Cum Volume (1000 m3)		0.15	
C & E Loss (m)	0.00	Cum SA (1000 m2)		4.66	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	214.55	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	214.55	Reach Len. (m)	40.00	35.00	41.00
Crit W.S. (m)		Flow Area (m2)		3.13	
E.G. Slope (m/m)	0.000477	Area (m2)		3.13	
Q Total (m3/s)	0.27	Flow (m3/s)		0.27	
Top Width (m)	60.75	Top Width (m)		60.75	
Vel Total (m/s)	0.09	Avg. Vel. (m/s)		0.09	
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	12.4	Conv. (m3/s)		12.4	
Length Wtd. (m)	35.00	Wetted Per. (m)		60.75	
Min Ch El (m)	214.47	Shear (N/m2)		0.24	
Alpha	1.00	Stream Power (N/m s)		0.02	
Frctn Loss (m)	0.05	Cum Volume (1000 m3)		0.20	
C & E Loss (m)	0.00	Cum SA (1000 m2)		5.07	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	214.56	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	214.56	Reach Len. (m)	40.00	35.00	41.00
Crit W.S. (m)		Flow Area (m2)		3.51	
E.G. Slope (m/m)	0.000581	Area (m2)		3.51	
Q Total (m3/s)	0.36	Flow (m3/s)		0.36	
Top Width (m)	61.18	Top Width (m)		61.18	
Vel Total (m/s)	0.10	Avg. Vel. (m/s)		0.10	
Max Chl Dpth (m)	0.09	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	14.9	Conv. (m3/s)		14.9	
Length Wtd. (m)	35.00	Wetted Per. (m)		61.18	
Min Ch El (m)	214.47	Shear (N/m2)		0.33	
Alpha	1.00	Stream Power (N/m s)		0.03	
Frctn Loss (m)	0.06	Cum Volume (1000 m3)		0.23	
C & E Loss (m)	0.00	Cum SA (1000 m2)		5.23	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	214.57	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	214.57	Reach Len. (m)	40.00	35.00	41.00
Crit W.S. (m)		Flow Area (m2)		4.34	
E.G. Slope (m/m)	0.000543	Area (m2)		4.34	
Q Total (m3/s)	0.49	Flow (m3/s)		0.49	
Top Width (m)	62.08	Top Width (m)		62.08	
Vel Total (m/s)	0.11	Avg. Vel. (m/s)		0.11	
Max Chl Dpth (m)	0.10	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	21.0	Conv. (m3/s)		21.0	
Length Wtd. (m)	35.00	Wetted Per. (m)		62.08	
Min Ch El (m)	214.47	Shear (N/m2)		0.37	
Alpha	1.00	Stream Power (N/m s)		0.04	
Frctn Loss (m)	0.05	Cum Volume (1000 m3)		0.31	
C & E Loss (m)	0.00	Cum SA (1000 m2)		7.29	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	214.58	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	214.58	Reach Len. (m)	40.00	35.00	41.00
Crit W.S. (m)		Flow Area (m2)		4.82	
E.G. Slope (m/m)	0.000560	Area (m2)		4.82	
Q Total (m3/s)	0.59	Flow (m3/s)		0.59	
Top Width (m)	62.60	Top Width (m)		62.60	
Vel Total (m/s)	0.12	Avg. Vel. (m/s)		0.12	
Max Chl Dpth (m)	0.11	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	24.9	Conv. (m3/s)		24.9	
Length Wtd. (m)	35.00	Wetted Per. (m)		62.60	
Min Ch El (m)	214.47	Shear (N/m2)		0.42	
Alpha	1.00	Stream Power (N/m s)		0.05	
Frctn Loss (m)	0.05	Cum Volume (1000 m3)		0.35	
C & E Loss (m)	0.00	Cum SA (1000 m2)		7.40	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	214.58	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	214.58	Reach Len. (m)	40.00	35.00	41.00
Crit W.S. (m)		Flow Area (m2)		5.09	
E.G. Slope (m/m)	0.000661	Area (m2)		5.09	
Q Total (m3/s)	0.70	Flow (m3/s)		0.70	
Top Width (m)	62.89	Top Width (m)		62.89	
Vel Total (m/s)	0.14	Avg. Vel. (m/s)		0.14	
Max Chl Dpth (m)	0.11	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	27.2	Conv. (m3/s)		27.2	
Length Wtd. (m)	35.00	Wetted Per. (m)		62.89	
Min Ch El (m)	214.47	Shear (N/m2)		0.52	
Alpha	1.00	Stream Power (N/m s)		0.07	
Frctn Loss (m)	0.06	Cum Volume (1000 m3)		0.38	
C & E Loss (m)	0.00	Cum SA (1000 m2)		7.58	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	214.59	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	214.59	Reach Len. (m)	40.00	35.00	41.00
Crit W.S. (m)		Flow Area (m2)		5.63	
E.G. Slope (m/m)	0.000811	Area (m2)		5.63	
Q Total (m3/s)	0.91	Flow (m3/s)		0.91	
Top Width (m)	63.45	Top Width (m)		63.45	
Vel Total (m/s)	0.16	Avg. Vel. (m/s)		0.16	
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.09	
Conv. Total (m3/s)	32.0	Conv. (m3/s)		32.0	
Length Wtd. (m)	35.00	Wetted Per. (m)		63.46	
Min Ch El (m)	214.47	Shear (N/m2)		0.71	
Alpha	1.00	Stream Power (N/m s)		0.11	
Frctn Loss (m)	0.07	Cum Volume (1000 m3)		0.45	
C & E Loss (m)	0.00	Cum SA (1000 m2)		8.01	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	214.68	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	214.67	Reach Len. (m)	40.00	35.00	41.00
Crit W.S. (m)		Flow Area (m2)		11.20	
E.G. Slope (m/m)	0.001182	Area (m2)		11.20	
Q Total (m3/s)	3.27	Flow (m3/s)		3.27	
Top Width (m)	69.10	Top Width (m)		69.10	
Vel Total (m/s)	0.29	Avg. Vel. (m/s)		0.29	
Max Chl Dpth (m)	0.20	Hydr. Depth (m)		0.16	
Conv. Total (m3/s)	95.1	Conv. (m3/s)		95.1	
Length Wtd. (m)	35.00	Wetted Per. (m)		69.11	

Min Ch El (m)	214.47	Shear (N/m2)	1.88
Alpha	1.00	Stream Power (N/m s)	0.55
Frctn Loss (m)	0.09	Cum Volume (1000 m3)	1.03
C & E Loss (m)	0.00	Cum SA (1000 m2)	8.87

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: DUFFINS
REACH: WC36 RS: 100

INPUT
Description: ST 100 (Updated Sep 2016)
Station Elevation Data num= 71

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	217.09	1.51	217	2.9	216.91	3.51	216.87	8.88	216.5
10.77	216.37	16.96	216	27.2	215.58	29	215.5	29.99	215.48
30.48	215.47	30.75	215.47	31.26	215.46	32.06	215.45	39.63	215.34
41.22	215.32	46.77	215.26	50.32	215.22	54.93	215.17	55.82	215.16
57.52	215.15	58.98	215.15	60.73	215.13	61.82	215.13	64.65	215.13
70.51	215.15	76.67	215.07	79.32	215.07	82.54	215.07	95.65	215.01
96.26	215	96.82	215	97.22	215	108.15	214.65	112.4	214.5
120.78	214.45	122.88	214.44	123.84	214.44	126.3	214.45	139.17	214.47
142.43	214.49	144.03	214.5	149.17	214.5	155.93	214.5	158.5	214.5
160.28	214.5	166.26	214.5	168.28	214.5	169.84	214.5	176.79	214.5
176.8	214.5	178.01	214.5	181.39	214.5	182.23	214.5	183.16	214.5
186.92	214.5	188.1	214.5	195.21	214.83	198.64	214.99	198.78	215
198.94	215.01	199.92	215.1	204.17	215.5	204.64	215.55	209.1	216
209.28	216	209.51	216	212.61	216	212.79	216	213.53	216
214.85	216								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	96.26	.035	198.64	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
96.26	198.64	23	42	36	.3	.5

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	214.49	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	214.48	Reach Len. (m)	23.00	42.00	36.00
Crit W.S. (m)		Flow Area (m2)		0.61	
E.G. Slope (m/m)	0.015899	Area (m2)		0.61	
Q Total (m3/s)	0.18	Flow (m3/s)		0.18	
Top Width (m)	25.97	Top Width (m)		25.97	
Vel Total (m/s)	0.30	Avg. Vel. (m/s)		0.30	
Max Chl Dpth (m)	0.04	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	1.4	Conv. (m3/s)		1.4	
Length Wtd. (m)	42.00	Wetted Per. (m)		25.98	
Min Ch El (m)	214.44	Shear (N/m2)		3.66	
Alpha	1.00	Stream Power (N/m s)		1.08	
Frctn Loss (m)	0.49	Cum Volume (1000 m3)		0.10	
C & E Loss (m)	0.00	Cum SA (1000 m2)		3.16	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	214.50	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	214.49	Reach Len. (m)	23.00	42.00	36.00
Crit W.S. (m)	214.48	Flow Area (m2)		0.86	
E.G. Slope (m/m)	0.013144	Area (m2)		0.86	
Q Total (m3/s)	0.27	Flow (m3/s)		0.27	
Top Width (m)	28.99	Top Width (m)		28.99	
Vel Total (m/s)	0.31	Avg. Vel. (m/s)		0.31	
Max Chl Dpth (m)	0.05	Hydr. Depth (m)		0.03	
Conv. Total (m3/s)	2.4	Conv. (m3/s)		2.4	
Length Wtd. (m)	42.00	Wetted Per. (m)		28.99	
Min Ch El (m)	214.44	Shear (N/m2)		3.82	
Alpha	1.00	Stream Power (N/m s)		1.20	
Frctn Loss (m)	0.49	Cum Volume (1000 m3)		0.13	
C & E Loss (m)	0.00	Cum SA (1000 m2)		3.50	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	214.50	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	214.49	Reach Len. (m)	23.00	42.00	36.00
Crit W.S. (m)	214.49	Flow Area (m2)		0.91	
E.G. Slope (m/m)	0.020055	Area (m2)		0.91	
Q Total (m3/s)	0.36	Flow (m3/s)		0.36	
Top Width (m)	29.52	Top Width (m)		29.52	
Vel Total (m/s)	0.40	Avg. Vel. (m/s)		0.40	
Max Chl Dpth (m)	0.05	Hydr. Depth (m)		0.03	
Conv. Total (m3/s)	2.5	Conv. (m3/s)		2.5	
Length Wtd. (m)	42.00	Wetted Per. (m)		29.52	
Min Ch El (m)	214.44	Shear (N/m2)		6.04	
Alpha	1.00	Stream Power (N/m s)		2.40	
Frctn Loss (m)	0.48	Cum Volume (1000 m3)		0.15	
C & E Loss (m)	0.00	Cum SA (1000 m2)		3.65	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	214.51	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	214.51	Reach Len. (m)	23.00	42.00	36.00
Crit W.S. (m)	214.49	Flow Area (m2)		1.80	
E.G. Slope (m/m)	0.013388	Area (m2)		1.80	
Q Total (m3/s)	0.49	Flow (m3/s)		0.49	
Top Width (m)	76.16	Top Width (m)		76.16	
Vel Total (m/s)	0.27	Avg. Vel. (m/s)		0.27	
Max Chl Dpth (m)	0.07	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	4.2	Conv. (m3/s)		4.2	
Length Wtd. (m)	42.00	Wetted Per. (m)		76.16	
Min Ch El (m)	214.44	Shear (N/m2)		3.10	
Alpha	1.00	Stream Power (N/m s)		0.84	
Frctn Loss (m)	0.47	Cum Volume (1000 m3)		0.20	
C & E Loss (m)	0.00	Cum SA (1000 m2)		4.87	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	214.52	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	214.51	Reach Len. (m)	23.00	42.00	36.00
Crit W.S. (m)	214.49	Flow Area (m2)		1.95	
E.G. Slope (m/m)	0.014847	Area (m2)		1.95	
Q Total (m3/s)	0.59	Flow (m3/s)		0.59	
Top Width (m)	76.26	Top Width (m)		76.26	
Vel Total (m/s)	0.30	Avg. Vel. (m/s)		0.30	
Max Chl Dpth (m)	0.07	Hydr. Depth (m)		0.03	
Conv. Total (m3/s)	4.8	Conv. (m3/s)		4.8	

Length Wtd. (m)	42.00	Wetted Per. (m)	76.26
Min Ch El (m)	214.44	Shear (N/m2)	3.73
Alpha	1.00	Stream Power (N/m s)	1.13
Frctn Loss (m)	0.47	Cum Volume (1000 m3)	0.23
C & E Loss (m)	0.00	Cum SA (1000 m2)	4.97

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	214.52	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	214.51	Reach Len. (m)	23.00	42.00	36.00
Crit W.S. (m)	214.51	Flow Area (m2)		2.14	
E.G. Slope (m/m)	0.015327	Area (m2)		2.14	
Q Total (m3/s)	0.70	Flow (m3/s)		0.70	
Top Width (m)	76.38	Top Width (m)		76.38	
Vel Total (m/s)	0.33	Avg. Vel. (m/s)		0.33	
Max Chl Dpth (m)	0.07	Hydr. Depth (m)		0.03	
Conv. Total (m3/s)	5.7	Conv. (m3/s)		5.7	
Length Wtd. (m)	42.00	Wetted Per. (m)		76.38	
Min Ch El (m)	214.44	Shear (N/m2)		4.22	
Alpha	1.00	Stream Power (N/m s)		1.38	
Frctn Loss (m)	0.47	Cum Volume (1000 m3)		0.26	
C & E Loss (m)	0.00	Cum SA (1000 m2)		5.14	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	214.53	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	214.52	Reach Len. (m)	23.00	42.00	36.00
Crit W.S. (m)	214.51	Flow Area (m2)		2.55	
E.G. Slope (m/m)	0.014494	Area (m2)		2.55	
Q Total (m3/s)	0.91	Flow (m3/s)		0.91	
Top Width (m)	76.65	Top Width (m)		76.65	
Vel Total (m/s)	0.36	Avg. Vel. (m/s)		0.36	
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.03	
Conv. Total (m3/s)	7.6	Conv. (m3/s)		7.6	
Length Wtd. (m)	42.00	Wetted Per. (m)		76.65	
Min Ch El (m)	214.44	Shear (N/m2)		4.74	
Alpha	1.00	Stream Power (N/m s)		1.69	
Frctn Loss (m)	0.46	Cum Volume (1000 m3)		0.31	
C & E Loss (m)	0.00	Cum SA (1000 m2)		5.55	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	214.58	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	214.57	Reach Len. (m)	23.00	42.00	36.00
Crit W.S. (m)	214.54	Flow Area (m2)		6.16	
E.G. Slope (m/m)	0.010371	Area (m2)		6.16	
Q Total (m3/s)	3.27	Flow (m3/s)		3.27	
Top Width (m)	78.96	Top Width (m)		78.96	
Vel Total (m/s)	0.53	Avg. Vel. (m/s)		0.53	
Max Chl Dpth (m)	0.13	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	32.1	Conv. (m3/s)		32.1	
Length Wtd. (m)	42.00	Wetted Per. (m)		78.96	
Min Ch El (m)	214.44	Shear (N/m2)		7.93	
Alpha	1.00	Stream Power (N/m s)		4.21	
Frctn Loss (m)	0.42	Cum Volume (1000 m3)		0.72	
C & E Loss (m)	0.00	Cum SA (1000 m2)		6.28	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: DUFFINS
REACH: WC36 RS: 10

INPUT
Description: ST 10 (Updated Sep 2016)
Station Elevation Data num= 150

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	217.139	1.251	217.062	2.183	217	3.143	216.911	5.27	216.722
7.698	216.5	9.125	216.392	14.343	216	20.116	215.747	25.345	215.5
31.068	215.342	33.907	215.267	40.149	215.089	41.79	215.047	46.55	215
49.481	214.995	52.002	214.992	54.956	214.953	55.525	214.955	56.375	214.947
56.708	214.943	61.594	214.89	70.06	214.815	87.052	214.845	88.696	214.848
90.34	214.853	90.88	214.854	91.038	214.856	91.301	214.859	91.984	214.86
93.629	214.861	95.273	214.864	96.917	214.869	98.324	214.873	98.561	214.878
100.205	214.914	104.202	215	104.418	215.002	105.728	215.004	106.948	215.005
108.402	215.005	108.574	215.003	108.82	215	109.242	215	109.245	215
110.18	214.996	110.797	214.993	111.115	214.984	114.635	214.882	115.314	214.862
123.04	214.619	124.202	214.582	125.17	214.551	126.137	214.52	126.776	214.5
128.128	214.443	130.519	214.346	139.241	214	139.531	214.01	140.012	214.028
140.254	214.021	140.808	214	141.42	213.993	141.501	213.992	142.776	213.993
145.326	213.995	146.04	213.98	146.065	213.979	147.502	213.947	148.133	213.933
149.098	213.913	149.928	213.917	151.734	213.973	152.893	213.963	152.987	213.962
153.479	213.96	154.375	213.955	156.562	213.947	157.38	213.955	157.864	213.96
161.136	213.992	161.549	213.996	161.662	213.997	162.004	214	162.455	214.006
164.027	214.106	164.418	214.127	164.909	214.154	165.712	214.197	166.016	214.202
166.581	214.217	167.17	214.256	167.561	214.252	167.993	214.26	168.563	214.262
168.944	214.27	169.307	214.275	169.316	214.275	169.904	214.305	173.352	214.485
173.692	214.484	174.302	214.484	174.808	214.484	174.833	214.484	175.345	214.482
176.091	214.481	176.273	214.48	176.651	214.479	178.375	214.486	179.205	214.49
179.653	214.492	187.212	214.487	187.884	214.488	188.816	214.489	191.066	214.492
191.486	214.492	191.872	214.492	192.631	214.492	192.771	214.492	193.021	214.492
193.041	214.492	193.625	214.492	193.683	214.492	193.816	214.492	193.832	214.491
193.945	214.491	193.954	214.491	194.057	214.491	194.102	214.491	194.138	214.491
194.855	214.491	195.235	214.491	195.545	214.491	196.547	214.492	197.187	214.492
197.873	214.493	198.414	214.494	199.221	214.494	199.867	214.495	204.242	214.5
206.148	214.604	213.279	215	218.061	215.484	218.219	215.5	218.464	215.528
222.43	215.943	222.973	216	222.987	216	224.532	216.001	227.184	216.003

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	126.776	.035	173.352	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
126.776	173.352	57.7	62.2	67.9	.3	.5

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	214.00	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	214.00	Reach Len. (m)	57.70	62.20	67.90
Crit W.S. (m)	213.97	Flow Area (m2)		0.66	
E.G. Slope (m/m)	0.008833	Area (m2)		0.66	
Q Total (m3/s)	0.18	Flow (m3/s)		0.18	
Top Width (m)	20.64	Top Width (m)		20.64	
Vel Total (m/s)	0.27	Avg. Vel. (m/s)		0.27	
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.03	
Conv. Total (m3/s)	1.9	Conv. (m3/s)		1.9	
Length Wtd. (m)	62.20	Wetted Per. (m)		20.64	
Min Ch El (m)	213.91	Shear (N/m2)		2.78	
Alpha	1.00	Stream Power (N/m s)		0.76	
Frctn Loss (m)	0.64	Cum Volume (1000 m3)		0.07	
C & E Loss (m)	0.00	Cum SA (1000 m2)		2.18	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate

the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	214.01	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	214.00	Reach Len. (m)	57.70	62.20	67.90
Crit W.S. (m)	214.00	Flow Area (m2)		0.82	
E.G. Slope (m/m)	0.010497	Area (m2)		0.82	
Q Total (m3/s)	0.27	Flow (m3/s)		0.27	
Top Width (m)	21.94	Top Width (m)		21.94	
Vel Total (m/s)	0.33	Avg. Vel. (m/s)		0.33	
Max Chl Dpth (m)	0.09	Hydr. Depth (m)		0.04	
Conv. Total (m3/s)	2.6	Conv. (m3/s)		2.6	
Length Wtd. (m)	62.20	Wetted Per. (m)		21.94	
Min Ch El (m)	213.91	Shear (N/m2)		3.86	
Alpha	1.00	Stream Power (N/m s)		1.27	
Frctn Loss (m)	0.64	Cum Volume (1000 m3)		0.09	
C & E Loss (m)	0.00	Cum SA (1000 m2)		2.43	

Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	214.02	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	214.02	Reach Len. (m)	57.70	62.20	67.90
Crit W.S. (m)	214.00	Flow Area (m2)		1.11	
E.G. Slope (m/m)	0.007346	Area (m2)		1.11	
Q Total (m3/s)	0.36	Flow (m3/s)		0.36	
Top Width (m)	23.23	Top Width (m)		23.23	
Vel Total (m/s)	0.32	Avg. Vel. (m/s)		0.32	
Max Chl Dpth (m)	0.10	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	4.2	Conv. (m3/s)		4.2	
Length Wtd. (m)	62.20	Wetted Per. (m)		23.23	
Min Ch El (m)	213.91	Shear (N/m2)		3.45	
Alpha	1.00	Stream Power (N/m s)		1.12	
Frctn Loss (m)	0.64	Cum Volume (1000 m3)		0.11	
C & E Loss (m)	0.00	Cum SA (1000 m2)		2.54	

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	214.03	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	214.02	Reach Len. (m)	57.70	62.20	67.90
Crit W.S. (m)	214.01	Flow Area (m2)		1.25	
E.G. Slope (m/m)	0.009644	Area (m2)		1.25	
Q Total (m3/s)	0.49	Flow (m3/s)		0.49	
Top Width (m)	23.78	Top Width (m)		23.78	
Vel Total (m/s)	0.39	Avg. Vel. (m/s)		0.39	
Max Chl Dpth (m)	0.11	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	5.0	Conv. (m3/s)		5.0	
Length Wtd. (m)	62.20	Wetted Per. (m)		23.78	
Min Ch El (m)	213.91	Shear (N/m2)		4.96	
Alpha	1.00	Stream Power (N/m s)		1.95	
Frctn Loss (m)	0.65	Cum Volume (1000 m3)		0.14	
C & E Loss (m)	0.00	Cum SA (1000 m2)		2.77	

Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	214.04	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	214.03	Reach Len. (m)	57.70	62.20	67.90
Crit W.S. (m)	214.00	Flow Area (m2)		1.45	
E.G. Slope (m/m)	0.008688	Area (m2)		1.45	
Q Total (m3/s)	0.59	Flow (m3/s)		0.59	
Top Width (m)	24.42	Top Width (m)		24.42	
Vel Total (m/s)	0.41	Avg. Vel. (m/s)		0.41	
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	6.3	Conv. (m3/s)		6.3	
Length Wtd. (m)	62.20	Wetted Per. (m)		24.43	
Min Ch El (m)	213.91	Shear (N/m2)		5.07	
Alpha	1.00	Stream Power (N/m s)		2.06	
Frctn Loss (m)	0.65	Cum Volume (1000 m3)		0.16	
C & E Loss (m)	0.00	Cum SA (1000 m2)		2.85	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	214.05	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	214.04	Reach Len. (m)	57.70	62.20	67.90
Crit W.S. (m)	214.01	Flow Area (m2)		1.62	
E.G. Slope (m/m)	0.008684	Area (m2)		1.62	
Q Total (m3/s)	0.70	Flow (m3/s)		0.70	
Top Width (m)	24.70	Top Width (m)		24.70	
Vel Total (m/s)	0.43	Avg. Vel. (m/s)		0.43	
Max Chl Dpth (m)	0.13	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	7.5	Conv. (m3/s)		7.5	
Length Wtd. (m)	62.20	Wetted Per. (m)		24.70	
Min Ch El (m)	213.91	Shear (N/m2)		5.58	
Alpha	1.00	Stream Power (N/m s)		2.41	
Frctn Loss (m)	0.65	Cum Volume (1000 m3)		0.18	
C & E Loss (m)	0.00	Cum SA (1000 m2)		3.02	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	214.06	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	214.05	Reach Len. (m)	57.70	62.20	67.90
Crit W.S. (m)		Flow Area (m2)		1.93	
E.G. Slope (m/m)	0.008445	Area (m2)		1.93	
Q Total (m3/s)	0.91	Flow (m3/s)		0.91	
Top Width (m)	25.20	Top Width (m)		25.20	
Vel Total (m/s)	0.47	Avg. Vel. (m/s)		0.47	
Max Chl Dpth (m)	0.14	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	9.9	Conv. (m3/s)		9.9	
Length Wtd. (m)	62.20	Wetted Per. (m)		25.21	
Min Ch El (m)	213.91	Shear (N/m2)		6.33	
Alpha	1.00	Stream Power (N/m s)		2.99	
Frctn Loss (m)	0.64	Cum Volume (1000 m3)		0.22	
C & E Loss (m)	0.00	Cum SA (1000 m2)		3.42	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	214.17	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	214.14	Reach Len. (m)	57.70	62.20	67.90

Crit W.S. (m)		Flow Area (m2)	4.22
E.G. Slope (m/m)	0.009538	Area (m2)	4.22
Q Total (m3/s)	3.27	Flow (m3/s)	3.27
Top Width (m)	28.76	Top Width (m)	28.76
Vel Total (m/s)	0.78	Avg. Vel. (m/s)	0.78
Max Chl Dpth (m)	0.22	Hydr. Depth (m)	0.15
Conv. Total (m3/s)	33.5	Conv. (m3/s)	33.5
Length Wtd. (m)	62.20	Wetted Per. (m)	28.77
Min Ch El (m)	213.91	Shear (N/m2)	13.71
Alpha	1.00	Stream Power (N/m s)	10.63
Frctn Loss (m)	0.68	Cum Volume (1000 m3)	0.50
C & E Loss (m)	0.00	Cum SA (1000 m2)	4.02

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: DUFFINS
REACH: WC36 RS: 5

INPUT
Description: ST 5 (Added Sep 2016)
Station Elevation Data num= 41

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	214.22	1.41	214.23	4.97	214.23	12.72	214.19	24.76	214.08
26.74	214.07	28.34	214.07	29.16	214.07	31.71	214	40.2	213.64
44.42	213.5	50.26	213.32	54.45	213.32	59.48	213.39	60.15	213.39
61.13	213.4	62.01	213.4	64.74	213.4	65.12	213.39	65.15	213.39
65.39	213.39	65.53	213.38	65.59	213.38	73.67	213.3	80.11	213.34
81.84	213.36	87.93	213.5	90.09	213.68	93.91	214	95.99	214.14
103.14	214.5	142.84	214.99	143.11	214.99	143.19	214.99	143.37	215
143.52	215	143.57	215	144.14	215	146.94	215.02	149.75	215.12
153.58	215.19								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	40.2	.035	90.09	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
40.2	90.09	49	67.6	70	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	213.36	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	213.36	Reach Len. (m)	49.00	67.60	70.00
Crit W.S. (m)		Flow Area (m2)		0.61	
E.G. Slope (m/m)	0.012191	Area (m2)		0.61	
Q Total (m3/s)	0.18	Flow (m3/s)		0.18	
Top Width (m)	21.28	Top Width (m)		21.28	
Vel Total (m/s)	0.30	Avg. Vel. (m/s)		0.30	
Max Chl Dpth (m)	0.06	Hydr. Depth (m)		0.03	
Conv. Total (m3/s)	1.6	Conv. (m3/s)		1.6	
Length Wtd. (m)	67.60	Wetted Per. (m)		21.28	
Min Ch El (m)	213.30	Shear (N/m2)		3.42	
Alpha	1.00	Stream Power (N/m s)		1.01	
Frctn Loss (m)	1.26	Cum Volume (1000 m3)		0.03	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.88	

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	213.37	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	213.37	Reach Len. (m)	49.00	67.60	70.00
Crit W.S. (m)		Flow Area (m2)		0.87	
E.G. Slope (m/m)	0.010059	Area (m2)		0.87	
Q Total (m3/s)	0.27	Flow (m3/s)		0.27	
Top Width (m)	24.29	Top Width (m)		24.29	
Vel Total (m/s)	0.31	Avg. Vel. (m/s)		0.31	
Max Chl Dpth (m)	0.07	Hydr. Depth (m)		0.04	
Conv. Total (m3/s)	2.7	Conv. (m3/s)		2.7	
Length Wtd. (m)	67.60	Wetted Per. (m)		24.29	
Min Ch El (m)	213.30	Shear (N/m2)		3.53	
Alpha	1.00	Stream Power (N/m s)		1.10	
Frctn Loss (m)	1.24	Cum Volume (1000 m3)		0.04	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.99	

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	213.38	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	213.37	Reach Len. (m)	49.00	67.60	70.00
Crit W.S. (m)	213.36	Flow Area (m2)		0.91	
E.G. Slope (m/m)	0.015594	Area (m2)		0.91	
Q Total (m3/s)	0.36	Flow (m3/s)		0.36	
Top Width (m)	24.73	Top Width (m)		24.73	
Vel Total (m/s)	0.40	Avg. Vel. (m/s)		0.40	
Max Chl Dpth (m)	0.07	Hydr. Depth (m)		0.04	
Conv. Total (m3/s)	2.9	Conv. (m3/s)		2.9	
Length Wtd. (m)	67.60	Wetted Per. (m)		24.73	
Min Ch El (m)	213.30	Shear (N/m2)		5.64	
Alpha	1.00	Stream Power (N/m s)		2.23	
Frctn Loss (m)	1.22	Cum Volume (1000 m3)		0.05	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.05	

Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	213.39	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	213.38	Reach Len. (m)	49.00	67.60	70.00
Crit W.S. (m)	213.37	Flow Area (m2)		1.27	
E.G. Slope (m/m)	0.011355	Area (m2)		1.27	
Q Total (m3/s)	0.49	Flow (m3/s)		0.49	
Top Width (m)	27.97	Top Width (m)		27.97	
Vel Total (m/s)	0.39	Avg. Vel. (m/s)		0.39	
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	4.6	Conv. (m3/s)		4.6	
Length Wtd. (m)	67.60	Wetted Per. (m)		27.97	
Min Ch El (m)	213.30	Shear (N/m2)		5.04	
Alpha	1.00	Stream Power (N/m s)		1.95	
Frctn Loss (m)	1.21	Cum Volume (1000 m3)		0.06	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.16	

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	213.40	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	213.39	Reach Len. (m)	49.00	67.60	70.00
Crit W.S. (m)	213.37	Flow Area (m2)		1.38	
E.G. Slope (m/m)	0.012895	Area (m2)		1.38	
Q Total (m3/s)	0.59	Flow (m3/s)		0.59	
Top Width (m)	28.59	Top Width (m)		28.59	
Vel Total (m/s)	0.43	Avg. Vel. (m/s)		0.43	
Max Chl Dpth (m)	0.09	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	5.2	Conv. (m3/s)		5.2	
Length Wtd. (m)	67.60	Wetted Per. (m)		28.59	
Min Ch El (m)	213.30	Shear (N/m2)		6.08	
Alpha	1.00	Stream Power (N/m s)		2.61	
Frctn Loss (m)	1.22	Cum Volume (1000 m3)		0.07	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.21	

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	213.40	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	213.39	Reach Len. (m)	49.00	67.60	70.00
Crit W.S. (m)	213.37	Flow Area (m2)		1.58	
E.G. Slope (m/m)	0.012633	Area (m2)		1.58	
Q Total (m3/s)	0.70	Flow (m3/s)		0.70	
Top Width (m)	30.80	Top Width (m)		30.80	
Vel Total (m/s)	0.44	Avg. Vel. (m/s)		0.44	
Max Chl Dpth (m)	0.09	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	6.2	Conv. (m3/s)		6.2	
Length Wtd. (m)	67.60	Wetted Per. (m)		30.80	
Min Ch El (m)	213.30	Shear (N/m2)		6.35	
Alpha	1.00	Stream Power (N/m s)		2.82	
Frctn Loss (m)	1.21	Cum Volume (1000 m3)		0.08	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.29	

Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	213.42	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	213.40	Reach Len. (m)	49.00	67.60	70.00
Crit W.S. (m)	213.40	Flow Area (m2)		1.96	
E.G. Slope (m/m)	0.013017	Area (m2)		1.96	
Q Total (m3/s)	0.91	Flow (m3/s)		0.91	
Top Width (m)	36.23	Top Width (m)		36.23	
Vel Total (m/s)	0.47	Avg. Vel. (m/s)		0.47	
Max Chl Dpth (m)	0.10	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	8.0	Conv. (m3/s)		8.0	
Length Wtd. (m)	67.60	Wetted Per. (m)		36.23	
Min Ch El (m)	213.30	Shear (N/m2)		6.89	
Alpha	1.00	Stream Power (N/m s)		3.21	
Frctn Loss (m)	1.19	Cum Volume (1000 m3)		0.10	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.50	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	213.50	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	213.47	Reach Len. (m)	49.00	67.60	70.00
Crit W.S. (m)	213.45	Flow Area (m2)		4.49	
E.G. Slope (m/m)	0.012515	Area (m2)		4.49	
Q Total (m3/s)	3.27	Flow (m3/s)		3.27	
Top Width (m)	41.20	Top Width (m)		41.20	
Vel Total (m/s)	0.73	Avg. Vel. (m/s)		0.73	
Max Chl Dpth (m)	0.17	Hydr. Depth (m)		0.11	
Conv. Total (m3/s)	29.2	Conv. (m3/s)		29.2	
Length Wtd. (m)	67.60	Wetted Per. (m)		41.20	
Min Ch El (m)	213.30	Shear (N/m2)		13.36	
Alpha	1.00	Stream Power (N/m s)		9.74	
Frctn Loss (m)	1.08	Cum Volume (1000 m3)		0.23	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.84	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: DUFFINS
REACH: WC36 RS: 1

INPUT
Description: ST 1 (Added Sep 2016)
Station Elevation Data num= 92

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	216.27	7.14	216	7.18	216	7.19	216	10.59	215.98
14.66	215.83	17.68	215.73	22.68	215.61	25.9	215.51	26.72	215.5
29.38	215.43	43.15	215	43.32	215	43.66	214.99	44.51	214.97
61.71	214.51	62.52	214.51	65.77	214.51	68.44	214.51	69.62	214.51
76.36	214.5	91.34	214.15	97.73	214.01	98.3	214	100.56	213.89
102.9	213.79	107.84	213.66	109.81	213.62	110.25	213.61	115.07	213.66
119.08	213.86	121.93	213.88	122.7	213.84	122.73	213.84	124.42	213.75
127.2	213.53	128.13	213.5	129.76	213.28	131.98	213	136.95	212.53
137.26	212.5	137.9	212.39	140.07	212	140.59	212	140.78	212
141.43	212	141.49	212	141.54	212	141.75	212	142.01	212
142.02	212	147.6	212.18	149.8	212.26	152.98	212.36	153.13	212.36
156.81	212.5	159.23	212.78	161.01	213	162.22	213.16	164.93	213.5
166.36	213.64	169.36	214	172.67	214.02	176.65	214.04	180.22	214.06
182.63	214.07	184.99	214.07	191.99	214.1	192.79	214.1	197.4	214.11
198.17	214.11	208.17	214.14	210.57	214.12	212.23	214.12	219.22	214.13
222.11	214.14	224.01	214.15	231.09	214.18	231.42	214.18	243.5	214.29
264.52	214.49	268.83	214.5	269.86	214.5	272.03	214.5	278.19	214.68
278.24	214.68	286.1	215	286.13	215	286.23	215	299.66	215.5
307.26	215.52	308.08	215.52						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	129.76	.035	162.22	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
129.76	162.22	0	0	0	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	212.10	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	212.08	Reach Len. (m)			
Crit W.S. (m)	212.08	Flow Area (m2)		0.25	
E.G. Slope (m/m)	0.032132	Area (m2)		0.25	
Q Total (m3/s)	0.18	Flow (m3/s)		0.18	
Top Width (m)	4.69	Top Width (m)		4.69	
Vel Total (m/s)	0.72	Avg. Vel. (m/s)		0.72	
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	1.0	Conv. (m3/s)		1.0	
Length Wtd. (m)		Wetted Per. (m)		4.70	
Min Ch El (m)	212.00	Shear (N/m2)		16.70	
Alpha	1.00	Stream Power (N/m s)		12.07	

Frctn Loss (m)		Cum Volume (1000 m3)	
C & E Loss (m)		Cum SA (1000 m2)	

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	212.13	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.035	
W.S. Elev (m)	212.09	Reach Len. (m)			
Crit W.S. (m)	212.09	Flow Area (m2)		0.30	
E.G. Slope (m/m)	0.043721	Area (m2)		0.30	
Q Total (m3/s)	0.27	Flow (m3/s)		0.27	
Top Width (m)	5.06	Top Width (m)		5.06	
Vel Total (m/s)	0.90	Avg. Vel. (m/s)		0.90	
Max Chl Dpth (m)	0.09	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	1.3	Conv. (m3/s)		1.3	
Length Wtd. (m)		Wetted Per. (m)		5.07	
Min Ch El (m)	212.00	Shear (N/m2)		25.25	
Alpha	1.00	Stream Power (N/m s)		22.83	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	212.15	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	212.12	Reach Len. (m)			
Crit W.S. (m)	212.12	Flow Area (m2)		0.48	
E.G. Slope (m/m)	0.021297	Area (m2)		0.48	
Q Total (m3/s)	0.36	Flow (m3/s)		0.36	
Top Width (m)	6.23	Top Width (m)		6.23	
Vel Total (m/s)	0.75	Avg. Vel. (m/s)		0.75	
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	2.5	Conv. (m3/s)		2.5	
Length Wtd. (m)		Wetted Per. (m)		6.24	
Min Ch El (m)	212.00	Shear (N/m2)		16.02	
Alpha	1.00	Stream Power (N/m s)		12.05	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	212.17	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	212.12	Reach Len. (m)			
Crit W.S. (m)	212.12	Flow Area (m2)		0.52	
E.G. Slope (m/m)	0.032238	Area (m2)		0.52	
Q Total (m3/s)	0.49	Flow (m3/s)		0.49	
Top Width (m)	6.44	Top Width (m)		6.44	
Vel Total (m/s)	0.95	Avg. Vel. (m/s)		0.95	
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	2.7	Conv. (m3/s)		2.7	
Length Wtd. (m)		Wetted Per. (m)		6.45	
Min Ch El (m)	212.00	Shear (N/m2)		25.24	
Alpha	1.00	Stream Power (N/m s)		24.01	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	212.18	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.035	
W.S. Elev (m)	212.14	Reach Len. (m)			
Crit W.S. (m)	212.14	Flow Area (m2)		0.63	
E.G. Slope (m/m)	0.026852	Area (m2)		0.63	
Q Total (m3/s)	0.59	Flow (m3/s)		0.59	
Top Width (m)	7.07	Top Width (m)		7.07	
Vel Total (m/s)	0.93	Avg. Vel. (m/s)		0.93	
Max Chl Dpth (m)	0.14	Hydr. Depth (m)		0.09	
Conv. Total (m3/s)	3.6	Conv. (m3/s)		3.6	
Length Wtd. (m)		Wetted Per. (m)		7.08	
Min Ch El (m)	212.00	Shear (N/m2)		23.48	
Alpha	1.00	Stream Power (N/m s)		21.94	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	212.20	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	212.15	Reach Len. (m)			
Crit W.S. (m)	212.15	Flow Area (m2)		0.71	
E.G. Slope (m/m)	0.027122	Area (m2)		0.71	
Q Total (m3/s)	0.70	Flow (m3/s)		0.70	
Top Width (m)	7.48	Top Width (m)		7.48	
Vel Total (m/s)	0.98	Avg. Vel. (m/s)		0.98	
Max Chl Dpth (m)	0.15	Hydr. Depth (m)		0.10	
Conv. Total (m3/s)	4.3	Conv. (m3/s)		4.3	
Length Wtd. (m)		Wetted Per. (m)		7.50	
Min Ch El (m)	212.00	Shear (N/m2)		25.32	
Alpha	1.00	Stream Power (N/m s)		24.84	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	212.23	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	212.17	Reach Len. (m)			
Crit W.S. (m)	212.17	Flow Area (m2)		0.89	
E.G. Slope (m/m)	0.025241	Area (m2)		0.89	
Q Total (m3/s)	0.91	Flow (m3/s)		0.91	
Top Width (m)	8.29	Top Width (m)		8.29	
Vel Total (m/s)	1.02	Avg. Vel. (m/s)		1.02	
Max Chl Dpth (m)	0.17	Hydr. Depth (m)		0.11	
Conv. Total (m3/s)	5.7	Conv. (m3/s)		5.7	
Length Wtd. (m)		Wetted Per. (m)		8.31	
Min Ch El (m)	212.00	Shear (N/m2)		26.48	
Alpha	1.00	Stream Power (N/m s)		27.10	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	212.41	Element	Left OB	Channel	Right OB
Vel Head (m)	0.09	Wt. n-Val.		0.035	
W.S. Elev (m)	212.32	Reach Len. (m)			
Crit W.S. (m)	212.32	Flow Area (m2)		2.44	
E.G. Slope (m/m)	0.021147	Area (m2)		2.44	
Q Total (m3/s)	3.27	Flow (m3/s)		3.27	
Top Width (m)	13.35	Top Width (m)		13.35	
Vel Total (m/s)	1.34	Avg. Vel. (m/s)		1.34	
Max Chl Dpth (m)	0.32	Hydr. Depth (m)		0.18	
Conv. Total (m3/s)	22.5	Conv. (m3/s)		22.5	
Length Wtd. (m)		Wetted Per. (m)		13.39	
Min Ch El (m)	212.00	Shear (N/m2)		37.88	
Alpha	1.00	Stream Power (N/m s)		50.66	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

SUMMARY OF MANNING'S N VALUES

River:DUFFINS

Reach	River Sta.	n1	n2	n3

WC36	500	.07	.035	.07
WC36	450	Culvert		
WC36	400	.07	.035	.07
WC36	300	.07	.035	.07
WC36	200	.07	.035	.07
WC36	100	.07	.035	.07
WC36	10	.07	.035	.07
WC36	5	.07	.035	.07
WC36	1	.07	.035	.07

SUMMARY OF REACH LENGTHS

River: DUFFINS

Reach	River Sta.	Left	Channel	Right
WC36	500	86.7	86.7	86.7
WC36	450	Culvert		
WC36	400	122.3	122.3	122.3
WC36	300	33	34	22
WC36	200	40	35	41
WC36	100	23	42	36
WC36	10	57.7	62.2	67.9
WC36	5	49	67.6	70
WC36	1	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: DUFFINS

Reach	River Sta.	Contr.	Expan.
WC36	500	.3	.5
WC36	450	Culvert	
WC36	400	.3	.5
WC36	300	.3	.5
WC36	200	.3	.5
WC36	100	.3	.5
WC36	10	.3	.5
WC36	5	.1	.3
WC36	1	.1	.3

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
WC36	500	2-yr	0.18	217.50	217.75	217.56	217.75	0.000273	0.19	0.96	76.97	0.12
WC36	500	5-yr	0.27	217.50	217.81	217.59	217.81	0.000309	0.23	1.18	78.04	0.13
WC36	500	10-yr	0.36	217.50	217.86	217.59	217.86	0.000337	0.26	1.37	78.94	0.14
WC36	500	25-yr	0.49	217.50	217.92	217.62	217.92	0.000368	0.31	1.60	80.09	0.15
WC36	500	50-yr	0.59	217.50	217.96	217.63	217.96	0.000387	0.33	1.76	80.93	0.16
WC36	500	100-yr	0.70	217.50	218.00	217.65	218.01	0.000406	0.36	1.93	81.78	0.16
WC36	500	Check Flow	0.91	217.50	218.07	217.68	218.08	0.000435	0.41	2.21	83.40	0.17
WC36	500	Regional	3.27	217.50	218.65	217.92	218.68	0.000552	0.74	4.43	97.59	0.22
WC36	450		Culvert									
WC36	400	2-yr	0.18	215.00	215.06	215.06	215.08	0.023496	0.68	0.27	10.85	0.88
WC36	400	5-yr	0.27	215.00	215.07	215.07	215.11	0.028635	0.85	0.32	11.07	1.00
WC36	400	10-yr	0.36	215.00	215.08	215.08	215.13	0.032019	0.98	0.37	11.28	1.08
WC36	400	25-yr	0.49	215.00	215.12	215.12	215.17	0.018410	0.94	0.52	11.96	0.87
WC36	400	50-yr	0.59	215.00	215.12	215.12	215.19	0.024041	1.10	0.54	12.03	1.00
WC36	400	100-yr	0.70	215.00	215.14	215.14	215.21	0.023366	1.17	0.60	12.31	1.00
WC36	400	Check Flow	0.91	215.00	215.16	215.16	215.25	0.021833	1.27	0.72	12.85	1.00
WC36	400	Regional	3.27	215.00	215.39	215.39	215.58	0.016524	1.95	1.68	24.07	1.00
WC36	300	2-yr	0.18	214.49	214.56		214.56	0.000410	0.08	2.33	47.84	0.11
WC36	300	5-yr	0.27	214.49	214.57		214.57	0.000482	0.09	2.86	49.11	0.12
WC36	300	10-yr	0.36	214.49	214.58		214.58	0.000525	0.11	3.35	50.24	0.13
WC36	300	25-yr	0.49	214.49	214.59		214.59	0.000572	0.12	3.97	51.65	0.14
WC36	300	50-yr	0.59	214.49	214.60		214.60	0.000599	0.13	4.41	52.63	0.15
WC36	300	100-yr	0.70	214.49	214.60		214.61	0.000651	0.15	4.79	53.47	0.16
WC36	300	Check Flow	0.91	214.49	214.62		214.62	0.000729	0.17	5.48	54.93	0.17
WC36	300	Regional	3.27	214.49	214.71		214.72	0.001077	0.29	11.21	64.66	0.22
WC36	200	2-yr	0.18	214.47	214.54		214.54	0.000499	0.07	2.41	59.95	0.12
WC36	200	5-yr	0.27	214.47	214.55		214.55	0.000477	0.09	3.13	60.75	0.12
WC36	200	10-yr	0.36	214.47	214.56		214.56	0.000581	0.10	3.51	61.18	0.14
WC36	200	25-yr	0.49	214.47	214.57		214.57	0.000543	0.11	4.34	62.08	0.14
WC36	200	50-yr	0.59	214.47	214.58		214.58	0.000560	0.12	4.82	62.60	0.14
WC36	200	100-yr	0.70	214.47	214.58		214.58	0.000661	0.14	5.09	62.89	0.15
WC36	200	Check Flow	0.91	214.47	214.59		214.59	0.000811	0.16	5.63	63.45	0.17
WC36	200	Regional	3.27	214.47	214.67		214.68	0.001182	0.29	11.20	69.10	0.23
WC36	100	2-yr	0.18	214.44	214.48		214.49	0.015899	0.30	0.61	25.97	0.62
WC36	100	5-yr	0.27	214.44	214.49	214.48	214.50	0.013144	0.31	0.86	28.99	0.58
WC36	100	10-yr	0.36	214.44	214.49	214.49	214.50	0.020055	0.40	0.91	29.52	0.72
WC36	100	25-yr	0.49	214.44	214.51	214.49	214.51	0.013388	0.27	1.80	76.16	0.57
WC36	100	50-yr	0.59	214.44	214.51	214.49	214.52	0.014847	0.30	1.95	76.26	0.60
WC36	100	100-yr	0.70	214.44	214.51	214.51	214.52	0.015327	0.33	2.14	76.38	0.62
WC36	100	Check Flow	0.91	214.44	214.52	214.51	214.53	0.014494	0.36	2.55	76.65	0.62
WC36	100	Regional	3.27	214.44	214.57	214.54	214.58	0.010371	0.53	6.16	78.96	0.61
WC36	10	2-yr	0.18	213.91	214.00	213.97	214.00	0.008833	0.27	0.66	20.64	0.48
WC36	10	5-yr	0.27	213.91	214.00	214.00	214.01	0.010497	0.33	0.82	21.94	0.54
WC36	10	10-yr	0.36	213.91	214.02	214.00	214.02	0.007346	0.32	1.11	23.23	0.47
WC36	10	25-yr	0.49	213.91	214.02	214.01	214.03	0.009644	0.39	1.25	23.78	0.55
WC36	10	50-yr	0.59	213.91	214.03	214.00	214.04	0.008688	0.41	1.45	24.42	0.53
WC36	10	100-yr	0.70	213.91	214.04	214.01	214.05	0.008684	0.43	1.62	24.70	0.54
WC36	10	Check Flow	0.91	213.91	214.05		214.06	0.008445	0.47	1.93	25.20	0.55
WC36	10	Regional	3.27	213.91	214.14		214.17	0.009538	0.78	4.22	28.76	0.65
WC36	5	2-yr	0.18	213.30	213.36		213.36	0.012191	0.30	0.61	21.28	0.56
WC36	5	5-yr	0.27	213.30	213.37		213.37	0.010059	0.31	0.87	24.29	0.53
WC36	5	10-yr	0.36	213.30	213.37	213.36	213.38	0.015594	0.40	0.91	24.73	0.66
WC36	5	25-yr	0.49	213.30	213.38	213.37	213.39	0.011355	0.39	1.27	27.97	0.58
WC36	5	50-yr	0.59	213.30	213.39	213.37	213.40	0.012895	0.43	1.38	28.59	0.62
WC36	5	100-yr	0.70	213.30	213.39	213.37	213.40	0.012633	0.44	1.58	30.80	0.63
WC36	5	Check Flow	0.91	213.30	213.40	213.40	213.42	0.013017	0.47	1.96	36.23	0.64
WC36	5	Regional	3.27	213.30	213.47	213.45	213.50	0.012515	0.73	4.49	41.20	0.71
WC36	1	2-yr	0.18	212.00	212.08	212.08	212.10	0.032132	0.72	0.25	4.69	1.00
WC36	1	5-yr	0.27	212.00	212.09	212.09	212.13	0.043721	0.90	0.30	5.06	1.19
WC36	1	10-yr	0.36	212.00	212.12	212.12	212.15	0.021297	0.75	0.48	6.23	0.87
WC36	1	25-yr	0.49	212.00	212.12	212.12	212.17	0.032238	0.95	0.52	6.44	1.07
WC36	1	50-yr	0.59	212.00	212.14	212.14	212.18	0.026852	0.93	0.63	7.07	1.00
WC36	1	100-yr	0.70	212.00	212.15	212.15	212.20	0.027122	0.98	0.71	7.48	1.01
WC36	1	Check Flow	0.91	212.00	212.17	212.17	212.23	0.025241	1.02	0.89	8.29	1.00
WC36	1	Regional	3.27	212.00	212.32	212.32	212.41	0.021147	1.34	2.44	13.35	1.00

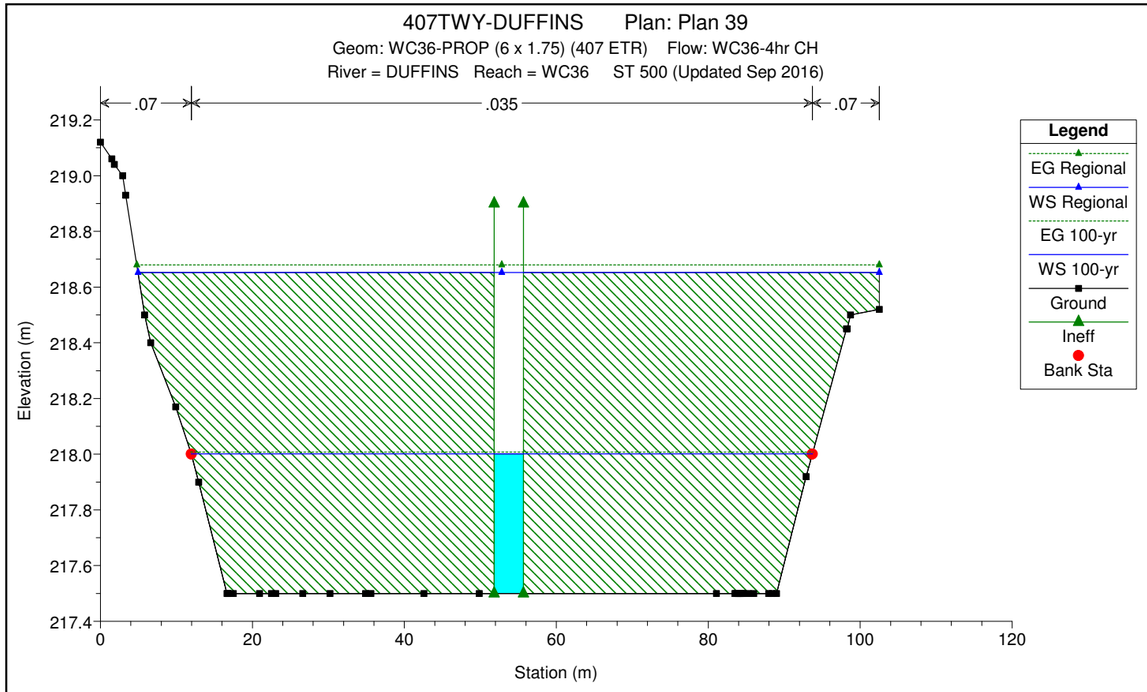
Profile Output Table - Standard Table 2

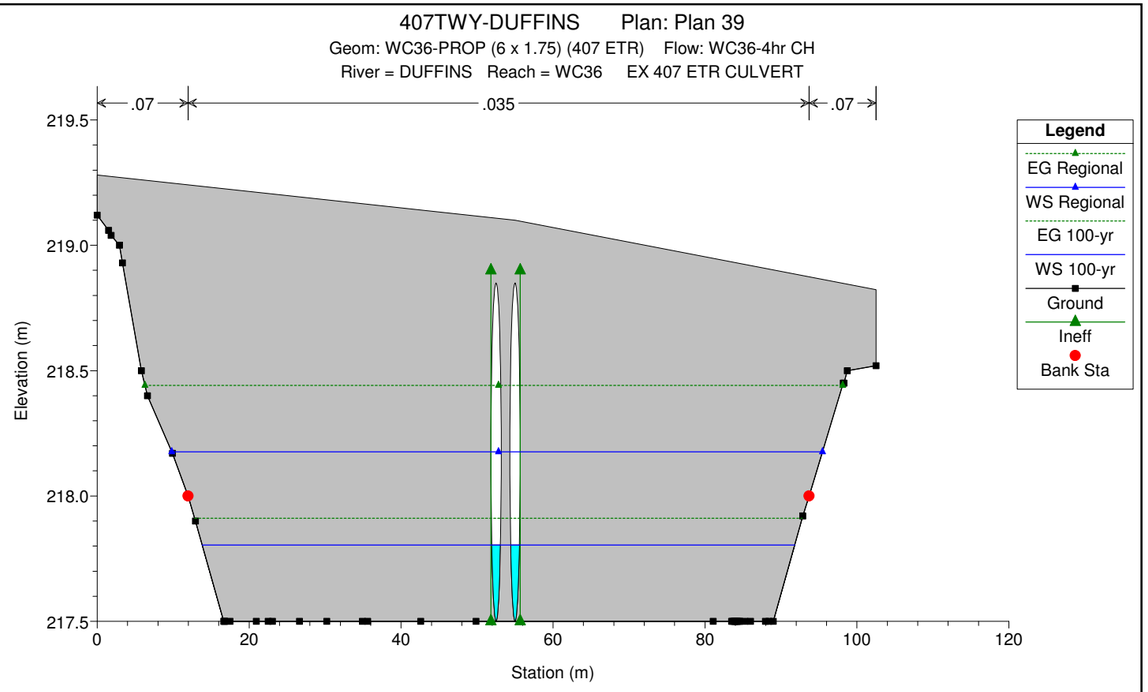
Reach	River Sta	Profile	E.G. Elev (m)	W.S. Elev (m)	Vel Head (m)	Frctn Loss (m)	C & E Loss (m)	Q Left (m3/s)	Q Channel (m3/s)	Q Right (m3/s)	Top Width (m)
WC36	500	2-yr	217.75	217.75	0.00				0.18		76.97
WC36	500	5-yr	217.81	217.81	0.00				0.27		78.04
WC36	500	10-yr	217.86	217.86	0.00				0.36		78.94
WC36	500	25-yr	217.92	217.92	0.00				0.49		80.09
WC36	500	50-yr	217.96	217.96	0.01				0.59		80.93
WC36	500	100-yr	218.01	218.00	0.01				0.70		81.78
WC36	500	Check Flow	218.08	218.07	0.01				0.91		83.40
WC36	500	Regional	218.68	218.65	0.03				3.27		97.59

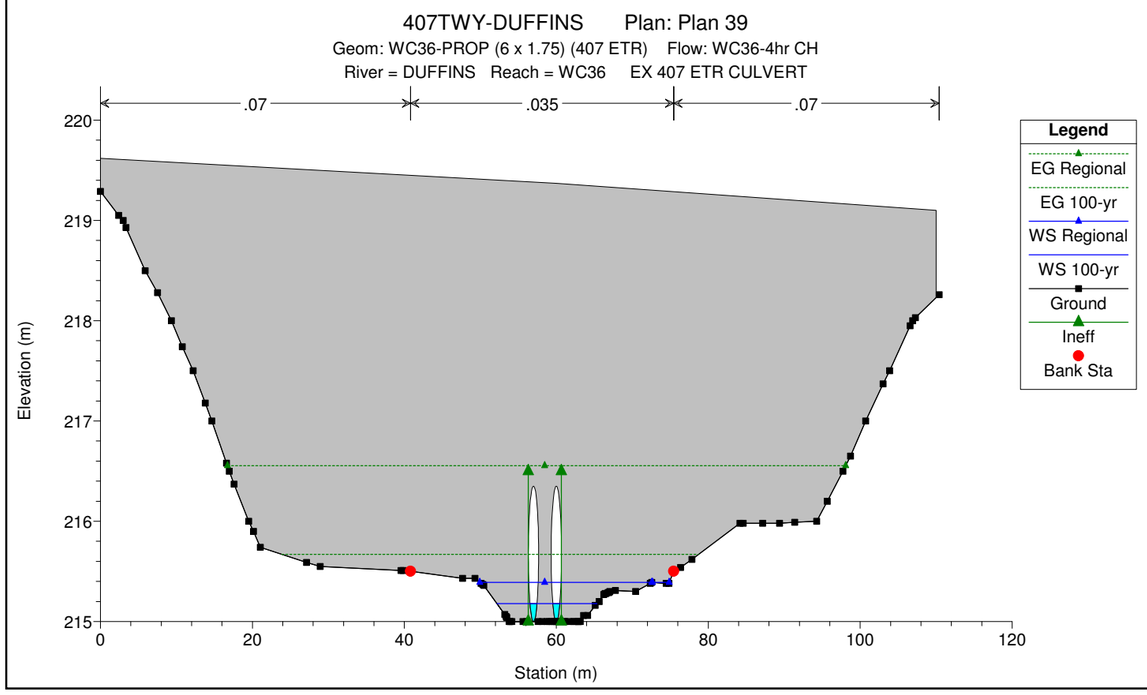
WC36	450		Culvert						
WC36	400	2-yr	215.08	215.06	0.02	0.16	0.01	0.18	10.85
WC36	400	5-yr	215.11	215.07	0.04	0.18	0.02	0.27	11.07
WC36	400	10-yr	215.13	215.08	0.05	0.20	0.02	0.36	11.28
WC36	400	25-yr	215.17	215.12	0.05	0.20	0.02	0.49	11.96
WC36	400	50-yr	215.19	215.12	0.06	0.22	0.03	0.59	12.03
WC36	400	100-yr	215.21	215.14	0.07	0.23	0.03	0.70	12.31
WC36	400	Check Flow	215.25	215.16	0.08	0.25	0.04	0.91	12.85
WC36	400	Regional	215.58	215.39	0.19	0.33	0.09	3.27	24.07
WC36	300	2-yr	214.56	214.56	0.00	0.02	0.00	0.18	47.84
WC36	300	5-yr	214.57	214.57	0.00	0.02	0.00	0.27	49.11
WC36	300	10-yr	214.58	214.58	0.00	0.02	0.00	0.36	50.24
WC36	300	25-yr	214.59	214.59	0.00	0.02	0.00	0.49	51.65
WC36	300	50-yr	214.60	214.60	0.00	0.02	0.00	0.59	52.63
WC36	300	100-yr	214.61	214.60	0.00	0.02	0.00	0.70	53.47
WC36	300	Check Flow	214.62	214.62	0.00	0.03	0.00	0.91	54.93
WC36	300	Regional	214.72	214.71	0.00	0.04	0.00	3.27	64.66
WC36	200	2-yr	214.54	214.54	0.00	0.05	0.00	0.18	59.95
WC36	200	5-yr	214.55	214.55	0.00	0.05	0.00	0.27	60.75
WC36	200	10-yr	214.56	214.56	0.00	0.06	0.00	0.36	61.18
WC36	200	25-yr	214.57	214.57	0.00	0.05	0.00	0.49	62.08
WC36	200	50-yr	214.58	214.58	0.00	0.05	0.00	0.59	62.60
WC36	200	100-yr	214.58	214.58	0.00	0.06	0.00	0.70	62.89
WC36	200	Check Flow	214.59	214.59	0.00	0.07	0.00	0.91	63.45
WC36	200	Regional	214.68	214.67	0.00	0.09	0.00	3.27	69.10
WC36	100	2-yr	214.49	214.48	0.00	0.49	0.00	0.18	25.97
WC36	100	5-yr	214.50	214.49	0.01	0.49	0.00	0.27	28.99
WC36	100	10-yr	214.50	214.49	0.01	0.48	0.00	0.36	29.52
WC36	100	25-yr	214.51	214.51	0.00	0.47	0.00	0.49	76.16
WC36	100	50-yr	214.52	214.51	0.00	0.47	0.00	0.59	76.26
WC36	100	100-yr	214.52	214.51	0.01	0.47	0.00	0.70	76.38
WC36	100	Check Flow	214.53	214.52	0.01	0.46	0.00	0.91	76.65
WC36	100	Regional	214.58	214.57	0.01	0.42	0.00	3.27	78.96
WC36	10	2-yr	214.00	214.00	0.00	0.64	0.00	0.18	20.64
WC36	10	5-yr	214.01	214.00	0.01	0.64	0.00	0.27	21.94
WC36	10	10-yr	214.02	214.02	0.01	0.64	0.00	0.36	23.23
WC36	10	25-yr	214.03	214.02	0.01	0.65	0.00	0.49	23.78
WC36	10	50-yr	214.04	214.03	0.01	0.65	0.00	0.59	24.42
WC36	10	100-yr	214.05	214.04	0.01	0.65	0.00	0.70	24.70
WC36	10	Check Flow	214.06	214.05	0.01	0.64	0.00	0.91	25.20
WC36	10	Regional	214.17	214.14	0.03	0.68	0.00	3.27	28.76
WC36	5	2-yr	213.36	213.36	0.00	1.26	0.00	0.18	21.28
WC36	5	5-yr	213.37	213.37	0.00	1.24	0.00	0.27	24.29
WC36	5	10-yr	213.38	213.37	0.01	1.22	0.00	0.36	24.73
WC36	5	25-yr	213.39	213.38	0.01	1.21	0.00	0.49	27.97
WC36	5	50-yr	213.40	213.39	0.01	1.22	0.00	0.59	28.59
WC36	5	100-yr	213.40	213.39	0.01	1.21	0.00	0.70	30.80
WC36	5	Check Flow	213.42	213.40	0.01	1.19	0.00	0.91	36.23
WC36	5	Regional	213.50	213.47	0.03	1.08	0.01	3.27	41.20
WC36	1	2-yr	212.10	212.08	0.03			0.18	4.69
WC36	1	5-yr	212.13	212.09	0.04			0.27	5.06
WC36	1	10-yr	212.15	212.12	0.03			0.36	6.23
WC36	1	25-yr	212.17	212.12	0.05			0.49	6.44
WC36	1	50-yr	212.18	212.14	0.04			0.59	7.07
WC36	1	100-yr	212.20	212.15	0.05			0.70	7.48
WC36	1	Check Flow	212.23	212.17	0.05			0.91	8.29
WC36	1	Regional	212.41	212.32	0.09			3.27	13.35

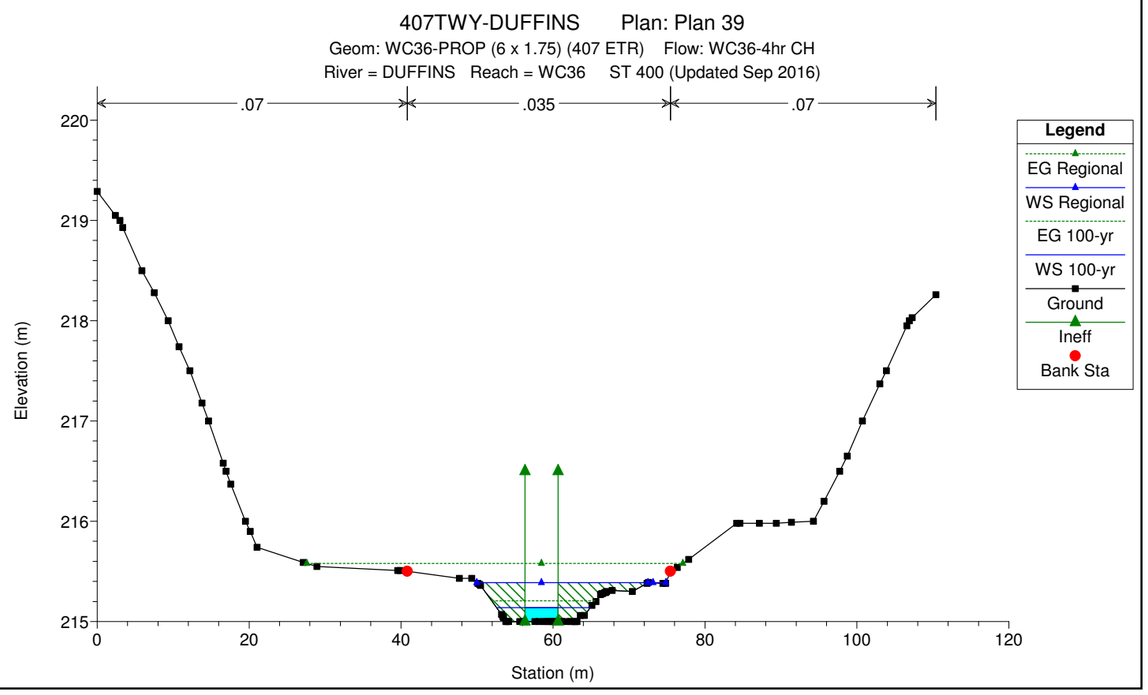
Profile Output Table - Culvert Only

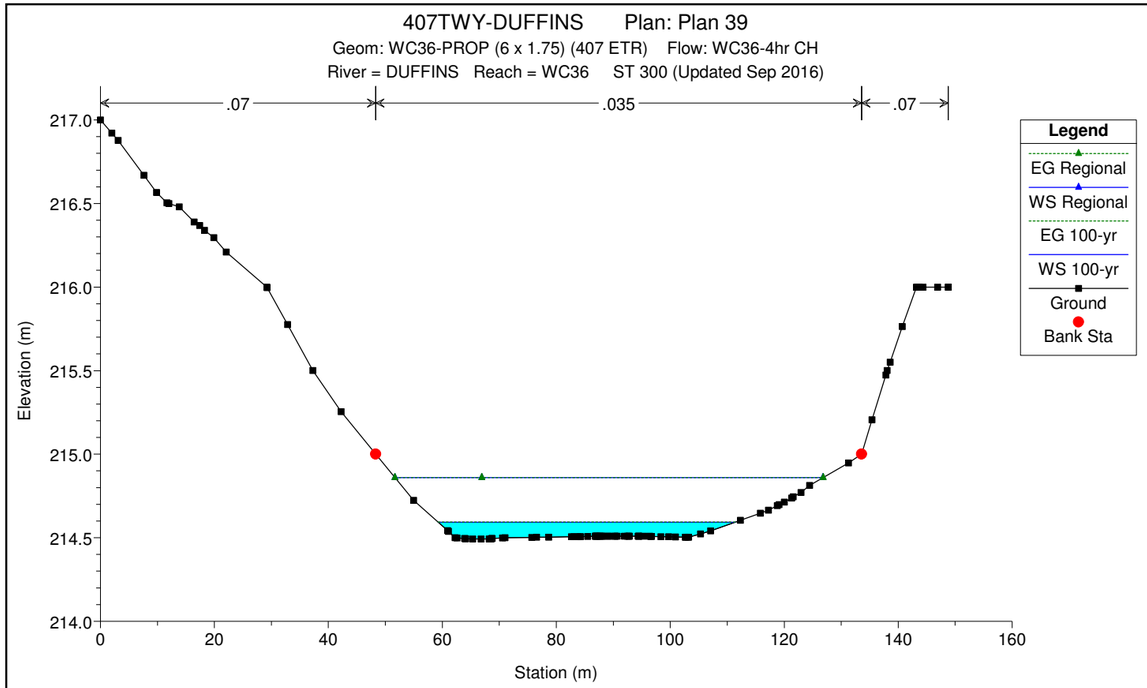
Reach	River Sta		Profile	E.G. US. (m)	W.S. US. (m)	E.G. IC (m)	E.G. OC (m)	Min El Weir Flow (m)	Q Culv Group (m3/s)	Q Weir (m3/s)	Delta WS (m)	Culv Vel US (m/s)	Culv Vel DS (m/s)
WC36	450	Culvert #2	2-yr	217.75	217.75	217.69	217.75	218.90	0.09		2.69	1.01	2.02
WC36	450	Culvert #1	2-yr	217.75	217.75	217.69	217.75	218.90	0.09		2.69	1.01	2.02
WC36	450	Culvert #2	5-yr	217.81	217.81	217.73	217.81	218.90	0.14		2.73	1.12	2.29
WC36	450	Culvert #1	5-yr	217.81	217.81	217.73	217.81	218.90	0.14		2.73	1.12	2.29
WC36	450	Culvert #2	10-yr	217.86	217.86	217.78	217.86	218.90	0.18		2.77	1.21	2.56
WC36	450	Culvert #1	10-yr	217.86	217.86	217.78	217.86	218.90	0.18		2.77	1.21	2.56
WC36	450	Culvert #2	25-yr	217.92	217.92	217.83	217.92	218.90	0.25		2.80	1.32	2.76
WC36	450	Culvert #1	25-yr	217.92	217.92	217.83	217.92	218.90	0.25		2.80	1.32	2.76
WC36	450	Culvert #2	50-yr	217.96	217.96	217.86	217.96	218.90	0.29		2.83	1.38	2.90
WC36	450	Culvert #1	50-yr	217.96	217.96	217.86	217.96	218.90	0.29		2.83	1.38	2.90
WC36	450	Culvert #2	100-yr	218.01	218.00	217.90	218.01	218.90	0.35		2.86	1.45	3.10
WC36	450	Culvert #1	100-yr	218.01	218.00	217.90	218.01	218.90	0.35		2.86	1.45	3.10
WC36	450	Culvert #2	Check Flow	218.08	218.07	217.97	218.08	218.90	0.46		2.91	1.56	3.34
WC36	450	Culvert #1	Check Flow	218.08	218.07	217.97	218.08	218.90	0.46		2.91	1.56	3.34
WC36	450	Culvert #2	Regional	218.68	218.65	218.53	218.68	218.90	1.64		3.27	2.28	4.78
WC36	450	Culvert #1	Regional	218.68	218.65	218.53	218.68	218.90	1.64		3.27	2.28	4.78

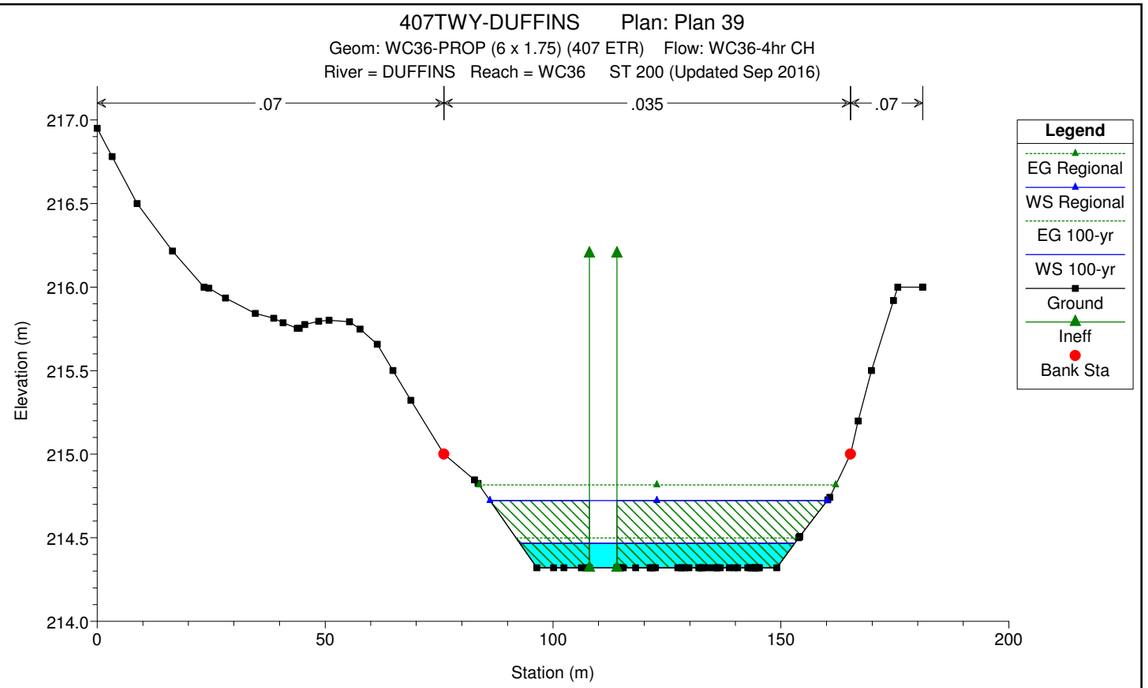

407TWY-DUFFINS Plan: Plan 39
Geom: WC36-PROP (6 x 1.75) (407 ETR) Flow: WC36-4hr CH
River = DUFFINS Reach = WC36 ST 500 (Updated Sep 2016)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta

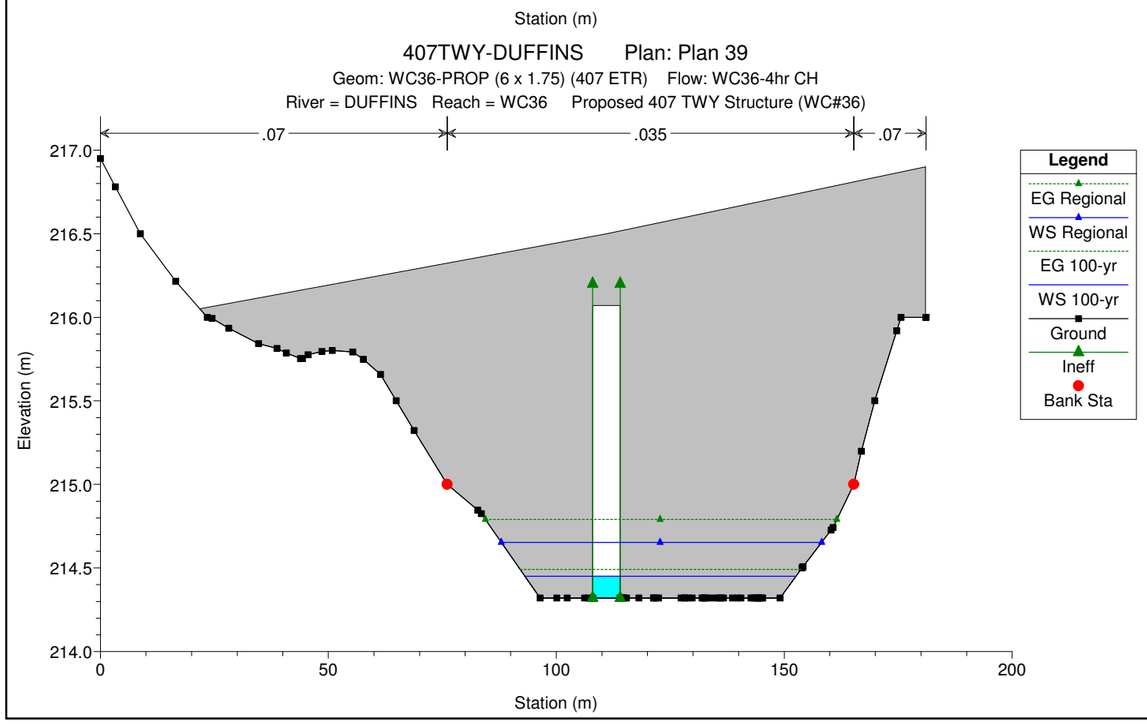

407TWY-DUFFINS Plan: Plan 39
Geom: WC36-PROP (6 x 1.75) (407 ETR) Flow: WC36-4hr CH
River = DUFFINS Reach = WC36 EX 407 ETR CULVERT
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta

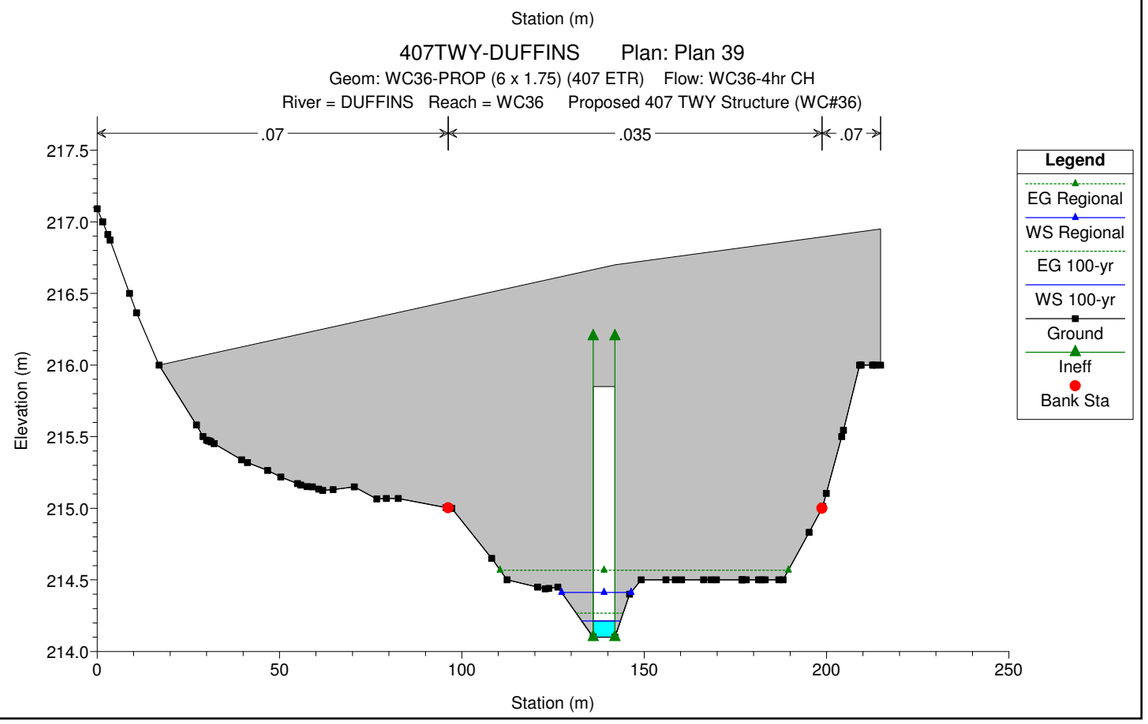

407TWY-DUFFINS Plan: Plan 39
Geom: WC36-PROP (6 x 1.75) (407 ETR) Flow: WC36-4hr CH
River = DUFFINS Reach = WC36 EX 407 ETR CULVERT
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
EG 100-yr
WS Regional
WS 100-yr
Ground
Ineff
Bank Sta

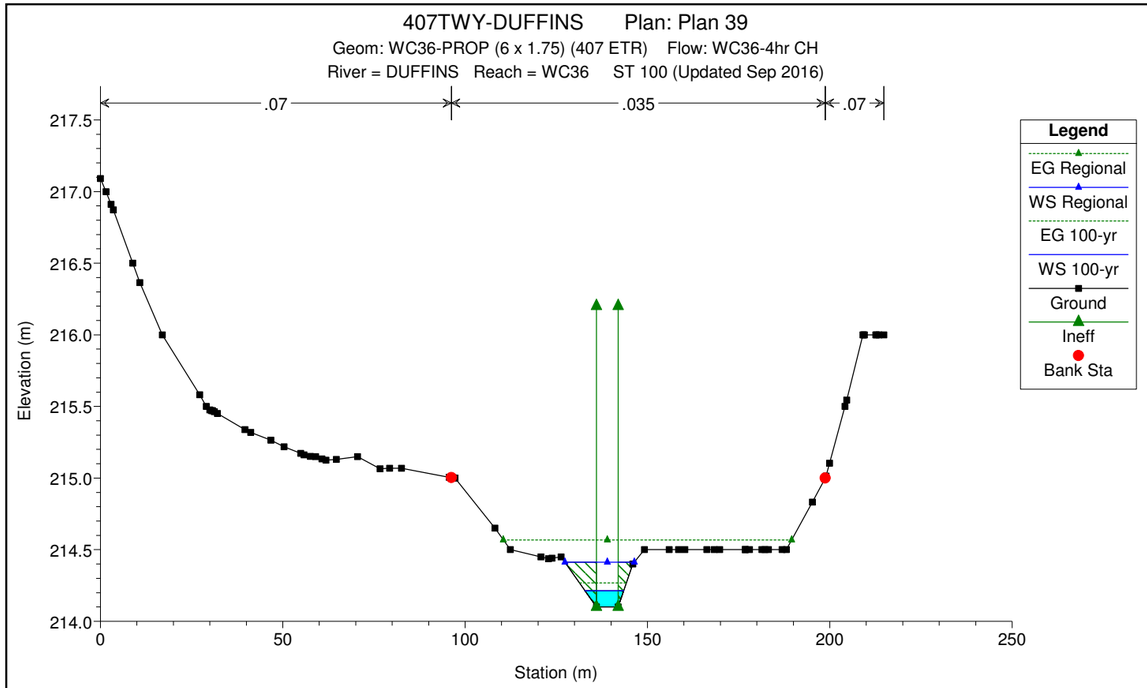

407TWY-DUFFINS Plan: Plan 39
Geom: WC36-PROP (6 x 1.75) (407 ETR) Flow: WC36-4hr CH
River = DUFFINS Reach = WC36 ST 400 (Updated Sep 2016)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta

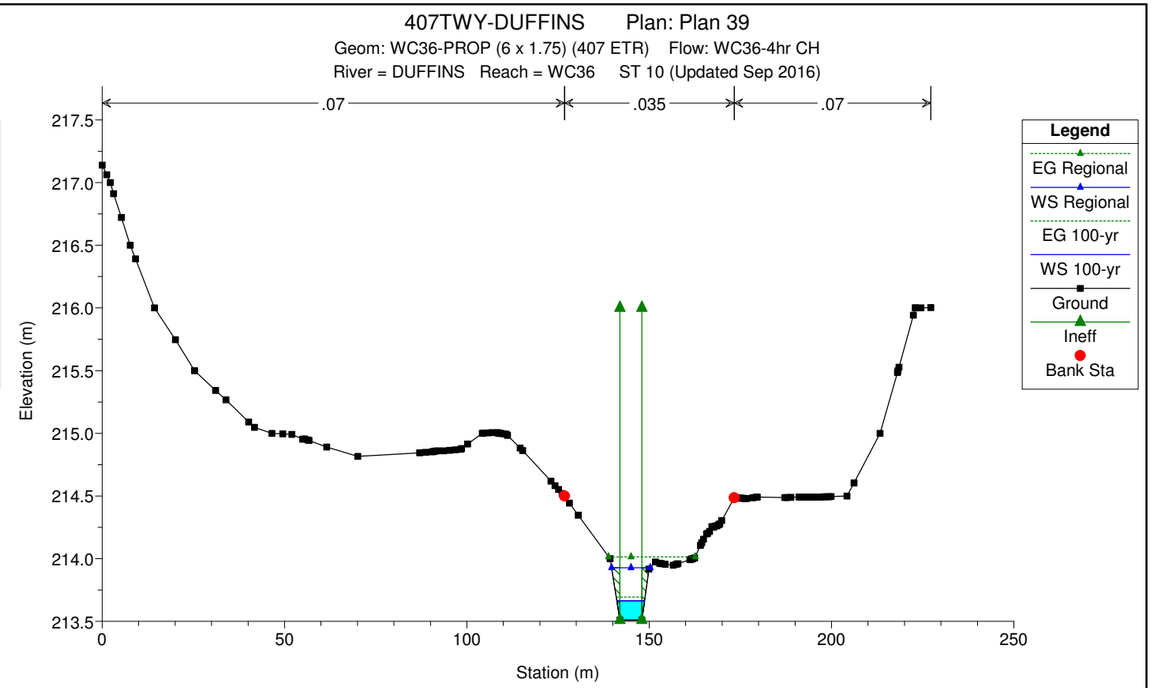

407TWY-DUFFINS Plan: Plan 39
Geom: WC36-PROP (6 x 1.75) (407 ETR) Flow: WC36-4hr CH
River = DUFFINS Reach = WC36 ST 300 (Updated Sep 2016)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Bank Sta

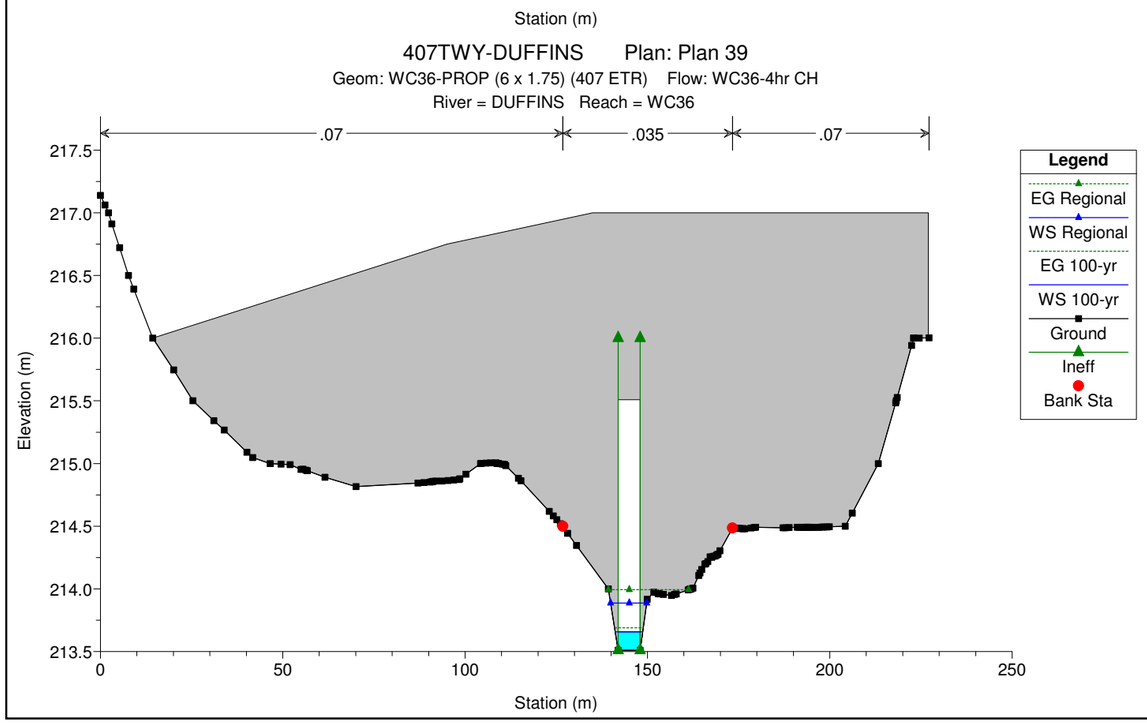

407TWY-DUFFINS Plan: Plan 39
Geom: WC36-PROP (6 x 1.75) (407 ETR) Flow: WC36-4hr CH
River = DUFFINS Reach = WC36 ST 200 (Updated Sep 2016)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta

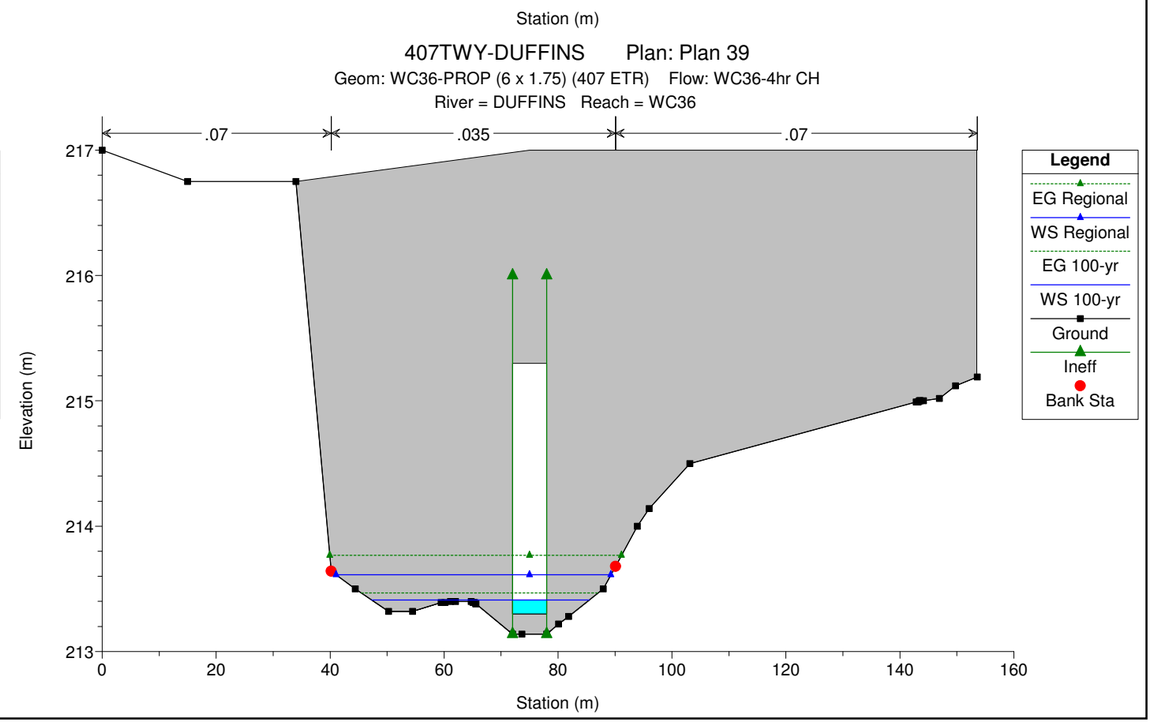

407TWY-DUFFINS Plan: Plan 39
Geom: WC36-PROP (6 x 1.75) (407 ETR) Flow: WC36-4hr CH
River = DUFFINS Reach = WC36 Proposed 407 TWY Structure (WC#36)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta

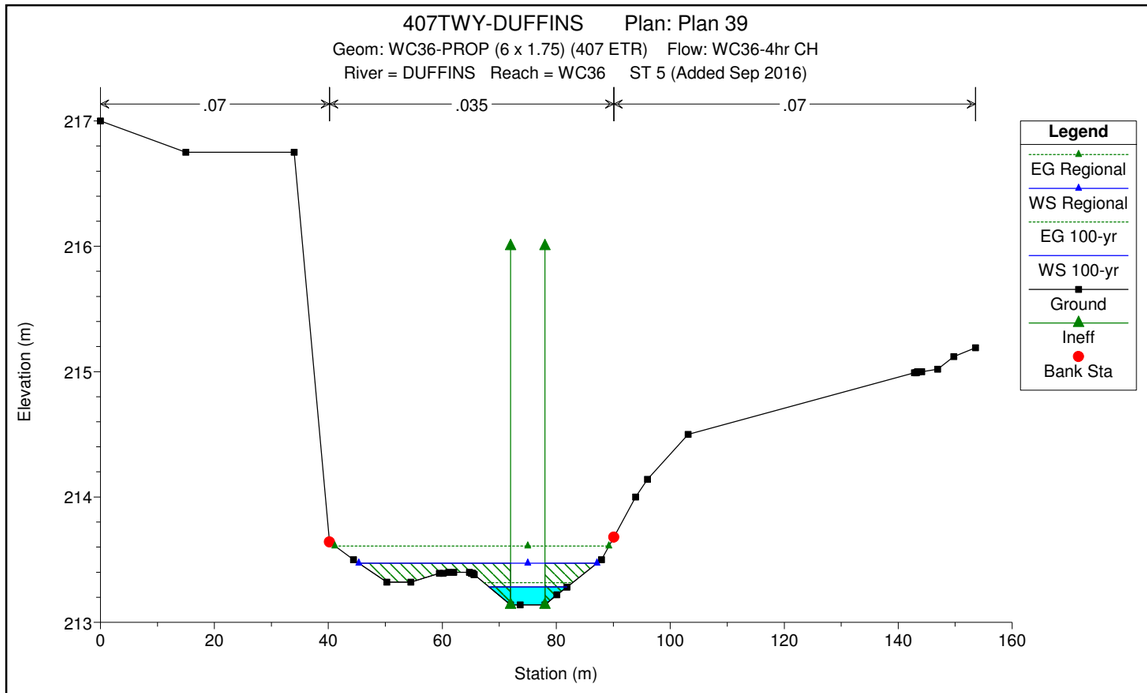

407TWY-DUFFINS Plan: Plan 39
Geom: WC36-PROP (6 x 1.75) (407 ETR) Flow: WC36-4hr CH
River = DUFFINS Reach = WC36 Proposed 407 TWY Structure (WC#36)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta

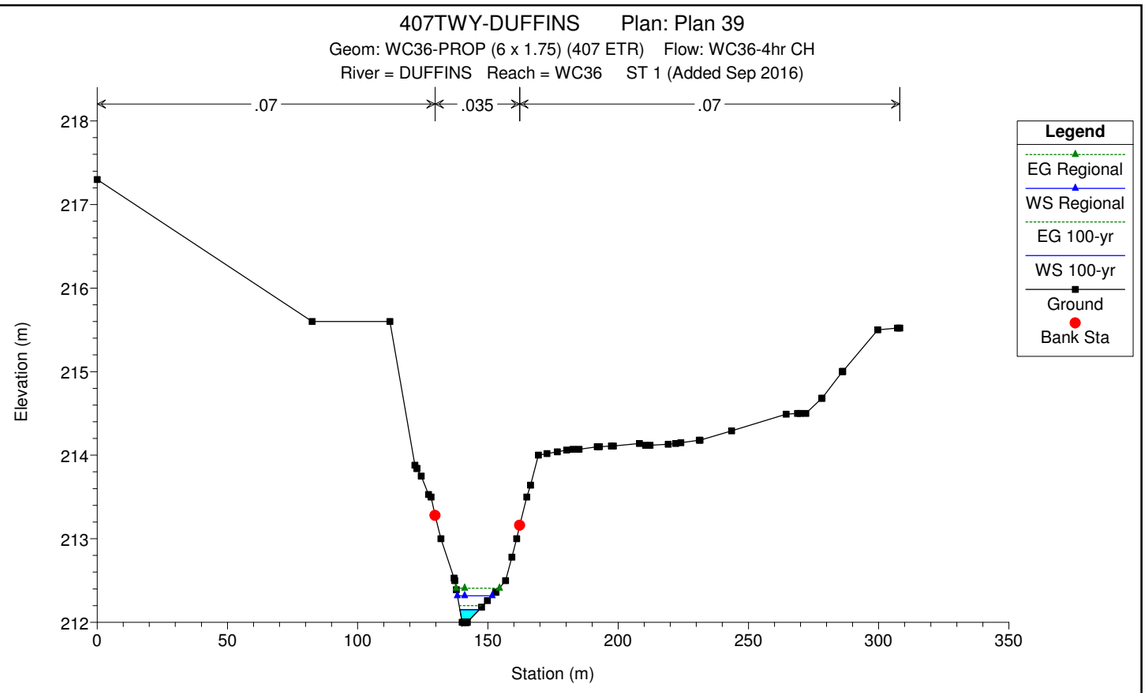

407TWY-DUFFINS Plan: Plan 39
Geom: WC36-PROP (6 x 1.75) (407 ETR) Flow: WC36-4hr CH
River = DUFFINS Reach = WC36 ST 100 (Updated Sep 2016)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


407TWY-DUFFINS Plan: Plan 39
Geom: WC36-PROP (6 x 1.75) (407 ETR) Flow: WC36-4hr CH
River = DUFFINS Reach = WC36 ST 10 (Updated Sep 2016)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


407TWY-DUFFINS Plan: Plan 39
Geom: WC36-PROP (6 x 1.75) (407 ETR) Flow: WC36-4hr CH
River = DUFFINS Reach = WC36
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


407TWY-DUFFINS Plan: Plan 39
Geom: WC36-PROP (6 x 1.75) (407 ETR) Flow: WC36-4hr CH
River = DUFFINS Reach = WC36
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


407TWY-DUFFINS Plan: Plan 39
Geom: WC36-PROP (6 x 1.75) (407 ETR) Flow: WC36-4hr CH
River = DUFFINS Reach = WC36 ST 5 (Added Sep 2016)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


407TWY-DUFFINS Plan: Plan 39
Geom: WC36-PROP (6 x 1.75) (407 ETR) Flow: WC36-4hr CH
River = DUFFINS Reach = WC36 ST 1 (Added Sep 2016)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Bank Sta

HEC-RAS Plan: WC36 - PROP(4hr CH) River: DUFFINS Reach: WC36

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC36	500	2-yr	0.18	217.50	217.75	217.56	217.75	0.000273	0.19	0.96	76.97	0.12
WC36	500	5-yr	0.27	217.50	217.81	217.59	217.81	0.000309	0.23	1.18	78.04	0.13
WC36	500	10-yr	0.36	217.50	217.86	217.59	217.86	0.000337	0.26	1.37	78.94	0.14
WC36	500	25-yr	0.49	217.50	217.92	217.62	217.92	0.000368	0.31	1.60	80.09	0.15
WC36	500	50-yr	0.59	217.50	217.96	217.63	217.96	0.000387	0.33	1.76	80.93	0.16
WC36	500	100-yr	0.70	217.50	218.00	217.65	218.01	0.000406	0.36	1.93	81.78	0.16
WC36	500	Check Flow	0.91	217.50	218.07	217.68	218.08	0.000435	0.41	2.21	83.40	0.17
WC36	500	Regional	3.27	217.50	218.65	217.92	218.68	0.000552	0.74	4.43	97.59	0.22
WC36	450		Culvert									
WC36	400	2-yr	0.18	215.00	215.07	215.06	215.09	0.017177	0.62	0.29	10.95	0.76
WC36	400	5-yr	0.27	215.00	215.08	215.07	215.11	0.020905	0.77	0.35	11.21	0.87
WC36	400	10-yr	0.36	215.00	215.09	215.08	215.13	0.028661	0.95	0.38	11.33	1.03
WC36	400	25-yr	0.49	215.00	215.12	215.12	215.17	0.018410	0.94	0.52	11.96	0.87
WC36	400	50-yr	0.59	215.00	215.12	215.12	215.19	0.024041	1.10	0.54	12.03	1.00
WC36	400	100-yr	0.70	215.00	215.14	215.14	215.21	0.023366	1.17	0.60	12.31	1.00
WC36	400	Check Flow	0.91	215.00	215.16	215.16	215.25	0.021833	1.27	0.72	12.85	1.00
WC36	400	Regional	3.27	215.00	215.39	215.39	215.58	0.016413	1.94	1.68	24.25	1.00
WC36	300	2-yr	0.18	214.49	214.54		214.54	0.001970	0.13	1.43	45.53	0.23
WC36	300	5-yr	0.27	214.49	214.55	214.52	214.55	0.001905	0.15	1.86	46.68	0.23
WC36	300	10-yr	0.36	214.49	214.56	214.53	214.56	0.001755	0.16	2.28	47.72	0.23
WC36	300	25-yr	0.49	214.49	214.57		214.57	0.001245	0.16	3.09	49.65	0.20
WC36	300	50-yr	0.59	214.49	214.58		214.58	0.001279	0.17	3.45	50.48	0.21
WC36	300	100-yr	0.70	214.49	214.59		214.59	0.001003	0.17	4.17	52.10	0.19
WC36	300	Check Flow	0.91	214.49	214.61		214.61	0.000923	0.18	5.08	54.07	0.19
WC36	300	Regional	3.27	214.49	214.86		214.86	0.000151	0.15	21.47	75.10	0.09
WC36	200	2-yr	0.18	214.32	214.38	214.37	214.39	0.012893	0.50	0.36	55.81	0.65
WC36	200	5-yr	0.27	214.32	214.40	214.37	214.41	0.013117	0.59	0.46	56.66	0.68
WC36	200	10-yr	0.36	214.32	214.42	214.40	214.44	0.011314	0.63	0.57	57.63	0.66
WC36	200	25-yr	0.49	214.32	214.43	214.41	214.46	0.011700	0.72	0.68	58.58	0.69
WC36	200	50-yr	0.59	214.32	214.45	214.42	214.48	0.011452	0.77	0.76	59.32	0.69
WC36	200	100-yr	0.70	214.32	214.47	214.42	214.50	0.009995	0.79	0.88	60.35	0.66
WC36	200	Check Flow	0.91	214.32	214.49	214.45	214.53	0.009449	0.87	1.05	61.81	0.66
WC36	200	Regional	3.27	214.32	214.72	214.63	214.82	0.007549	1.35	2.42	74.04	0.68
WC36	150		Culvert									

HEC-RAS Plan: WC36 - PROP(4hr CH) River: DUFFINS Reach: WC36 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC36	100	2-yr	0.18	214.10	214.15	214.14	214.17	0.024020	0.60	0.30	8.05	0.86
WC36	100	5-yr	0.27	214.10	214.16	214.16	214.19	0.023098	0.70	0.39	8.65	0.88
WC36	100	10-yr	0.36	214.10	214.18	214.18	214.21	0.018104	0.73	0.49	9.38	0.81
WC36	100	25-yr	0.49	214.10	214.19	214.18	214.23	0.025178	0.91	0.54	9.69	0.97
WC36	100	50-yr	0.59	214.10	214.20	214.20	214.25	0.023974	0.97	0.61	10.18	0.97
WC36	100	100-yr	0.70	214.10	214.21	214.21	214.27	0.023540	1.03	0.68	10.66	0.97
WC36	100	Check Flow	0.91	214.10	214.25	214.25	214.30	0.017446	1.04	0.87	11.97	0.87
WC36	100	Regional	3.27	214.10	214.41	214.41	214.57	0.017636	1.75	1.87	19.04	1.00
WC36	10	2-yr	0.18	213.51	213.58	213.56	213.59	0.008897	0.45	0.40	6.70	0.55
WC36	10	5-yr	0.27	213.51	213.60	213.57	213.61	0.008995	0.53	0.51	6.89	0.57
WC36	10	10-yr	0.36	213.51	213.61	213.58	213.63	0.008948	0.59	0.61	7.06	0.59
WC36	10	25-yr	0.49	213.51	213.63	213.60	213.66	0.008522	0.66	0.75	7.29	0.60
WC36	10	50-yr	0.59	213.51	213.65	213.61	213.67	0.008536	0.71	0.83	7.44	0.61
WC36	10	100-yr	0.70	213.51	213.66	213.62	213.69	0.008562	0.76	0.92	7.59	0.62
WC36	10	Check Flow	0.91	213.51	213.70	213.64	213.73	0.007720	0.82	1.11	7.92	0.61
WC36	10	Regional	3.27	213.51	213.93	213.82	214.01	0.006685	1.31	2.51	10.62	0.64
WC36	7		Culvert									
WC36	5	2-yr	0.18	213.14	213.21	213.19	213.22	0.008050	0.43	0.42	9.68	0.52
WC36	5	5-yr	0.27	213.14	213.22	213.20	213.24	0.010298	0.55	0.49	10.36	0.61
WC36	5	10-yr	0.36	213.14	213.24	213.21	213.26	0.009259	0.60	0.60	11.39	0.60
WC36	5	25-yr	0.49	213.14	213.26	213.23	213.28	0.010838	0.71	0.69	12.22	0.66
WC36	5	50-yr	0.59	213.14	213.26	213.24	213.29	0.013707	0.82	0.72	12.49	0.75
WC36	5	100-yr	0.70	213.14	213.28	213.25	213.32	0.011353	0.83	0.85	13.64	0.70
WC36	5	Check Flow	0.91	213.14	213.30	213.28	213.35	0.011747	0.93	0.98	14.86	0.73
WC36	5	Regional	3.27	213.14	213.47	213.46	213.61	0.014501	1.65	1.99	41.77	0.91
WC36	1	2-yr	0.18	212.00	212.07	212.07	212.10	0.051259	0.85	0.21	4.38	1.24
WC36	1	5-yr	0.27	212.00	212.09	212.09	212.13	0.030416	0.79	0.34	5.36	1.00
WC36	1	10-yr	0.36	212.00	212.10	212.10	212.15	0.036821	0.92	0.39	5.69	1.12
WC36	1	25-yr	0.49	212.00	212.13	212.13	212.17	0.028113	0.90	0.54	6.59	1.01
WC36	1	50-yr	0.59	212.00	212.15	212.15	212.19	0.019649	0.83	0.71	7.45	0.86
WC36	1	100-yr	0.70	212.00	212.15	212.15	212.20	0.026347	0.97	0.72	7.52	1.00
WC36	1	Check Flow	0.91	212.00	212.17	212.17	212.23	0.025288	1.02	0.89	8.29	1.00
WC36	1	Regional	3.27	212.00	212.32	212.32	212.41	0.021124	1.34	2.45	13.35	1.00

HEC-RAS HEC-RAS 5.0.1 April 2016
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X    X
X     X  X        X           X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X           X  X     X    X        X
X     X  X        X    X      X   X    X    X        X
X     X  XXXXXX    XXXX       X    X   X    X   XXXXX
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PROJECT DATA
Project Title: 407TWY-DUFFINS
Project File : 407TWY-DUFFINS.prj
Run Date and Time: 9/30/2016 2:40:46 PM

Project in SI units

Project Description:
HEC-RAS Model created for 407 TWY project from Kennedy Rd. to Brock Rd. -
Duffins Creek Watershed

PLAN DATA

Plan Title: Plan 39
Plan File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.p39

Geometry Title: WC36-PROP (6 x 1.75) (407 ETR)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.g12

Flow Title   : WC36-4hr CH
Flow File   : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.f10

Plan Summary Information:
Number of: Cross Sections = 8 Multiple Openings = 0
            Culverts   = 3 Inline Structures = 0
            Bridges   = 0 Lateral Structures = 0

Computational Information
    Water surface calculation tolerance = 0.01
    Critical depth calculation tolerance = 0.01
    Maximum number of iterations   = 20
    Maximum difference tolerance   = 0.3
    Flow tolerance factor   = 0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method: Average Conveyance
    Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: WC36-4hr CH
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.f10

Flow Data (m3/s)

River	Reach	RS	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Check Flow	Regional
DUFFINS	WC36	500	.18	.27	.36	.49	.59	.7	.91	3.27

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
DUFFINS	WC36	2-yr		Critical
DUFFINS	WC36	5-yr		Critical
DUFFINS	WC36	10-yr		Critical
DUFFINS	WC36	25-yr		Critical
DUFFINS	WC36	50-yr		Critical
DUFFINS	WC36	100-yr		Critical
DUFFINS	WC36	Check Flow		Critical
DUFFINS	WC36	Regional		Critical

GEOMETRY DATA

Geometry Title: WC36-PROP (6 x 1.75) (407 ETR)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.g12

CROSS SECTION

RIVER: DUFFINS
REACH: WC36 RS: 500

INPUT
Description: ST 500 (Updated Sep 2016)
Station Elevation Data num= 45

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	219.12	1.51	219.06	1.84	219.04	2.94	219	3.34	218.93
5.82	218.5	6.62	218.4	9.9	218.17	11.96	218	12.93	217.9
16.67	217.5	16.74	217.5	16.76	217.5	17.48	217.5	20.95	217.5
22.5	217.5	23.06	217.5	26.64	217.5	30.22	217.5	34.91	217.5
35.6	217.5	42.57	217.5	49.86	217.5	81.08	217.5	83.49	217.5
83.63	217.5	83.83	217.5	83.9	217.5	83.98	217.5	84.18	217.5
84.21	217.5	84.34	217.5	84.47	217.5	84.55	217.5	85.25	217.5
86.01	217.5	87.97	217.5	88.43	217.5	88.98	217.5	92.89	217.92
93.72	218	98.21	218.45	98.28	218.45	98.73	218.5	102.53	218.52

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	11.96	.035	93.72	.07

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
          11.96 93.72   86.7   86.7   86.7   .3   .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	51.825	218.9	T
55.675	102.53	218.9	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	217.75	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	217.75	Reach Len. (m)	86.70	86.70	86.70
Crit W.S. (m)	217.56	Flow Area (m2)		0.96	
E.G. Slope (m/m)	0.000273	Area (m2)		18.63	
Q Total (m3/s)	0.18	Flow (m3/s)		0.18	
Top Width (m)	76.97	Top Width (m)		76.97	
Vel Total (m/s)	0.19	Avg. Vel. (m/s)		0.19	
Max Chl Dpth (m)	0.25	Hydr. Depth (m)		0.25	
Conv. Total (m3/s)	10.9	Conv. (m3/s)		10.9	
Length Wtd. (m)	86.70	Wetted Per. (m)		3.85	
Min Ch El (m)	217.50	Shear (N/m2)		0.67	
Alpha	1.00	Stream Power (N/m s)		0.13	
Frctn Loss (m)		Cum Volume (1000 m3)		0.31	

C & E Loss (m)		Cum SA (1000 m2)	11.40

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	217.81	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	217.81	Reach Len. (m)	86.70	86.70	86.70
Crit W.S. (m)	217.59	Flow Area (m2)		1.18	
E.G. Slope (m/m)	0.000309	Area (m2)		23.07	
Q Total (m3/s)	0.27	Flow (m3/s)		0.27	
Top Width (m)	78.04	Top Width (m)		78.04	
Vel Total (m/s)	0.23	Avg. Vel. (m/s)		0.23	
Max Chl Dpth (m)	0.31	Hydr. Depth (m)		0.31	
Conv. Total (m3/s)	15.4	Conv. (m3/s)		15.4	
Length Wtd. (m)	86.70	Wetted Per. (m)		3.85	
Min Ch El (m)	217.50	Shear (N/m2)		0.93	
Alpha	1.00	Stream Power (N/m s)		0.21	
Frctn Loss (m)		Cum Volume (1000 m3)		0.40	
C & E Loss (m)		Cum SA (1000 m2)		11.70	

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	217.86	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	217.86	Reach Len. (m)	86.70	86.70	86.70
Crit W.S. (m)	217.59	Flow Area (m2)		1.37	
E.G. Slope (m/m)	0.000337	Area (m2)		26.88	
Q Total (m3/s)	0.36	Flow (m3/s)		0.36	
Top Width (m)	78.94	Top Width (m)		78.94	
Vel Total (m/s)	0.26	Avg. Vel. (m/s)		0.26	
Max Chl Dpth (m)	0.36	Hydr. Depth (m)		0.36	
Conv. Total (m3/s)	19.6	Conv. (m3/s)		19.6	
Length Wtd. (m)	86.70	Wetted Per. (m)		3.85	
Min Ch El (m)	217.50	Shear (N/m2)		1.17	
Alpha	1.00	Stream Power (N/m s)		0.31	
Frctn Loss (m)		Cum Volume (1000 m3)		0.48	
C & E Loss (m)		Cum SA (1000 m2)		11.98	

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	217.92	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	217.92	Reach Len. (m)	86.70	86.70	86.70
Crit W.S. (m)	217.62	Flow Area (m2)		1.60	
E.G. Slope (m/m)	0.000368	Area (m2)		31.73	
Q Total (m3/s)	0.49	Flow (m3/s)		0.49	
Top Width (m)	80.09	Top Width (m)		80.09	
Vel Total (m/s)	0.31	Avg. Vel. (m/s)		0.31	
Max Chl Dpth (m)	0.42	Hydr. Depth (m)		0.42	
Conv. Total (m3/s)	25.5	Conv. (m3/s)		25.5	
Length Wtd. (m)	86.70	Wetted Per. (m)		3.85	
Min Ch El (m)	217.50	Shear (N/m2)		1.50	
Alpha	1.00	Stream Power (N/m s)		0.46	
Frctn Loss (m)		Cum Volume (1000 m3)		0.62	
C & E Loss (m)		Cum SA (1000 m2)		12.39	

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	217.96	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	217.96	Reach Len. (m)	86.70	86.70	86.70
Crit W.S. (m)	217.63	Flow Area (m2)		1.76	
E.G. Slope (m/m)	0.000387	Area (m2)		35.11	
Q Total (m3/s)	0.59	Flow (m3/s)		0.59	
Top Width (m)	80.93	Top Width (m)		80.93	
Vel Total (m/s)	0.33	Avg. Vel. (m/s)		0.33	
Max Chl Dpth (m)	0.46	Hydr. Depth (m)		0.46	
Conv. Total (m3/s)	30.0	Conv. (m3/s)		30.0	
Length Wtd. (m)	86.70	Wetted Per. (m)		3.85	
Min Ch El (m)	217.50	Shear (N/m2)		1.74	
Alpha	1.00	Stream Power (N/m s)		0.58	
Frctn Loss (m)		Cum Volume (1000 m3)		0.69	
C & E Loss (m)		Cum SA (1000 m2)		12.60	

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	218.01	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	218.00	Reach Len. (m)	86.70	86.70	86.70
Crit W.S. (m)	217.65	Flow Area (m2)		1.93	
E.G. Slope (m/m)	0.000406	Area (m2)	0.00	38.56	0.00
Q Total (m3/s)	0.70	Flow (m3/s)		0.70	
Top Width (m)	81.78	Top Width (m)	0.01	81.76	0.01
Vel Total (m/s)	0.36	Avg. Vel. (m/s)		0.36	
Max Chl Dpth (m)	0.50	Hydr. Depth (m)		0.50	
Conv. Total (m3/s)	34.7	Conv. (m3/s)		34.7	
Length Wtd. (m)	86.70	Wetted Per. (m)		3.85	
Min Ch El (m)	217.50	Shear (N/m2)		1.99	
Alpha	1.00	Stream Power (N/m s)		0.72	
Frctn Loss (m)		Cum Volume (1000 m3)		0.81	
C & E Loss (m)		Cum SA (1000 m2)	0.00	12.93	0.00

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	218.08	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	218.07	Reach Len. (m)	86.70	86.70	86.70
Crit W.S. (m)	217.68	Flow Area (m2)		2.21	
E.G. Slope (m/m)	0.000435	Area (m2)	0.03	44.57	0.03
Q Total (m3/s)	0.91	Flow (m3/s)		0.91	
Top Width (m)	83.40	Top Width (m)	0.90	81.76	0.74
Vel Total (m/s)	0.41	Avg. Vel. (m/s)		0.41	
Max Chl Dpth (m)	0.57	Hydr. Depth (m)		0.57	
Conv. Total (m3/s)	43.6	Conv. (m3/s)		43.6	
Length Wtd. (m)	86.70	Wetted Per. (m)		3.85	
Min Ch El (m)	217.50	Shear (N/m2)		2.45	
Alpha	1.00	Stream Power (N/m s)		1.01	
Frctn Loss (m)		Cum Volume (1000 m3)		0.99	
C & E Loss (m)		Cum SA (1000 m2)	0.04	13.36	0.03

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	218.68	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	218.65	Reach Len. (m)	86.70	86.70	86.70
Crit W.S. (m)	217.92	Flow Area (m2)		4.43	
E.G. Slope (m/m)	0.000552	Area (m2)	2.60	91.79	2.55
Q Total (m3/s)	3.27	Flow (m3/s)		3.27	
Top Width (m)	97.59	Top Width (m)	7.02	81.76	8.81
Vel Total (m/s)	0.74	Avg. Vel. (m/s)		0.74	
Max Chl Dpth (m)	1.15	Hydr. Depth (m)		1.15	
Conv. Total (m3/s)	139.2	Conv. (m3/s)		139.2	
Length Wtd. (m)	86.70	Wetted Per. (m)		3.85	
Min Ch El (m)	217.50	Shear (N/m2)		6.23	
Alpha	1.00	Stream Power (N/m s)		4.59	
Frctn Loss (m)		Cum Volume (1000 m3)		3.30	
C & E Loss (m)		Cum SA (1000 m2)	0.30	18.95	0.38

CULVERT

RIVER: DUFFINS
REACH: WC36 RS: 450

INPUT
Description: EX 407 ETR CULVERT

```
Distance from Upstream XS =      14
Deck/Roadway Width        =      59
Weir Coefficient          =     1.4
Upstream  Deck/Roadway Coordinates
    num=           3
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0  219.28              55   219.1              103  218.82

Upstream Bridge Cross Section Data
Station Elevation Data    num=      45
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  219.12    1.51  219.06    1.84  219.04    2.94     219    3.34  218.93
    5.82   218.5    6.62   218.4     9.9  218.17   11.96     218   12.93   217.9
   16.67   217.5   16.74   217.5   16.76   217.5   17.48   217.5   20.95   217.5
    22.5   217.5   23.06   217.5   26.64   217.5   30.22   217.5   34.91   217.5
    35.6   217.5   42.57   217.5   49.86   217.5   81.08   217.5   83.49   217.5
   83.63   217.5   83.83   217.5    83.9   217.5   83.98   217.5   84.18   217.5
   84.21   217.5   84.34   217.5   84.47   217.5   84.55   217.5   85.25   217.5
   86.01   217.5   87.97   217.5   88.43   217.5   88.98   217.5   92.89  217.92
   93.72     218   98.21  218.45   98.28  218.45   98.73   218.5  102.53  218.52

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .07   11.96    .035   93.72     .07

Bank Sta: Left   Right    Coeff Contr.   Expan.
         11.96   93.72            .3      .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0  51.825   218.9       T
  55.675  102.53   218.9       T

Downstream  Deck/Roadway Coordinates
    num=           3
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0  219.62              60  219.37              110   219.1

Downstream Bridge Cross Section Data
Station Elevation Data    num=      89
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  219.29    2.39  219.05    2.98     219    3.36  218.93    5.89   218.5
    7.52  218.28    9.33     218   10.78  217.74   12.19   217.5    13.8  217.18
   14.67     217    16.6  216.58   16.94   216.5   17.58  216.37   19.51     216
   20.14   215.9   21.04  215.74   27.13  215.59   28.93  215.55   39.57  215.51
   39.84  215.51   40.82   215.5   47.67  215.43   49.28  215.43   50.08  215.38
   50.33  215.37   50.47  215.36   53.23  215.07   53.37  215.05    53.5  215.04
    53.8     215   53.85     215   53.94     215   54.16     215   55.61     215
   56.08     215   57.62     215   58.15     215   58.76     215   59.06     215
   59.39     215   59.73     215   59.95     215   60.01     215    60.2     215
   60.92     215   61.12     215   61.64     215   62.27     215   62.41     215
   62.89     215    62.9     215   62.95     215   63.15     215   63.59  215.06
   64.13  215.06   65.11  215.16   65.64   215.2   66.24  215.27    66.4  215.28
   66.55  215.28   66.81  215.29   66.94  215.29   67.06   215.3   67.79  215.31
   70.44   215.3   72.36  215.38   72.57  215.39   74.47  215.38   74.81  215.38
   75.47   215.5   76.37  215.54   77.84  215.62   84.18  215.98   84.61  215.98
   87.15  215.98   89.39  215.98   91.39  215.99   94.28     216   95.66   216.2
   97.72   216.5   98.71  216.65  100.73     217     103  217.37  103.89   217.5
  106.58  217.95  106.91     218  107.28  218.03  110.39  218.26

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .07   40.82    .035   75.47     .07

Bank Sta: Left   Right    Coeff Contr.   Expan.
         40.82   75.47            .3      .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0  56.325   216.5       T
  60.675  110.39   216.5       T

Upstream Embankment side slope              =       2 horiz. to 1.0 vertical
Downstream Embankment side slope            =       2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  2

Culvert Name     Shape      Rise    Span
Culvert #2      Circular    1.35
FHWA Chart # 2 - Corrugated Metal Pipe Culvert
FHWA Scale # 3 - Pipe projecting from fill
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length     Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                 .6     84.5      .013      .013        0                   .9               1
Upstream   Elevation =  217.5
           Centerline Station =  52.5
Downstream Elevation =  215
           Centerline Station =  57

Culvert Name     Shape      Rise    Span
Culvert #1      Circular    1.35
FHWA Chart # 2 - Corrugated Metal Pipe Culvert
FHWA Scale # 3 - Pipe projecting from fill
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length     Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                1.2     84.5      .013      .013        0                   .9               1
Upstream   Elevation =  217.5
           Centerline Station =  55
Downstream Elevation =  215
           Centerline Station =  60

CULVERT OUTPUT  Profile #2-yr  Culv Group:  Culvert #2

  Q Culv Group (m3/s)       0.09    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         1.01
  Q Barrel (m3/s)           0.09    Culv Vel DS (m/s)         2.02
  E.G. US. (m)            217.75    Culv Inv El Up (m)      217.50
  W.S. US. (m)            217.75    Culv Inv El Dn (m)      215.00
  E.G. DS (m)             215.09    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             215.07    Culv Exit Loss (m)        0.22
  Delta EG (m)              2.66    Culv Entr Loss (m)        0.05
  Delta WS (m)              2.68    Q Weir (m3/s)
  E.G. IC (m)             217.69    Weir Sta Lft (m)
  E.G. OC (m)             217.75    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       217.65    Weir Max Depth (m)
  Culv WS Outlet (m)      215.10    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.10    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.15    Min El Weir Flow (m)    218.90


Note:    During supercritical analysis, the culvert direct step method went to normal depth.  The program then assumed
         normal depth at the outlet.
Note:    The flow in the culvert is entirely supercritical.

CULVERT OUTPUT  Profile #5-yr  Culv Group:  Culvert #2

  Q Culv Group (m3/s)       0.14    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         1.12
  Q Barrel (m3/s)           0.14    Culv Vel DS (m/s)         2.29
  E.G. US. (m)            217.81    Culv Inv El Up (m)      217.50
  W.S. US. (m)            217.81    Culv Inv El Dn (m)      215.00
  E.G. DS (m)             215.11    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             215.08    Culv Exit Loss (m)        0.27
  Delta EG (m)              2.70    Culv Entr Loss (m)        0.06
  Delta WS (m)              2.73    Q Weir (m3/s)
  E.G. IC (m)             217.73    Weir Sta Lft (m)
  E.G. OC (m)             217.81    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       217.69    Weir Max Depth (m)
  Culv WS Outlet (m)      215.12    Weir Avg Depth (m)
```

Culv Nml Depth (m)	0.12	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.19	Min El Weir Flow (m)	218.90

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #10-yr Culv Group: Culvert #2

Q Culv Group (m3/s)	0.18	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.21
Q Barrel (m3/s)	0.18	Culv Vel DS (m/s)	2.56
E.G. US. (m)	217.86	Culv Inv El Up (m)	217.50
W.S. US. (m)	217.86	Culv Inv El Dn (m)	215.00
E.G. DS (m)	215.13	Culv Frctn Ls (m)	0.00
W.S. DS (m)	215.09	Culv Exit Loss (m)	0.33
Delta EG (m)	2.73	Culv Entr Loss (m)	0.07
Delta WS (m)	2.77	Q Weir (m3/s)	
E.G. IC (m)	217.78	Weir Sta Lft (m)	
E.G. OC (m)	217.86	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	217.72	Weir Max Depth (m)	
Culv WS Outlet (m)	215.13	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.13	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.22	Min El Weir Flow (m)	218.90

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #25-yr Culv Group: Culvert #2

Q Culv Group (m3/s)	0.25	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.32
Q Barrel (m3/s)	0.25	Culv Vel DS (m/s)	2.76
E.G. US. (m)	217.92	Culv Inv El Up (m)	217.50
W.S. US. (m)	217.92	Culv Inv El Dn (m)	215.00
E.G. DS (m)	215.17	Culv Frctn Ls (m)	0.00
W.S. DS (m)	215.12	Culv Exit Loss (m)	0.38
Delta EG (m)	2.76	Culv Entr Loss (m)	0.08
Delta WS (m)	2.80	Q Weir (m3/s)	
E.G. IC (m)	217.83	Weir Sta Lft (m)	
E.G. OC (m)	217.92	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	217.75	Weir Max Depth (m)	
Culv WS Outlet (m)	215.15	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.15	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.25	Min El Weir Flow (m)	218.90

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #50-yr Culv Group: Culvert #2

Q Culv Group (m3/s)	0.29	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.38
Q Barrel (m3/s)	0.29	Culv Vel DS (m/s)	2.90
E.G. US. (m)	217.96	Culv Inv El Up (m)	217.50
W.S. US. (m)	217.96	Culv Inv El Dn (m)	215.00
E.G. DS (m)	215.19	Culv Frctn Ls (m)	0.00
W.S. DS (m)	215.12	Culv Exit Loss (m)	0.41
Delta EG (m)	2.78	Culv Entr Loss (m)	0.09
Delta WS (m)	2.83	Q Weir (m3/s)	
E.G. IC (m)	217.86	Weir Sta Lft (m)	
E.G. OC (m)	217.96	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	217.78	Weir Max Depth (m)	
Culv WS Outlet (m)	215.17	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.17	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.28	Min El Weir Flow (m)	218.90

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #100-yr Culv Group: Culvert #2

Q Culv Group (m3/s)	0.35	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.45
Q Barrel (m3/s)	0.35	Culv Vel DS (m/s)	3.10
E.G. US. (m)	218.01	Culv Inv El Up (m)	217.50
W.S. US. (m)	218.00	Culv Inv El Dn (m)	215.00
E.G. DS (m)	215.21	Culv Frctn Ls (m)	0.00
W.S. DS (m)	215.14	Culv Exit Loss (m)	0.46
Delta EG (m)	2.80	Culv Entr Loss (m)	0.10
Delta WS (m)	2.86	Q Weir (m3/s)	
E.G. IC (m)	217.90	Weir Sta Lft (m)	
E.G. OC (m)	218.01	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	217.80	Weir Max Depth (m)	
Culv WS Outlet (m)	215.18	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.18	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.30	Min El Weir Flow (m)	218.90

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #Check Flow Culv Group: Culvert #2

Q Culv Group (m3/s)	0.46	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.56
Q Barrel (m3/s)	0.46	Culv Vel DS (m/s)	3.34
E.G. US. (m)	218.08	Culv Inv El Up (m)	217.50
W.S. US. (m)	218.07	Culv Inv El Dn (m)	215.00
E.G. DS (m)	215.25	Culv Frctn Ls (m)	0.00
W.S. DS (m)	215.16	Culv Exit Loss (m)	0.53
Delta EG (m)	2.84	Culv Entr Loss (m)	0.11
Delta WS (m)	2.91	Q Weir (m3/s)	
E.G. IC (m)	217.97	Weir Sta Lft (m)	
E.G. OC (m)	218.08	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	217.85	Weir Max Depth (m)	
Culv WS Outlet (m)	215.20	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.20	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.35	Min El Weir Flow (m)	218.90

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #Regional Culv Group: Culvert #2

Q Culv Group (m3/s)	1.64	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	2.28
Q Barrel (m3/s)	1.64	Culv Vel DS (m/s)	4.78
E.G. US. (m)	218.68	Culv Inv El Up (m)	217.50
W.S. US. (m)	218.65	Culv Inv El Dn (m)	215.00
E.G. DS (m)	215.58	Culv Frctn Ls (m)	0.00
W.S. DS (m)	215.39	Culv Exit Loss (m)	0.98
Delta EG (m)	3.10	Culv Entr Loss (m)	0.24
Delta WS (m)	3.27	Q Weir (m3/s)	
E.G. IC (m)	218.53	Weir Sta Lft (m)	
E.G. OC (m)	218.68	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	218.18	Weir Max Depth (m)	
Culv WS Outlet (m)	215.39	Weir Avg Depth (m)	

Culv Nml Depth (m)	0.38	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.68	Min El Weir Flow (m)	218.90

Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #2-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.09	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.01
Q Barrel (m3/s)	0.09	Culv Vel DS (m/s)	2.02
E.G. US. (m)	217.75	Culv Inv El Up (m)	217.50
W.S. US. (m)	217.75	Culv Inv El Dn (m)	215.00
E.G. DS (m)	215.09	Culv Frctn Ls (m)	0.00
W.S. DS (m)	215.07	Culv Exit Loss (m)	0.22
Delta EG (m)	2.66	Culv Entr Loss (m)	0.05
Delta WS (m)	2.68	Q Weir (m3/s)	
E.G. IC (m)	217.69	Weir Sta Lft (m)	
E.G. OC (m)	217.75	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	217.65	Weir Max Depth (m)	
Culv WS Outlet (m)	215.10	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.10	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.15	Min El Weir Flow (m)	218.90

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #5-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.14	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.12
Q Barrel (m3/s)	0.14	Culv Vel DS (m/s)	2.29
E.G. US. (m)	217.81	Culv Inv El Up (m)	217.50
W.S. US. (m)	217.81	Culv Inv El Dn (m)	215.00
E.G. DS (m)	215.11	Culv Frctn Ls (m)	0.00
W.S. DS (m)	215.08	Culv Exit Loss (m)	0.27
Delta EG (m)	2.70	Culv Entr Loss (m)	0.06
Delta WS (m)	2.73	Q Weir (m3/s)	
E.G. IC (m)	217.73	Weir Sta Lft (m)	
E.G. OC (m)	217.81	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	217.69	Weir Max Depth (m)	
Culv WS Outlet (m)	215.12	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.12	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.19	Min El Weir Flow (m)	218.90

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #10-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.18	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.21
Q Barrel (m3/s)	0.18	Culv Vel DS (m/s)	2.56
E.G. US. (m)	217.86	Culv Inv El Up (m)	217.50
W.S. US. (m)	217.86	Culv Inv El Dn (m)	215.00
E.G. DS (m)	215.13	Culv Frctn Ls (m)	0.00
W.S. DS (m)	215.09	Culv Exit Loss (m)	0.33
Delta EG (m)	2.73	Culv Entr Loss (m)	0.07
Delta WS (m)	2.77	Q Weir (m3/s)	
E.G. IC (m)	217.78	Weir Sta Lft (m)	
E.G. OC (m)	217.86	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	217.72	Weir Max Depth (m)	
Culv WS Outlet (m)	215.13	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.13	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.22	Min El Weir Flow (m)	218.90

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #25-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.25	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.32
Q Barrel (m3/s)	0.25	Culv Vel DS (m/s)	2.76
E.G. US. (m)	217.92	Culv Inv El Up (m)	217.50
W.S. US. (m)	217.92	Culv Inv El Dn (m)	215.00
E.G. DS (m)	215.17	Culv Frctn Ls (m)	0.00
W.S. DS (m)	215.12	Culv Exit Loss (m)	0.38
Delta EG (m)	2.76	Culv Entr Loss (m)	0.08
Delta WS (m)	2.80	Q Weir (m3/s)	
E.G. IC (m)	217.83	Weir Sta Lft (m)	
E.G. OC (m)	217.92	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	217.75	Weir Max Depth (m)	
Culv WS Outlet (m)	215.15	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.15	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.25	Min El Weir Flow (m)	218.90

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #50-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.29	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.38
Q Barrel (m3/s)	0.29	Culv Vel DS (m/s)	2.90
E.G. US. (m)	217.96	Culv Inv El Up (m)	217.50
W.S. US. (m)	217.96	Culv Inv El Dn (m)	215.00
E.G. DS (m)	215.19	Culv Frctn Ls (m)	0.00
W.S. DS (m)	215.12	Culv Exit Loss (m)	0.41
Delta EG (m)	2.78	Culv Entr Loss (m)	0.09
Delta WS (m)	2.83	Q Weir (m3/s)	
E.G. IC (m)	217.86	Weir Sta Lft (m)	
E.G. OC (m)	217.96	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	217.78	Weir Max Depth (m)	
Culv WS Outlet (m)	215.17	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.17	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.28	Min El Weir Flow (m)	218.90

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #100-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.35	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.45
Q Barrel (m3/s)	0.35	Culv Vel DS (m/s)	3.10
E.G. US. (m)	218.01	Culv Inv El Up (m)	217.50
W.S. US. (m)	218.00	Culv Inv El Dn (m)	215.00
E.G. DS (m)	215.21	Culv Frctn Ls (m)	0.00
W.S. DS (m)	215.14	Culv Exit Loss (m)	0.46
Delta EG (m)	2.80	Culv Entr Loss (m)	0.10
Delta WS (m)	2.86	Q Weir (m3/s)	
E.G. IC (m)	217.90	Weir Sta Lft (m)	
E.G. OC (m)	218.01	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	217.80	Weir Max Depth (m)	
Culv WS Outlet (m)	215.18	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.18	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.30	Min El Weir Flow (m)	218.90

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #Check Flow Culv Group: Culvert #1

Q Culv Group (m3/s)	0.46	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.56
Q Barrel (m3/s)	0.46	Culv Vel DS (m/s)	3.34
E.G. US. (m)	218.08	Culv Inv El Up (m)	217.50
W.S. US. (m)	218.07	Culv Inv El Dn (m)	215.00
E.G. DS (m)	215.25	Culv Frctn Ls (m)	0.00
W.S. DS (m)	215.16	Culv Exit Loss (m)	0.53
Delta EG (m)	2.84	Culv Entr Loss (m)	0.11
Delta WS (m)	2.91	Q Weir (m3/s)	
E.G. IC (m)	217.97	Weir Sta Lft (m)	
E.G. OC (m)	218.08	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	217.85	Weir Max Depth (m)	
Culv WS Outlet (m)	215.20	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.20	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.35	Min El Weir Flow (m)	218.90

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #Regional Culv Group: Culvert #1

Q Culv Group (m3/s)	1.64	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	2.28
Q Barrel (m3/s)	1.64	Culv Vel DS (m/s)	4.78
E.G. US. (m)	218.68	Culv Inv El Up (m)	217.50
W.S. US. (m)	218.65	Culv Inv El Dn (m)	215.00
E.G. DS (m)	215.58	Culv Frctn Ls (m)	0.00
W.S. DS (m)	215.39	Culv Exit Loss (m)	0.98
Delta EG (m)	3.10	Culv Entr Loss (m)	0.24
Delta WS (m)	3.27	Q Weir (m3/s)	
E.G. IC (m)	218.53	Weir Sta Lft (m)	
E.G. OC (m)	218.68	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	218.18	Weir Max Depth (m)	
Culv WS Outlet (m)	215.39	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.38	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.68	Min El Weir Flow (m)	218.90

Note: The flow in the culvert is entirely supercritical.

CROSS SECTION

RIVER: DUFFINS
REACH: WC36 RS: 400

INPUT
Description: ST 400 (Updated Sep 2016)
Station Elevation Data num= 89

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	219.29	2.39	219.05	2.98	219	3.36	218.93	5.89	218.5
7.52	218.28	9.33	218	10.78	217.74	12.19	217.5	13.8	217.18
14.67	217	16.6	216.58	16.94	216.5	17.58	216.37	19.51	216
20.14	215.9	21.04	215.74	27.13	215.59	28.93	215.55	39.57	215.51
39.84	215.51	40.82	215.5	47.67	215.43	49.28	215.43	50.08	215.38
50.33	215.37	50.47	215.36	53.23	215.07	53.37	215.05	53.5	215.04
53.8	215	53.85	215	53.94	215	54.16	215	55.61	215
56.08	215	57.62	215	58.15	215	58.76	215	59.06	215
59.39	215	59.73	215	59.95	215	60.01	215	60.2	215
60.92	215	61.12	215	61.64	215	62.27	215	62.41	215
62.89	215	62.9	215	62.95	215	63.15	215	63.59	215.06
64.13	215.06	65.11	215.16	65.64	215.2	66.24	215.27	66.4	215.28
66.55	215.28	66.81	215.29	66.94	215.29	67.06	215.3	67.79	215.31
70.44	215.3	72.36	215.38	72.57	215.39	74.47	215.38	74.81	215.38
75.47	215.5	76.37	215.54	77.84	215.62	84.18	215.98	84.61	215.98
87.15	215.98	89.39	215.98	91.39	215.99	94.28	216	95.66	216.2
97.72	216.5	98.71	216.65	100.73	217	103	217.37	103.89	217.5
106.58	217.95	106.91	218	107.28	218.03	110.39	218.26		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	40.82	.035	75.47	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
40.82	75.47	122.3	122.3	122.3	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	56.325	216.5	T
60.675	110.39	216.5	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	215.09	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	215.07	Reach Len. (m)	122.30	122.30	122.30
Crit W.S. (m)	215.06	Flow Area (m2)		0.29	
E.G. Slope (m/m)	0.017177	Area (m2)		0.66	
Q Total (m3/s)	0.18	Flow (m3/s)		0.18	
Top Width (m)	10.95	Top Width (m)		10.95	
Vel Total (m/s)	0.62	Avg. Vel. (m/s)		0.62	
Max Chl Dpth (m)	0.07	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	1.4	Conv. (m3/s)		1.4	
Length Wtd. (m)	122.30	Wetted Per. (m)		4.35	
Min Ch El (m)	215.00	Shear (N/m2)		11.28	
Alpha	1.00	Stream Power (N/m s)		6.97	
Frctn Loss (m)	0.54	Cum Volume (1000 m3)		0.29	
C & E Loss (m)	0.01	Cum SA (1000 m2)		7.59	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	215.11	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	215.08	Reach Len. (m)	122.30	122.30	122.30
Crit W.S. (m)	215.07	Flow Area (m2)		0.35	
E.G. Slope (m/m)	0.020905	Area (m2)		0.82	
Q Total (m3/s)	0.27	Flow (m3/s)		0.27	
Top Width (m)	11.21	Top Width (m)		11.21	
Vel Total (m/s)	0.77	Avg. Vel. (m/s)		0.77	
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	1.9	Conv. (m3/s)		1.9	
Length Wtd. (m)	122.30	Wetted Per. (m)		4.35	
Min Ch El (m)	215.00	Shear (N/m2)		16.51	
Alpha	1.00	Stream Power (N/m s)		12.72	
Frctn Loss (m)	0.55	Cum Volume (1000 m3)		0.37	
C & E Loss (m)	0.01	Cum SA (1000 m2)		7.83	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	215.13	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	

W.S. Elev (m)	215.09	Reach Len. (m)	122.30	122.30	122.30
Crit W.S. (m)	215.08	Flow Area (m2)		0.38	
E.G. Slope (m/m)	0.028661	Area (m2)		0.89	
Q Total (m3/s)	0.36	Flow (m3/s)		0.36	
Top Width (m)	11.33	Top Width (m)		11.33	
Vel Total (m/s)	0.95	Avg. Vel. (m/s)		0.95	
Max Chl Dpth (m)	0.09	Hydr. Depth (m)		0.09	
Conv. Total (m3/s)	2.1	Conv. (m3/s)		2.1	
Length Wtd. (m)	122.30	Wetted Per. (m)		4.35	
Min Ch El (m)	215.00	Shear (N/m2)		24.48	
Alpha	1.00	Stream Power (N/m s)		23.26	
Frctn Loss (m)	0.55	Cum Volume (1000 m3)		0.45	
C & E Loss (m)	0.02	Cum SA (1000 m2)		8.07	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	215.17	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	215.12	Reach Len. (m)	122.30	122.30	122.30
Crit W.S. (m)	215.12	Flow Area (m2)		0.52	
E.G. Slope (m/m)	0.018410	Area (m2)		1.27	
Q Total (m3/s)	0.49	Flow (m3/s)		0.49	
Top Width (m)	11.96	Top Width (m)		11.96	
Vel Total (m/s)	0.94	Avg. Vel. (m/s)		0.94	
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.12	
Conv. Total (m3/s)	3.6	Conv. (m3/s)		3.6	
Length Wtd. (m)	122.30	Wetted Per. (m)		4.35	
Min Ch El (m)	215.00	Shear (N/m2)		21.60	
Alpha	1.00	Stream Power (N/m s)		20.34	
Frctn Loss (m)	0.38	Cum Volume (1000 m3)		0.59	
C & E Loss (m)	0.02	Cum SA (1000 m2)		8.40	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	215.19	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.035	
W.S. Elev (m)	215.12	Reach Len. (m)	122.30	122.30	122.30
Crit W.S. (m)	215.12	Flow Area (m2)		0.54	
E.G. Slope (m/m)	0.024041	Area (m2)		1.31	
Q Total (m3/s)	0.59	Flow (m3/s)		0.59	
Top Width (m)	12.03	Top Width (m)		12.03	
Vel Total (m/s)	1.10	Avg. Vel. (m/s)		1.10	
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.12	
Conv. Total (m3/s)	3.8	Conv. (m3/s)		3.8	
Length Wtd. (m)	122.30	Wetted Per. (m)		4.35	
Min Ch El (m)	215.00	Shear (N/m2)		29.11	
Alpha	1.00	Stream Power (N/m s)		31.98	
Frctn Loss (m)	0.41	Cum Volume (1000 m3)		0.66	
C & E Loss (m)	0.03	Cum SA (1000 m2)		8.57	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	215.21	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.035	
W.S. Elev (m)	215.14	Reach Len. (m)	122.30	122.30	122.30
Crit W.S. (m)	215.14	Flow Area (m2)		0.60	
E.G. Slope (m/m)	0.023366	Area (m2)		1.49	
Q Total (m3/s)	0.70	Flow (m3/s)		0.70	
Top Width (m)	12.31	Top Width (m)		12.31	
Vel Total (m/s)	1.17	Avg. Vel. (m/s)		1.17	
Max Chl Dpth (m)	0.14	Hydr. Depth (m)		0.14	
Conv. Total (m3/s)	4.6	Conv. (m3/s)		4.6	
Length Wtd. (m)	122.30	Wetted Per. (m)		4.35	
Min Ch El (m)	215.00	Shear (N/m2)		31.62	
Alpha	1.00	Stream Power (N/m s)		36.87	
Frctn Loss (m)	0.34	Cum Volume (1000 m3)		0.77	
C & E Loss (m)	0.03	Cum SA (1000 m2)		8.85	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	215.25	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.		0.035	
W.S. Elev (m)	215.16	Reach Len. (m)	122.30	122.30	122.30
Crit W.S. (m)	215.16	Flow Area (m2)		0.72	
E.G. Slope (m/m)	0.021833	Area (m2)		1.83	
Q Total (m3/s)	0.91	Flow (m3/s)		0.91	
Top Width (m)	12.85	Top Width (m)		12.85	
Vel Total (m/s)	1.27	Avg. Vel. (m/s)		1.27	
Max Chl Dpth (m)	0.16	Hydr. Depth (m)		0.16	
Conv. Total (m3/s)	6.2	Conv. (m3/s)		6.2	
Length Wtd. (m)	122.30	Wetted Per. (m)		4.35	
Min Ch El (m)	215.00	Shear (N/m2)		35.29	
Alpha	1.00	Stream Power (N/m s)		44.79	
Frctn Loss (m)	0.31	Cum Volume (1000 m3)		0.93	
C & E Loss (m)	0.04	Cum SA (1000 m2)		9.26	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	215.58	Element	Left OB	Channel	Right OB
Vel Head (m)	0.19	Wt. n-Val.		0.035	
W.S. Elev (m)	215.39	Reach Len. (m)	122.30	122.30	122.30
Crit W.S. (m)	215.39	Flow Area (m2)		1.68	
E.G. Slope (m/m)	0.016413	Area (m2)		5.56	
Q Total (m3/s)	3.27	Flow (m3/s)		3.27	

Top Width (m)	24.25	Top Width (m)	24.25
Vel Total (m/s)	1.94	Avg. Vel. (m/s)	1.94
Max Chl Dpth (m)	0.39	Hydr. Depth (m)	0.39
Conv. Total (m3/s)	25.5	Conv. (m3/s)	25.5
Length Wtd. (m)	122.30	Wetted Per. (m)	4.35
Min Ch El (m)	215.00	Shear (N/m2)	62.26
Alpha	1.00	Stream Power (N/m s)	120.99
Frctn Loss (m)	0.06	Cum Volume (1000 m3)	3.18
C & E Loss (m)	0.10	Cum SA (1000 m2)	14.36

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: DUFFINS
REACH: WC36 RS: 300

INPUT
Description: ST 300 (Updated Sep 2016)
Station Elevation Data num= 102

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	217	2.008	216.921	3.091	216.878	7.617	216.669	9.848	216.566
11.643	216.504	11.998	216.5	13.833	216.48	16.457	216.389	17.397	216.368
18.281	216.339	19.909	216.295	22.084	216.209	29.186	216	29.243	215.997
32.845	215.776	37.255	215.5	42.231	215.255	48.299	215	54.954	214.724
60.936	214.543	61.096	214.538	62.226	214.5	62.575	214.499	63.924	214.495
64.032	214.494	64.072	214.494	65.347	214.493	66.778	214.493	68.209	214.493
68.515	214.493	68.643	214.495	68.723	214.495	70.54	214.499	70.992	214.5
75.679	214.502	76.56	214.503	78.692	214.504	82.674	214.506	83.099	214.507
83.789	214.507	84.198	214.507	84.207	214.507	85.5	214.508	86.808	214.509
86.862	214.509	86.943	214.509	87.035	214.509	87.167	214.509	87.641	214.51
87.838	214.51	88.085	214.51	88.101	214.51	89.094	214.51	89.241	214.51
90.331	214.51	90.337	214.51	90.662	214.51	91.97	214.51	92.479	214.51
92.776	214.51	92.812	214.51	94.349	214.51	94.383	214.51	94.558	214.51
95.294	214.509	96.388	214.509	96.569	214.508	96.695	214.508	98.353	214.507
99.744	214.506	100.905	214.505	102.67	214.504	102.691	214.504	103.062	214.504
103.227	214.504	105.301	214.523	107.099	214.541	112.296	214.604	115.805	214.647
117.232	214.665	118.793	214.692	119.106	214.698	120.043	214.714	121.29	214.738
121.582	214.745	122.926	214.771	124.441	214.813	131.284	214.948	133.594	215
135.418	215.206	137.854	215.474	138.082	215.5	138.593	215.551	140.736	215.764
143.193	216	143.373	216	143.699	216	144.341	216	146.908	216
148.777	216	148.796	216						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	48.299	.035	133.594	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
48.299	133.594	33	34	22	.3	.5

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	214.54	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	214.54	Reach Len. (m)	33.00	34.00	22.00
Crit W.S. (m)		Flow Area (m2)		1.43	
E.G. Slope (m/m)	0.001970	Area (m2)		1.43	
Q Total (m3/s)	0.18	Flow (m3/s)		0.18	
Top Width (m)	45.53	Top Width (m)		45.53	
Vel Total (m/s)	0.13	Avg. Vel. (m/s)		0.13	
Max Chl Dpth (m)	0.04	Hydr. Depth (m)		0.03	
Conv. Total (m3/s)	4.1	Conv. (m3/s)		4.1	
Length Wtd. (m)	34.00	Wetted Per. (m)		45.53	
Min Ch El (m)	214.49	Shear (N/m2)		0.61	
Alpha	1.00	Stream Power (N/m s)		0.08	
Frctn Loss (m)	0.14	Cum Volume (1000 m3)		0.16	
C & E Loss (m)	0.00	Cum SA (1000 m2)		4.13	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	214.55	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	214.55	Reach Len. (m)	33.00	34.00	22.00
Crit W.S. (m)	214.52	Flow Area (m2)		1.86	
E.G. Slope (m/m)	0.001905	Area (m2)		1.86	
Q Total (m3/s)	0.27	Flow (m3/s)		0.27	
Top Width (m)	46.68	Top Width (m)		46.68	
Vel Total (m/s)	0.15	Avg. Vel. (m/s)		0.15	
Max Chl Dpth (m)	0.05	Hydr. Depth (m)		0.04	
Conv. Total (m3/s)	6.2	Conv. (m3/s)		6.2	
Length Wtd. (m)	34.00	Wetted Per. (m)		46.68	
Min Ch El (m)	214.49	Shear (N/m2)		0.74	
Alpha	1.00	Stream Power (N/m s)		0.11	
Frctn Loss (m)	0.14	Cum Volume (1000 m3)		0.21	
C & E Loss (m)	0.00	Cum SA (1000 m2)		4.29	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	214.56	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	214.56	Reach Len. (m)	33.00	34.00	22.00
Crit W.S. (m)	214.53	Flow Area (m2)		2.28	
E.G. Slope (m/m)	0.001755	Area (m2)		2.28	
Q Total (m3/s)	0.36	Flow (m3/s)		0.36	
Top Width (m)	47.72	Top Width (m)		47.72	
Vel Total (m/s)	0.16	Avg. Vel. (m/s)		0.16	
Max Chl Dpth (m)	0.06	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	8.6	Conv. (m3/s)		8.6	
Length Wtd. (m)	34.00	Wetted Per. (m)		47.72	
Min Ch El (m)	214.49	Shear (N/m2)		0.82	
Alpha	1.00	Stream Power (N/m s)		0.13	
Frctn Loss (m)	0.12	Cum Volume (1000 m3)		0.26	
C & E Loss (m)	0.01	Cum SA (1000 m2)		4.46	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	214.57	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	214.57	Reach Len. (m)	33.00	34.00	22.00
Crit W.S. (m)		Flow Area (m2)		3.09	
E.G. Slope (m/m)	0.001245	Area (m2)		3.09	
Q Total (m3/s)	0.49	Flow (m3/s)		0.49	
Top Width (m)	49.65	Top Width (m)		49.65	
Vel Total (m/s)	0.16	Avg. Vel. (m/s)		0.16	
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	13.9	Conv. (m3/s)		13.9	
Length Wtd. (m)	34.00	Wetted Per. (m)		49.65	
Min Ch El (m)	214.49	Shear (N/m2)		0.76	
Alpha	1.00	Stream Power (N/m s)		0.12	

Frctn Loss (m)	0.10	Cum Volume (1000 m3)	0.32
C & E Loss (m)	0.01	Cum SA (1000 m2)	4.63

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	214.58	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	214.58	Reach Len. (m)	33.00	34.00	22.00
Crit W.S. (m)		Flow Area (m2)		3.45	
E.G. Slope (m/m)	0.001279	Area (m2)		3.45	
Q Total (m3/s)	0.59	Flow (m3/s)		0.59	
Top Width (m)	50.48	Top Width (m)		50.48	
Vel Total (m/s)	0.17	Avg. Vel. (m/s)		0.17	
Max Chl Dpth (m)	0.09	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	16.5	Conv. (m3/s)		16.5	
Length Wtd. (m)	34.00	Wetted Per. (m)		50.48	
Min Ch El (m)	214.49	Shear (N/m2)		0.86	
Alpha	1.00	Stream Power (N/m s)		0.15	
Frctn Loss (m)	0.10	Cum Volume (1000 m3)		0.36	
C & E Loss (m)	0.01	Cum SA (1000 m2)		4.75	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	214.59	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	214.59	Reach Len. (m)	33.00	34.00	22.00
Crit W.S. (m)		Flow Area (m2)		4.17	
E.G. Slope (m/m)	0.001003	Area (m2)		4.17	
Q Total (m3/s)	0.70	Flow (m3/s)		0.70	
Top Width (m)	52.10	Top Width (m)		52.10	
Vel Total (m/s)	0.17	Avg. Vel. (m/s)		0.17	
Max Chl Dpth (m)	0.10	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	22.1	Conv. (m3/s)		22.1	
Length Wtd. (m)	34.00	Wetted Per. (m)		52.10	
Min Ch El (m)	214.49	Shear (N/m2)		0.79	
Alpha	1.00	Stream Power (N/m s)		0.13	
Frctn Loss (m)	0.08	Cum Volume (1000 m3)		0.42	
C & E Loss (m)	0.01	Cum SA (1000 m2)		4.91	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	214.61	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	214.61	Reach Len. (m)	33.00	34.00	22.00
Crit W.S. (m)		Flow Area (m2)		5.08	
E.G. Slope (m/m)	0.000923	Area (m2)		5.08	
Q Total (m3/s)	0.91	Flow (m3/s)		0.91	
Top Width (m)	54.07	Top Width (m)		54.07	
Vel Total (m/s)	0.18	Avg. Vel. (m/s)		0.18	
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.09	
Conv. Total (m3/s)	30.0	Conv. (m3/s)		30.0	
Length Wtd. (m)	34.00	Wetted Per. (m)		54.07	
Min Ch El (m)	214.49	Shear (N/m2)		0.85	
Alpha	1.00	Stream Power (N/m s)		0.15	
Frctn Loss (m)	0.07	Cum Volume (1000 m3)		0.51	
C & E Loss (m)	0.01	Cum SA (1000 m2)		5.17	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	214.86	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	214.86	Reach Len. (m)	33.00	34.00	22.00
Crit W.S. (m)		Flow Area (m2)		21.47	
E.G. Slope (m/m)	0.000151	Area (m2)		21.47	
Q Total (m3/s)	3.27	Flow (m3/s)		3.27	
Top Width (m)	75.10	Top Width (m)		75.10	
Vel Total (m/s)	0.15	Avg. Vel. (m/s)		0.15	
Max Chl Dpth (m)	0.37	Hydr. Depth (m)		0.29	
Conv. Total (m3/s)	266.1	Conv. (m3/s)		266.1	
Length Wtd. (m)	34.00	Wetted Per. (m)		75.11	
Min Ch El (m)	214.49	Shear (N/m2)		0.42	
Alpha	1.00	Stream Power (N/m s)		0.06	
Frctn Loss (m)	0.02	Cum Volume (1000 m3)		1.53	
C & E Loss (m)	0.03	Cum SA (1000 m2)		8.28	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: DUFFINS
REACH: WC36 RS: 200

INPUT
Description: ST 200 (Updated Sep 2016)
Station Elevation Data num= 80

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	216.95	3.242	216.781	8.728	216.5	16.518	216.215	23.425	216
24.512	215.993	28.148	215.934	34.682	215.842	38.742	215.813	40.789	215.787
43.88	215.753	44.33	215.753	45.542	215.776	48.585	215.796	50.84	215.801
55.351	215.793	57.656	215.749	61.465	215.658	64.878	215.5	68.83	215.323
76.073	215	82.762	214.846	83.53	214.825	96.432	214.32	100.099	214.32
102.363	214.32	106.203	214.32	107.041	214.32	108	214.32	114	214.32
114.042	214.32	114.143	214.32	114.384	214.32	114.721	214.32	114.779	214.32
115.427	214.32	118.12	214.32	121.321	214.32	121.339	214.32	121.879	214.32
122.435	214.32	127.394	214.32	128.148	214.32	128.185	214.32	128.977	214.32
129.783	214.32	131.989	214.32	132.285	214.32	132.551	214.32	132.794	214.32
133.942	214.32	135.315	214.32	135.811	214.32	136.107	214.32	136.668	214.32
138.661	214.32	139.761	214.32	140.483	214.32	142.734	214.32	143.241	214.32
143.573	214.32	144.074	214.32	144.316	214.32	144.37	214.32	144.371	214.32
145.123	214.32	145.283	214.32	149.087	214.32	153.914	214.5	154.079	214.506
154.115	214.508	160.302	214.727	160.705	214.742	165.285	215	166.92	215.199
169.88	215.5	174.707	215.92	175.633	216	181.052	216	181.092	216

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	76.073	.035	165.285	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
76.073	165.285	40	35	41	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	108	216.2	T
114	181.092	216.2	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	214.39	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	214.38	Reach Len. (m)	40.00	35.00	41.00
Crit W.S. (m)	214.37	Flow Area (m2)		0.36	
E.G. Slope (m/m)	0.012893	Area (m2)		3.26	
Q Total (m3/s)	0.18	Flow (m3/s)		0.18	
Top Width (m)	55.81	Top Width (m)		55.81	
Vel Total (m/s)	0.50	Avg. Vel. (m/s)		0.50	
Max Chl Dpth (m)	0.06	Hydr. Depth (m)		0.06	

Conv. Total (m3/s)	1.6	Conv. (m3/s)	1.6
Length Wtd. (m)	35.00	Wetted Per. (m)	6.00
Min Ch El (m)	214.32	Shear (N/m2)	7.61
Alpha	1.00	Stream Power (N/m s)	3.79
Frctn Loss (m)		Cum Volume (1000 m3)	0.08
C & E Loss (m)		Cum SA (1000 m2)	2.41

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	214.41	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	214.40	Reach Len. (m)	40.00	35.00	41.00
Crit W.S. (m)	214.37	Flow Area (m2)		0.46	
E.G. Slope (m/m)	0.013117	Area (m2)		4.17	
Q Total (m3/s)	0.27	Flow (m3/s)		0.27	
Top Width (m)	56.66	Top Width (m)		56.66	
Vel Total (m/s)	0.59	Avg. Vel. (m/s)		0.59	
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	2.4	Conv. (m3/s)		2.4	
Length Wtd. (m)	35.00	Wetted Per. (m)		6.00	
Min Ch El (m)	214.32	Shear (N/m2)		9.83	
Alpha	1.00	Stream Power (N/m s)		5.79	
Frctn Loss (m)		Cum Volume (1000 m3)		0.11	
C & E Loss (m)		Cum SA (1000 m2)		2.54	

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	214.44	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	214.42	Reach Len. (m)	40.00	35.00	41.00
Crit W.S. (m)	214.40	Flow Area (m2)		0.57	
E.G. Slope (m/m)	0.011314	Area (m2)		5.23	
Q Total (m3/s)	0.36	Flow (m3/s)		0.36	
Top Width (m)	57.63	Top Width (m)		57.63	
Vel Total (m/s)	0.63	Avg. Vel. (m/s)		0.63	
Max Chl Dpth (m)	0.09	Hydr. Depth (m)		0.09	
Conv. Total (m3/s)	3.4	Conv. (m3/s)		3.4	
Length Wtd. (m)	35.00	Wetted Per. (m)		6.00	
Min Ch El (m)	214.32	Shear (N/m2)		10.53	
Alpha	1.00	Stream Power (N/m s)		6.66	
Frctn Loss (m)		Cum Volume (1000 m3)		0.13	
C & E Loss (m)		Cum SA (1000 m2)		2.67	

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	214.46	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	214.43	Reach Len. (m)	40.00	35.00	41.00
Crit W.S. (m)	214.41	Flow Area (m2)		0.68	
E.G. Slope (m/m)	0.011700	Area (m2)		6.29	
Q Total (m3/s)	0.49	Flow (m3/s)		0.49	
Top Width (m)	58.58	Top Width (m)		58.58	
Vel Total (m/s)	0.72	Avg. Vel. (m/s)		0.72	
Max Chl Dpth (m)	0.11	Hydr. Depth (m)		0.11	
Conv. Total (m3/s)	4.5	Conv. (m3/s)		4.5	
Length Wtd. (m)	35.00	Wetted Per. (m)		6.00	
Min Ch El (m)	214.32	Shear (N/m2)		12.97	
Alpha	1.00	Stream Power (N/m s)		9.37	
Frctn Loss (m)		Cum Volume (1000 m3)		0.16	
C & E Loss (m)		Cum SA (1000 m2)		2.79	

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	214.48	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	214.45	Reach Len. (m)	40.00	35.00	41.00
Crit W.S. (m)	214.42	Flow Area (m2)		0.76	
E.G. Slope (m/m)	0.011452	Area (m2)		7.12	
Q Total (m3/s)	0.59	Flow (m3/s)		0.59	
Top Width (m)	59.32	Top Width (m)		59.32	
Vel Total (m/s)	0.77	Avg. Vel. (m/s)		0.77	
Max Chl Dpth (m)	0.13	Hydr. Depth (m)		0.13	
Conv. Total (m3/s)	5.5	Conv. (m3/s)		5.5	
Length Wtd. (m)	35.00	Wetted Per. (m)		6.00	
Min Ch El (m)	214.32	Shear (N/m2)		14.28	
Alpha	1.00	Stream Power (N/m s)		11.04	
Frctn Loss (m)		Cum Volume (1000 m3)		0.18	
C & E Loss (m)		Cum SA (1000 m2)		2.88	

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	214.50	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	214.47	Reach Len. (m)	40.00	35.00	41.00
Crit W.S. (m)	214.42	Flow Area (m2)		0.88	
E.G. Slope (m/m)	0.009995	Area (m2)		8.29	
Q Total (m3/s)	0.70	Flow (m3/s)		0.70	
Top Width (m)	60.35	Top Width (m)		60.35	
Vel Total (m/s)	0.79	Avg. Vel. (m/s)		0.79	
Max Chl Dpth (m)	0.15	Hydr. Depth (m)		0.15	
Conv. Total (m3/s)	7.0	Conv. (m3/s)		7.0	
Length Wtd. (m)	35.00	Wetted Per. (m)		6.00	
Min Ch El (m)	214.32	Shear (N/m2)		14.39	
Alpha	1.00	Stream Power (N/m s)		11.44	
Frctn Loss (m)		Cum Volume (1000 m3)		0.21	
C & E Loss (m)		Cum SA (1000 m2)		3.00	

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	214.53	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.035	
W.S. Elev (m)	214.49	Reach Len. (m)	40.00	35.00	41.00
Crit W.S. (m)	214.45	Flow Area (m2)		1.05	
E.G. Slope (m/m)	0.009449	Area (m2)		10.00	
Q Total (m3/s)	0.91	Flow (m3/s)		0.91	
Top Width (m)	61.81	Top Width (m)		61.81	
Vel Total (m/s)	0.87	Avg. Vel. (m/s)		0.87	
Max Chl Dpth (m)	0.17	Hydr. Depth (m)		0.17	
Conv. Total (m3/s)	9.4	Conv. (m3/s)		9.4	
Length Wtd. (m)	35.00	Wetted Per. (m)		6.00	
Min Ch El (m)	214.32	Shear (N/m2)		16.19	
Alpha	1.00	Stream Power (N/m s)		14.05	
Frctn Loss (m)		Cum Volume (1000 m3)		0.26	
C & E Loss (m)		Cum SA (1000 m2)		3.20	

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	214.82	Element	Left OB	Channel	Right OB
Vel Head (m)	0.09	Wt. n-Val.		0.035	
W.S. Elev (m)	214.72	Reach Len. (m)	40.00	35.00	41.00
Crit W.S. (m)	214.63	Flow Area (m2)		2.42	
E.G. Slope (m/m)	0.007549	Area (m2)		25.48	
Q Total (m3/s)	3.27	Flow (m3/s)		3.27	
Top Width (m)	74.04	Top Width (m)		74.04	
Vel Total (m/s)	1.35	Avg. Vel. (m/s)		1.35	
Max Chl Dpth (m)	0.40	Hydr. Depth (m)		0.40	
Conv. Total (m3/s)	37.6	Conv. (m3/s)		37.6	
Length Wtd. (m)	35.00	Wetted Per. (m)		6.00	
Min Ch El (m)	214.32	Shear (N/m2)		29.81	
Alpha	1.00	Stream Power (N/m s)		40.35	
Frctn Loss (m)		Cum Volume (1000 m3)		0.73	
C & E Loss (m)		Cum SA (1000 m2)		5.74	

CULVERT

```
RIVER: DUFFINS
REACH: WC36               RS: 150

INPUT
Description: Proposed 407 TWY Structure (WC#36)
Distance from Upstream XS =      12
Deck/Roadway Width        =      20
Weir Coefficient          =     1.4
Upstream  Deck/Roadway Coordinates
    num=       3
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
    11.5     216             111   216.5             181   216.9

Upstream Bridge Cross Section Data
Station Elevation Data    num=      80
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  216.95   3.242 216.781   8.728   216.5  16.518 216.215  23.425     216
  24.512 215.993  28.148 215.934  34.682 215.842  38.742 215.813  40.789 215.787
   43.88 215.753   44.33 215.753  45.542 215.776  48.585 215.796   50.84 215.801
  55.351 215.793  57.656 215.749  61.465 215.658  64.878   215.5   68.83 215.323
  76.073     215  82.762 214.846   83.53 214.825  96.432  214.32 100.099  214.32
 102.363  214.32 106.203  214.32 107.041  214.32     108  214.32     114  214.32
 114.042  214.32 114.143  214.32 114.384  214.32 114.721  214.32 114.779  214.32
 115.427  214.32  118.12  214.32 121.321  214.32 121.339  214.32 121.879  214.32
 122.435  214.32 127.394  214.32 128.148  214.32 128.185  214.32 128.977  214.32
 129.783  214.32 131.989  214.32 132.285  214.32 132.551  214.32 132.794  214.32
 133.942  214.32 135.315  214.32 135.811  214.32 136.107  214.32 136.668  214.32
 138.661  214.32 139.761  214.32 140.483  214.32 142.734  214.32 143.241  214.32
 143.573  214.32 144.074  214.32 144.316  214.32  144.37  214.32 144.371  214.32
 145.123  214.32 145.283  214.32 149.087  214.32 153.914   214.5 154.079 214.506
 154.115 214.508 160.302 214.727 160.705 214.742 165.285     215  166.92 215.199
  169.88   215.5 174.707  215.92 175.633     216 181.052     216 181.092     216

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .07  76.073    .035 165.285     .07

Bank Sta: Left   Right    Coeff Contr.   Expan.
       76.073 165.285            .3        .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0     108   216.2       T
     114 181.092   216.2       T

Downstream  Deck/Roadway Coordinates
    num=       3
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
   16.96     216             142   216.7             215  216.95

Downstream Bridge Cross Section Data
Station Elevation Data    num=      72
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 217.091   1.513     217   2.897 216.911   3.508 216.872   8.876   216.5
  10.769 216.365  16.964     216  27.196 215.582  28.997   215.5  29.993 215.475
   30.48 215.471  30.746  215.47  31.264 215.463  32.061 215.452  39.629 215.339
  41.224 215.319  46.772 215.264  50.318 215.219  54.929 215.172  55.824 215.162
  57.521 215.152  58.981 215.149  60.725 215.134  61.818 215.125   64.65 215.131
  70.505  215.15  76.672 215.065  79.321 215.069  82.542 215.069  95.653 215.005
  96.259 215.003  96.819 215.001  97.219     215 108.147  214.65 112.404   214.5
 120.776 214.449 122.876 214.437 123.842  214.44   126.3  214.45     136   214.1
     142   214.1     146   214.4 149.172   214.5 155.931   214.5 158.504   214.5
 160.283   214.5 166.257   214.5 168.281   214.5 169.837   214.5 176.785   214.5
 176.786   214.5 176.796   214.5 178.009   214.5 181.388   214.5 182.233   214.5
 183.163   214.5  186.92   214.5 188.096   214.5 195.205 214.832 198.636 214.992
 198.779     215 198.935 215.013 199.915 215.103 204.167   215.5 204.636 215.545
 209.103     216 209.275     216 209.514     216 212.613     216 212.793     216
 213.534     216  214.85     216

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .07  96.259    .035 198.779     .07

Bank Sta: Left   Right    Coeff Contr.   Expan.
       96.259 198.779            .3        .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0     136   216.2       T
     142  214.85   216.2       T

Upstream Embankment side slope              =       2 horiz. to 1.0 vertical
Downstream Embankment side slope            =       0 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1           Box    1.75       6
FHWA Chart # 10- 90 degree headwall; Chamfered or beveled inlet
FHWA Scale # 2 - Inlet edges beveled 1/2 inch at 45 degrees (1:1)
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
               1.5      29     .013     .025        0                  .2               1
Upstream   Elevation =  214.32
           Centerline Station =  111
Downstream Elevation =  214.1
           Centerline Station =  139

CULVERT OUTPUT  Profile #2-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.18    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         0.52
  Q Barrel (m3/s)           0.18    Culv Vel DS (m/s)         0.60
  E.G. US. (m)            214.39    Culv Inv El Up (m)      214.32
  W.S. US. (m)            214.38    Culv Inv El Dn (m)      214.10
  E.G. DS (m)             214.17    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             214.15    Culv Exit Loss (m)        0.00
  Delta EG (m)              0.23    Culv Entr Loss (m)        0.00
  Delta WS (m)              0.23    Q Weir (m3/s)
  E.G. IC (m)             214.39    Weir Sta Lft (m)
  E.G. OC (m)             214.39    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       214.38    Weir Max Depth (m)
  Culv WS Outlet (m)      214.15    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.06    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.05    Min El Weir Flow (m)    216.20


Note:    During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth.  Therefore, the
         inlet will be at normal depth.

CULVERT OUTPUT  Profile #5-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.27    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         0.61
  Q Barrel (m3/s)           0.27    Culv Vel DS (m/s)         0.70
  E.G. US. (m)            214.42    Culv Inv El Up (m)      214.32
  W.S. US. (m)            214.40    Culv Inv El Dn (m)      214.10
  E.G. DS (m)             214.19    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             214.16    Culv Exit Loss (m)        0.00
  Delta EG (m)              0.23    Culv Entr Loss (m)        0.00
  Delta WS (m)              0.23    Q Weir (m3/s)
  E.G. IC (m)             214.41    Weir Sta Lft (m)
  E.G. OC (m)             214.42    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       214.39    Weir Max Depth (m)
  Culv WS Outlet (m)      214.16    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.07    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.06    Min El Weir Flow (m)    216.20
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Note: During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth. Therefore, the inlet will be at normal depth.

CULVERT OUTPUT Profile #10-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.36	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	0.68
Q Barrel (m3/s)	0.36	Culv Vel DS (m/s)	0.73
E.G. US. (m)	214.44	Culv Inv El Up (m)	214.32
W.S. US. (m)	214.42	Culv Inv El Dn (m)	214.10
E.G. DS (m)	214.21	Culv Frctn Ls (m)	0.00
W.S. DS (m)	214.18	Culv Exit Loss (m)	0.00
Delta EG (m)	0.23	Culv Entr Loss (m)	0.00
Delta WS (m)	0.23	Q Weir (m3/s)	
E.G. IC (m)	214.43	Weir Sta Lft (m)	
E.G. OC (m)	214.44	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	214.41	Weir Max Depth (m)	
Culv WS Outlet (m)	214.18	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.09	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.07	Min El Weir Flow (m)	216.20

Note: During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth. Therefore, the inlet will be at normal depth.

CULVERT OUTPUT Profile #25-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.49	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	0.78
Q Barrel (m3/s)	0.49	Culv Vel DS (m/s)	0.91
E.G. US. (m)	214.46	Culv Inv El Up (m)	214.32
W.S. US. (m)	214.43	Culv Inv El Dn (m)	214.10
E.G. DS (m)	214.23	Culv Frctn Ls (m)	0.00
W.S. DS (m)	214.19	Culv Exit Loss (m)	0.00
Delta EG (m)	0.23	Culv Entr Loss (m)	0.01
Delta WS (m)	0.24	Q Weir (m3/s)	
E.G. IC (m)	214.46	Weir Sta Lft (m)	
E.G. OC (m)	214.46	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	214.43	Weir Max Depth (m)	
Culv WS Outlet (m)	214.19	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.10	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.09	Min El Weir Flow (m)	216.20

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #50-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.59	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	0.83
Q Barrel (m3/s)	0.59	Culv Vel DS (m/s)	0.97
E.G. US. (m)	214.48	Culv Inv El Up (m)	214.32
W.S. US. (m)	214.45	Culv Inv El Dn (m)	214.10
E.G. DS (m)	214.25	Culv Frctn Ls (m)	0.00
W.S. DS (m)	214.20	Culv Exit Loss (m)	0.00
Delta EG (m)	0.23	Culv Entr Loss (m)	0.01
Delta WS (m)	0.25	Q Weir (m3/s)	
E.G. IC (m)	214.48	Weir Sta Lft (m)	
E.G. OC (m)	214.48	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	214.44	Weir Max Depth (m)	
Culv WS Outlet (m)	214.20	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.12	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.10	Min El Weir Flow (m)	216.20

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #100-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.70	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	0.89
Q Barrel (m3/s)	0.70	Culv Vel DS (m/s)	1.03
E.G. US. (m)	214.50	Culv Inv El Up (m)	214.32
W.S. US. (m)	214.47	Culv Inv El Dn (m)	214.10
E.G. DS (m)	214.27	Culv Frctn Ls (m)	0.00
W.S. DS (m)	214.21	Culv Exit Loss (m)	0.00
Delta EG (m)	0.23	Culv Entr Loss (m)	0.01
Delta WS (m)	0.25	Q Weir (m3/s)	
E.G. IC (m)	214.50	Weir Sta Lft (m)	
E.G. OC (m)	214.50	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	214.45	Weir Max Depth (m)	
Culv WS Outlet (m)	214.21	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.13	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.11	Min El Weir Flow (m)	216.20

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #Check Flow Culv Group: Culvert #1

Q Culv Group (m3/s)	0.91	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	0.98
Q Barrel (m3/s)	0.91	Culv Vel DS (m/s)	1.04
E.G. US. (m)	214.53	Culv Inv El Up (m)	214.32
W.S. US. (m)	214.49	Culv Inv El Dn (m)	214.10
E.G. DS (m)	214.30	Culv Frctn Ls (m)	0.00
W.S. DS (m)	214.25	Culv Exit Loss (m)	0.00
Delta EG (m)	0.23	Culv Entr Loss (m)	0.01
Delta WS (m)	0.25	Q Weir (m3/s)	
E.G. IC (m)	214.53	Weir Sta Lft (m)	
E.G. OC (m)	214.53	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	214.47	Weir Max Depth (m)	
Culv WS Outlet (m)	214.25	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.15	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.13	Min El Weir Flow (m)	216.20

Note: During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth. Therefore, the inlet will be at normal depth.

CULVERT OUTPUT Profile #Regional Culv Group: Culvert #1

Q Culv Group (m3/s)	3.27	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.63
Q Barrel (m3/s)	3.27	Culv Vel DS (m/s)	1.75
E.G. US. (m)	214.82	Culv Inv El Up (m)	214.32
W.S. US. (m)	214.72	Culv Inv El Dn (m)	214.10
E.G. DS (m)	214.57	Culv Frctn Ls (m)	0.00
W.S. DS (m)	214.41	Culv Exit Loss (m)	0.00
Delta EG (m)	0.25	Culv Entr Loss (m)	0.03
Delta WS (m)	0.31	Q Weir (m3/s)	
E.G. IC (m)	214.81	Weir Sta Lft (m)	
E.G. OC (m)	214.82	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	214.65	Weir Max Depth (m)	
Culv WS Outlet (m)	214.41	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.33	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.31	Min El Weir Flow (m)	216.20

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CROSS SECTION

RIVER: DUFFINS
REACH: WC36 RS: 100

INPUT

```
Description: ST 100 (Updated Sep 2016)
Station Elevation Data    num=      72
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 217.091   1.513     217   2.897 216.911   3.508 216.872   8.876   216.5
  10.769 216.365  16.964     216  27.196 215.582  28.997   215.5  29.993 215.475
   30.48 215.471  30.746  215.47  31.264 215.463  32.061 215.452  39.629 215.339
  41.224 215.319  46.772 215.264  50.318 215.219  54.929 215.172  55.824 215.162
  57.521 215.152  58.981 215.149  60.725 215.134  61.818 215.125   64.65 215.131
  70.505  215.15  76.672 215.065  79.321 215.069  82.542 215.069  95.653 215.005
  96.259 215.003  96.819 215.001  97.219     215 108.147  214.65 112.404   214.5
 120.776 214.449 122.876 214.437 123.842  214.44   126.3  214.45     136   214.1
     142   214.1     146   214.4 149.172   214.5 155.931   214.5 158.504   214.5
 160.283   214.5 166.257   214.5 168.281   214.5 169.837   214.5 176.785   214.5
 176.786   214.5 176.796   214.5 178.009   214.5 181.388   214.5 182.233   214.5
 183.163   214.5  186.92   214.5 188.096   214.5 195.205 214.832 198.636 214.992
 198.779     215 198.935 215.013 199.915 215.103 204.167   215.5 204.636 215.545
 209.103     216 209.275     216 209.514     216 212.613     216 212.793     216
 213.534     216  214.85     216

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .07  96.259    .035 198.779     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        96.259 198.779             23      42      36             .3       .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0     136   216.2       T
     142  214.85   216.2       T

CROSS SECTION OUTPUT  Profile #2-yr

  E.G. Elev (m)           214.17    Element                Left OB    Channel   Right OB
  Vel Head (m)              0.02    Wt. n-Val.                         0.035
  W.S. Elev (m)           214.15    Reach Len. (m)           23.00     42.00      36.00
  Crit W.S. (m)           214.14    Flow Area (m2)                      0.30
  E.G. Slope (m/m)      0.024020    Area (m2)                           0.35
  Q Total (m3/s)            0.18    Flow (m3/s)                         0.18
  Top Width (m)             8.05    Top Width (m)                       8.05
  Vel Total (m/s)           0.60    Avg. Vel. (m/s)                     0.60
  Max Chl Dpth (m)          0.05    Hydr. Depth (m)                     0.05
  Conv. Total (m3/s)         1.2    Conv. (m3/s)                         1.2
  Length Wtd. (m)          42.00    Wetted Per. (m)                     6.00
  Min Ch El (m)           214.10    Shear (N/m2)                       11.77
  Alpha                     1.00    Stream Power (N/m s)                7.07
  Frctn Loss (m)            0.58    Cum Volume (1000 m3)                0.07
  C & E Loss (m)            0.00    Cum SA (1000 m2)                    1.29


Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
         1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate
         the need for additional cross sections.

CROSS SECTION OUTPUT  Profile #5-yr

  E.G. Elev (m)           214.19    Element                Left OB    Channel   Right OB
  Vel Head (m)              0.02    Wt. n-Val.                         0.035
  W.S. Elev (m)           214.16    Reach Len. (m)           23.00     42.00      36.00
  Crit W.S. (m)           214.16    Flow Area (m2)                      0.39
  E.G. Slope (m/m)      0.023098    Area (m2)                           0.47
  Q Total (m3/s)            0.27    Flow (m3/s)                         0.27
  Top Width (m)             8.65    Top Width (m)                       8.65
  Vel Total (m/s)           0.70    Avg. Vel. (m/s)                     0.70
  Max Chl Dpth (m)          0.06    Hydr. Depth (m)                     0.06
  Conv. Total (m3/s)         1.8    Conv. (m3/s)                         1.8
  Length Wtd. (m)          42.00    Wetted Per. (m)                     6.00
  Min Ch El (m)           214.10    Shear (N/m2)                       14.60
  Alpha                     1.00    Stream Power (N/m s)               10.19
  Frctn Loss (m)            0.57    Cum Volume (1000 m3)                0.09
  C & E Loss (m)            0.01    Cum SA (1000 m2)                    1.39


Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
         1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate
         the need for additional cross sections.

CROSS SECTION OUTPUT  Profile #10-yr

  E.G. Elev (m)           214.21    Element                Left OB    Channel   Right OB
  Vel Head (m)              0.03    Wt. n-Val.                         0.035
  W.S. Elev (m)           214.18    Reach Len. (m)           23.00     42.00      36.00
  Crit W.S. (m)           214.18    Flow Area (m2)                      0.49
  E.G. Slope (m/m)      0.018104    Area (m2)                           0.63
  Q Total (m3/s)            0.36    Flow (m3/s)                         0.36
  Top Width (m)             9.38    Top Width (m)                       9.38
  Vel Total (m/s)           0.73    Avg. Vel. (m/s)                     0.73
  Max Chl Dpth (m)          0.08    Hydr. Depth (m)                     0.08
  Conv. Total (m3/s)         2.7    Conv. (m3/s)                         2.7
  Length Wtd. (m)          42.00    Wetted Per. (m)                     6.00
  Min Ch El (m)           214.10    Shear (N/m2)                       14.63
  Alpha                     1.00    Stream Power (N/m s)               10.65
  Frctn Loss (m)            0.52    Cum Volume (1000 m3)                0.11
  C & E Loss (m)            0.00    Cum SA (1000 m2)                    1.50


Warning: The energy equation could not be balanced within the specified number of iterations.  The program used critical
         depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate
         the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
         water surface came back below critical depth.  This indicates that there is not a valid subcritical answer.  The
         program defaulted to critical depth.

CROSS SECTION OUTPUT  Profile #25-yr

  E.G. Elev (m)           214.23    Element                Left OB    Channel   Right OB
  Vel Head (m)              0.04    Wt. n-Val.                         0.035
  W.S. Elev (m)           214.19    Reach Len. (m)           23.00     42.00      36.00
  Crit W.S. (m)           214.18    Flow Area (m2)                      0.54
  E.G. Slope (m/m)      0.025178    Area (m2)                           0.70
  Q Total (m3/s)            0.49    Flow (m3/s)                         0.49
  Top Width (m)             9.69    Top Width (m)                       9.69
  Vel Total (m/s)           0.91    Avg. Vel. (m/s)                     0.91
  Max Chl Dpth (m)          0.09    Hydr. Depth (m)                     0.09
  Conv. Total (m3/s)         3.1    Conv. (m3/s)                         3.1
  Length Wtd. (m)          42.00    Wetted Per. (m)                     6.00
  Min Ch El (m)           214.10    Shear (N/m2)                       22.18
  Alpha                     1.00    Stream Power (N/m s)               20.16
  Frctn Loss (m)            0.57    Cum Volume (1000 m3)                0.13
  C & E Loss (m)            0.01    Cum SA (1000 m2)                    1.60


Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
         1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate
         the need for additional cross sections.

CROSS SECTION OUTPUT  Profile #50-yr

  E.G. Elev (m)           214.25    Element                Left OB    Channel   Right OB
  Vel Head (m)              0.05    Wt. n-Val.                         0.035
  W.S. Elev (m)           214.20    Reach Len. (m)           23.00     42.00      36.00
  Crit W.S. (m)           214.20    Flow Area (m2)                      0.61
  E.G. Slope (m/m)      0.023974    Area (m2)                           0.82
  Q Total (m3/s)            0.59    Flow (m3/s)                         0.59
  Top Width (m)            10.18    Top Width (m)                      10.18
  Vel Total (m/s)           0.97    Avg. Vel. (m/s)                     0.97
  Max Chl Dpth (m)          0.10    Hydr. Depth (m)                     0.10
  Conv. Total (m3/s)         3.8    Conv. (m3/s)                         3.8
  Length Wtd. (m)          42.00    Wetted Per. (m)                     6.00
  Min Ch El (m)           214.10    Shear (N/m2)                       23.96
  Alpha                     1.00    Stream Power (N/m s)               23.12
```

Frctn Loss (m)	0.56	Cum Volume (1000 m3)	0.15
C & E Loss (m)	0.01	Cum SA (1000 m2)	1.66

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	214.27	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	214.21	Reach Len. (m)	23.00	42.00	36.00
Crit W.S. (m)	214.21	Flow Area (m2)		0.68	
E.G. Slope (m/m)	0.023540	Area (m2)		0.95	
Q Total (m3/s)	0.70	Flow (m3/s)		0.70	
Top Width (m)	10.66	Top Width (m)		10.66	
Vel Total (m/s)	1.03	Avg. Vel. (m/s)		1.03	
Max Chl Dpth (m)	0.11	Hydr. Depth (m)		0.11	
Conv. Total (m3/s)	4.6	Conv. (m3/s)		4.6	
Length Wtd. (m)	42.00	Wetted Per. (m)		6.00	
Min Ch El (m)	214.10	Shear (N/m2)		26.21	
Alpha	1.00	Stream Power (N/m s)		26.93	
Frctn Loss (m)	0.56	Cum Volume (1000 m3)		0.17	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.76	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	214.30	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.035	
W.S. Elev (m)	214.25	Reach Len. (m)	23.00	42.00	36.00
Crit W.S. (m)	214.25	Flow Area (m2)		0.87	
E.G. Slope (m/m)	0.017446	Area (m2)		1.31	
Q Total (m3/s)	0.91	Flow (m3/s)		0.91	
Top Width (m)	11.97	Top Width (m)		11.97	
Vel Total (m/s)	1.04	Avg. Vel. (m/s)		1.04	
Max Chl Dpth (m)	0.15	Hydr. Depth (m)		0.15	
Conv. Total (m3/s)	6.9	Conv. (m3/s)		6.9	
Length Wtd. (m)	42.00	Wetted Per. (m)		6.00	
Min Ch El (m)	214.10	Shear (N/m2)		24.87	
Alpha	1.00	Stream Power (N/m s)		25.95	
Frctn Loss (m)	0.47	Cum Volume (1000 m3)		0.21	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.91	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	214.57	Element	Left OB	Channel	Right OB
Vel Head (m)	0.16	Wt. n-Val.		0.035	
W.S. Elev (m)	214.41	Reach Len. (m)	23.00	42.00	36.00
Crit W.S. (m)	214.41	Flow Area (m2)		1.87	
E.G. Slope (m/m)	0.017636	Area (m2)		3.87	
Q Total (m3/s)	3.27	Flow (m3/s)		3.27	
Top Width (m)	19.04	Top Width (m)		19.04	
Vel Total (m/s)	1.75	Avg. Vel. (m/s)		1.75	
Max Chl Dpth (m)	0.31	Hydr. Depth (m)		0.31	
Conv. Total (m3/s)	24.6	Conv. (m3/s)		24.6	
Length Wtd. (m)	42.00	Wetted Per. (m)		6.00	
Min Ch El (m)	214.10	Shear (N/m2)		53.98	
Alpha	1.00	Stream Power (N/m s)		94.25	
Frctn Loss (m)	0.43	Cum Volume (1000 m3)		0.63	
C & E Loss (m)	0.03	Cum SA (1000 m2)		4.12	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: DUFFINS
REACH: WC36 RS: 10

INPUT
Description: ST 10 (Updated Sep 2016)
Station Elevation Data num= 139

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	217.139	1.251	217.062	2.183	217	3.143	216.911	5.27	216.722
7.698	216.5	9.125	216.392	14.343	216	20.116	215.747	25.345	215.5
31.068	215.342	33.907	215.267	40.149	215.089	41.79	215.047	46.55	215
49.481	214.995	52.002	214.992	54.956	214.953	55.525	214.955	56.375	214.947
56.708	214.943	61.594	214.89	70.06	214.815	87.052	214.845	88.696	214.848
90.34	214.853	90.88	214.854	91.038	214.856	91.301	214.859	91.984	214.86
93.629	214.861	95.273	214.864	96.917	214.869	98.324	214.873	98.561	214.878
100.205	214.914	104.202	215	104.418	215.002	105.728	215.004	106.948	215.005
108.402	215.005	108.574	215.003	108.82	215	109.242	215	109.245	215
110.18	214.996	110.797	214.993	111.115	214.984	114.635	214.882	115.314	214.862
123.04	214.619	124.202	214.582	125.17	214.551	126.137	214.52	126.776	214.5
128.128	214.443	130.519	214.346	139.241	214	142	213.51	148	213.51
149.928	213.917	151.734	213.973	152.893	213.963	152.987	213.962	153.479	213.96
154.375	213.955	156.562	213.947	157.38	213.955	157.864	213.96	161.136	213.992
161.549	213.996	161.662	213.997	162.004	214	162.455	214.006	164.027	214.106
164.418	214.127	164.909	214.154	165.712	214.197	166.016	214.202	166.581	214.217
167.17	214.256	167.561	214.252	167.993	214.26	168.563	214.262	168.944	214.27
169.307	214.275	169.316	214.275	169.904	214.305	173.352	214.485	173.692	214.484
174.302	214.484	174.808	214.484	174.833	214.484	175.345	214.482	176.091	214.481
176.273	214.48	176.651	214.479	178.375	214.486	179.205	214.49	179.653	214.492
187.212	214.487	187.884	214.488	188.816	214.489	191.066	214.492	191.486	214.492
191.872	214.492	192.631	214.492	192.771	214.492	193.021	214.492	193.041	214.492
193.625	214.492	193.683	214.492	193.816	214.492	193.832	214.491	193.945	214.491
193.954	214.491	194.057	214.491	194.102	214.491	194.138	214.491	194.855	214.491
195.235	214.491	195.545	214.491	196.547	214.492	197.187	214.492	197.873	214.493
198.414	214.494	199.221	214.494	199.867	214.495	204.242	214.5	206.148	214.604
213.279	215	218.061	215.484	218.219	215.5	218.464	215.528	222.43	215.943
222.973	216	222.987	216	224.532	216.001	227.184	216.003		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	126.776	.035	173.352	.07

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
126.776 173.352 57.7 62.2 67.9 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	142	216	F
148	227.184	216	F

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	213.59	Element	Left OB	Channel	Right OB

Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	213.58	Reach Len. (m)	57.70	62.20	67.90
Crit W.S. (m)	213.56	Flow Area (m2)		0.40	
E.G. Slope (m/m)	0.008897	Area (m2)		0.43	
Q Total (m3/s)	0.18	Flow (m3/s)		0.18	
Top Width (m)	6.70	Top Width (m)		6.70	
Vel Total (m/s)	0.45	Avg. Vel. (m/s)		0.45	
Max Chl Dpth (m)	0.07	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	1.9	Conv. (m3/s)		1.9	
Length Wtd. (m)	62.20	Wetted Per. (m)		6.00	
Min Ch El (m)	213.51	Shear (N/m2)		5.87	
Alpha	1.00	Stream Power (N/m s)		2.62	
Frctn Loss (m)		Cum Volume (1000 m3)		0.05	
C & E Loss (m)		Cum SA (1000 m2)		0.98	

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	213.61	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	213.60	Reach Len. (m)	57.70	62.20	67.90
Crit W.S. (m)	213.57	Flow Area (m2)		0.51	
E.G. Slope (m/m)	0.008995	Area (m2)		0.55	
Q Total (m3/s)	0.27	Flow (m3/s)		0.27	
Top Width (m)	6.89	Top Width (m)		6.89	
Vel Total (m/s)	0.53	Avg. Vel. (m/s)		0.53	
Max Chl Dpth (m)	0.09	Hydr. Depth (m)		0.09	
Conv. Total (m3/s)	2.8	Conv. (m3/s)		2.8	
Length Wtd. (m)	62.20	Wetted Per. (m)		6.00	
Min Ch El (m)	213.51	Shear (N/m2)		7.55	
Alpha	1.00	Stream Power (N/m s)		3.97	
Frctn Loss (m)		Cum Volume (1000 m3)		0.07	
C & E Loss (m)		Cum SA (1000 m2)		1.07	

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	213.63	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	213.61	Reach Len. (m)	57.70	62.20	67.90
Crit W.S. (m)	213.58	Flow Area (m2)		0.61	
E.G. Slope (m/m)	0.008948	Area (m2)		0.66	
Q Total (m3/s)	0.36	Flow (m3/s)		0.36	
Top Width (m)	7.06	Top Width (m)		7.06	
Vel Total (m/s)	0.59	Avg. Vel. (m/s)		0.59	
Max Chl Dpth (m)	0.10	Hydr. Depth (m)		0.10	
Conv. Total (m3/s)	3.8	Conv. (m3/s)		3.8	
Length Wtd. (m)	62.20	Wetted Per. (m)		6.00	
Min Ch El (m)	213.51	Shear (N/m2)		8.93	
Alpha	1.00	Stream Power (N/m s)		5.26	
Frctn Loss (m)		Cum Volume (1000 m3)		0.08	
C & E Loss (m)		Cum SA (1000 m2)		1.15	

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	213.66	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	213.63	Reach Len. (m)	57.70	62.20	67.90
Crit W.S. (m)	213.60	Flow Area (m2)		0.75	
E.G. Slope (m/m)	0.008522	Area (m2)		0.83	
Q Total (m3/s)	0.49	Flow (m3/s)		0.49	
Top Width (m)	7.29	Top Width (m)		7.29	
Vel Total (m/s)	0.66	Avg. Vel. (m/s)		0.66	
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.12	
Conv. Total (m3/s)	5.3	Conv. (m3/s)		5.3	
Length Wtd. (m)	62.20	Wetted Per. (m)		6.00	
Min Ch El (m)	213.51	Shear (N/m2)		10.39	
Alpha	1.00	Stream Power (N/m s)		6.83	
Frctn Loss (m)		Cum Volume (1000 m3)		0.10	
C & E Loss (m)		Cum SA (1000 m2)		1.24	

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	213.67	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	213.65	Reach Len. (m)	57.70	62.20	67.90
Crit W.S. (m)	213.61	Flow Area (m2)		0.83	
E.G. Slope (m/m)	0.008536	Area (m2)		0.93	
Q Total (m3/s)	0.59	Flow (m3/s)		0.59	
Top Width (m)	7.44	Top Width (m)		7.44	
Vel Total (m/s)	0.71	Avg. Vel. (m/s)		0.71	
Max Chl Dpth (m)	0.14	Hydr. Depth (m)		0.14	
Conv. Total (m3/s)	6.4	Conv. (m3/s)		6.4	
Length Wtd. (m)	62.20	Wetted Per. (m)		6.00	
Min Ch El (m)	213.51	Shear (N/m2)		11.63	
Alpha	1.00	Stream Power (N/m s)		8.23	
Frctn Loss (m)		Cum Volume (1000 m3)		0.11	
C & E Loss (m)		Cum SA (1000 m2)		1.29	

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	213.69	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	213.66	Reach Len. (m)	57.70	62.20	67.90
Crit W.S. (m)	213.62	Flow Area (m2)		0.92	
E.G. Slope (m/m)	0.008562	Area (m2)		1.05	
Q Total (m3/s)	0.70	Flow (m3/s)		0.70	
Top Width (m)	7.59	Top Width (m)		7.59	
Vel Total (m/s)	0.76	Avg. Vel. (m/s)		0.76	
Max Chl Dpth (m)	0.15	Hydr. Depth (m)		0.15	
Conv. Total (m3/s)	7.6	Conv. (m3/s)		7.6	
Length Wtd. (m)	62.20	Wetted Per. (m)		6.00	
Min Ch El (m)	213.51	Shear (N/m2)		12.91	
Alpha	1.00	Stream Power (N/m s)		9.80	
Frctn Loss (m)		Cum Volume (1000 m3)		0.13	
C & E Loss (m)		Cum SA (1000 m2)		1.38	

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	213.73	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	213.70	Reach Len. (m)	57.70	62.20	67.90
Crit W.S. (m)	213.64	Flow Area (m2)		1.11	
E.G. Slope (m/m)	0.007720	Area (m2)		1.29	
Q Total (m3/s)	0.91	Flow (m3/s)		0.91	
Top Width (m)	7.92	Top Width (m)		7.92	
Vel Total (m/s)	0.82	Avg. Vel. (m/s)		0.82	
Max Chl Dpth (m)	0.19	Hydr. Depth (m)		0.19	
Conv. Total (m3/s)	10.4	Conv. (m3/s)		10.4	
Length Wtd. (m)	62.20	Wetted Per. (m)		6.00	
Min Ch El (m)	213.51	Shear (N/m2)		14.06	
Alpha	1.00	Stream Power (N/m s)		11.48	
Frctn Loss (m)		Cum Volume (1000 m3)		0.16	
C & E Loss (m)		Cum SA (1000 m2)		1.49	

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	214.01	Element	Left OB	Channel	Right OB
Vel Head (m)	0.09	Wt. n-Val.		0.035	
W.S. Elev (m)	213.93	Reach Len. (m)	57.70	62.20	67.90
Crit W.S. (m)	213.82	Flow Area (m2)		2.51	
E.G. Slope (m/m)	0.006685	Area (m2)		3.41	
Q Total (m3/s)	3.27	Flow (m3/s)		3.27	
Top Width (m)	10.62	Top Width (m)		10.62	
Vel Total (m/s)	1.31	Avg. Vel. (m/s)		1.31	
Max Chl Dpth (m)	0.42	Hydr. Depth (m)		0.42	
Conv. Total (m3/s)	40.0	Conv. (m3/s)		40.0	
Length Wtd. (m)	62.20	Wetted Per. (m)		6.00	
Min Ch El (m)	213.51	Shear (N/m2)		27.37	
Alpha	1.00	Stream Power (N/m s)		35.73	
Frctn Loss (m)		Cum Volume (1000 m3)		0.48	
C & E Loss (m)		Cum SA (1000 m2)		3.49	

Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CULVERT

RIVER: DUFFINS
REACH: WC36 RS: 7

INPUT
Description:
Distance from Upstream XS = 27.4
Deck/Roadway Width = 20
Weir Coefficient = 1.4
Upstream Deck/Roadway Coordinates
num= 5

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
14.34	216		95	216.75		135	217	
190	217		227	217				

Upstream Bridge Cross Section Data
Station Elevation Data num= 139

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	217.139	1.251	217.062	2.183	217	3.143	216.911	5.27	216.722
7.698	216.5	9.125	216.392	14.343	216	20.116	215.747	25.345	215.5
31.068	215.342	33.907	215.267	40.149	215.089	41.79	215.047	46.55	215
49.481	214.995	52.002	214.992	54.956	214.953	55.525	214.955	56.375	214.947
56.708	214.943	61.594	214.89	70.06	214.815	87.052	214.845	88.696	214.848
90.34	214.853	90.88	214.854	91.038	214.856	91.301	214.859	91.984	214.86
93.629	214.861	95.273	214.864	96.917	214.869	98.324	214.873	98.561	214.878
100.205	214.914	104.202	215	104.418	215.002	105.728	215.004	106.948	215.005
108.402	215.005	108.574	215.003	108.82	215	109.242	215	109.245	215
110.18	214.996	110.797	214.993	111.115	214.984	114.635	214.882	115.314	214.862
123.04	214.619	124.202	214.582	125.17	214.551	126.137	214.52	126.776	214.5
128.128	214.443	130.519	214.346	139.241	214	142	213.51	148	213.51
149.928	213.917	151.734	213.973	152.893	213.963	152.987	213.962	153.479	213.96
154.375	213.955	156.562	213.947	157.38	213.955	157.864	213.96	161.136	213.992
161.549	213.996	161.662	213.997	162.004	214	162.455	214.006	164.027	214.106
164.418	214.127	164.909	214.154	165.712	214.197	166.016	214.202	166.581	214.217
167.17	214.256	167.561	214.252	167.993	214.26	168.563	214.262	168.944	214.27
169.307	214.275	169.316	214.275	169.904	214.305	173.352	214.485	173.692	214.484
174.302	214.484	174.808	214.484	174.833	214.484	175.345	214.482	176.091	214.481
176.273	214.48	176.651	214.479	178.375	214.486	179.205	214.49	179.653	214.492
187.212	214.487	187.884	214.488	188.816	214.489	191.066	214.492	191.486	214.492
191.872	214.492	192.631	214.492	192.771	214.492	193.021	214.492	193.041	214.492
193.625	214.492	193.683	214.492	193.816	214.492	193.832	214.491	193.945	214.491
193.954	214.491	194.057	214.491	194.102	214.491	194.138	214.491	194.855	214.491
195.235	214.491	195.545	214.491	196.547	214.492	197.187	214.492	197.873	214.493
198.414	214.494	199.221	214.494	199.867	214.495	204.242	214.5	206.148	214.604
213.279	215	218.061	215.484	218.219	215.5	218.464	215.528	222.43	215.943
222.973	216	222.987	216	224.532	216.001	227.184	216.003		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	126.776	.035	173.352	.07

Bank Sta: Left Right Coeff Contr. Expan.
126.776 173.352 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	142	216	F
148	227.184	216	F

Downstream Deck/Roadway Coordinates
num= 5

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
34	216.75		34	216.75		75	217	
125	217		153.5	217				

Downstream Bridge Cross Section Data
Station Elevation Data num= 37

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	217	15	216.75	34	216.75	40.2	213.64	44.42	213.5
50.26	213.32	54.45	213.32	59.48	213.39	60.15	213.39	61.13	213.4
62.01	213.4	64.74	213.4	65.12	213.39	65.15	213.39	65.39	213.39
65.53	213.38	65.59	213.38	72	213.14	73.67	213.14	78	213.14
80.11	213.22	81.84	213.28	87.93	213.5	90.09	213.68	93.91	214
95.99	214.14	103.14	214.5	142.84	214.99	143.11	214.99	143.19	214.99
143.37	215	143.52	215	143.57	215	144.14	215	146.94	215.02
149.75	215.12	153.58	215.19						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	40.2	.035	90.09	.07

Bank Sta: Left Right Coeff Contr. Expan.
40.2 90.09 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	72	216	F
78	153.58	216	F

Upstream Embankment side slope = 3 horiz. to 1.0 vertical
Downstream Embankment side slope = 3 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .98
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name	Shape	Rise	Span
Culvert #1	Box	2	6

FHWA Chart # 8 - flared wingwalls
FHWA Scale # 1 - Wingwall flared 30 to 75 deg.
Solution Criteria = Highest U.S. EG

Culvert Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
12.2	41	.013	.025	0	.2	1

Upstream Elevation = 213.51
Centerline Station = 145
Downstream Elevation = 213.3
Centerline Station = 75

CULVERT OUTPUT Profile #2-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.18	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	0.46
Q Barrel (m3/s)	0.18	Culv Vel DS (m/s)	0.67
E.G. US. (m)	213.59	Culv Inv El Up (m)	213.51
W.S. US. (m)	213.58	Culv Inv El Dn (m)	213.30
E.G. DS (m)	213.22	Culv Frctn Ls (m)	0.00
W.S. DS (m)	213.21	Culv Exit Loss (m)	0.15
Delta EG (m)	0.37	Culv Entr Loss (m)	0.00
Delta WS (m)	0.37	Q Weir (m3/s)	
E.G. IC (m)	213.57	Weir Sta Lft (m)	

E.G. OC (m)	213.59	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	213.58	Weir Max Depth (m)	
Culv WS Outlet (m)	213.35	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.07	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.05	Min El Weir Flow (m)	216.00

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #5-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.27	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	0.54
Q Barrel (m3/s)	0.27	Culv Vel DS (m/s)	0.76
E.G. US. (m)	213.61	Culv Inv El Up (m)	213.51
W.S. US. (m)	213.60	Culv Inv El Dn (m)	213.30
E.G. DS (m)	213.24	Culv Frctn Ls (m)	0.00
W.S. DS (m)	213.22	Culv Exit Loss (m)	0.15
Delta EG (m)	0.37	Culv Entr Loss (m)	0.00
Delta WS (m)	0.37	Q Weir (m3/s)	
E.G. IC (m)	213.60	Weir Sta Lft (m)	
E.G. OC (m)	213.61	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	213.59	Weir Max Depth (m)	
Culv WS Outlet (m)	213.36	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.08	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.06	Min El Weir Flow (m)	216.00

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #10-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.36	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	0.61
Q Barrel (m3/s)	0.36	Culv Vel DS (m/s)	0.84
E.G. US. (m)	213.63	Culv Inv El Up (m)	213.51
W.S. US. (m)	213.61	Culv Inv El Dn (m)	213.30
E.G. DS (m)	213.26	Culv Frctn Ls (m)	0.00
W.S. DS (m)	213.24	Culv Exit Loss (m)	0.15
Delta EG (m)	0.37	Culv Entr Loss (m)	0.00
Delta WS (m)	0.37	Q Weir (m3/s)	
E.G. IC (m)	213.61	Weir Sta Lft (m)	
E.G. OC (m)	213.63	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	213.61	Weir Max Depth (m)	
Culv WS Outlet (m)	213.37	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.10	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.07	Min El Weir Flow (m)	216.00

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #25-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.49	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	0.68
Q Barrel (m3/s)	0.49	Culv Vel DS (m/s)	0.93
E.G. US. (m)	213.66	Culv Inv El Up (m)	213.51
W.S. US. (m)	213.63	Culv Inv El Dn (m)	213.30
E.G. DS (m)	213.28	Culv Frctn Ls (m)	0.00
W.S. DS (m)	213.26	Culv Exit Loss (m)	0.15
Delta EG (m)	0.38	Culv Entr Loss (m)	0.00
Delta WS (m)	0.38	Q Weir (m3/s)	
E.G. IC (m)	213.64	Weir Sta Lft (m)	
E.G. OC (m)	213.66	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	213.63	Weir Max Depth (m)	
Culv WS Outlet (m)	213.39	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.12	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.09	Min El Weir Flow (m)	216.00

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #50-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.59	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	0.74
Q Barrel (m3/s)	0.59	Culv Vel DS (m/s)	0.99
E.G. US. (m)	213.68	Culv Inv El Up (m)	213.51
W.S. US. (m)	213.65	Culv Inv El Dn (m)	213.30
E.G. DS (m)	213.29	Culv Frctn Ls (m)	0.00
W.S. DS (m)	213.26	Culv Exit Loss (m)	0.15
Delta EG (m)	0.38	Culv Entr Loss (m)	0.01
Delta WS (m)	0.39	Q Weir (m3/s)	
E.G. IC (m)	213.66	Weir Sta Lft (m)	
E.G. OC (m)	213.68	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	213.64	Weir Max Depth (m)	
Culv WS Outlet (m)	213.40	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.13	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.10	Min El Weir Flow (m)	216.00

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #100-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.70	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	0.79
Q Barrel (m3/s)	0.70	Culv Vel DS (m/s)	1.05
E.G. US. (m)	213.70	Culv Inv El Up (m)	213.51
W.S. US. (m)	213.66	Culv Inv El Dn (m)	213.30
E.G. DS (m)	213.32	Culv Frctn Ls (m)	0.00
W.S. DS (m)	213.28	Culv Exit Loss (m)	0.15
Delta EG (m)	0.38	Culv Entr Loss (m)	0.01
Delta WS (m)	0.38	Q Weir (m3/s)	
E.G. IC (m)	213.68	Weir Sta Lft (m)	
E.G. OC (m)	213.70	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	213.66	Weir Max Depth (m)	
Culv WS Outlet (m)	213.41	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.15	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.11	Min El Weir Flow (m)	216.00

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #Check Flow Culv Group: Culvert #1

Q Culv Group (m3/s)	0.91	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	0.88
Q Barrel (m3/s)	0.91	Culv Vel DS (m/s)	1.14
E.G. US. (m)	213.73	Culv Inv El Up (m)	213.51
W.S. US. (m)	213.70	Culv Inv El Dn (m)	213.30
E.G. DS (m)	213.35	Culv Frctn Ls (m)	0.00
W.S. DS (m)	213.30	Culv Exit Loss (m)	0.15
Delta EG (m)	0.38	Culv Entr Loss (m)	0.01
Delta WS (m)	0.39	Q Weir (m3/s)	
E.G. IC (m)	213.71	Weir Sta Lft (m)	
E.G. OC (m)	213.73	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	213.68	Weir Max Depth (m)	
Culv WS Outlet (m)	213.43	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.17	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.13	Min El Weir Flow (m)	216.00

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #Regional Culv Group: Culvert #1

Q Culv Group (m3/s)	3.27	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.44
Q Barrel (m3/s)	3.27	Culv Vel DS (m/s)	1.75
E.G. US. (m)	214.01	Culv Inv El Up (m)	213.51
W.S. US. (m)	213.93	Culv Inv El Dn (m)	213.30
E.G. DS (m)	213.61	Culv Frctn Ls (m)	0.00
W.S. DS (m)	213.47	Culv Exit Loss (m)	0.16
Delta EG (m)	0.41	Culv Entr Loss (m)	0.02
Delta WS (m)	0.46	Q Weir (m3/s)	
E.G. IC (m)	213.99	Weir Sta Lft (m)	
E.G. OC (m)	214.01	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	213.89	Weir Max Depth (m)	
Culv WS Outlet (m)	213.61	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.38	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.31	Min El Weir Flow (m)	216.00

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CROSS SECTION

RIVER: DUFFINS
REACH: WC36 RS: 5

INPUT
Description: ST 5 (Added Sep 2016)
Station Elevation Data num= 37

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	217	15	216.75	34	216.75	40.2	213.64	44.42	213.5
50.26	213.32	54.45	213.32	59.48	213.39	60.15	213.39	61.13	213.4
62.01	213.4	64.74	213.4	65.12	213.39	65.15	213.39	65.39	213.39
65.53	213.38	65.59	213.38	72	213.14	73.67	213.14	78	213.14
80.11	213.22	81.84	213.28	87.93	213.5	90.09	213.68	93.91	214
95.99	214.14	103.14	214.5	142.84	214.99	143.11	214.99	143.19	214.99
143.37	215	143.52	215	143.57	215	144.14	215	146.94	215.02
149.75	215.12	153.58	215.19						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	40.2	.035	90.09	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
40.2	90.09	49	67.6	70	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	72	216	F
78	153.58	216	F

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	213.22	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	213.21	Reach Len. (m)	49.00	67.60	70.00
Crit W.S. (m)	213.19	Flow Area (m2)		0.42	
E.G. Slope (m/m)	0.008050	Area (m2)		0.54	
Q Total (m3/s)	0.18	Flow (m3/s)		0.18	
Top Width (m)	9.68	Top Width (m)		9.68	
Vel Total (m/s)	0.43	Avg. Vel. (m/s)		0.43	
Max Chl Dpth (m)	0.07	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	2.0	Conv. (m3/s)		2.0	
Length Wtd. (m)	67.60	Wetted Per. (m)		6.00	
Min Ch El (m)	213.14	Shear (N/m2)		5.47	
Alpha	1.00	Stream Power (N/m s)		2.37	
Frctn Loss (m)	1.12	Cum Volume (1000 m3)		0.03	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.48	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	213.24	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	213.22	Reach Len. (m)	49.00	67.60	70.00
Crit W.S. (m)	213.20	Flow Area (m2)		0.49	
E.G. Slope (m/m)	0.010298	Area (m2)		0.67	
Q Total (m3/s)	0.27	Flow (m3/s)		0.27	
Top Width (m)	10.36	Top Width (m)		10.36	
Vel Total (m/s)	0.55	Avg. Vel. (m/s)		0.55	
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	2.7	Conv. (m3/s)		2.7	
Length Wtd. (m)	67.60	Wetted Per. (m)		6.00	
Min Ch El (m)	213.14	Shear (N/m2)		8.29	
Alpha	1.00	Stream Power (N/m s)		4.54	
Frctn Loss (m)	1.11	Cum Volume (1000 m3)		0.03	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.53	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	213.26	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	213.24	Reach Len. (m)	49.00	67.60	70.00
Crit W.S. (m)	213.21	Flow Area (m2)		0.60	
E.G. Slope (m/m)	0.009259	Area (m2)		0.87	
Q Total (m3/s)	0.36	Flow (m3/s)		0.36	
Top Width (m)	11.39	Top Width (m)		11.39	
Vel Total (m/s)	0.60	Avg. Vel. (m/s)		0.60	
Max Chl Dpth (m)	0.10	Hydr. Depth (m)		0.10	
Conv. Total (m3/s)	3.7	Conv. (m3/s)		3.7	
Length Wtd. (m)	67.60	Wetted Per. (m)		6.00	
Min Ch El (m)	213.14	Shear (N/m2)		9.15	
Alpha	1.00	Stream Power (N/m s)		5.45	
Frctn Loss (m)	1.11	Cum Volume (1000 m3)		0.04	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.58	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	213.28	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	213.26	Reach Len. (m)	49.00	67.60	70.00
Crit W.S. (m)	213.23	Flow Area (m2)		0.69	
E.G. Slope (m/m)	0.010838	Area (m2)		1.05	
Q Total (m3/s)	0.49	Flow (m3/s)		0.49	
Top Width (m)	12.22	Top Width (m)		12.22	
Vel Total (m/s)	0.71	Avg. Vel. (m/s)		0.71	
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.12	
Conv. Total (m3/s)	4.7	Conv. (m3/s)		4.7	
Length Wtd. (m)	67.60	Wetted Per. (m)		6.00	
Min Ch El (m)	213.14	Shear (N/m2)		12.29	
Alpha	1.00	Stream Power (N/m s)		8.68	
Frctn Loss (m)	1.12	Cum Volume (1000 m3)		0.05	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.64	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	213.29	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.03	Wt. n-Val.		0.035		
W.S. Elev (m)	213.26	Reach Len. (m)	49.00	67.60	70.00	
Crit W.S. (m)	213.24	Flow Area (m2)		0.72		
E.G. Slope (m/m)	0.013707	Area (m2)		1.11		
Q Total (m3/s)	0.59	Flow (m3/s)		0.59		
Top Width (m)	12.49	Top Width (m)		12.49		
Vel Total (m/s)	0.82	Avg. Vel. (m/s)		0.82		
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.12		
Conv. Total (m3/s)	5.0	Conv. (m3/s)		5.0		
Length Wtd. (m)	67.60	Wetted Per. (m)		6.00		
Min Ch El (m)	213.14	Shear (N/m2)		16.20		
Alpha	1.00	Stream Power (N/m s)		13.22		
Frctn Loss (m)	1.10	Cum Volume (1000 m3)		0.06		
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.67		

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	213.32	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.03	Wt. n-Val.		0.035		
W.S. Elev (m)	213.28	Reach Len. (m)	49.00	67.60	70.00	
Crit W.S. (m)	213.25	Flow Area (m2)		0.85		
E.G. Slope (m/m)	0.011353	Area (m2)		1.38		
Q Total (m3/s)	0.70	Flow (m3/s)		0.70		
Top Width (m)	13.64	Top Width (m)		13.64		
Vel Total (m/s)	0.83	Avg. Vel. (m/s)		0.83		
Max Chl Dpth (m)	0.14	Hydr. Depth (m)		0.14		
Conv. Total (m3/s)	6.6	Conv. (m3/s)		6.6		
Length Wtd. (m)	67.60	Wetted Per. (m)		6.00		
Min Ch El (m)	213.14	Shear (N/m2)		15.73		
Alpha	1.00	Stream Power (N/m s)		12.99		
Frctn Loss (m)	1.12	Cum Volume (1000 m3)		0.07		
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.72		

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	213.35	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.04	Wt. n-Val.		0.035		
W.S. Elev (m)	213.30	Reach Len. (m)	49.00	67.60	70.00	
Crit W.S. (m)	213.28	Flow Area (m2)		0.98		
E.G. Slope (m/m)	0.011747	Area (m2)		1.70		
Q Total (m3/s)	0.91	Flow (m3/s)		0.91		
Top Width (m)	14.86	Top Width (m)		14.86		
Vel Total (m/s)	0.93	Avg. Vel. (m/s)		0.93		
Max Chl Dpth (m)	0.16	Hydr. Depth (m)		0.16		
Conv. Total (m3/s)	8.4	Conv. (m3/s)		8.4		
Length Wtd. (m)	67.60	Wetted Per. (m)		6.00		
Min Ch El (m)	213.14	Shear (N/m2)		18.86		
Alpha	1.00	Stream Power (N/m s)		17.47		
Frctn Loss (m)	1.12	Cum Volume (1000 m3)		0.09		
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.78		

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	213.61	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.14	Wt. n-Val.		0.035		
W.S. Elev (m)	213.47	Reach Len. (m)	49.00	67.60	70.00	
Crit W.S. (m)	213.46	Flow Area (m2)		1.99		
E.G. Slope (m/m)	0.014501	Area (m2)		6.88		
Q Total (m3/s)	3.27	Flow (m3/s)		3.27		
Top Width (m)	41.77	Top Width (m)		41.77		
Vel Total (m/s)	1.65	Avg. Vel. (m/s)		1.65		
Max Chl Dpth (m)	0.33	Hydr. Depth (m)		0.33		
Conv. Total (m3/s)	27.2	Conv. (m3/s)		27.2		
Length Wtd. (m)	67.60	Wetted Per. (m)		6.00		
Min Ch El (m)	213.14	Shear (N/m2)		47.07		
Alpha	1.00	Stream Power (N/m s)		77.50		
Frctn Loss (m)	1.17	Cum Volume (1000 m3)		0.32		
C & E Loss (m)	0.02	Cum SA (1000 m2)		1.86		

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: DUFFINS
REACH: WC36 RS: 1

INPUT
Description: ST 1 (Added Sep 2016)
Station Elevation Data num= 64

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	217.3	82.5	215.6	112.4	215.6	121.93	213.88	122.7	213.84
122.73	213.84	124.42	213.75	127.2	213.53	128.13	213.5	129.76	213.28
131.98	213	136.95	212.53	137.26	212.5	137.9	212.39	140.07	212
140.59	212	140.78	212	141.43	212	141.49	212	141.54	212
141.75	212	142.01	212	142.02	212	147.6	212.18	149.8	212.26
152.98	212.36	153.13	212.36	156.81	212.5	159.23	212.78	161.01	213
162.22	213.16	164.93	213.5	166.36	213.64	169.36	214	172.67	214.02
176.65	214.04	180.22	214.06	182.63	214.07	184.99	214.07	191.99	214.1
192.79	214.1	197.4	214.11	198.17	214.11	208.17	214.14	210.57	214.12
212.23	214.12	219.22	214.13	222.11	214.14	224.01	214.15	231.09	214.18
231.42	214.18	243.5	214.29	264.52	214.49	268.83	214.5	269.86	214.5
272.03	214.5	278.19	214.68	278.24	214.68	286.1	215	286.13	215
286.23	215	299.66	215.5	307.26	215.52	308.08	215.52		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	129.76	.035	162.22	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
129.76	162.22	0	0	0 .3	.5

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	212.10	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.04	Wt. n-Val.		0.035		
W.S. Elev (m)	212.07	Reach Len. (m)				
Crit W.S. (m)	212.07	Flow Area (m2)		0.21		
E.G. Slope (m/m)	0.051259	Area (m2)		0.21		
Q Total (m3/s)	0.18	Flow (m3/s)		0.18		
Top Width (m)	4.38	Top Width (m)		4.38		
Vel Total (m/s)	0.85	Avg. Vel. (m/s)		0.85		
Max Chl Dpth (m)	0.07	Hydr. Depth (m)		0.05		

Conv. Total (m3/s)	0.8	Conv. (m3/s)	0.8
Length Wtd. (m)		Wetted Per. (m)	4.39
Min Ch El (m)	212.00	Shear (N/m2)	24.13
Alpha	1.00	Stream Power (N/m s)	20.62
Frctn Loss (m)		Cum Volume (1000 m3)	
C & E Loss (m)		Cum SA (1000 m2)	

CROSS SECTION OUTPUT Profile #5-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	212.13	Element			
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	212.09	Reach Len. (m)			
Crit W.S. (m)	212.09	Flow Area (m2)		0.34	
E.G. Slope (m/m)	0.030416	Area (m2)		0.34	
Q Total (m3/s)	0.27	Flow (m3/s)		0.27	
Top Width (m)	5.36	Top Width (m)		5.36	
Vel Total (m/s)	0.79	Avg. Vel. (m/s)		0.79	
Max Chl Dpth (m)	0.09	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	1.5	Conv. (m3/s)		1.5	
Length Wtd. (m)		Wetted Per. (m)		5.37	
Min Ch El (m)	212.00	Shear (N/m2)		18.93	
Alpha	1.00	Stream Power (N/m s)		15.01	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #10-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	212.15	Element			
Vel Head (m)	0.04	Wt. n-Val.		0.035	
W.S. Elev (m)	212.10	Reach Len. (m)			
Crit W.S. (m)	212.10	Flow Area (m2)		0.39	
E.G. Slope (m/m)	0.036821	Area (m2)		0.39	
Q Total (m3/s)	0.36	Flow (m3/s)		0.36	
Top Width (m)	5.69	Top Width (m)		5.69	
Vel Total (m/s)	0.92	Avg. Vel. (m/s)		0.92	
Max Chl Dpth (m)	0.10	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	1.9	Conv. (m3/s)		1.9	
Length Wtd. (m)		Wetted Per. (m)		5.70	
Min Ch El (m)	212.00	Shear (N/m2)		24.79	
Alpha	1.00	Stream Power (N/m s)		22.79	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #25-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	212.17	Element			
Vel Head (m)	0.04	Wt. n-Val.		0.035	
W.S. Elev (m)	212.13	Reach Len. (m)			
Crit W.S. (m)	212.13	Flow Area (m2)		0.54	
E.G. Slope (m/m)	0.028113	Area (m2)		0.54	
Q Total (m3/s)	0.49	Flow (m3/s)		0.49	
Top Width (m)	6.59	Top Width (m)		6.59	
Vel Total (m/s)	0.90	Avg. Vel. (m/s)		0.90	
Max Chl Dpth (m)	0.13	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	2.9	Conv. (m3/s)		2.9	
Length Wtd. (m)		Wetted Per. (m)		6.60	
Min Ch El (m)	212.00	Shear (N/m2)		22.62	
Alpha	1.00	Stream Power (N/m s)		20.47	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #50-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	212.19	Element			
Vel Head (m)	0.04	Wt. n-Val.		0.035	
W.S. Elev (m)	212.15	Reach Len. (m)			
Crit W.S. (m)	212.15	Flow Area (m2)		0.71	
E.G. Slope (m/m)	0.019649	Area (m2)		0.71	
Q Total (m3/s)	0.59	Flow (m3/s)		0.59	
Top Width (m)	7.45	Top Width (m)		7.45	
Vel Total (m/s)	0.83	Avg. Vel. (m/s)		0.83	
Max Chl Dpth (m)	0.15	Hydr. Depth (m)		0.10	
Conv. Total (m3/s)	4.2	Conv. (m3/s)		4.2	
Length Wtd. (m)		Wetted Per. (m)		7.47	
Min Ch El (m)	212.00	Shear (N/m2)		18.27	
Alpha	1.00	Stream Power (N/m s)		15.22	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #100-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	212.20	Element			
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	212.15	Reach Len. (m)			
Crit W.S. (m)	212.15	Flow Area (m2)		0.72	
E.G. Slope (m/m)	0.026347	Area (m2)		0.72	
Q Total (m3/s)	0.70	Flow (m3/s)		0.70	
Top Width (m)	7.52	Top Width (m)		7.52	
Vel Total (m/s)	0.97	Avg. Vel. (m/s)		0.97	
Max Chl Dpth (m)	0.15	Hydr. Depth (m)		0.10	
Conv. Total (m3/s)	4.3	Conv. (m3/s)		4.3	
Length Wtd. (m)		Wetted Per. (m)		7.53	
Min Ch El (m)	212.00	Shear (N/m2)		24.74	
Alpha	1.00	Stream Power (N/m s)		24.01	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Check Flow

			Left OB	Channel	Right OB
E.G. Elev (m)	212.23	Element			
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	212.17	Reach Len. (m)			
Crit W.S. (m)	212.17	Flow Area (m2)		0.89	
E.G. Slope (m/m)	0.025288	Area (m2)		0.89	
Q Total (m3/s)	0.91	Flow (m3/s)		0.91	
Top Width (m)	8.29	Top Width (m)		8.29	
Vel Total (m/s)	1.02	Avg. Vel. (m/s)		1.02	
Max Chl Dpth (m)	0.17	Hydr. Depth (m)		0.11	
Conv. Total (m3/s)	5.7	Conv. (m3/s)		5.7	
Length Wtd. (m)		Wetted Per. (m)		8.31	
Min Ch El (m)	212.00	Shear (N/m2)		26.52	
Alpha	1.00	Stream Power (N/m s)		27.16	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Regional

			Left OB	Channel	Right OB
E.G. Elev (m)	212.41	Element			
Vel Head (m)	0.09	Wt. n-Val.		0.035	
W.S. Elev (m)	212.32	Reach Len. (m)			
Crit W.S. (m)	212.32	Flow Area (m2)		2.45	
E.G. Slope (m/m)	0.021124	Area (m2)		2.45	
Q Total (m3/s)	3.27	Flow (m3/s)		3.27	
Top Width (m)	13.35	Top Width (m)		13.35	
Vel Total (m/s)	1.34	Avg. Vel. (m/s)		1.34	
Max Chl Dpth (m)	0.32	Hydr. Depth (m)		0.18	
Conv. Total (m3/s)	22.5	Conv. (m3/s)		22.5	
Length Wtd. (m)		Wetted Per. (m)		13.39	
Min Ch El (m)	212.00	Shear (N/m2)		37.84	
Alpha	1.00	Stream Power (N/m s)		50.60	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

SUMMARY OF MANNING'S N VALUES

River:DUFFINS

Reach	River Sta.	n1	n2	n3
WC36	500	.07	.035	.07
WC36	450	Culvert		
WC36	400	.07	.035	.07
WC36	300	.07	.035	.07
WC36	200	.07	.035	.07
WC36	150	Culvert		
WC36	100	.07	.035	.07
WC36	10	.07	.035	.07
WC36	7	Culvert		
WC36	5	.07	.035	.07
WC36	1	.07	.035	.07

SUMMARY OF REACH LENGTHS

River: DUFFINS

Reach	River Sta.	Left	Channel	Right
WC36	500	86.7	86.7	86.7
WC36	450	Culvert		
WC36	400	122.3	122.3	122.3
WC36	300	33	34	22
WC36	200	40	35	41
WC36	150	Culvert		
WC36	100	23	42	36
WC36	10	57.7	62.2	67.9
WC36	7	Culvert		
WC36	5	49	67.6	70
WC36	1	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: DUFFINS

Reach	River Sta.	Contr.	Expan.
WC36	500	.3	.5
WC36	450	Culvert	
WC36	400	.3	.5
WC36	300	.3	.5
WC36	200	.3	.5
WC36	150	Culvert	
WC36	100	.3	.5
WC36	10	.3	.5
WC36	7	Culvert	
WC36	5	.3	.5
WC36	1	.3	.5

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
WC36	500	2-yr	0.18	217.50	217.75	217.56	217.75	0.000273	0.19	0.96	76.97	0.12
WC36	500	5-yr	0.27	217.50	217.81	217.59	217.81	0.000309	0.23	1.18	78.04	0.13
WC36	500	10-yr	0.36	217.50	217.86	217.59	217.86	0.000337	0.26	1.37	78.94	0.14
WC36	500	25-yr	0.49	217.50	217.92	217.62	217.92	0.000368	0.31	1.60	80.09	0.15
WC36	500	50-yr	0.59	217.50	217.96	217.63	217.96	0.000387	0.33	1.76	80.93	0.16
WC36	500	100-yr	0.70	217.50	218.00	217.65	218.01	0.000406	0.36	1.93	81.78	0.16
WC36	500	Check Flow	0.91	217.50	218.07	217.68	218.08	0.000435	0.41	2.21	83.40	0.17
WC36	500	Regional	3.27	217.50	218.65	217.92	218.68	0.000552	0.74	4.43	97.59	0.22
WC36	450		Culvert									
WC36	400	2-yr	0.18	215.00	215.07	215.06	215.09	0.017177	0.62	0.29	10.95	0.76
WC36	400	5-yr	0.27	215.00	215.08	215.07	215.11	0.020905	0.77	0.35	11.21	0.87
WC36	400	10-yr	0.36	215.00	215.09	215.08	215.13	0.028661	0.95	0.38	11.33	1.03
WC36	400	25-yr	0.49	215.00	215.12	215.12	215.17	0.018410	0.94	0.52	11.96	0.87
WC36	400	50-yr	0.59	215.00	215.12	215.12	215.19	0.024041	1.10	0.54	12.03	1.00
WC36	400	100-yr	0.70	215.00	215.14	215.14	215.21	0.023366	1.17	0.60	12.31	1.00
WC36	400	Check Flow	0.91	215.00	215.16	215.16	215.25	0.021833	1.27	0.72	12.85	1.00
WC36	400	Regional	3.27	215.00	215.39	215.39	215.58	0.016413	1.94	1.68	24.25	1.00
WC36	300	2-yr	0.18	214.49	214.54		214.54	0.001970	0.13	1.43	45.53	0.23
WC36	300	5-yr	0.27	214.49	214.55	214.52	214.55	0.001905	0.15	1.86	46.68	0.23
WC36	300	10-yr	0.36	214.49	214.56	214.53	214.56	0.001755	0.16	2.28	47.72	0.23
WC36	300	25-yr	0.49	214.49	214.57		214.57	0.001245	0.16	3.09	49.65	0.20
WC36	300	50-yr	0.59	214.49	214.58		214.58	0.001279	0.17	3.45	50.48	0.21
WC36	300	100-yr	0.70	214.49	214.59		214.59	0.001003	0.17	4.17	52.10	0.19
WC36	300	Check Flow	0.91	214.49	214.61		214.61	0.000923	0.18	5.08	54.07	0.19
WC36	300	Regional	3.27	214.49	214.86		214.86	0.000151	0.15	21.47	75.10	0.09
WC36	200	2-yr	0.18	214.32	214.38	214.37	214.39	0.012893	0.50	0.36	55.81	0.65
WC36	200	5-yr	0.27	214.32	214.40	214.37	214.41	0.013117	0.59	0.46	56.66	0.68
WC36	200	10-yr	0.36	214.32	214.42	214.40	214.44	0.011314	0.63	0.57	57.63	0.66
WC36	200	25-yr	0.49	214.32	214.43	214.41	214.46	0.011700	0.72	0.68	58.58	0.69
WC36	200	50-yr	0.59	214.32	214.45	214.42	214.48	0.011452	0.77	0.76	59.32	0.69
WC36	200	100-yr	0.70	214.32	214.47	214.42	214.50	0.009995	0.79	0.88	60.35	0.66
WC36	200	Check Flow	0.91	214.32	214.49	214.45	214.53	0.009449	0.87	1.05	61.81	0.66
WC36	200	Regional	3.27	214.32	214.72	214.63	214.82	0.007549	1.35	2.42	74.04	0.68
WC36	150		Culvert									
WC36	100	2-yr	0.18	214.10	214.15	214.14	214.17	0.024020	0.60	0.30	8.05	0.86
WC36	100	5-yr	0.27	214.10	214.16	214.16	214.19	0.023098	0.70	0.39	8.65	0.88
WC36	100	10-yr	0.36	214.10	214.18	214.18	214.21	0.018104	0.73	0.49	9.38	0.81
WC36	100	25-yr	0.49	214.10	214.19	214.18	214.23	0.025178	0.91	0.54	9.69	0.97
WC36	100	50-yr	0.59	214.10	214.20	214.20	214.25	0.023974	0.97	0.61	10.18	0.97
WC36	100	100-yr	0.70	214.10	214.21	214.21	214.27	0.023540	1.03	0.68	10.66	0.97
WC36	100	Check Flow	0.91	214.10	214.25	214.25	214.30	0.017446	1.04	0.87	11.97	0.87
WC36	100	Regional	3.27	214.10	214.41	214.41	214.57	0.017636	1.75	1.87	19.04	1.00
WC36	10	2-yr	0.18	213.51	213.58	213.56	213.59	0.008897	0.45	0.40	6.70	0.55
WC36	10	5-yr	0.27	213.51	213.60	213.57	213.61	0.008995	0.53	0.51	6.89	0.57
WC36	10	10-yr	0.36	213.51	213.61	213.58	213.63	0.008948	0.59	0.61	7.06	0.59
WC36	10	25-yr	0.49	213.51	213.63	213.60	213.66	0.008522	0.66	0.75	7.29	0.60
WC36	10	50-yr	0.59	213.51	213.65	213.61	213.67	0.008536	0.71	0.83	7.44	0.61
WC36	10	100-yr	0.70	213.51	213.66	213.62	213.69	0.008562	0.76	0.92	7.59	0.62
WC36	10	Check Flow	0.91	213.51	213.70	213.64	213.73	0.007720	0.82	1.11	7.92	0.61
WC36	10	Regional	3.27	213.51	213.93	213.82	214.01	0.006685	1.31	2.51	10.62	0.64
WC36	7		Culvert									
WC36	5	2-yr	0.18	213.14	213.21	213.19	213.22	0.008050	0.43	0.42	9.68	0.52
WC36	5	5-yr	0.27	213.14	213.22	213.20	213.24	0.010298	0.55	0.49	10.36	0.61
WC36	5	10-yr	0.36	213.14	213.24	213.21	213.26	0.009259	0.60	0.60	11.39	0.60
WC36	5	25-yr	0.49	213.14	213.26	213.23	213.28	0.010838	0.71	0.69	12.22	0.66
WC36	5	50-yr	0.59	213.14	213.26	213.24	213.29	0.013707	0.82	0.72	12.49	0.75
WC36	5	100-yr	0.70	213.14	213.28	213.25	213.32	0.011353	0.83	0.85	13.64	0.70
WC36	5	Check Flow	0.91	213.14	213.30	213.28	213.35	0.011747	0.93	0.98	14.86	0.73
WC36	5	Regional	3.27	213.14	213.47	213.46	213.61	0.014501	1.65	1.99	41.77	0.91
WC36	1	2-yr	0.18	212.00	212.07	212.07	212.10	0.051259	0.85	0.21	4.38	1.24
WC36	1	5-yr	0.27	212.00	212.09	212.09	212.13	0.030416	0.79	0.34	5.36	1.00
WC36	1	10-yr	0.36	212.00	212.10	212.10	212.15	0.036821	0.92	0.39	5.69	1.12
WC36	1	25-yr	0.49	212.00	212.13	212.13	212.17	0.028113	0.90	0.54	6.59	1.01
WC36	1	50-yr	0.59	212.00	212.15	212.15	212.19	0.019649	0.83	0.71	7.45	0.86
WC36	1	100-yr	0.70	212.00	212.15	212.15	212.20	0.026347	0.97	0.72	7.52	1.00
WC36	1	Check Flow	0.91	212.00	212.17	212.17	212.23	0.025288	1.02	0.89	8.29	1.00
WC36	1	Regional	3.27	212.00	212.32	212.32	212.41	0.021124	1.34	2.45	13.35	1.00

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (m)	W.S. Elev (m)	Vel Head (m)	Frctn Loss (m)	C & E Loss (m)	Q Left (m3/s)	Q Channel (m3/s)	Q Right (m3/s)	Top Width (m)
WC36	500	2-yr	217.75	217.75	0.00				0.18		76.97
WC36	500	5-yr	217.81	217.81	0.00				0.27		78.04
WC36	500	10-yr	217.86	217.86	0.00				0.36		78.94
WC36	500	25-yr	217.92	217.92	0.00				0.49		80.09
WC36	500	50-yr	217.96	217.96	0.01				0.59		80.93
WC36	500	100-yr	218.01	218.00	0.01				0.70		81.78
WC36	500	Check Flow	218.08	218.07	0.01				0.91		83.40
WC36	500	Regional	218.68	218.65	0.03				3.27		97.59
WC36	450		Culvert								
WC36	400	2-yr	215.09	215.07	0.02	0.54	0.01		0.18		10.95
WC36	400	5-yr	215.11	215.08	0.03	0.55	0.01		0.27		11.21
WC36	400	10-yr	215.13	215.09	0.05	0.55	0.02		0.36		11.33
WC36	400	25-yr	215.17	215.12	0.05	0.38	0.02		0.49		11.96
WC36	400	50-yr	215.19	215.12	0.06	0.41	0.03		0.59		12.03
WC36	400	100-yr	215.21	215.14	0.07	0.34	0.03		0.70		12.31
WC36	400	Check Flow	215.25	215.16	0.08	0.31	0.04		0.91		12.85
WC36	400	Regional	215.58	215.39	0.19	0.06	0.10		3.27		24.25
WC36	300	2-yr	214.54	214.54	0.00	0.14	0.00		0.18		45.53
WC36	300	5-yr	214.55	214.55	0.00	0.14	0.00		0.27		46.68
WC36	300	10-yr	214.56	214.56	0.00	0.12	0.01		0.36		47.72
WC36	300	25-yr	214.57	214.57	0.00	0.10	0.01		0.49		49.65
WC36	300	50-yr	214.58	214.58	0.00	0.10	0.01		0.59		50.48
WC36	300	100-yr	214.59	214.59	0.00	0.08	0.01		0.70		52.10
WC36	300	Check Flow	214.61	214.61	0.00	0.07	0.01		0.91		54.07
WC36	300	Regional	214.86	214.86	0.00	0.02	0.03		3.27		75.10
WC36	200	2-yr	214.39	214.38	0.01				0.18		55.81
WC36	200	5-yr	214.41	214.40	0.02				0.27		56.66
WC36	200	10-yr	214.44	214.42	0.02				0.36		57.63
WC36	200	25-yr	214.46	214.43	0.03				0.49		58.58
WC36	200	50-yr	214.48	214.45	0.03				0.59		59.32
WC36	200	100-yr	214.50	214.47	0.03				0.70		60.35
WC36	200	Check Flow	214.53	214.49	0.04				0.91		61.81
WC36	200	Regional	214.82	214.72	0.09				3.27		74.04
WC36	150		Culvert								
WC36	100	2-yr	214.17	214.15	0.02	0.58	0.00		0.18		8.05
WC36	100	5-yr	214.19	214.16	0.02	0.57	0.01		0.27		8.65
WC36	100	10-yr	214.21	214.18	0.03	0.52	0.00		0.36		9.38
WC36	100	25-yr	214.23	214.19	0.04	0.57	0.01		0.49		9.69
WC36	100	50-yr	214.25	214.20	0.05	0.56	0.01		0.59		10.18
WC36	100	100-yr	214.27	214.21	0.05	0.56	0.01		0.70		10.66
WC36	100	Check Flow	214.30	214.25	0.06	0.47	0.01		0.91		11.97
WC36	100	Regional	214.57	214.41	0.16	0.43	0.03		3.27		19.04
WC36	10	2-yr	213.59	213.58	0.01				0.18		6.70
WC36	10	5-yr	213.61	213.60	0.01				0.27		6.89
WC36	10	10-yr	213.63	213.61	0.02				0.36		7.06
WC36	10	25-yr	213.66	213.63	0.02				0.49		7.29
WC36	10	50-yr	213.67	213.65	0.03				0.59		7.44
WC36	10	100-yr	213.69	213.66	0.03				0.70		7.59
WC36	10	Check Flow	213.73	213.70	0.03				0.91		7.92
WC36	10	Regional	214.01	213.93	0.09				3.27		10.62
WC36	7		Culvert								
WC36	5	2-yr	213.22	213.21	0.01	1.12	0.01		0.18		9.68
WC36	5	5-yr	213.24	213.22	0.02	1.11	0.01		0.27		10.36
WC36	5	10-yr	213.26	213.24	0.02	1.11	0.01		0.36		11.39
WC36	5	25-yr	213.28	213.26	0.03	1.12	0.00		0.49		12.22
WC36	5	50-yr	213.29	213.26	0.03	1.10	0.00		0.59		12.49
WC36	5	100-yr	213.32	213.28	0.03	1.12	0.00		0.70		13.64
WC36	5	Check Flow	213.35	213.30	0.04	1.12	0.00		0.91		14.86
WC36	5	Regional	213.61	213.47	0.14	1.17	0.02		3.27		41.77
WC36	1	2-yr	212.10	212.07	0.04				0.18		4.38
WC36	1	5-yr	212.13	212.09	0.03				0.27		5.36
WC36	1	10-yr	212.15	212.10	0.04				0.36		5.69
WC36	1	25-yr	212.17	212.13	0.04				0.49		6.59
WC36	1	50-yr	212.19	212.15	0.04				0.59		7.45
WC36	1	100-yr	212.20	212.15	0.05				0.70		7.52
WC36	1	Check Flow	212.23	212.17	0.05				0.91		8.29
WC36	1	Regional	212.41	212.32	0.09				3.27		13.35

Profile Output Table - Culvert Only

Reach	River Sta		Profile	E.G. US. (m)	W.S. US. (m)	E.G. IC (m)	E.G. OC (m)	Min El Weir Flow (m)	Q Culv Group (m3/s)	Q Weir (m3/s)	Delta WS (m)	Culv Vel US (m/s)	Culv Vel DS (m/s)
WC36	450	Culvert #2	2-yr	217.75	217.75	217.69	217.75	218.90	0.09		2.68	1.01	2.02
WC36	450	Culvert #1	2-yr	217.75	217.75	217.69	217.75	218.90	0.09		2.68	1.01	2.02
WC36	450	Culvert #2	5-yr	217.81	217.81	217.73	217.81	218.90	0.14		2.73	1.12	2.29
WC36	450	Culvert #1	5-yr	217.81	217.81	217.73	217.81	218.90	0.14		2.73	1.12	2.29
WC36	450	Culvert #2	10-yr	217.86	217.86	217.78	217.86	218.90	0.18		2.77	1.21	2.56
WC36	450	Culvert #1	10-yr	217.86	217.86	217.78	217.86	218.90	0.18		2.77	1.21	2.56
WC36	450	Culvert #2	25-yr	217.92	217.92	217.83	217.92	218.90	0.25		2.80	1.32	2.76
WC36	450	Culvert #1	25-yr	217.92	217.92	217.83	217.92	218.90	0.25		2.80	1.32	2.76
WC36	450	Culvert #2	50-yr	217.96	217.96	217.86	217.96	218.90	0.29		2.83	1.38	2.90
WC36	450	Culvert #1	50-yr	217.96	217.96	217.86	217.96	218.90	0.29		2.83	1.38	2.90
WC36	450	Culvert #2	100-yr	218.01	218.00	217.90	218.01	218.90	0.35		2.86	1.45	3.10
WC36	450	Culvert #1	100-yr	218.01	218.00	217.90	218.01	218.90	0.35		2.86	1.45	3.10
WC36	450	Culvert #2	Check Flow	218.08	218.07	217.97	218.08	218.90	0.46		2.91	1.56	3.34
WC36	450	Culvert #1	Check Flow	218.08	218.07	217.97	218.08	218.90	0.46		2.91	1.56	3.34
WC36	450	Culvert #2	Regional	218.68	218.65	218.53	218.68	218.90	1.64		3.27	2.28	4.78
WC36	450	Culvert #1	Regional	218.68	218.65	218.53	218.68	218.90	1.64		3.27	2.28	4.78
WC36	150	Culvert #1	2-yr	214.39	214.38	214.39	214.39	216.20	0.18		0.23	0.52	0.60
WC36	150	Culvert #1	5-yr	214.42	214.40	214.41	214.42	216.20	0.27		0.23	0.61	0.70
WC36	150	Culvert #1	10-yr	214.44	214.42	214.43	214.44	216.20	0.36		0.23	0.68	0.73
WC36	150	Culvert #1	25-yr	214.46	214.43	214.46	214.46	216.20	0.49		0.24	0.78	0.91
WC36	150	Culvert #1	50-yr	214.48	214.45	214.48	214.48	216.20	0.59		0.25	0.83	0.97
WC36	150	Culvert #1	100-yr	214.50	214.47	214.50	214.50	216.20	0.70		0.25	0.89	1.03
WC36	150	Culvert #1	Check Flow	214.53	214.49	214.53	214.53	216.20	0.91		0.25	0.98	1.04
WC36	150	Culvert #1	Regional	214.82	214.72	214.81	214.82	216.20	3.27		0.31	1.63	1.75
WC36	7	Culvert #1	2-yr	213.59	213.58	213.57	213.59	216.00	0.18		0.37	0.46	0.67
WC36	7	Culvert #1	5-yr	213.61	213.60	213.60	213.61	216.00	0.27		0.37	0.54	0.76
WC36	7	Culvert #1	10-yr	213.63	213.61	213.61	213.63	216.00	0.36		0.37	0.61	0.84
WC36	7	Culvert #1	25-yr	213.66	213.63	213.64	213.66	216.00	0.49		0.38	0.68	0.93
WC36	7	Culvert #1	50-yr	213.68	213.65	213.66	213.68	216.00	0.59		0.39	0.74	0.99
WC36	7	Culvert #1	100-yr	213.70	213.66	213.68	213.70	216.00	0.70		0.38	0.79	1.05
WC36	7	Culvert #1	Check Flow	213.73	213.70	213.71	213.73	216.00	0.91		0.39	0.88	1.14
WC36	7	Culvert #1	Regional	214.01	213.93	213.99	214.01	216.00	3.27		0.46	1.44	1.75

DUFFINS CREEK

HEC-RAS ANALYSIS WC#37

EXISTING 407 ETR

ST 200		
	219.15	219.24
	218.87	219.08

PROPOSED 407 TWY

15+300

15+400

15+500

15+600

ST 300		
	219.41	219.47
	219.14	219.23

ST 100		
	218.83	218.73
	218.60	218.60

PROP CULV WC#37
SPAN x RISE=(6 x 2)m
L=32m, S=0.9%
U/S INV=218.70m
D/S INV=218.40m

ST 10		
	218.12	218.12
	218.05	218.05

LEGEND

- EXISTING 407 ETR
- PROPOSED 407 TWY
- CREEK FLOW DIRECTION
- EXISTING CULVERT
- PROPOSED CULVERT
- PROPOSED REGIONAL FLOODLINE

CROSS SECTION NUMBER

EX REG	PR REG	HEC ST
EX 100	PR 100	

PARSONS HEC-RAS SECTION

PROPOSED WL ELEVATION (m)

EXISTING UPDATED WL ELEVATION (m)

5m 0m 10m 20m 30m

SCALE HORIZONTAL 1:1000

DATE: SEPTEMBER 2016

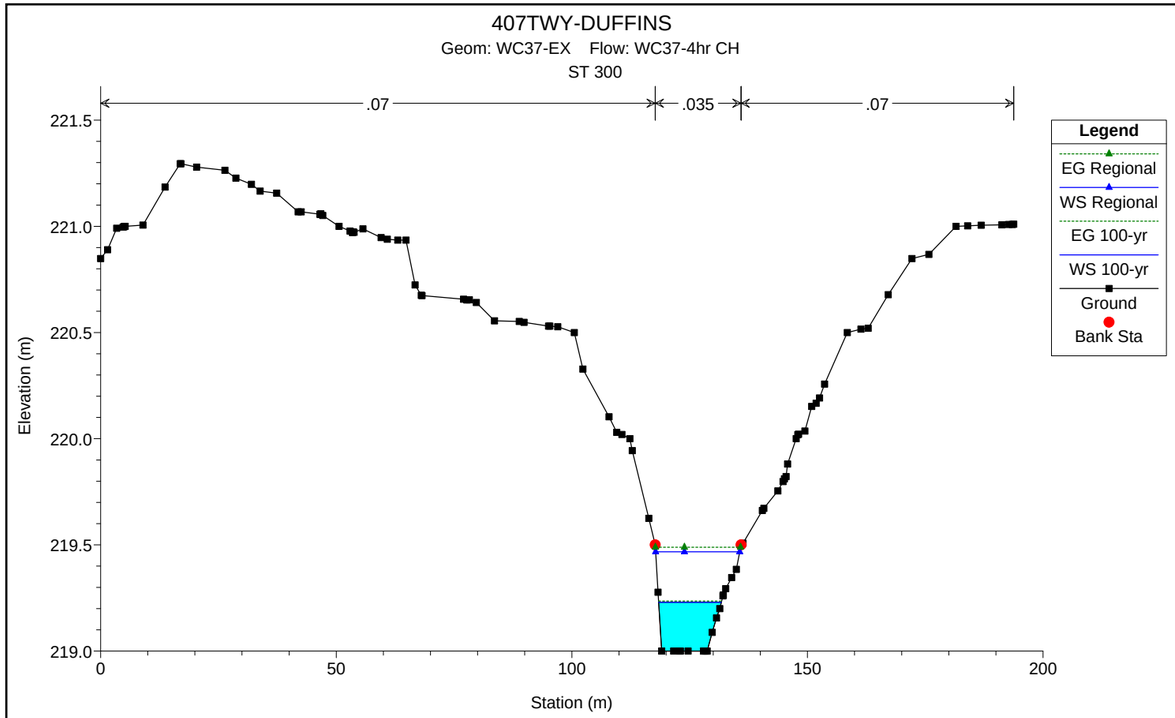
SCALE: 1:1000

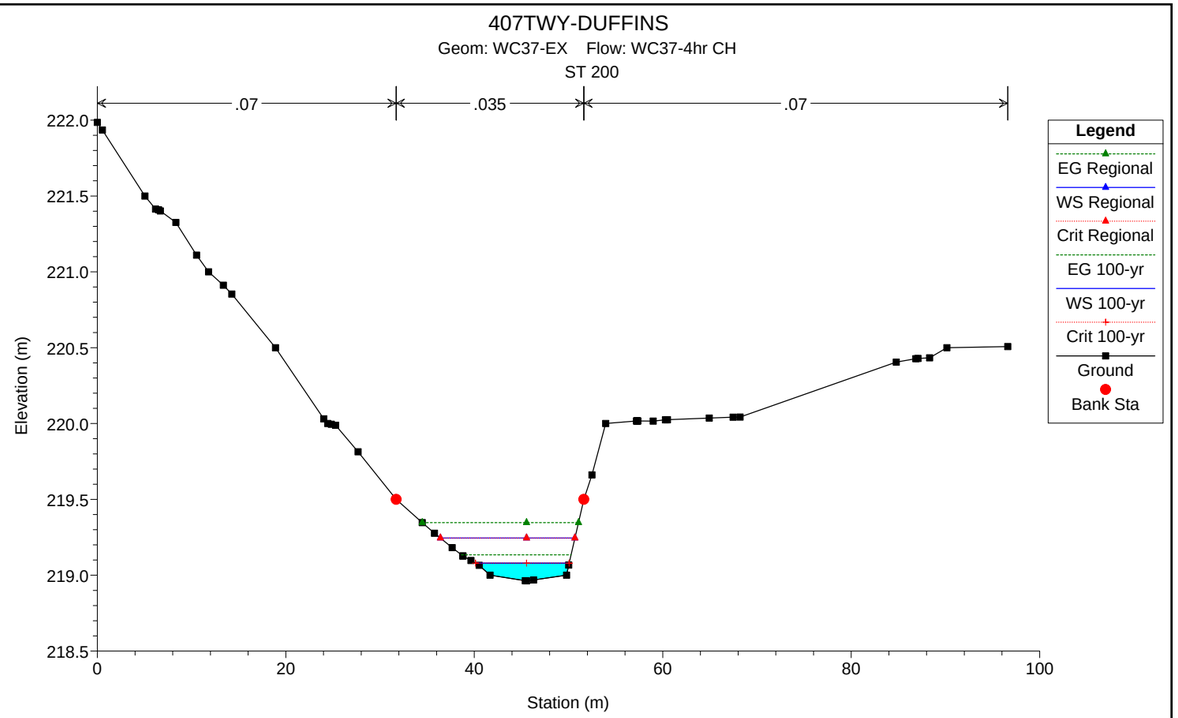
Ontario

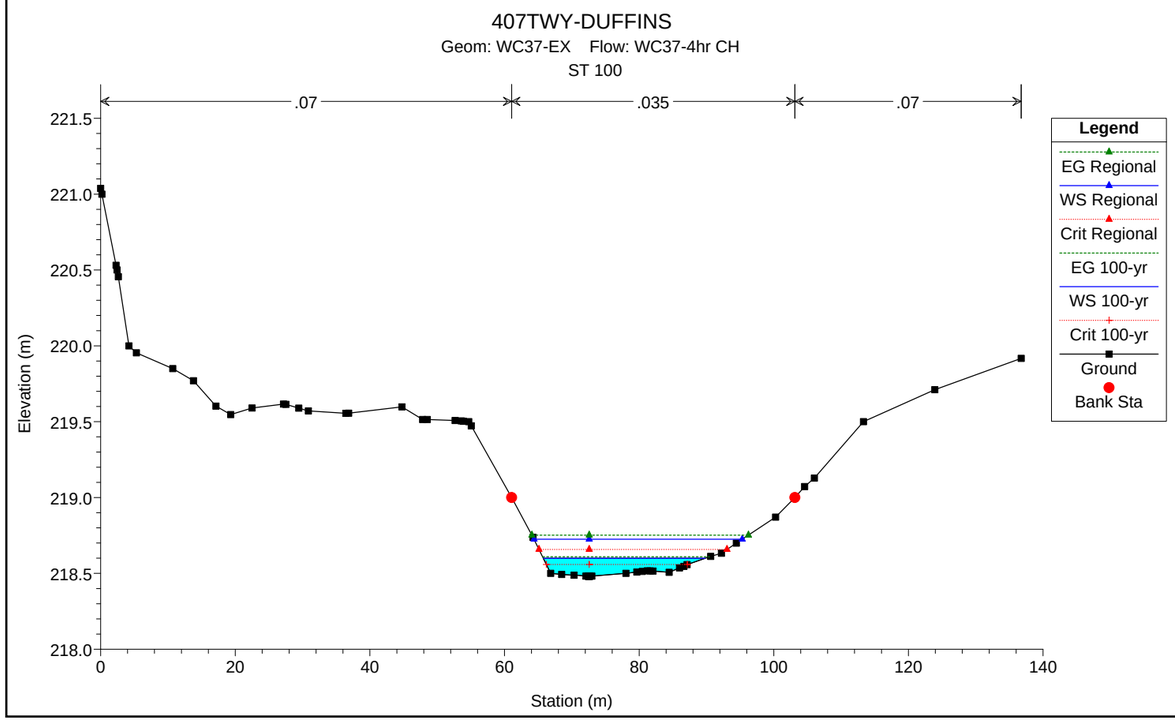
PARSONS
625 COCHRANE DRIVE, SUITE 500
MARKHAM, ONTARIO L3R 9R9
TEL: 905-943-0500
FAX: 905-943-0400

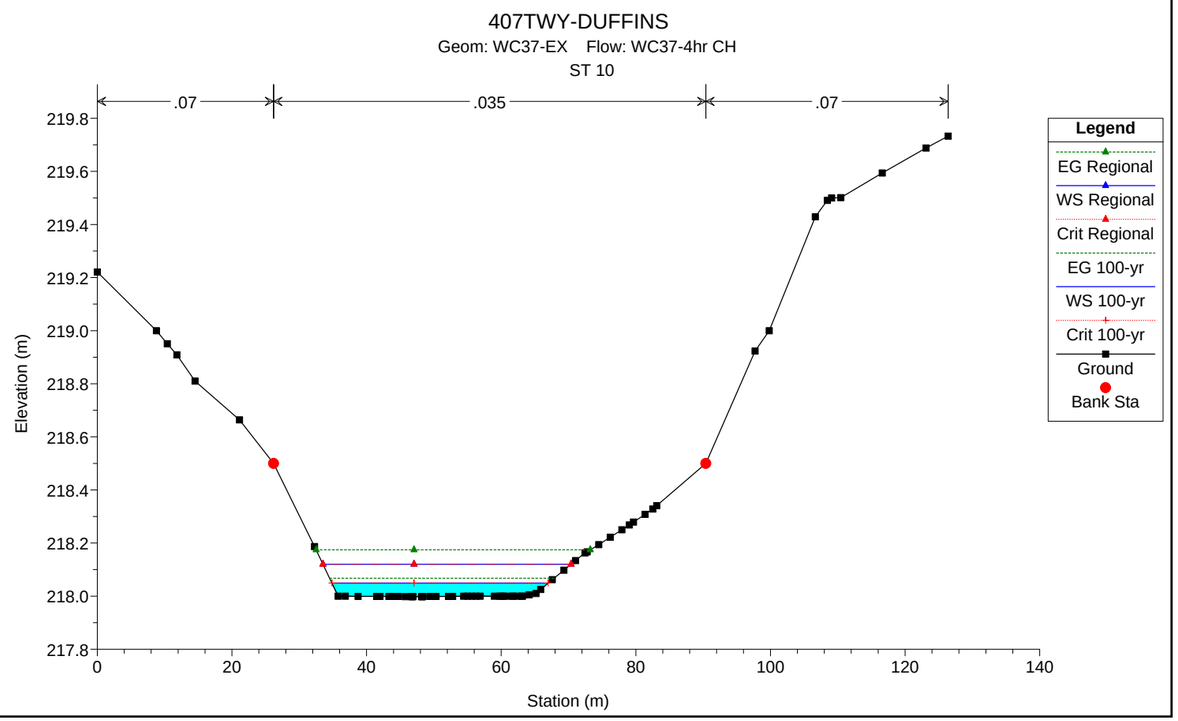
407 TRANSITWAY FROM KENNEDY RD TO BROCK RD

FIGURE 6.20 - HEC-RAS ANALYSIS - DUFFINS CREEK (WC#37)


407TWY-DUFFINS
Geom: WC37-EX Flow: WC37-4hr CH
ST 300
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Bank Sta


407TWY-DUFFINS
Geom: WC37-EX Flow: WC37-4hr CH
ST 200
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta


407TWY-DUFFINS
Geom: WC37-EX Flow: WC37-4hr CH
ST 100
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta


407TWY-DUFFINS
Geom: WC37-EX Flow: WC37-4hr CH
ST 10
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta

HEC-RAS Plan: WC37-EX-4hr CH River: DUFFINS Reach: WC37

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC37	300	2-yr	0.19	219.00	219.11		219.11	0.000731	0.17	1.14	11.32	0.17
WC37	300	5-yr	0.34	219.00	219.14		219.14	0.001029	0.23	1.48	11.80	0.21
WC37	300	10-yr	0.46	219.00	219.16		219.17	0.001059	0.26	1.79	12.23	0.21
WC37	300	25-yr	0.62	219.00	219.19		219.19	0.001180	0.30	2.10	12.69	0.23
WC37	300	50-yr	0.75	219.00	219.21		219.21	0.001197	0.32	2.37	13.03	0.24
WC37	300	100-yr	0.90	219.00	219.23		219.24	0.001258	0.34	2.63	13.30	0.25
WC37	300	Check Flow	1.17	219.00	219.26		219.27	0.001402	0.39	3.01	13.70	0.26
WC37	300	Regional	4.09	219.00	219.47		219.49	0.002001	0.64	6.38	17.85	0.34
WC37	200	2-yr	0.19	218.96	219.02	219.02	219.04	0.038379	0.61	0.31	8.52	1.03
WC37	200	5-yr	0.34	218.96	219.05	219.05	219.07	0.019648	0.62	0.55	9.10	0.80
WC37	200	10-yr	0.46	218.96	219.04	219.04	219.08	0.044875	0.90	0.51	9.01	1.20
WC37	200	25-yr	0.62	218.96	219.06	219.06	219.10	0.028241	0.86	0.72	9.49	1.00
WC37	200	50-yr	0.75	218.96	219.07	219.07	219.12	0.029618	0.93	0.81	9.76	1.03
WC37	200	100-yr	0.90	218.96	219.08	219.08	219.13	0.034792	1.04	0.86	9.93	1.13
WC37	200	Check Flow	1.17	218.96	219.11	219.11	219.16	0.025762	1.03	1.14	10.77	1.01
WC37	200	Regional	4.09	218.96	219.24	219.24	219.35	0.020696	1.42	2.89	14.27	1.00
WC37	100	2-yr	0.19	218.48	218.54	218.52	218.55	0.004133	0.22	0.85	20.10	0.35
WC37	100	5-yr	0.34	218.48	218.56	218.53	218.57	0.004297	0.28	1.22	21.12	0.37
WC37	100	10-yr	0.46	218.48	218.57	218.55	218.58	0.004804	0.32	1.43	21.88	0.40
WC37	100	25-yr	0.62	218.48	218.58	218.55	218.59	0.004886	0.36	1.73	22.91	0.41
WC37	100	50-yr	0.75	218.48	218.59	218.55	218.60	0.006637	0.42	1.78	23.06	0.48
WC37	100	100-yr	0.90	218.48	218.60	218.56	218.61	0.005891	0.43	2.09	24.07	0.47
WC37	100	Check Flow	1.17	218.48	218.62	218.57	218.63	0.005336	0.45	2.59	25.67	0.45
WC37	100	Regional	4.09	218.48	218.73	218.66	218.75	0.006412	0.73	5.59	30.94	0.55
WC37	10	2-yr	0.19	218.00	218.01	218.01	218.02	0.061763	0.43	0.44	29.88	1.12
WC37	10	5-yr	0.34	218.00	218.02	218.02	218.04	0.057148	0.53	0.65	30.33	1.15
WC37	10	10-yr	0.46	218.00	218.03	218.03	218.04	0.039143	0.53	0.87	30.82	1.00
WC37	10	25-yr	0.62	218.00	218.03	218.03	218.05	0.042242	0.60	1.03	31.14	1.06
WC37	10	50-yr	0.75	218.00	218.05	218.05	218.06	0.020366	0.52	1.45	32.01	0.78
WC37	10	100-yr	0.90	218.00	218.05	218.05	218.07	0.025634	0.60	1.51	32.13	0.88
WC37	10	Check Flow	1.17	218.00	218.05	218.05	218.08	0.033242	0.71	1.64	32.40	1.01
WC37	10	Regional	4.09	218.00	218.12	218.12	218.17	0.025517	1.03	3.96	36.86	1.00

HEC-RAS Version 4.1.0 Jan 2010
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
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PROJECT DATA
Project Title: 407TWY-DUFFINS
Project File : 407TWY-DUFFINS.prj
Run Date and Time: 1/20/2016 5:09:27 PM

Project in SI units

Project Description:
HEC-RAS Model created for 407 TWY project from Kennedy Rd. to Brock Rd. -
Duffins Creek Watershed

PLAN DATA

Plan Title: Plan 01
Plan File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.p01

Geometry Title: WC37-EX
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.g06

Flow Title : WC37-4hr CH
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.f13

Plan Summary Information:
Number of: Cross Sections = 4 Multiple Openings = 0
Culverts = 0 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: WC37-4hr CH
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.f13

Flow Data (m3/s)

River	Reach	RS	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Check Flow	Regional
DUFFINS	WC37	300	.19	.34	.46	.62	.75	.9	1.17	4.09

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
DUFFINS	WC37	2-yr		Critical
DUFFINS	WC37	5-yr		Critical
DUFFINS	WC37	10-yr		Critical
DUFFINS	WC37	25-yr		Critical
DUFFINS	WC37	50-yr		Critical
DUFFINS	WC37	100-yr		Critical
DUFFINS	WC37	Check Flow		Critical
DUFFINS	WC37	Regional		Critical

GEOMETRY DATA

Geometry Title: WC37-EX
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.g06

CROSS SECTION

RIVER: DUFFINS
REACH: WC37 RS: 300

INPUT
Description: ST 300
Station Elevation Data num= 104

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	220.848	1.465	220.89	3.401	220.991	4.778	220.997	4.965	220.998
5.127	221	5.186	221	8.969	221.006	13.678	221.185	16.89	221.295
17.036	221.295	20.369	221.279	26.374	221.264	28.689	221.227	31.987	221.198
33.838	221.166	37.354	221.156	41.902	221.068	42.553	221.068	46.546	221.057
46.594	221.056	46.746	221.059	47.152	221.051	50.593	221	52.939	220.978
53.442	220.971	53.57	220.974	53.785	220.972	55.673	220.988	59.533	220.947
60.837	220.939	63.049	220.935	64.811	220.935	66.737	220.724	68.048	220.675
68.193	220.674	77.025	220.657	77.714	220.653	78.253	220.654	79.719	220.641
83.583	220.555	88.843	220.552	89.866	220.548	95.069	220.53	95.32	220.53
97.016	220.527	100.53	220.5	102.351	220.328	107.9	220.103	109.539	220.03
110.619	220.02	112.309	220	112.811	219.944	116.346	219.625	117.698	219.5
118.284	219.277	119.06	219	121.622	219	122.899	219	123.032	219
124.668	219	127.939	219	128.263	219	128.291	219	128.497	219
128.722	219	129.795	219.088	130.708	219.156	131.389	219.2	132.064	219.26
132.137	219.264	132.654	219.294	133.915	219.346	134.894	219.385	135.914	219.5
136.323	219.508	140.439	219.662	140.742	219.672	143.733	219.754	144.83	219.798
145.114	219.811	145.463	219.822	145.79	219.881	147.604	220	147.956	220.019
148.105	220.021	149.445	220.036	150.893	220.152	151.832	220.167	152.575	220.192
153.632	220.257	158.462	220.5	161.369	220.516	162.879	220.52	167.156	220.678
172.182	220.848	175.778	220.868	181.548	221	183.991	221.002	186.881	221.005
191.275	221.007	192.721	221.009	193.493	221.009	193.775	221.01		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	117.698	.035	135.914	.07

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
117.698 135.914 18 28 39 .1 .3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	219.11	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.00	Wt. n-Val.		0.035		
W.S. Elev (m)	219.11	Reach Len. (m)	18.00	28.00	39.00	
Crit W.S. (m)		Flow Area (m2)		1.14		

E.G. Slope (m/m)	0.000731	Area (m2)		1.14	
Q Total (m3/s)	0.19	Flow (m3/s)		0.19	
Top Width (m)	11.32	Top Width (m)		11.32	
Vel Total (m/s)	0.17	Avg. Vel. (m/s)		0.17	
Max Chl Dpth (m)	0.11	Hydr. Depth (m)		0.10	
Conv. Total (m3/s)	7.0	Conv. (m3/s)		7.0	
Length Wtd. (m)	28.00	Wetted Per. (m)		11.34	
Min Ch El (m)	219.00	Shear (N/m2)		0.72	
Alpha	1.00	Stream Power (N/m s)	9277.54	0.00	0.00
Frctn Loss (m)	0.06	Cum Volume (1000 m3)		0.08	
C & E Loss (m)	0.00	Cum SA (1000 m2)		2.10	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	219.14	Element			
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	219.14	Reach Len. (m)	18.00	28.00	39.00
Crit W.S. (m)		Flow Area (m2)		1.48	
E.G. Slope (m/m)	0.001029	Area (m2)		1.48	
Q Total (m3/s)	0.34	Flow (m3/s)		0.34	
Top Width (m)	11.80	Top Width (m)		11.80	
Vel Total (m/s)	0.23	Avg. Vel. (m/s)		0.23	
Max Chl Dpth (m)	0.14	Hydr. Depth (m)		0.13	
Conv. Total (m3/s)	10.6	Conv. (m3/s)		10.6	
Length Wtd. (m)	28.00	Wetted Per. (m)		11.83	
Min Ch El (m)	219.00	Shear (N/m2)		1.26	
Alpha	1.00	Stream Power (N/m s)	9277.54	0.00	0.00
Frctn Loss (m)	0.08	Cum Volume (1000 m3)		0.11	
C & E Loss (m)	0.00	Cum SA (1000 m2)		2.18	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	219.17	Element			
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	219.16	Reach Len. (m)	18.00	28.00	39.00
Crit W.S. (m)		Flow Area (m2)		1.79	
E.G. Slope (m/m)	0.001059	Area (m2)		1.79	
Q Total (m3/s)	0.46	Flow (m3/s)		0.46	
Top Width (m)	12.23	Top Width (m)		12.23	
Vel Total (m/s)	0.26	Avg. Vel. (m/s)		0.26	
Max Chl Dpth (m)	0.16	Hydr. Depth (m)		0.15	
Conv. Total (m3/s)	14.1	Conv. (m3/s)		14.1	
Length Wtd. (m)	28.00	Wetted Per. (m)		12.26	
Min Ch El (m)	219.00	Shear (N/m2)		1.51	
Alpha	1.00	Stream Power (N/m s)	9277.54	0.00	0.00
Frctn Loss (m)	0.09	Cum Volume (1000 m3)		0.13	
C & E Loss (m)	0.00	Cum SA (1000 m2)		2.23	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	219.19	Element			
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	219.19	Reach Len. (m)	18.00	28.00	39.00
Crit W.S. (m)		Flow Area (m2)		2.10	
E.G. Slope (m/m)	0.001180	Area (m2)		2.10	
Q Total (m3/s)	0.62	Flow (m3/s)		0.62	
Top Width (m)	12.69	Top Width (m)		12.69	
Vel Total (m/s)	0.30	Avg. Vel. (m/s)		0.30	
Max Chl Dpth (m)	0.19	Hydr. Depth (m)		0.17	
Conv. Total (m3/s)	18.1	Conv. (m3/s)		18.1	
Length Wtd. (m)	28.00	Wetted Per. (m)		12.73	
Min Ch El (m)	219.00	Shear (N/m2)		1.91	
Alpha	1.00	Stream Power (N/m s)	9277.54	0.00	0.00
Frctn Loss (m)	0.09	Cum Volume (1000 m3)		0.16	
C & E Loss (m)	0.00	Cum SA (1000 m2)		2.31	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	219.21	Element			
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	219.21	Reach Len. (m)	18.00	28.00	39.00
Crit W.S. (m)		Flow Area (m2)		2.37	
E.G. Slope (m/m)	0.001197	Area (m2)		2.37	
Q Total (m3/s)	0.75	Flow (m3/s)		0.75	
Top Width (m)	13.03	Top Width (m)		13.03	
Vel Total (m/s)	0.32	Avg. Vel. (m/s)		0.32	
Max Chl Dpth (m)	0.21	Hydr. Depth (m)		0.18	
Conv. Total (m3/s)	21.7	Conv. (m3/s)		21.7	
Length Wtd. (m)	28.00	Wetted Per. (m)		13.07	
Min Ch El (m)	219.00	Shear (N/m2)		2.13	
Alpha	1.00	Stream Power (N/m s)	9277.54	0.00	0.00
Frctn Loss (m)	0.09	Cum Volume (1000 m3)		0.18	
C & E Loss (m)	0.00	Cum SA (1000 m2)		2.35	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	219.24	Element			
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	219.23	Reach Len. (m)	18.00	28.00	39.00
Crit W.S. (m)		Flow Area (m2)		2.63	
E.G. Slope (m/m)	0.001258	Area (m2)		2.63	
Q Total (m3/s)	0.90	Flow (m3/s)		0.90	
Top Width (m)	13.30	Top Width (m)		13.30	
Vel Total (m/s)	0.34	Avg. Vel. (m/s)		0.34	
Max Chl Dpth (m)	0.23	Hydr. Depth (m)		0.20	
Conv. Total (m3/s)	25.4	Conv. (m3/s)		25.4	
Length Wtd. (m)	28.00	Wetted Per. (m)		13.35	
Min Ch El (m)	219.00	Shear (N/m2)		2.43	
Alpha	1.00	Stream Power (N/m s)	9277.54	0.00	0.00
Frctn Loss (m)	0.10	Cum Volume (1000 m3)		0.20	
C & E Loss (m)	0.00	Cum SA (1000 m2)		2.41	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

			Left OB	Channel	Right OB
E.G. Elev (m)	219.27	Element			
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	219.26	Reach Len. (m)	18.00	28.00	39.00
Crit W.S. (m)		Flow Area (m2)		3.01	
E.G. Slope (m/m)	0.001402	Area (m2)		3.01	
Q Total (m3/s)	1.17	Flow (m3/s)		1.17	
Top Width (m)	13.70	Top Width (m)		13.70	
Vel Total (m/s)	0.39	Avg. Vel. (m/s)		0.39	
Max Chl Dpth (m)	0.26	Hydr. Depth (m)		0.22	
Conv. Total (m3/s)	31.2	Conv. (m3/s)		31.2	
Length Wtd. (m)	28.00	Wetted Per. (m)		13.76	
Min Ch El (m)	219.00	Shear (N/m2)		3.01	
Alpha	1.00	Stream Power (N/m s)	9277.54	0.00	0.00
Frctn Loss (m)	0.10	Cum Volume (1000 m3)		0.24	

C & E Loss (m)	0.00	Cum SA (1000 m2)	2.52

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	219.49	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.02	Wt. n-Val.		0.035		
W.S. Elev (m)	219.47	Reach Len. (m)	18.00	28.00	39.00	
Crit W.S. (m)		Flow Area (m2)		6.38		
E.G. Slope (m/m)	0.002001	Area (m2)		6.38		
Q Total (m3/s)	4.09	Flow (m3/s)		4.09		
Top Width (m)	17.85	Top Width (m)		17.85		
Vel Total (m/s)	0.64	Avg. Vel. (m/s)		0.64		
Max Chl Dpth (m)	0.47	Hydr. Depth (m)		0.36		
Conv. Total (m3/s)	91.4	Conv. (m3/s)		91.4		
Length Wtd. (m)	28.00	Wetted Per. (m)		17.95		
Min Ch El (m)	219.00	Shear (N/m2)		6.97		
Alpha	1.00	Stream Power (N/m s)	9277.54	0.00	0.00	
Frctn Loss (m)	0.13	Cum Volume (1000 m3)		0.54		
C & E Loss (m)	0.01	Cum SA (1000 m2)		3.05		

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: DUFFINS
REACH: WC37 RS: 200

INPUT
Description: ST 200
Station Elevation Data num= 54

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	221.985	.538	221.935	5.056	221.5	6.182	221.414	6.503	221.409
6.68	221.401	8.341	221.326	10.53	221.11	11.802	221	13.367	220.912
14.275	220.854	18.909	220.5	24.031	220.031	24.457	220	24.831	219.995
25.285	219.989	27.665	219.814	31.717	219.5	34.477	219.347	35.78	219.277
37.647	219.182	38.793	219.127	38.794	219.127	39.649	219.097	40.514	219.065
41.672	219	45.414	218.964	45.538	218.963	46.29	218.969	49.79	219
50.016	219.067	51.631	219.5	52.484	219.661	53.949	220	57.234	220.017
57.239	220.017	57.245	220.017	57.271	220.017	57.276	220.017	57.302	220.017
57.365	220.017	58.991	220.016	60.279	220.024	60.442	220.024	60.505	220.025
64.931	220.036	67.465	220.042	68.202	220.043	84.78	220.405	86.849	220.427
87.086	220.429	88.312	220.433	90.152	220.5	96.616	220.507		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	31.717	.035	51.631	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
31.717	51.631	39	40	37	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	219.04	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.02	Wt. n-Val.		0.035		
W.S. Elev (m)	219.02	Reach Len. (m)	39.00	40.00	37.00	
Crit W.S. (m)	219.02	Flow Area (m2)		0.31		
E.G. Slope (m/m)	0.038379	Area (m2)		0.31		
Q Total (m3/s)	0.19	Flow (m3/s)		0.19		
Top Width (m)	8.52	Top Width (m)		8.52		
Vel Total (m/s)	0.61	Avg. Vel. (m/s)		0.61		
Max Chl Dpth (m)	0.06	Hydr. Depth (m)		0.04		
Conv. Total (m3/s)	1.0	Conv. (m3/s)		1.0		
Length Wtd. (m)	40.00	Wetted Per. (m)		8.52		
Min Ch El (m)	218.96	Shear (N/m2)		13.67		
Alpha	1.00	Stream Power (N/m s)	4625.77	0.00	0.00	
Frctn Loss (m)	0.37	Cum Volume (1000 m3)		0.06		
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.82		

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	219.07	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.02	Wt. n-Val.		0.035		
W.S. Elev (m)	219.05	Reach Len. (m)	39.00	40.00	37.00	
Crit W.S. (m)	219.05	Flow Area (m2)		0.55		
E.G. Slope (m/m)	0.019648	Area (m2)		0.55		
Q Total (m3/s)	0.34	Flow (m3/s)		0.34		
Top Width (m)	9.10	Top Width (m)		9.10		
Vel Total (m/s)	0.62	Avg. Vel. (m/s)		0.62		
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.06		
Conv. Total (m3/s)	2.4	Conv. (m3/s)		2.4		
Length Wtd. (m)	40.00	Wetted Per. (m)		9.11		
Min Ch El (m)	218.96	Shear (N/m2)		11.65		
Alpha	1.00	Stream Power (N/m s)	4625.77	0.00	0.00	
Frctn Loss (m)	0.32	Cum Volume (1000 m3)		0.08		
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.89		

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	219.08	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.04	Wt. n-Val.		0.035		
W.S. Elev (m)	219.04	Reach Len. (m)	39.00	40.00	37.00	
Crit W.S. (m)	219.04	Flow Area (m2)		0.51		
E.G. Slope (m/m)	0.044875	Area (m2)		0.51		
Q Total (m3/s)	0.46	Flow (m3/s)		0.46		
Top Width (m)	9.01	Top Width (m)		9.01		
Vel Total (m/s)	0.90	Avg. Vel. (m/s)		0.90		
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.06		
Conv. Total (m3/s)	2.2	Conv. (m3/s)		2.2		
Length Wtd. (m)	40.00	Wetted Per. (m)		9.02		
Min Ch El (m)	218.96	Shear (N/m2)		25.05		
Alpha	1.00	Stream Power (N/m s)	4625.77	0.00	0.00	
Frctn Loss (m)	0.44	Cum Volume (1000 m3)		0.10		
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.94		

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program

defaulted to critical depth.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	219.10	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.035	
W.S. Elev (m)	219.06	Reach Len. (m)	39.00	40.00	37.00
Crit W.S. (m)	219.06	Flow Area (m2)		0.72	
E.G. Slope (m/m)	0.028241	Area (m2)		0.72	
Q Total (m3/s)	0.62	Flow (m3/s)		0.62	
Top Width (m)	9.49	Top Width (m)		9.49	
Vel Total (m/s)	0.86	Avg. Vel. (m/s)		0.86	
Max Chl Dpth (m)	0.10	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	3.7	Conv. (m3/s)		3.7	
Length Wtd. (m)	40.00	Wetted Per. (m)		9.50	
Min Ch El (m)	218.96	Shear (N/m2)		21.01	
Alpha	1.00	Stream Power (N/m s)	4625.77	0.00	0.00
Frctn Loss (m)	0.39	Cum Volume (1000 m3)		0.12	
C & E Loss (m)	0.01	Cum SA (1000 m2)		2.00	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for adns.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	219.12	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.035	
W.S. Elev (m)	219.07	Reach Len. (m)	39.00	40.00	37.00
Crit W.S. (m)	219.07	Flow Area (m2)		0.81	
E.G. Slope (m/m)	0.029618	Area (m2)		0.81	
Q Total (m3/s)	0.75	Flow (m3/s)		0.75	
Top Width (m)	9.76	Top Width (m)		9.76	
Vel Total (m/s)	0.93	Avg. Vel. (m/s)		0.93	
Max Chl Dpth (m)	0.11	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	4.4	Conv. (m3/s)		4.4	
Length Wtd. (m)	40.00	Wetted Per. (m)		9.77	
Min Ch El (m)	218.96	Shear (N/m2)		23.94	
Alpha	1.00	Stream Power (N/m s)	4625.77	0.00	0.00
Frctn Loss (m)	0.49	Cum Volume (1000 m3)		0.13	
C & E Loss (m)	0.01	Cum SA (1000 m2)		2.03	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	219.13	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.035	
W.S. Elev (m)	219.08	Reach Len. (m)	39.00	40.00	37.00
Crit W.S. (m)	219.08	Flow Area (m2)		0.86	
E.G. Slope (m/m)	0.034792	Area (m2)		0.86	
Q Total (m3/s)	0.90	Flow (m3/s)		0.90	
Top Width (m)	9.93	Top Width (m)		9.93	
Vel Total (m/s)	1.04	Avg. Vel. (m/s)		1.04	
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.09	
Conv. Total (m3/s)	4.8	Conv. (m3/s)		4.8	
Length Wtd. (m)	40.00	Wetted Per. (m)		9.95	
Min Ch El (m)	218.96	Shear (N/m2)		29.58	
Alpha	1.00	Stream Power (N/m s)	4625.77	0.00	0.00
Frctn Loss (m)	0.47	Cum Volume (1000 m3)		0.15	
C & E Loss (m)	0.01	Cum SA (1000 m2)		2.09	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	219.16	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	219.11	Reach Len. (m)	39.00	40.00	37.00
Crit W.S. (m)	219.11	Flow Area (m2)		1.14	
E.G. Slope (m/m)	0.025762	Area (m2)		1.14	
Q Total (m3/s)	1.17	Flow (m3/s)		1.17	
Top Width (m)	10.77	Top Width (m)		10.77	
Vel Total (m/s)	1.03	Avg. Vel. (m/s)		1.03	
Max Chl Dpth (m)	0.14	Hydr. Depth (m)		0.11	
Conv. Total (m3/s)	7.3	Conv. (m3/s)		7.3	
Length Wtd. (m)	40.00	Wetted Per. (m)		10.79	
Min Ch El (m)	218.96	Shear (N/m2)		26.71	
Alpha	1.00	Stream Power (N/m s)	4625.77	0.00	0.00
Frctn Loss (m)	0.40	Cum Volume (1000 m3)		0.18	
C & E Loss (m)	0.01	Cum SA (1000 m2)		2.18	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	219.35	Element	Left OB	Channel	Right OB
Vel Head (m)	0.10	Wt. n-Val.		0.035	
W.S. Elev (m)	219.24	Reach Len. (m)	39.00	40.00	37.00
Crit W.S. (m)	219.24	Flow Area (m2)		2.89	
E.G. Slope (m/m)	0.020696	Area (m2)		2.89	
Q Total (m3/s)	4.09	Flow (m3/s)		4.09	
Top Width (m)	14.27	Top Width (m)		14.27	
Vel Total (m/s)	1.42	Avg. Vel. (m/s)		1.42	
Max Chl Dpth (m)	0.28	Hydr. Depth (m)		0.20	
Conv. Total (m3/s)	28.4	Conv. (m3/s)		28.4	
Length Wtd. (m)	40.00	Wetted Per. (m)		14.31	
Min Ch El (m)	218.96	Shear (N/m2)		41.00	
Alpha	1.00	Stream Power (N/m s)	4625.77	0.00	0.00
Frctn Loss (m)	0.42	Cum Volume (1000 m3)		0.41	
C & E Loss (m)	0.02	Cum SA (1000 m2)		2.60	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the

need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: DUFFINS
REACH: WC37 RS: 100

INPUT
Description: ST 100
Station Elevation Data num= 60

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	221.038	.179	221	2.298	220.531	2.442	220.5	2.632	220.456
4.209	220	5.306	219.954	10.708	219.85	13.791	219.77	17.125	219.603
19.324	219.547	22.489	219.59	27.167	219.616	27.526	219.614	29.434	219.589
30.866	219.571	36.427	219.555	36.842	219.556	44.761	219.598	47.838	219.514
48.512	219.514	52.661	219.508	53.582	219.505	53.871	219.503	54.687	219.5
55.054	219.473	61.064	219	64.232	218.738	66.852	218.5	68.497	218.493
70.337	218.488	72.092	218.482	72.453	218.481	72.477	218.481	72.478	218.481
72.507	218.481	72.573	218.481	72.602	218.481	72.694	218.481	72.969	218.482
78.041	218.5	79.659	218.509	80.452	218.513	81.209	218.517	81.644	218.516
82.052	218.515	84.448	218.507	85.992	218.536	86.649	218.546	87.113	218.558
90.622	218.612	92.223	218.633	94.431	218.699	100.274	218.871	103.144	219
104.587	219.072	106.022	219.128	113.328	219.5	123.927	219.711	136.748	219.917

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	61.064	.035	103.144	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
61.064	103.144	33	50	28	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	218.55	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	218.54	Reach Len. (m)	33.00	50.00	28.00
Crit W.S. (m)	218.52	Flow Area (m2)		0.85	
E.G. Slope (m/m)	0.004133	Area (m2)		0.85	
Q Total (m3/s)	0.19	Flow (m3/s)		0.19	
Top Width (m)	20.10	Top Width (m)		20.10	
Vel Total (m/s)	0.22	Avg. Vel. (m/s)		0.22	
Max Chl Dpth (m)	0.06	Hydr. Depth (m)		0.04	
Conv. Total (m3/s)	3.0	Conv. (m3/s)		3.0	
Length Wtd. (m)	50.00	Wetted Per. (m)		20.10	
Min Ch El (m)	218.48	Shear (N/m2)		1.72	
Alpha	1.00	Stream Power (N/m s)	6547.20	0.00	0.00
Frctn Loss (m)	0.52	Cum Volume (1000 m3)		0.03	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.25	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	218.57	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	218.56	Reach Len. (m)	33.00	50.00	28.00
Crit W.S. (m)	218.53	Flow Area (m2)		1.22	
E.G. Slope (m/m)	0.004297	Area (m2)		1.22	
Q Total (m3/s)	0.34	Flow (m3/s)		0.34	
Top Width (m)	21.12	Top Width (m)		21.12	
Vel Total (m/s)	0.28	Avg. Vel. (m/s)		0.28	
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	5.2	Conv. (m3/s)		5.2	
Length Wtd. (m)	50.00	Wetted Per. (m)		21.13	
Min Ch El (m)	218.48	Shear (N/m2)		2.43	
Alpha	1.00	Stream Power (N/m s)	6547.20	0.00	0.00
Frctn Loss (m)	0.53	Cum Volume (1000 m3)		0.05	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.29	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	218.58	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	218.57	Reach Len. (m)	33.00	50.00	28.00
Crit W.S. (m)	218.55	Flow Area (m2)		1.43	
E.G. Slope (m/m)	0.004804	Area (m2)		1.43	
Q Total (m3/s)	0.46	Flow (m3/s)		0.46	
Top Width (m)	21.88	Top Width (m)		21.88	
Vel Total (m/s)	0.32	Avg. Vel. (m/s)		0.32	
Max Chl Dpth (m)	0.09	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	6.6	Conv. (m3/s)		6.6	
Length Wtd. (m)	50.00	Wetted Per. (m)		21.89	
Min Ch El (m)	218.48	Shear (N/m2)		3.08	
Alpha	1.00	Stream Power (N/m s)	6547.20	0.00	0.00
Frctn Loss (m)	0.53	Cum Volume (1000 m3)		0.06	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.32	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	218.59	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	218.58	Reach Len. (m)	33.00	50.00	28.00
Crit W.S. (m)	218.55	Flow Area (m2)		1.73	
E.G. Slope (m/m)	0.004886	Area (m2)		1.73	
Q Total (m3/s)	0.62	Flow (m3/s)		0.62	
Top Width (m)	22.91	Top Width (m)		22.91	
Vel Total (m/s)	0.36	Avg. Vel. (m/s)		0.36	
Max Chl Dpth (m)	0.10	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	8.9	Conv. (m3/s)		8.9	
Length Wtd. (m)	50.00	Wetted Per. (m)		22.92	
Min Ch El (m)	218.48	Shear (N/m2)		3.63	
Alpha	1.00	Stream Power (N/m s)	6547.20	0.00	0.00
Frctn Loss (m)	0.54	Cum Volume (1000 m3)		0.07	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.35	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	218.60	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	218.59	Reach Len. (m)	33.00	50.00	28.00
Crit W.S. (m)	218.55	Flow Area (m2)		1.78	
E.G. Slope (m/m)	0.006637	Area (m2)		1.78	
Q Total (m3/s)	0.75	Flow (m3/s)		0.75	
Top Width (m)	23.06	Top Width (m)		23.06	
Vel Total (m/s)	0.42	Avg. Vel. (m/s)		0.42	
Max Chl Dpth (m)	0.11	Hydr. Depth (m)		0.08	

Conv. Total (m3/s)	9.2	Conv. (m3/s)		9.2		
Length Wtd. (m)	50.00	Wetted Per. (m)		23.06		
Min Ch El (m)	218.48	Shear (N/m2)		5.02		
Alpha	1.00	Stream Power (N/m s)	6547.20	0.00	0.00	
Frctn Loss (m)	0.54	Cum Volume (1000 m3)		0.08		
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.38		

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	218.61	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.01	Wt. n-Val.		0.035		
W.S. Elev (m)	218.60	Reach Len. (m)	33.00	50.00	28.00	
Crit W.S. (m)	218.56	Flow Area (m2)		2.09		
E.G. Slope (m/m)	0.005891	Area (m2)		2.09		
Q Total (m3/s)	0.90	Flow (m3/s)		0.90		
Top Width (m)	24.07	Top Width (m)		24.07		
Vel Total (m/s)	0.43	Avg. Vel. (m/s)		0.43		
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.09		
Conv. Total (m3/s)	11.7	Conv. (m3/s)		11.7		
Length Wtd. (m)	50.00	Wetted Per. (m)		24.07		
Min Ch El (m)	218.48	Shear (N/m2)		5.02		
Alpha	1.00	Stream Power (N/m s)	6547.20	0.00	0.00	
Frctn Loss (m)	0.54	Cum Volume (1000 m3)		0.09		
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.41		

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	218.63	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.01	Wt. n-Val.		0.035		
W.S. Elev (m)	218.62	Reach Len. (m)	33.00	50.00	28.00	
Crit W.S. (m)	218.57	Flow Area (m2)		2.59		
E.G. Slope (m/m)	0.005336	Area (m2)		2.59		
Q Total (m3/s)	1.17	Flow (m3/s)		1.17		
Top Width (m)	25.67	Top Width (m)		25.67		
Vel Total (m/s)	0.45	Avg. Vel. (m/s)		0.45		
Max Chl Dpth (m)	0.14	Hydr. Depth (m)		0.10		
Conv. Total (m3/s)	16.0	Conv. (m3/s)		16.0		
Length Wtd. (m)	50.00	Wetted Per. (m)		25.68		
Min Ch El (m)	218.48	Shear (N/m2)		5.27		
Alpha	1.00	Stream Power (N/m s)	6547.20	0.00	0.00	
Frctn Loss (m)	0.54	Cum Volume (1000 m3)		0.11		
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.45		

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	218.75	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.03	Wt. n-Val.		0.035		
W.S. Elev (m)	218.73	Reach Len. (m)	33.00	50.00	28.00	
Crit W.S. (m)	218.66	Flow Area (m2)		5.59		
E.G. Slope (m/m)	0.006412	Area (m2)		5.59		
Q Total (m3/s)	4.09	Flow (m3/s)		4.09		
Top Width (m)	30.94	Top Width (m)		30.94		
Vel Total (m/s)	0.73	Avg. Vel. (m/s)		0.73		
Max Chl Dpth (m)	0.24	Hydr. Depth (m)		0.18		
Conv. Total (m3/s)	51.1	Conv. (m3/s)		51.1		
Length Wtd. (m)	50.00	Wetted Per. (m)		30.95		
Min Ch El (m)	218.48	Shear (N/m2)		11.36		
Alpha	1.00	Stream Power (N/m s)	6547.20	0.00	0.00	
Frctn Loss (m)	0.57	Cum Volume (1000 m3)		0.24		
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.69		

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4.
This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: DUFFINS
REACH: WC37 RS: 10

INPUT
Description: ST 10
Station Elevation Data num= 68

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	219.221	8.786	219	10.386	218.951	11.815	218.909	14.518	218.81
21.128	218.664	26.197	218.5	32.266	218.187	35.781	218	36.835	218
38.73	217.999	41.503	217.999	42.002	217.999	43.314	217.999	44.039	217.999
44.708	217.999	45.762	217.998	46.669	217.998	46.789	217.998	46.904	217.998
48.15	217.998	48.24	217.998	48.343	217.998	49.399	217.999	50.325	217.999
52.169	217.999	52.795	217.999	54.412	218	55.03	218	55.649	218
56.268	218	56.878	218	58.98	218	59.808	218	59.99	218
60.326	218	60.703	218	61.663	218	61.751	218	62.426	218
63.041	218	63.16	218	64.149	218.005	65.165	218.01	65.871	218.025
67.594	218.062	69.317	218.098	71.04	218.134	72.44	218.163	72.763	218.167
74.486	218.194	76.209	218.222	77.932	218.25	79.031	218.268	79.655	218.279
81.378	218.308	82.518	218.328	83.101	218.341	90.395	218.5	97.713	218.923
99.825	219	106.67	219.429	108.452	219.491	109.084	219.5	110.449	219.501
116.598	219.594	123.121	219.688	126.393	219.733				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	26.197	.035	90.395	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
26.197	90.395	0	0	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	218.02	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.01	Wt. n-Val.		0.035		
W.S. Elev (m)	218.01	Reach Len. (m)				
Crit W.S. (m)	218.01	Flow Area (m2)		0.44		
E.G. Slope (m/m)	0.061763	Area (m2)		0.44		
Q Total (m3/s)	0.19	Flow (m3/s)		0.19		
Top Width (m)	29.88	Top Width (m)		29.88		
Vel Total (m/s)	0.43	Avg. Vel. (m/s)		0.43		
Max Chl Dpth (m)	0.02	Hydr. Depth (m)		0.01		
Conv. Total (m3/s)	0.8	Conv. (m3/s)		0.8		
Length Wtd. (m)		Wetted Per. (m)		29.88		
Min Ch El (m)	218.00	Shear (N/m2)		8.98		
Alpha	1.00	Stream Power (N/m s)	6051.43	0.00	0.00	
Frctn Loss (m)		Cum Volume (1000 m3)				
C & E Loss (m)		Cum SA (1000 m2)				

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	218.04	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.01	Wt. n-Val.		0.035		
W.S. Elev (m)	218.02	Reach Len. (m)				
Crit W.S. (m)	218.02	Flow Area (m2)		0.65		

E.G. Slope (m/m)	0.057148	Area (m2)		0.65	
Q Total (m3/s)	0.34	Flow (m3/s)		0.34	
Top Width (m)	30.33	Top Width (m)		30.33	
Vel Total (m/s)	0.53	Avg. Vel. (m/s)		0.53	
Max Chl Dpth (m)	0.02	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	1.4	Conv. (m3/s)		1.4	
Length Wtd. (m)		Wetted Per. (m)		30.33	
Min Ch El (m)	218.00	Shear (N/m2)		11.96	
Alpha	1.00	Stream Power (N/m s)	6051.43	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	218.04	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	218.03	Reach Len. (m)			
Crit W.S. (m)	218.03	Flow Area (m2)		0.87	
E.G. Slope (m/m)	0.039143	Area (m2)		0.87	
Q Total (m3/s)	0.46	Flow (m3/s)		0.46	
Top Width (m)	30.82	Top Width (m)		30.82	
Vel Total (m/s)	0.53	Avg. Vel. (m/s)		0.53	
Max Chl Dpth (m)	0.03	Hydr. Depth (m)		0.03	
Conv. Total (m3/s)	2.3	Conv. (m3/s)		2.3	
Length Wtd. (m)		Wetted Per. (m)		30.82	
Min Ch El (m)	218.00	Shear (N/m2)		10.89	
Alpha	1.00	Stream Power (N/m s)	6051.43	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	218.05	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	218.03	Reach Len. (m)			
Crit W.S. (m)	218.03	Flow Area (m2)		1.03	
E.G. Slope (m/m)	0.042242	Area (m2)		1.03	
Q Total (m3/s)	0.62	Flow (m3/s)		0.62	
Top Width (m)	31.14	Top Width (m)		31.14	
Vel Total (m/s)	0.60	Avg. Vel. (m/s)		0.60	
Max Chl Dpth (m)	0.04	Hydr. Depth (m)		0.03	
Conv. Total (m3/s)	3.0	Conv. (m3/s)		3.0	
Length Wtd. (m)		Wetted Per. (m)		31.14	
Min Ch El (m)	218.00	Shear (N/m2)		13.66	
Alpha	1.00	Stream Power (N/m s)	6051.43	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	218.06	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	218.05	Reach Len. (m)			
Crit W.S. (m)	218.05	Flow Area (m2)		1.45	
E.G. Slope (m/m)	0.020366	Area (m2)		1.45	
Q Total (m3/s)	0.75	Flow (m3/s)		0.75	
Top Width (m)	32.01	Top Width (m)		32.01	
Vel Total (m/s)	0.52	Avg. Vel. (m/s)		0.52	
Max Chl Dpth (m)	0.05	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	5.3	Conv. (m3/s)		5.3	
Length Wtd. (m)		Wetted Per. (m)		32.01	
Min Ch El (m)	218.00	Shear (N/m2)		9.04	
Alpha	1.00	Stream Power (N/m s)	6051.43	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	218.07	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	218.05	Reach Len. (m)			
Crit W.S. (m)	218.05	Flow Area (m2)		1.51	
E.G. Slope (m/m)	0.025634	Area (m2)		1.51	
Q Total (m3/s)	0.90	Flow (m3/s)		0.90	
Top Width (m)	32.13	Top Width (m)		32.13	
Vel Total (m/s)	0.60	Avg. Vel. (m/s)		0.60	
Max Chl Dpth (m)	0.05	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	5.6	Conv. (m3/s)		5.6	
Length Wtd. (m)		Wetted Per. (m)		32.13	
Min Ch El (m)	218.00	Shear (N/m2)		11.82	
Alpha	1.00	Stream Power (N/m s)	6051.43	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	218.08	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	218.05	Reach Len. (m)			
Crit W.S. (m)	218.05	Flow Area (m2)		1.64	
E.G. Slope (m/m)	0.033242	Area (m2)		1.64	
Q Total (m3/s)	1.17	Flow (m3/s)		1.17	
Top Width (m)	32.40	Top Width (m)		32.40	
Vel Total (m/s)	0.71	Avg. Vel. (m/s)		0.71	
Max Chl Dpth (m)	0.06	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	6.4	Conv. (m3/s)		6.4	
Length Wtd. (m)		Wetted Per. (m)		32.40	
Min Ch El (m)	218.00	Shear (N/m2)		16.51	
Alpha	1.00	Stream Power (N/m s)	6051.43	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	218.17	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	218.12	Reach Len. (m)			
Crit W.S. (m)	218.12	Flow Area (m2)		3.96	
E.G. Slope (m/m)	0.025517	Area (m2)		3.96	
Q Total (m3/s)	4.09	Flow (m3/s)		4.09	
Top Width (m)	36.86	Top Width (m)		36.86	
Vel Total (m/s)	1.03	Avg. Vel. (m/s)		1.03	
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.11	
Conv. Total (m3/s)	25.6	Conv. (m3/s)		25.6	
Length Wtd. (m)		Wetted Per. (m)		36.86	
Min Ch El (m)	218.00	Shear (N/m2)		26.91	
Alpha	1.00	Stream Power (N/m s)	6051.43	0.00	0.00
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

SUMMARY OF MANNING'S N VALUES

River:DUFFINS

Reach	River Sta.	n1	n2	n3
WC37	300	.07	.035	.07
WC37	200	.07	.035	.07
WC37	100	.07	.035	.07
WC37	10	.07	.035	.07

SUMMARY OF REACH LENGTHS

River: DUFFINS

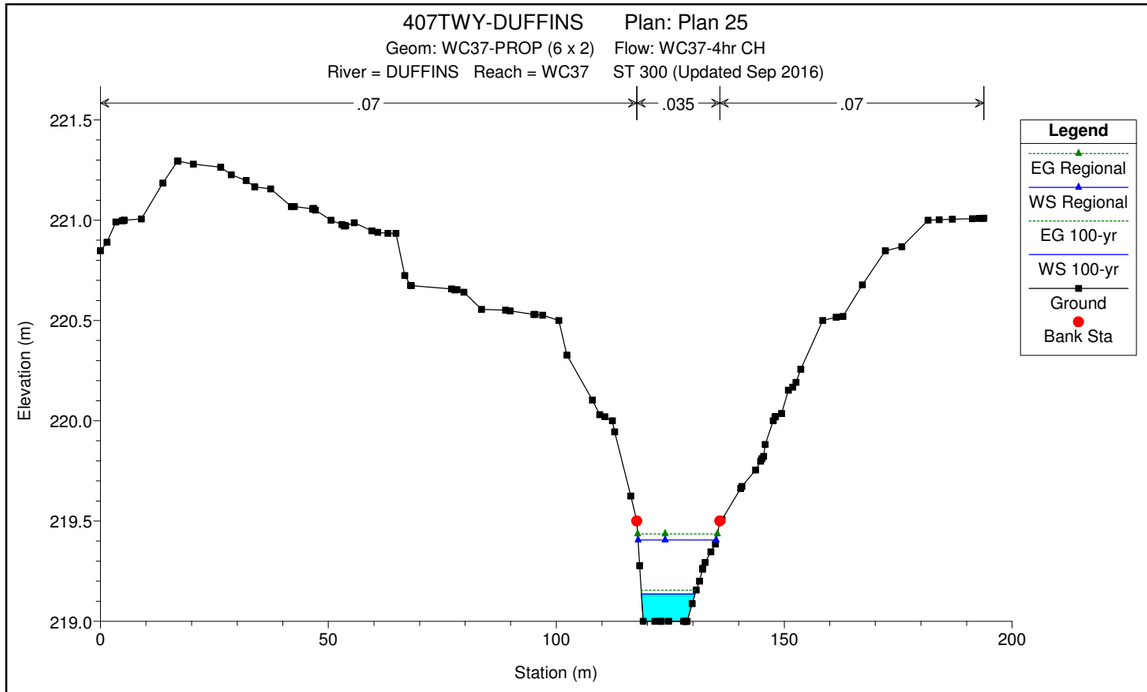
Reach	River Sta.	Left	Channel	Right
WC37	300	18	28	39
WC37	200	39	40	37
WC37	100	33	50	28
WC37	10	0	0	0

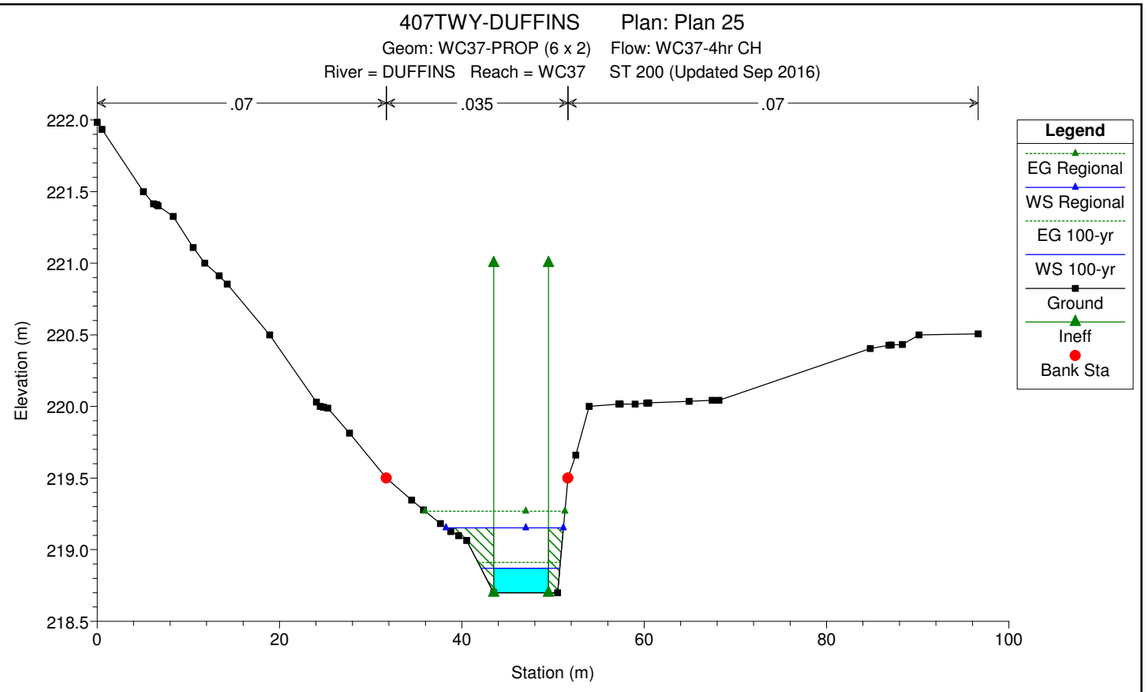
SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: DUFFINS

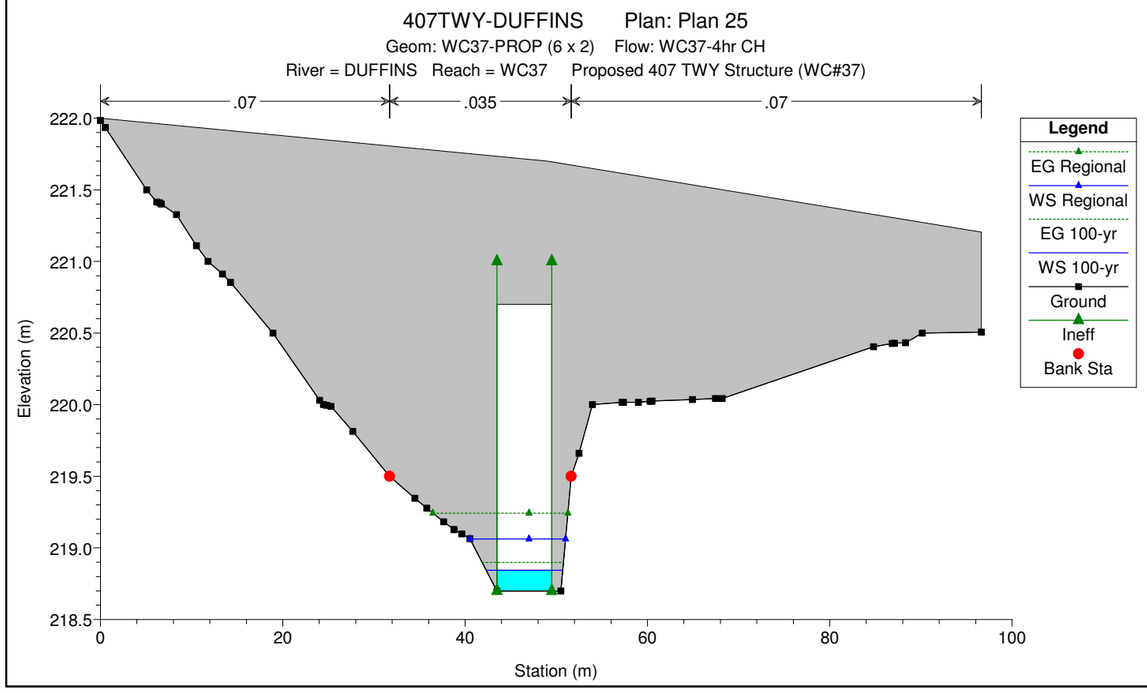
Reach	River Sta.	Contr.	Expan.
WC37	300	.1	.3
WC37	200	.1	.3
WC37	100	.1	.3
WC37	10	.1	.3

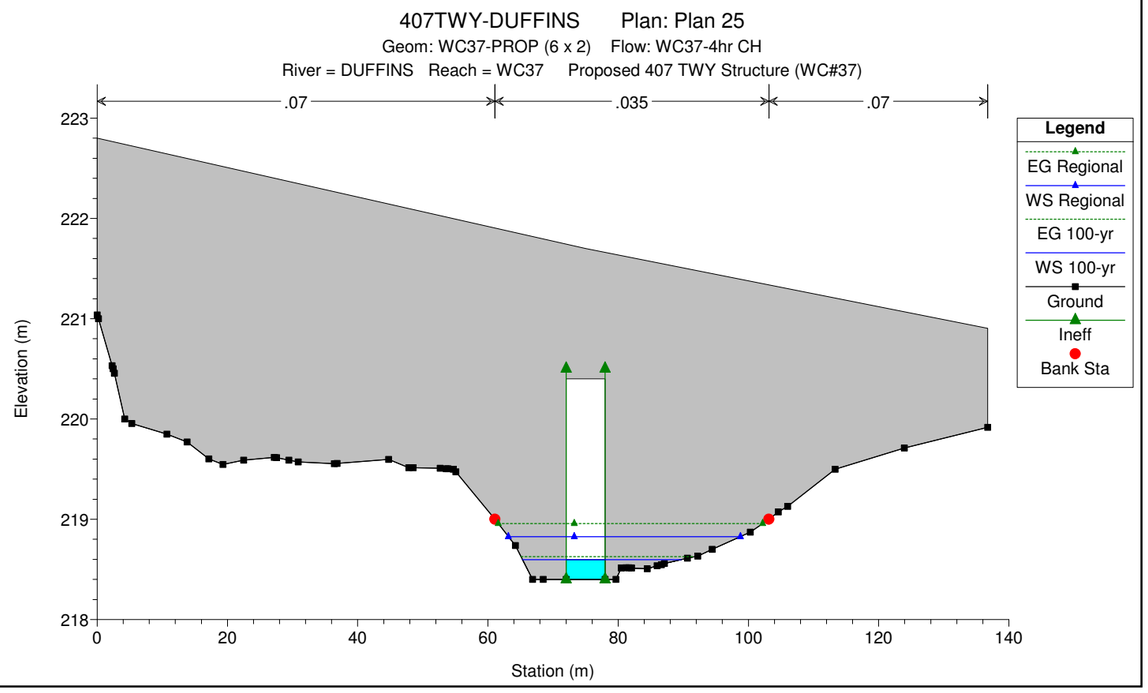
Profile Output Table - Standard Table 1

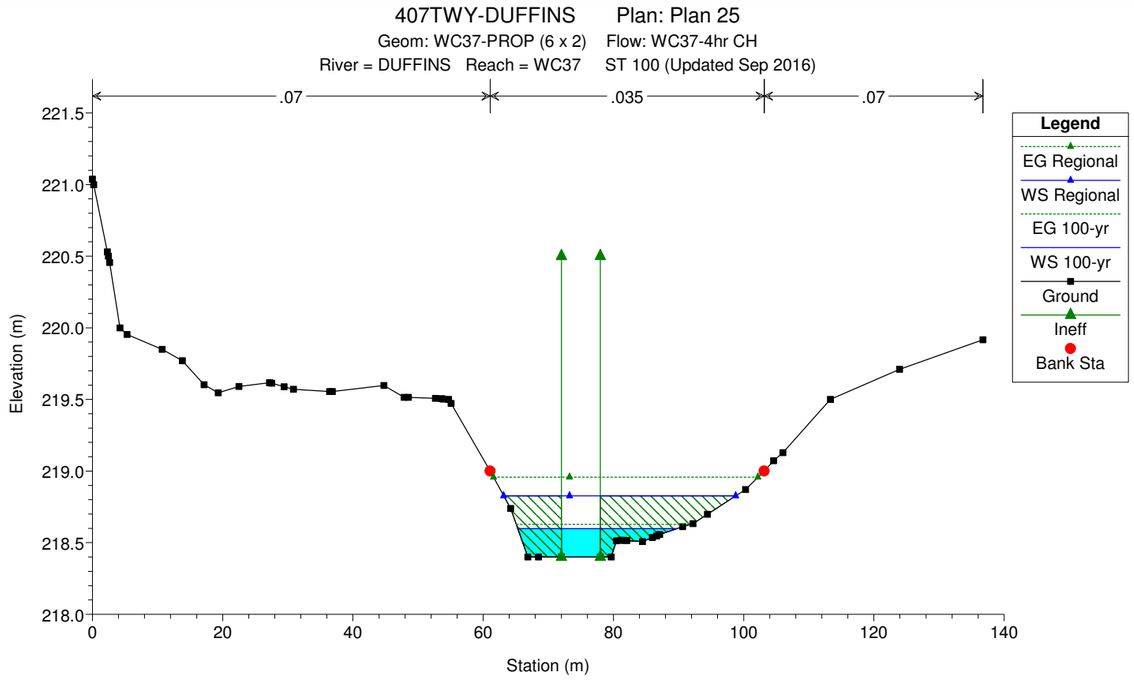
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
WC37	300	2-yr	0.19	219.00	219.11		219.11	0.000731	0.17	1.14	11.32	0.17
WC37	300	5-yr	0.34	219.00	219.14		219.14	0.001029	0.23	1.48	11.80	0.21
WC37	300	10-yr	0.46	219.00	219.16		219.17	0.001059	0.26	1.79	12.23	0.21
WC37	300	25-yr	0.62	219.00	219.19		219.19	0.001180	0.30	2.10	12.69	0.23
WC37	300	50-yr	0.75	219.00	219.21		219.21	0.001197	0.32	2.37	13.03	0.24
WC37	300	100-yr	0.90	219.00	219.23		219.24	0.001258	0.34	2.63	13.30	0.25
WC37	300	Check Flow	1.17	219.00	219.26		219.27	0.001402	0.39	3.01	13.70	0.26
WC37	300	Regional	4.09	219.00	219.47		219.49	0.002001	0.64	6.38	17.85	0.34
WC37	200	2-yr	0.19	218.96	219.02	219.02	219.04	0.038379	0.61	0.31	8.52	1.03
WC37	200	5-yr	0.34	218.96	219.05	219.05	219.07	0.019648	0.62	0.55	9.10	0.80
WC37	200	10-yr	0.46	218.96	219.04	219.04	219.08	0.044875	0.90	0.51	9.01	1.20
WC37	200	25-yr	0.62	218.96	219.06	219.06	219.10	0.028241	0.86	0.72	9.49	1.00
WC37	200	50-yr	0.75	218.96	219.07	219.07	219.12	0.029618	0.93	0.81	9.76	1.03
WC37	200	100-yr	0.90	218.96	219.08	219.08	219.13	0.034792	1.04	0.86	9.93	1.13
WC37	200	Check Flow	1.17	218.96	219.11	219.11	219.16	0.025762	1.03	1.14	10.77	1.01
WC37	200	Regional	4.09	218.96	219.24	219.24	219.35	0.020696	1.42	2.89	14.27	1.00
WC37	100	2-yr	0.19	218.48	218.54	218.52	218.55	0.004133	0.22	0.85	20.10	0.35
WC37	100	5-yr	0.34	218.48	218.56	218.53	218.57	0.004297	0.28	1.22	21.12	0.37
WC37	100	10-yr	0.46	218.48	218.57	218.55	218.58	0.004804	0.32	1.43	21.88	0.40
WC37	100	25-yr	0.62	218.48	218.58	218.55	218.59	0.004886	0.36	1.73	22.91	0.41
WC37	100	50-yr	0.75	218.48	218.59	218.55	218.60	0.006637	0.42	1.78	23.06	0.48
WC37	100	100-yr	0.90	218.48	218.60	218.56	218.61	0.005891	0.43	2.09	24.07	0.47
WC37	100	Check Flow	1.17	218.48	218.62	218.57	218.63	0.005336	0.45	2.59	25.67	0.45
WC37	100	Regional	4.09	218.48	218.73	218.66	218.75	0.006412	0.73	5.59	30.94	0.55
WC37	10	2-yr	0.19	218.00	218.01	218.01	218.02	0.061763	0.43	0.44	29.88	1.12
WC37	10	5-yr	0.34	218.00	218.02	218.02	218.04	0.057148	0.53	0.65	30.33	1.15
WC37	10	10-yr	0.46	218.00	218.03	218.03	218.04	0.039143	0.53	0.87	30.82	1.00
WC37	10	25-yr	0.62	218.00	218.03	218.03	218.05	0.042242	0.60	1.03	31.14	1.06
WC37	10	50-yr	0.75	218.00	218.05	218.05	218.06	0.020366	0.52	1.45	32.01	0.78
WC37	10	100-yr	0.90	218.00	218.05	218.05	218.07	0.025634	0.60	1.51	32.13	0.88
WC37	10	Check Flow	1.17	218.00	218.05	218.05	218.08	0.033242	0.71	1.64	32.40	1.01
WC37	10	Regional	4.09	218.00	218.12	218.12	218.17	0.025517	1.03	3.96	36.86	1.00

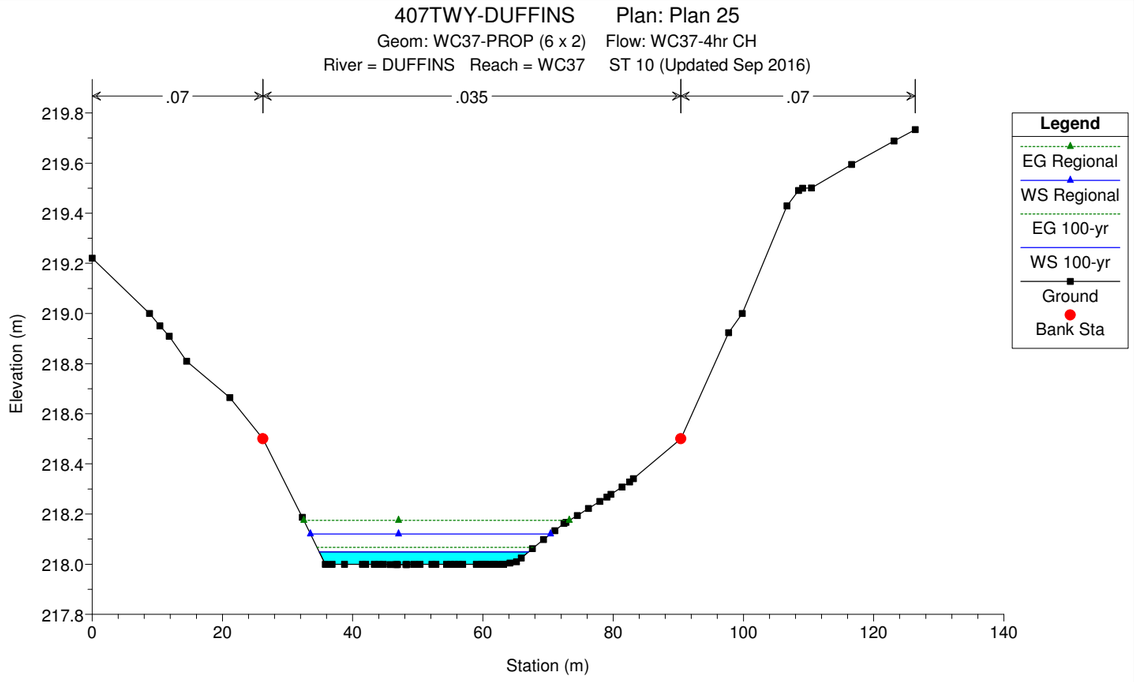

407TWY-DUFFINS Plan: Plan 25
Geom: WC37-PROP (6 x 2) Flow: WC37-4hr CH
River = DUFFINS Reach = WC37 ST 300 (Updated Sep 2016)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Bank Sta


407TWY-DUFFINS Plan: Plan 25
Geom: WC37-PROP (6 x 2) Flow: WC37-4hr CH
River = DUFFINS Reach = WC37 ST 200 (Updated Sep 2016)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


407TWY-DUFFINS Plan: Plan 25
Geom: WC37-PROP (6 x 2) Flow: WC37-4hr CH
River = DUFFINS Reach = WC37 Proposed 407 TWY Structure (WC#37)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


407TWY-DUFFINS Plan: Plan 25
Geom: WC37-PROP (6 x 2) Flow: WC37-4hr CH
River = DUFFINS Reach = WC37 Proposed 407 TWY Structure (WC#37)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


407TWY-DUFFINS Plan: Plan 25
Geom: WC37-PROP (6 x 2) Flow: WC37-4hr CH
River = DUFFINS Reach = WC37 ST 100 (Updated Sep 2016)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


407TWY-DUFFINS Plan: Plan 25
Geom: WC37-PROP (6 x 2) Flow: WC37-4hr CH
River = DUFFINS Reach = WC37 ST 10 (Updated Sep 2016)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Bank Sta

HEC-RAS Plan: WC37 - PROP (4hr CH) River: DUFFINS Reach: WC37

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC37	300	2-yr	0.19	219.00	219.06		219.06	0.006774	0.34	0.57	10.50	0.46
WC37	300	5-yr	0.34	219.00	219.08		219.09	0.007541	0.43	0.79	10.81	0.51
WC37	300	10-yr	0.46	219.00	219.09		219.10	0.007807	0.49	0.94	11.03	0.53
WC37	300	25-yr	0.62	219.00	219.11		219.13	0.006827	0.52	1.19	11.39	0.52
WC37	300	50-yr	0.75	219.00	219.12		219.14	0.007293	0.57	1.31	11.56	0.54
WC37	300	100-yr	0.90	219.00	219.14		219.16	0.007660	0.62	1.45	11.76	0.56
WC37	300	Check Flow	1.17	219.00	219.16		219.18	0.007488	0.67	1.74	12.15	0.57
WC37	300	Regional	4.09	219.00	219.41		219.44	0.003538	0.77	5.29	17.13	0.44
WC37	200	2-yr	0.19	218.70	218.76	218.74	218.77	0.017461	0.56	0.34	7.54	0.75
WC37	200	5-yr	0.34	218.70	218.79	218.77	218.81	0.014358	0.66	0.51	7.82	0.73
WC37	200	10-yr	0.46	218.70	218.81	218.79	218.83	0.011950	0.71	0.65	8.04	0.69
WC37	200	25-yr	0.62	218.70	218.83	218.80	218.86	0.012325	0.81	0.77	8.23	0.72
WC37	200	50-yr	0.75	218.70	218.85	218.82	218.89	0.010409	0.83	0.91	8.45	0.68
WC37	200	100-yr	0.90	218.70	218.87	218.83	218.91	0.010017	0.88	1.02	8.64	0.68
WC37	200	Check Flow	1.17	218.70	218.90	218.86	218.95	0.009480	0.96	1.22	8.95	0.68
WC37	200	Regional	4.09	218.70	219.15	219.06	219.27	0.008003	1.51	2.71	12.88	0.72
WC37	150		Culvert									
WC37	100	2-yr	0.19	218.40	218.49	218.45	218.50	0.003559	0.35	0.55	14.16	0.37
WC37	100	5-yr	0.34	218.40	218.53		218.54	0.003467	0.43	0.78	19.86	0.38
WC37	100	10-yr	0.46	218.40	218.54		218.56	0.004575	0.53	0.87	20.80	0.45
WC37	100	25-yr	0.62	218.40	218.57		218.59	0.004682	0.60	1.03	22.44	0.47
WC37	100	50-yr	0.75	218.40	218.57	218.52	218.60	0.006448	0.72	1.05	22.67	0.55
WC37	100	100-yr	0.90	218.40	218.60	218.53	218.63	0.006130	0.76	1.19	24.36	0.55
WC37	100	Check Flow	1.17	218.40	218.63	218.55	218.67	0.005885	0.83	1.41	27.22	0.55
WC37	100	Regional	4.09	218.40	218.83	218.76	218.96	0.009687	1.60	2.56	35.63	0.78
WC37	10	2-yr	0.19	218.00	218.01	218.01	218.02	0.061763	0.43	0.44	29.88	1.12
WC37	10	5-yr	0.34	218.00	218.02	218.02	218.04	0.113645	0.65	0.52	30.06	1.57
WC37	10	10-yr	0.46	218.00	218.03	218.03	218.04	0.039904	0.53	0.87	30.81	1.01
WC37	10	25-yr	0.62	218.00	218.03	218.03	218.05	0.043182	0.61	1.02	31.12	1.07
WC37	10	50-yr	0.75	218.00	218.05	218.05	218.06	0.020366	0.52	1.45	32.01	0.78
WC37	10	100-yr	0.90	218.00	218.05	218.05	218.07	0.025634	0.60	1.51	32.13	0.88
WC37	10	Check Flow	1.17	218.00	218.05	218.05	218.08	0.033242	0.71	1.64	32.40	1.01
WC37	10	Regional	4.09	218.00	218.12	218.12	218.17	0.025517	1.03	3.96	36.86	1.00

HEC-RAS HEC-RAS 5.0.1 April 2016
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
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PROJECT DATA
Project Title: 407TWY-DUFFINS
Project File : 407TWY-DUFFINS.prj
Run Date and Time: 9/21/2016 12:24:32 PM

Project in SI units

Project Description:
HEC-RAS Model created for 407 TWY project from Kennedy Rd. to Brock Rd. -
Duffins Creek Watershed

PLAN DATA

Plan Title: Plan 25
Plan File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.p25

Geometry Title: WC37-PROP (6 x 2)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.g19

Flow Title   : WC37-4hr CH
Flow File   : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.f13

Plan Summary Information:
Number of: Cross Sections = 4   Multiple Openings = 0
            Culverts   = 1   Inline Structures = 0
            Bridges   = 0   Lateral Structures = 0

Computational Information
    Water surface calculation tolerance = 0.01
    Critical depth calculation tolerance = 0.01
    Maximum number of iterations   = 20
    Maximum difference tolerance   = 0.3
    Flow tolerance factor   = 0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method: Average Conveyance
    Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: WC37-4hr CH
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.f13

Flow Data (m3/s)

River	Reach	RS	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Check Flow	Regional
DUFFINS	WC37	300	.19	.34	.46	.62	.75	.9	1.17	4.09

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
DUFFINS	WC37	2-yr		Critical
DUFFINS	WC37	5-yr		Critical
DUFFINS	WC37	10-yr		Critical
DUFFINS	WC37	25-yr		Critical
DUFFINS	WC37	50-yr		Critical
DUFFINS	WC37	100-yr		Critical
DUFFINS	WC37	Check Flow		Critical
DUFFINS	WC37	Regional		Critical

GEOMETRY DATA

Geometry Title: WC37-PROP (6 x 2)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.g19

CROSS SECTION

RIVER: DUFFINS
REACH: WC37 RS: 300

INPUT
Description: ST 300 (Updated Sep 2016)
Station Elevation Data num= 104

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	220.848	1.465	220.89	3.401	220.991	4.778	220.997	4.965	220.998
5.127	221	5.186	221	8.969	221.006	13.678	221.185	16.89	221.295
17.036	221.295	20.369	221.279	26.374	221.264	28.689	221.227	31.987	221.198
33.838	221.166	37.354	221.156	41.902	221.068	42.553	221.068	46.546	221.057
46.594	221.056	46.746	221.059	47.152	221.051	50.593	221	52.939	220.978
53.442	220.971	53.57	220.974	53.785	220.972	55.673	220.988	59.533	220.947
60.837	220.939	63.049	220.935	64.811	220.935	66.737	220.724	68.048	220.675
68.193	220.674	77.025	220.657	77.714	220.653	78.253	220.654	79.719	220.641
83.583	220.555	88.843	220.552	89.866	220.548	95.069	220.53	95.32	220.53
97.016	220.527	100.53	220.5	102.351	220.328	107.9	220.103	109.539	220.03
110.619	220.02	112.309	220	112.811	219.944	116.346	219.625	117.698	219.5
118.284	219.277	119.06	219	121.622	219	122.899	219	123.032	219
124.668	219	127.939	219	128.263	219	128.291	219	128.497	219
128.722	219	129.795	219.088	130.708	219.156	131.389	219.2	132.064	219.26
132.137	219.264	132.654	219.294	133.915	219.346	134.894	219.385	135.914	219.5
136.323	219.508	140.439	219.662	140.742	219.672	143.733	219.754	144.83	219.798
145.114	219.811	145.463	219.822	145.79	219.881	147.604	220	147.956	220.019
148.105	220.021	149.445	220.036	150.893	220.152	151.832	220.167	152.575	220.192
153.632	220.257	158.462	220.5	161.369	220.516	162.879	220.52	167.156	220.678
172.182	220.848	175.778	220.868	181.548	221	183.991	221.002	186.881	221.005
191.275	221.007	192.721	221.009	193.493	221.009	193.775	221.01		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	117.698	.035	135.914	.07

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
117.698 135.914 18 28 39 .3 .5

CROSS SECTION OUTPUT Profile #2-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	219.06	Element			
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	219.06	Reach Len. (m)	18.00	28.00	39.00
Crit W.S. (m)		Flow Area (m2)		0.57	
E.G. Slope (m/m)	0.006774	Area (m2)		0.57	
Q Total (m3/s)	0.19	Flow (m3/s)		0.19	

Top Width (m)	10.50	Top Width (m)	10.50
Vel Total (m/s)	0.34	Avg. Vel. (m/s)	0.34
Max Chl Dpth (m)	0.06	Hydr. Depth (m)	0.05
Conv. Total (m3/s)	2.3	Conv. (m3/s)	2.3
Length Wtd. (m)	28.00	Wetted Per. (m)	10.52
Min Ch El (m)	219.00	Shear (N/m2)	3.58
Alpha	1.00	Stream Power (N/m s)	1.20
Frctn Loss (m)	0.29	Cum Volume (1000 m3)	0.07
C & E Loss (m)	0.00	Cum SA (1000 m2)	1.79

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	219.09	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	219.08	Reach Len. (m)	18.00	28.00	39.00
Crit W.S. (m)		Flow Area (m2)		0.79	
E.G. Slope (m/m)	0.007541	Area (m2)		0.79	
Q Total (m3/s)	0.34	Flow (m3/s)		0.34	
Top Width (m)	10.81	Top Width (m)		10.81	
Vel Total (m/s)	0.43	Avg. Vel. (m/s)		0.43	
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	3.9	Conv. (m3/s)		3.9	
Length Wtd. (m)	28.00	Wetted Per. (m)		10.83	
Min Ch El (m)	219.00	Shear (N/m2)		5.37	
Alpha	1.00	Stream Power (N/m s)		2.32	
Frctn Loss (m)	0.28	Cum Volume (1000 m3)		0.10	
C & E Loss (m)	0.00	Cum SA (1000 m2)		2.06	

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	219.10	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	219.09	Reach Len. (m)	18.00	28.00	39.00
Crit W.S. (m)		Flow Area (m2)		0.94	
E.G. Slope (m/m)	0.007807	Area (m2)		0.94	
Q Total (m3/s)	0.46	Flow (m3/s)		0.46	
Top Width (m)	11.03	Top Width (m)		11.03	
Vel Total (m/s)	0.49	Avg. Vel. (m/s)		0.49	
Max Chl Dpth (m)	0.09	Hydr. Depth (m)		0.09	
Conv. Total (m3/s)	5.2	Conv. (m3/s)		5.2	
Length Wtd. (m)	28.00	Wetted Per. (m)		11.05	
Min Ch El (m)	219.00	Shear (N/m2)		6.52	
Alpha	1.00	Stream Power (N/m s)		3.19	
Frctn Loss (m)	0.27	Cum Volume (1000 m3)		0.12	
C & E Loss (m)	0.00	Cum SA (1000 m2)		2.13	

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	219.13	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	219.11	Reach Len. (m)	18.00	28.00	39.00
Crit W.S. (m)		Flow Area (m2)		1.19	
E.G. Slope (m/m)	0.006827	Area (m2)		1.19	
Q Total (m3/s)	0.62	Flow (m3/s)		0.62	
Top Width (m)	11.39	Top Width (m)		11.39	
Vel Total (m/s)	0.52	Avg. Vel. (m/s)		0.52	
Max Chl Dpth (m)	0.11	Hydr. Depth (m)		0.10	
Conv. Total (m3/s)	7.5	Conv. (m3/s)		7.5	
Length Wtd. (m)	28.00	Wetted Per. (m)		11.41	
Min Ch El (m)	219.00	Shear (N/m2)		6.97	
Alpha	1.00	Stream Power (N/m s)		3.64	
Frctn Loss (m)	0.25	Cum Volume (1000 m3)		0.15	
C & E Loss (m)	0.01	Cum SA (1000 m2)		2.23	

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	219.14	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	219.12	Reach Len. (m)	18.00	28.00	39.00
Crit W.S. (m)		Flow Area (m2)		1.31	
E.G. Slope (m/m)	0.007293	Area (m2)		1.31	
Q Total (m3/s)	0.75	Flow (m3/s)		0.75	
Top Width (m)	11.56	Top Width (m)		11.56	
Vel Total (m/s)	0.57	Avg. Vel. (m/s)		0.57	
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.11	
Conv. Total (m3/s)	8.8	Conv. (m3/s)		8.8	
Length Wtd. (m)	28.00	Wetted Per. (m)		11.59	
Min Ch El (m)	219.00	Shear (N/m2)		8.10	
Alpha	1.00	Stream Power (N/m s)		4.63	
Frctn Loss (m)	0.24	Cum Volume (1000 m3)		0.17	
C & E Loss (m)	0.01	Cum SA (1000 m2)		2.27	

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	219.16	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	219.14	Reach Len. (m)	18.00	28.00	39.00
Crit W.S. (m)		Flow Area (m2)		1.45	
E.G. Slope (m/m)	0.007660	Area (m2)		1.45	
Q Total (m3/s)	0.90	Flow (m3/s)		0.90	
Top Width (m)	11.76	Top Width (m)		11.76	
Vel Total (m/s)	0.62	Avg. Vel. (m/s)		0.62	
Max Chl Dpth (m)	0.14	Hydr. Depth (m)		0.12	
Conv. Total (m3/s)	10.3	Conv. (m3/s)		10.3	
Length Wtd. (m)	28.00	Wetted Per. (m)		11.79	
Min Ch El (m)	219.00	Shear (N/m2)		9.26	
Alpha	1.00	Stream Power (N/m s)		5.74	
Frctn Loss (m)	0.24	Cum Volume (1000 m3)		0.20	
C & E Loss (m)	0.01	Cum SA (1000 m2)		2.36	

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	219.18	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	219.16	Reach Len. (m)	18.00	28.00	39.00
Crit W.S. (m)		Flow Area (m2)		1.74	
E.G. Slope (m/m)	0.007488	Area (m2)		1.74	
Q Total (m3/s)	1.17	Flow (m3/s)		1.17	
Top Width (m)	12.15	Top Width (m)		12.15	
Vel Total (m/s)	0.67	Avg. Vel. (m/s)		0.67	
Max Chl Dpth (m)	0.16	Hydr. Depth (m)		0.14	
Conv. Total (m3/s)	13.5	Conv. (m3/s)		13.5	
Length Wtd. (m)	28.00	Wetted Per. (m)		12.18	
Min Ch El (m)	219.00	Shear (N/m2)		10.46	
Alpha	1.00	Stream Power (N/m s)		7.05	
Frctn Loss (m)	0.24	Cum Volume (1000 m3)		0.24	
C & E Loss (m)	0.01	Cum SA (1000 m2)		2.51	

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	219.44	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	219.41	Reach Len. (m)	18.00	28.00	39.00
Crit W.S. (m)		Flow Area (m2)		5.29	
E.G. Slope (m/m)	0.003538	Area (m2)		5.29	
Q Total (m3/s)	4.09	Flow (m3/s)		4.09	
Top Width (m)	17.13	Top Width (m)		17.13	
Vel Total (m/s)	0.77	Avg. Vel. (m/s)		0.77	
Max Chl Dpth (m)	0.41	Hydr. Depth (m)		0.31	
Conv. Total (m3/s)	68.8	Conv. (m3/s)		68.8	
Length Wtd. (m)	28.00	Wetted Per. (m)		17.21	
Min Ch El (m)	219.00	Shear (N/m2)		10.66	
Alpha	1.00	Stream Power (N/m s)		8.24	
Frctn Loss (m)	0.14	Cum Volume (1000 m3)		0.59	

C & E Loss (m)	0.03	Cum SA (1000 m2)	3.20

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: DUFFINS
REACH: WC37 RS: 200

INPUT
Description: ST 200 (Updated Sep 2016)
Station Elevation Data num= 50

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	221.985	.538	221.935	5.056	221.5	6.182	221.414	6.503	221.409
6.68	221.401	8.341	221.326	10.53	221.11	11.802	221	13.367	220.912
14.275	220.854	18.909	220.5	24.031	220.031	24.457	220	24.831	219.995
25.285	219.989	27.665	219.814	31.717	219.5	34.477	219.347	35.78	219.277
37.647	219.182	38.793	219.127	38.794	219.127	39.649	219.097	40.514	219.065
43.5	218.7	50.5	218.7	51.631	219.5	52.484	219.661	53.949	220
57.234	220.017	57.239	220.017	57.245	220.017	57.271	220.017	57.276	220.017
57.302	220.017	57.365	220.017	58.991	220.016	60.279	220.024	60.442	220.024
60.505	220.025	64.931	220.036	67.465	220.042	68.202	220.043	84.78	220.405
86.849	220.427	87.086	220.429	88.312	220.433	90.152	220.5	96.616	220.507

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	31.717	.035	51.631	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
31.717	51.631	39	40	37	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	43.5	221	T
49.5	96.616	221	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	218.77	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	218.76	Reach Len. (m)	39.00	40.00	37.00
Crit W.S. (m)	218.74	Flow Area (m2)		0.34	
E.G. Slope (m/m)	0.017461	Area (m2)		0.41	
Q Total (m3/s)	0.19	Flow (m3/s)		0.19	
Top Width (m)	7.54	Top Width (m)		7.54	
Vel Total (m/s)	0.56	Avg. Vel. (m/s)		0.56	
Max Chl Dpth (m)	0.06	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	1.4	Conv. (m3/s)		1.4	
Length Wtd. (m)	40.00	Wetted Per. (m)		6.00	
Min Ch El (m)	218.70	Shear (N/m2)		9.72	
Alpha	1.00	Stream Power (N/m s)		5.42	
Frctn Loss (m)		Cum Volume (1000 m3)		0.06	
C & E Loss (m)		Cum SA (1000 m2)		1.54	

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	218.81	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	218.79	Reach Len. (m)	39.00	40.00	37.00
Crit W.S. (m)	218.77	Flow Area (m2)		0.51	
E.G. Slope (m/m)	0.014358	Area (m2)		0.63	
Q Total (m3/s)	0.34	Flow (m3/s)		0.34	
Top Width (m)	7.82	Top Width (m)		7.82	
Vel Total (m/s)	0.66	Avg. Vel. (m/s)		0.66	
Max Chl Dpth (m)	0.09	Hydr. Depth (m)		0.09	
Conv. Total (m3/s)	2.8	Conv. (m3/s)		2.8	
Length Wtd. (m)	40.00	Wetted Per. (m)		6.00	
Min Ch El (m)	218.70	Shear (N/m2)		12.02	
Alpha	1.00	Stream Power (N/m s)		7.98	
Frctn Loss (m)		Cum Volume (1000 m3)		0.08	
C & E Loss (m)		Cum SA (1000 m2)		1.80	

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	218.83	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	218.81	Reach Len. (m)	39.00	40.00	37.00
Crit W.S. (m)	218.79	Flow Area (m2)		0.65	
E.G. Slope (m/m)	0.011950	Area (m2)		0.81	
Q Total (m3/s)	0.46	Flow (m3/s)		0.46	
Top Width (m)	8.04	Top Width (m)		8.04	
Vel Total (m/s)	0.71	Avg. Vel. (m/s)		0.71	
Max Chl Dpth (m)	0.11	Hydr. Depth (m)		0.11	
Conv. Total (m3/s)	4.2	Conv. (m3/s)		4.2	
Length Wtd. (m)	40.00	Wetted Per. (m)		6.00	
Min Ch El (m)	218.70	Shear (N/m2)		12.67	
Alpha	1.00	Stream Power (N/m s)		8.98	
Frctn Loss (m)		Cum Volume (1000 m3)		0.10	
C & E Loss (m)		Cum SA (1000 m2)		1.87	

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	218.86	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	218.83	Reach Len. (m)	39.00	40.00	37.00
Crit W.S. (m)	218.80	Flow Area (m2)		0.77	
E.G. Slope (m/m)	0.012325	Area (m2)		0.98	
Q Total (m3/s)	0.62	Flow (m3/s)		0.62	
Top Width (m)	8.23	Top Width (m)		8.23	
Vel Total (m/s)	0.81	Avg. Vel. (m/s)		0.81	
Max Chl Dpth (m)	0.13	Hydr. Depth (m)		0.13	
Conv. Total (m3/s)	5.6	Conv. (m3/s)		5.6	
Length Wtd. (m)	40.00	Wetted Per. (m)		6.00	
Min Ch El (m)	218.70	Shear (N/m2)		15.49	
Alpha	1.00	Stream Power (N/m s)		12.49	
Frctn Loss (m)		Cum Volume (1000 m3)		0.12	
C & E Loss (m)		Cum SA (1000 m2)		1.95	

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	218.89	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	218.85	Reach Len. (m)	39.00	40.00	37.00
Crit W.S. (m)	218.82	Flow Area (m2)		0.91	
E.G. Slope (m/m)	0.010409	Area (m2)		1.17	
Q Total (m3/s)	0.75	Flow (m3/s)		0.75	
Top Width (m)	8.45	Top Width (m)		8.45	
Vel Total (m/s)	0.83	Avg. Vel. (m/s)		0.83	
Max Chl Dpth (m)	0.15	Hydr. Depth (m)		0.15	
Conv. Total (m3/s)	7.4	Conv. (m3/s)		7.4	
Length Wtd. (m)	40.00	Wetted Per. (m)		6.00	
Min Ch El (m)	218.70	Shear (N/m2)		15.43	
Alpha	1.00	Stream Power (N/m s)		12.76	
Frctn Loss (m)		Cum Volume (1000 m3)		0.14	
C & E Loss (m)		Cum SA (1000 m2)		1.99	

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	218.91	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.035	
W.S. Elev (m)	218.87	Reach Len. (m)	39.00	40.00	37.00
Crit W.S. (m)	218.83	Flow Area (m2)		1.02	
E.G. Slope (m/m)	0.010017	Area (m2)		1.33	
Q Total (m3/s)	0.90	Flow (m3/s)		0.90	
Top Width (m)	8.64	Top Width (m)		8.64	
Vel Total (m/s)	0.88	Avg. Vel. (m/s)		0.88	
Max Chl Dpth (m)	0.17	Hydr. Depth (m)		0.17	

Conv. Total (m3/s)	9.0	Conv. (m3/s)	9.0
Length Wtd. (m)	40.00	Wetted Per. (m)	6.00
Min Ch El (m)	218.70	Shear (N/m2)	16.75
Alpha	1.00	Stream Power (N/m s)	14.74
Frctn Loss (m)		Cum Volume (1000 m3)	0.16
C & E Loss (m)		Cum SA (1000 m2)	2.07

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	218.95	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	218.90	Reach Len. (m)	39.00	40.00	37.00
Crit W.S. (m)	218.86	Flow Area (m2)		1.22	
E.G. Slope (m/m)	0.009480	Area (m2)		1.62	
Q Total (m3/s)	1.17	Flow (m3/s)		1.17	
Top Width (m)	8.95	Top Width (m)		8.95	
Vel Total (m/s)	0.96	Avg. Vel. (m/s)		0.96	
Max Chl Dpth (m)	0.20	Hydr. Depth (m)		0.20	
Conv. Total (m3/s)	12.0	Conv. (m3/s)		12.0	
Length Wtd. (m)	40.00	Wetted Per. (m)		6.00	
Min Ch El (m)	218.70	Shear (N/m2)		18.87	
Alpha	1.00	Stream Power (N/m s)		18.13	
Frctn Loss (m)		Cum Volume (1000 m3)		0.19	
C & E Loss (m)		Cum SA (1000 m2)		2.21	

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	219.27	Element	Left OB	Channel	Right OB
Vel Head (m)	0.12	Wt. n-Val.		0.035	
W.S. Elev (m)	219.15	Reach Len. (m)	39.00	40.00	37.00
Crit W.S. (m)	219.06	Flow Area (m2)		2.71	
E.G. Slope (m/m)	0.008003	Area (m2)		4.22	
Q Total (m3/s)	4.09	Flow (m3/s)		4.09	
Top Width (m)	12.88	Top Width (m)		12.88	
Vel Total (m/s)	1.51	Avg. Vel. (m/s)		1.51	
Max Chl Dpth (m)	0.45	Hydr. Depth (m)		0.45	
Conv. Total (m3/s)	45.7	Conv. (m3/s)		45.7	
Length Wtd. (m)	40.00	Wetted Per. (m)		6.00	
Min Ch El (m)	218.70	Shear (N/m2)		35.51	
Alpha	1.00	Stream Power (N/m s)		53.50	
Frctn Loss (m)		Cum Volume (1000 m3)		0.45	
C & E Loss (m)		Cum SA (1000 m2)		2.78	

CULVERT

RIVER: DUFFINS
REACH: WC37 RS: 150

INPUT
Description: Proposed 407 TWY Structure (WC#37)
Distance from Upstream XS = 11.5
Deck/Roadway Width = 12
Weir Coefficient = 1.4
Upstream Deck/Roadway Coordinates
num= 3

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	222		49	221.7		97	221.2	

Upstream Bridge Cross Section Data
Station Elevation Data num= 50

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	221.985	.538	221.935	5.056	221.5	6.182	221.414	6.503	221.409
6.68	221.401	8.341	221.326	10.53	221.11	11.802	221	13.367	220.912
14.275	220.854	18.909	220.5	24.031	220.031	24.457	220	24.831	219.995
25.285	219.989	27.665	219.814	31.717	219.5	34.477	219.347	35.78	219.277
37.647	219.182	38.793	219.127	38.794	219.127	39.649	219.097	40.514	219.065
43.5	218.7	50.5	218.7	51.631	219.5	52.484	219.661	53.949	220
57.234	220.017	57.239	220.017	57.245	220.017	57.271	220.017	57.276	220.017
57.302	220.017	57.365	220.017	58.991	220.016	60.279	220.024	60.442	220.024
60.505	220.025	64.931	220.036	67.465	220.042	68.202	220.043	84.78	220.405
86.849	220.427	87.086	220.429	88.312	220.433	90.152	220.5	96.616	220.507

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	31.717	.035	51.631	.07

Bank Sta: Left Right Coeff Contr. Expan.
31.717 51.631 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	43.5	221	T
49.5	96.616	221	T

Downstream Deck/Roadway Coordinates
num= 3

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	222.8		75	221.7		137	220.9	

Downstream Bridge Cross Section Data
Station Elevation Data num= 51

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	221.038	.179	221	2.298	220.531	2.442	220.5	2.632	220.456
4.209	220	5.306	219.954	10.708	219.85	13.791	219.77	17.125	219.603
19.324	219.547	22.489	219.59	27.167	219.616	27.526	219.614	29.434	219.589
30.866	219.571	36.427	219.555	36.842	219.556	44.761	219.598	47.838	219.514
48.512	219.514	52.661	219.508	53.582	219.505	53.871	219.503	54.687	219.5
55.054	219.473	61.064	219	64.232	218.738	66.852	218.4	68.497	218.4
72	218.4	78	218.4	79.659	218.4	80.452	218.513	81.209	218.517
81.644	218.516	82.052	218.515	84.448	218.507	85.992	218.536	86.649	218.546
87.113	218.558	90.622	218.612	92.223	218.633	94.431	218.699	100.274	218.871
103.144	219	104.587	219.072	106.022	219.128	113.328	219.5	123.927	219.711
136.748	219.917								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	61.064	.035	103.144	.07

Bank Sta: Left Right Coeff Contr. Expan.
61.064 103.144 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	72	220.5	T
78	136.748	220.5	T

Upstream Embankment side slope = 2 horiz. to 1.0 vertical
Downstream Embankment side slope = 2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .98
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name	Shape	Rise	Span
Culvert #1	Box	2	6

FHWA Chart # 10- 90 degree headwall; Chamfered or beveled inlet
FHWA Scale # 2 - Inlet edges beveled 1/2 inch at 45 degrees (1:1)
Solution Criteria = Highest U.S. EG

Culvert Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
3.8	32	.013	.025	0	.2	1

Upstream Elevation = 218.7
Centerline Station = 46.5
Downstream Elevation = 218.4
Centerline Station = 75

CULVERT OUTPUT Profile #2-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.19	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	0.57

Q Barrel (m3/s)	0.19	Culv Vel DS (m/s)	0.35
E.G. US. (m)	218.78	Culv Inv El Up (m)	218.70
W.S. US. (m)	218.76	Culv Inv El Dn (m)	218.40
E.G. DS (m)	218.50	Culv Frctn Ls (m)	0.00
W.S. DS (m)	218.49	Culv Exit Loss (m)	0.00
Delta EG (m)	0.28	Culv Entr Loss (m)	0.00
Delta WS (m)	0.27	Q Weir (m3/s)	
E.G. IC (m)	218.77	Weir Sta Lft (m)	
E.G. OC (m)	218.78	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	218.76	Weir Max Depth (m)	
Culv WS Outlet (m)	218.49	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.06	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.05	Min El Weir Flow (m)	221.21

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #5-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.34	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	0.72
Q Barrel (m3/s)	0.34	Culv Vel DS (m/s)	0.43
E.G. US. (m)	218.81	Culv Inv El Up (m)	218.70
W.S. US. (m)	218.79	Culv Inv El Dn (m)	218.40
E.G. DS (m)	218.54	Culv Frctn Ls (m)	0.00
W.S. DS (m)	218.53	Culv Exit Loss (m)	0.00
Delta EG (m)	0.27	Culv Entr Loss (m)	0.01
Delta WS (m)	0.25	Q Weir (m3/s)	
E.G. IC (m)	218.81	Weir Sta Lft (m)	
E.G. OC (m)	218.81	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	218.78	Weir Max Depth (m)	
Culv WS Outlet (m)	218.53	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.08	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.07	Min El Weir Flow (m)	221.21

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #10-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.46	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	0.81
Q Barrel (m3/s)	0.46	Culv Vel DS (m/s)	0.53
E.G. US. (m)	218.83	Culv Inv El Up (m)	218.70
W.S. US. (m)	218.81	Culv Inv El Dn (m)	218.40
E.G. DS (m)	218.56	Culv Frctn Ls (m)	0.00
W.S. DS (m)	218.54	Culv Exit Loss (m)	0.00
Delta EG (m)	0.28	Culv Entr Loss (m)	0.01
Delta WS (m)	0.26	Q Weir (m3/s)	
E.G. IC (m)	218.83	Weir Sta Lft (m)	
E.G. OC (m)	218.83	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	218.79	Weir Max Depth (m)	
Culv WS Outlet (m)	218.54	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.09	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.08	Min El Weir Flow (m)	221.21

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #25-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.62	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	0.91
Q Barrel (m3/s)	0.62	Culv Vel DS (m/s)	0.60
E.G. US. (m)	218.86	Culv Inv El Up (m)	218.70
W.S. US. (m)	218.83	Culv Inv El Dn (m)	218.40
E.G. DS (m)	218.59	Culv Frctn Ls (m)	0.00
W.S. DS (m)	218.57	Culv Exit Loss (m)	0.00
Delta EG (m)	0.27	Culv Entr Loss (m)	0.01
Delta WS (m)	0.26	Q Weir (m3/s)	
E.G. IC (m)	218.86	Weir Sta Lft (m)	
E.G. OC (m)	218.86	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	218.81	Weir Max Depth (m)	
Culv WS Outlet (m)	218.57	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.11	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.10	Min El Weir Flow (m)	221.21

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #50-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.75	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	0.98
Q Barrel (m3/s)	0.75	Culv Vel DS (m/s)	0.72
E.G. US. (m)	218.89	Culv Inv El Up (m)	218.70
W.S. US. (m)	218.85	Culv Inv El Dn (m)	218.40
E.G. DS (m)	218.60	Culv Frctn Ls (m)	0.00
W.S. DS (m)	218.57	Culv Exit Loss (m)	0.00
Delta EG (m)	0.29	Culv Entr Loss (m)	0.01
Delta WS (m)	0.28	Q Weir (m3/s)	
E.G. IC (m)	218.88	Weir Sta Lft (m)	
E.G. OC (m)	218.89	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	218.83	Weir Max Depth (m)	
Culv WS Outlet (m)	218.57	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.13	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.12	Min El Weir Flow (m)	221.21

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #100-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.90	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.05
Q Barrel (m3/s)	0.90	Culv Vel DS (m/s)	0.76
E.G. US. (m)	218.91	Culv Inv El Up (m)	218.70
W.S. US. (m)	218.87	Culv Inv El Dn (m)	218.40
E.G. DS (m)	218.63	Culv Frctn Ls (m)	0.00
W.S. DS (m)	218.60	Culv Exit Loss (m)	0.00
Delta EG (m)	0.28	Culv Entr Loss (m)	0.01
Delta WS (m)	0.27	Q Weir (m3/s)	
E.G. IC (m)	218.91	Weir Sta Lft (m)	
E.G. OC (m)	218.91	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	218.84	Weir Max Depth (m)	
Culv WS Outlet (m)	218.60	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.14	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.13	Min El Weir Flow (m)	221.21

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #Check Flow Culv Group: Culvert #1

Q Culv Group (m3/s)	1.17	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.16
Q Barrel (m3/s)	1.17	Culv Vel DS (m/s)	0.83
E.G. US. (m)	218.95	Culv Inv El Up (m)	218.70
W.S. US. (m)	218.90	Culv Inv El Dn (m)	218.40
E.G. DS (m)	218.67	Culv Frctn Ls (m)	0.00
W.S. DS (m)	218.63	Culv Exit Loss (m)	0.00
Delta EG (m)	0.28	Culv Entr Loss (m)	0.01
Delta WS (m)	0.27	Q Weir (m3/s)	
E.G. IC (m)	218.95	Weir Sta Lft (m)	
E.G. OC (m)	218.95	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	218.87	Weir Max Depth (m)	
Culv WS Outlet (m)	218.63	Weir Avg Depth (m)	

Culv Nml Depth (m)	0.17	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.16	Min El Weir Flow (m)	221.21

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #Regional Culv Group: Culvert #1

Q Culv Group (m3/s)	4.09	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.88
Q Barrel (m3/s)	4.09	Culv Vel DS (m/s)	1.60
E.G. US. (m)	219.27	Culv Inv El Up (m)	218.70
W.S. US. (m)	219.15	Culv Inv El Dn (m)	218.40
E.G. DS (m)	218.96	Culv Frctn Ls (m)	0.00
W.S. DS (m)	218.83	Culv Exit Loss (m)	0.00
Delta EG (m)	0.31	Culv Entr Loss (m)	0.03
Delta WS (m)	0.33	Q Weir (m3/s)	
E.G. IC (m)	219.27	Weir Sta Lft (m)	
E.G. OC (m)	219.28	Weir Sta Rgt (m)	
Culvert Control	Inlet	Weir Submerg	
Culv WS Inlet (m)	219.06	Weir Max Depth (m)	
Culv WS Outlet (m)	218.83	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.36	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.36	Min El Weir Flow (m)	221.21

Note: During the supercritical analysis, the water surface at the inlet was within 0.01 feet of normal depth. Therefore, the outlet will be at normal depth.
Note: During the supercritical calculations a hydraulic jump occurred inside of the culvert.

CROSS SECTION

RIVER: DUFFINS
REACH: WC37 RS: 100

INPUT
Description: ST 100 (Updated Sep 2016)
Station Elevation Data num= 51

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	221.038	.179	221	2.298	220.531	2.442	220.5	2.632	220.456
4.209	220	5.306	219.954	10.708	219.85	13.791	219.77	17.125	219.603
19.324	219.547	22.489	219.59	27.167	219.616	27.526	219.614	29.434	219.589
30.866	219.571	36.427	219.555	36.842	219.556	44.761	219.598	47.838	219.514
48.512	219.514	52.661	219.508	53.582	219.505	53.871	219.503	54.687	219.5
55.054	219.473	61.064	219	64.232	218.738	66.852	218.4	68.497	218.4
72	218.4	78	218.4	79.659	218.4	80.452	218.513	81.209	218.517
81.644	218.516	82.052	218.515	84.448	218.507	85.992	218.536	86.649	218.546
87.113	218.558	90.622	218.612	92.223	218.633	94.431	218.699	100.274	218.871
103.144	219	104.587	219.072	106.022	219.128	113.328	219.5	123.927	219.711
136.748	219.917								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	61.064	.035	103.144	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
61.064	103.144	33	50	28	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	72	220.5	T
78	136.748	220.5	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	218.50	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	218.49	Reach Len. (m)	33.00	50.00	28.00
Crit W.S. (m)	218.45	Flow Area (m2)		0.55	
E.G. Slope (m/m)	0.003559	Area (m2)		1.23	
Q Total (m3/s)	0.19	Flow (m3/s)		0.19	
Top Width (m)	14.16	Top Width (m)		14.16	
Vel Total (m/s)	0.35	Avg. Vel. (m/s)		0.35	
Max Chl Dpth (m)	0.09	Hydr. Depth (m)		0.09	
Conv. Total (m3/s)	3.2	Conv. (m3/s)		3.2	
Length Wtd. (m)	50.00	Wetted Per. (m)		6.00	
Min Ch El (m)	218.40	Shear (N/m2)		3.19	
Alpha	1.00	Stream Power (N/m s)		1.11	
Frctn Loss (m)	0.46	Cum Volume (1000 m3)		0.04	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.10	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	218.54	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	218.53	Reach Len. (m)	33.00	50.00	28.00
Crit W.S. (m)		Flow Area (m2)		0.78	
E.G. Slope (m/m)	0.003467	Area (m2)		1.89	
Q Total (m3/s)	0.34	Flow (m3/s)		0.34	
Top Width (m)	19.86	Top Width (m)		19.86	
Vel Total (m/s)	0.43	Avg. Vel. (m/s)		0.43	
Max Chl Dpth (m)	0.13	Hydr. Depth (m)		0.13	
Conv. Total (m3/s)	5.8	Conv. (m3/s)		5.8	
Length Wtd. (m)	50.00	Wetted Per. (m)		6.00	
Min Ch El (m)	218.40	Shear (N/m2)		4.45	
Alpha	1.00	Stream Power (N/m s)		1.93	
Frctn Loss (m)	0.50	Cum Volume (1000 m3)		0.06	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.25	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	218.56	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	218.54	Reach Len. (m)	33.00	50.00	28.00
Crit W.S. (m)		Flow Area (m2)		0.87	
E.G. Slope (m/m)	0.004575	Area (m2)		2.16	
Q Total (m3/s)	0.46	Flow (m3/s)		0.46	
Top Width (m)	20.80	Top Width (m)		20.80	
Vel Total (m/s)	0.53	Avg. Vel. (m/s)		0.53	
Max Chl Dpth (m)	0.14	Hydr. Depth (m)		0.14	
Conv. Total (m3/s)	6.8	Conv. (m3/s)		6.8	
Length Wtd. (m)	50.00	Wetted Per. (m)		6.00	
Min Ch El (m)	218.40	Shear (N/m2)		6.47	
Alpha	1.00	Stream Power (N/m s)		3.44	
Frctn Loss (m)	0.51	Cum Volume (1000 m3)		0.08	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.29	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	218.59	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	218.57	Reach Len. (m)	33.00	50.00	28.00
Crit W.S. (m)		Flow Area (m2)		1.03	
E.G. Slope (m/m)	0.004682	Area (m2)		2.74	
Q Total (m3/s)	0.62	Flow (m3/s)		0.62	
Top Width (m)	22.44	Top Width (m)		22.44	

Vel Total (m/s)	0.60	Avg. Vel. (m/s)	0.60
Max Chl Dpth (m)	0.17	Hydr. Depth (m)	0.17
Conv. Total (m3/s)	9.1	Conv. (m3/s)	9.1
Length Wtd. (m)	50.00	Wetted Per. (m)	6.00
Min Ch El (m)	218.40	Shear (N/m2)	7.87
Alpha	1.00	Stream Power (N/m s)	4.74
Frctn Loss (m)	0.53	Cum Volume (1000 m3)	0.09
C & E Loss (m)	0.00	Cum SA (1000 m2)	1.34

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	218.60	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	218.57	Reach Len. (m)	33.00	50.00	28.00
Crit W.S. (m)	218.52	Flow Area (m2)		1.05	
E.G. Slope (m/m)	0.006448	Area (m2)		2.81	
Q Total (m3/s)	0.75	Flow (m3/s)		0.75	
Top Width (m)	22.67	Top Width (m)		22.67	
Vel Total (m/s)	0.72	Avg. Vel. (m/s)		0.72	
Max Chl Dpth (m)	0.17	Hydr. Depth (m)		0.17	
Conv. Total (m3/s)	9.3	Conv. (m3/s)		9.3	
Length Wtd. (m)	50.00	Wetted Per. (m)		6.00	
Min Ch El (m)	218.40	Shear (N/m2)		11.03	
Alpha	1.00	Stream Power (N/m s)		7.90	
Frctn Loss (m)	0.53	Cum Volume (1000 m3)		0.11	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.37	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	218.63	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	218.60	Reach Len. (m)	33.00	50.00	28.00
Crit W.S. (m)	218.53	Flow Area (m2)		1.19	
E.G. Slope (m/m)	0.006130	Area (m2)		3.36	
Q Total (m3/s)	0.90	Flow (m3/s)		0.90	
Top Width (m)	24.36	Top Width (m)		24.36	
Vel Total (m/s)	0.76	Avg. Vel. (m/s)		0.76	
Max Chl Dpth (m)	0.20	Hydr. Depth (m)		0.20	
Conv. Total (m3/s)	11.5	Conv. (m3/s)		11.5	
Length Wtd. (m)	50.00	Wetted Per. (m)		6.00	
Min Ch El (m)	218.40	Shear (N/m2)		11.88	
Alpha	1.00	Stream Power (N/m s)		9.02	
Frctn Loss (m)	0.55	Cum Volume (1000 m3)		0.12	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.41	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	218.67	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.035	
W.S. Elev (m)	218.63	Reach Len. (m)	33.00	50.00	28.00
Crit W.S. (m)	218.55	Flow Area (m2)		1.41	
E.G. Slope (m/m)	0.005885	Area (m2)		4.30	
Q Total (m3/s)	1.17	Flow (m3/s)		1.17	
Top Width (m)	27.22	Top Width (m)		27.22	
Vel Total (m/s)	0.83	Avg. Vel. (m/s)		0.83	
Max Chl Dpth (m)	0.23	Hydr. Depth (m)		0.23	
Conv. Total (m3/s)	15.3	Conv. (m3/s)		15.3	
Length Wtd. (m)	50.00	Wetted Per. (m)		6.00	
Min Ch El (m)	218.40	Shear (N/m2)		13.51	
Alpha	1.00	Stream Power (N/m s)		11.25	
Frctn Loss (m)	0.58	Cum Volume (1000 m3)		0.15	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.49	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	218.96	Element	Left OB	Channel	Right OB
Vel Head (m)	0.13	Wt. n-Val.		0.035	
W.S. Elev (m)	218.83	Reach Len. (m)	33.00	50.00	28.00
Crit W.S. (m)	218.76	Flow Area (m2)		2.56	
E.G. Slope (m/m)	0.009687	Area (m2)		10.35	
Q Total (m3/s)	4.09	Flow (m3/s)		4.09	
Top Width (m)	35.63	Top Width (m)		35.63	
Vel Total (m/s)	1.60	Avg. Vel. (m/s)		1.60	
Max Chl Dpth (m)	0.43	Hydr. Depth (m)		0.43	
Conv. Total (m3/s)	41.6	Conv. (m3/s)		41.6	
Length Wtd. (m)	50.00	Wetted Per. (m)		6.00	
Min Ch El (m)	218.40	Shear (N/m2)		40.59	
Alpha	1.00	Stream Power (N/m s)		64.75	
Frctn Loss (m)	0.74	Cum Volume (1000 m3)		0.36	
C & E Loss (m)	0.04	Cum SA (1000 m2)		1.81	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: DUFFINS
REACH: WC37 RS: 10

INPUT
Description: ST 10 (Updated Sep 2016)
Station Elevation Data num= 68

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	219.221	8.786	219	10.386	218.951	11.815	218.909	14.518	218.81
21.128	218.664	26.197	218.5	32.266	218.187	35.781	218	36.835	218
38.73	217.999	41.503	217.999	42.002	217.999	43.314	217.999	44.039	217.999
44.708	217.999	45.762	217.998	46.669	217.998	46.789	217.998	46.904	217.998
48.15	217.998	48.24	217.998	48.343	217.998	49.399	217.999	50.325	217.999
52.169	217.999	52.795	217.999	54.412	218	55.03	218	55.649	218
56.268	218	56.878	218	58.98	218	59.808	218	59.99	218
60.326	218	60.703	218	61.663	218	61.751	218	62.426	218
63.041	218	63.16	218	64.149	218.005	65.165	218.01	65.871	218.025
67.594	218.062	69.317	218.098	71.04	218.134	72.44	218.163	72.763	218.167
74.486	218.194	76.209	218.222	77.932	218.25	79.031	218.268	79.655	218.279
81.378	218.308	82.518	218.328	83.101	218.341	90.395	218.5	97.713	218.923
99.825	219	106.67	219.429	108.452	219.491	109.084	219.5	110.449	219.501
116.598	219.594	123.121	219.688	126.393	219.733				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	26.197	.035	90.395	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
26.197	90.395	0	0	0 .3	.5

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	218.02	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	218.01	Reach Len. (m)			
Crit W.S. (m)	218.01	Flow Area (m2)		0.44	
E.G. Slope (m/m)	0.061763	Area (m2)		0.44	
Q Total (m3/s)	0.19	Flow (m3/s)		0.19	
Top Width (m)	29.88	Top Width (m)		29.88	
Vel Total (m/s)	0.43	Avg. Vel. (m/s)		0.43	
Max Chl Dpth (m)	0.02	Hydr. Depth (m)		0.01	
Conv. Total (m3/s)	0.8	Conv. (m3/s)		0.8	
Length Wtd. (m)		Wetted Per. (m)		29.88	
Min Ch El (m)	218.00	Shear (N/m2)		8.98	
Alpha	1.00	Stream Power (N/m s)		3.85	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	218.04	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	218.02	Reach Len. (m)			
Crit W.S. (m)	218.02	Flow Area (m2)		0.52	
E.G. Slope (m/m)	0.113645	Area (m2)		0.52	
Q Total (m3/s)	0.34	Flow (m3/s)		0.34	
Top Width (m)	30.06	Top Width (m)		30.06	
Vel Total (m/s)	0.65	Avg. Vel. (m/s)		0.65	
Max Chl Dpth (m)	0.02	Hydr. Depth (m)		0.02	
Conv. Total (m3/s)	1.0	Conv. (m3/s)		1.0	
Length Wtd. (m)		Wetted Per. (m)		30.06	
Min Ch El (m)	218.00	Shear (N/m2)		19.45	
Alpha	1.00	Stream Power (N/m s)		12.60	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	218.04	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	218.03	Reach Len. (m)			
Crit W.S. (m)	218.03	Flow Area (m2)		0.87	
E.G. Slope (m/m)	0.039904	Area (m2)		0.87	
Q Total (m3/s)	0.46	Flow (m3/s)		0.46	
Top Width (m)	30.81	Top Width (m)		30.81	
Vel Total (m/s)	0.53	Avg. Vel. (m/s)		0.53	
Max Chl Dpth (m)	0.03	Hydr. Depth (m)		0.03	
Conv. Total (m3/s)	2.3	Conv. (m3/s)		2.3	
Length Wtd. (m)		Wetted Per. (m)		30.81	
Min Ch El (m)	218.00	Shear (N/m2)		11.04	
Alpha	1.00	Stream Power (N/m s)		5.84	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	218.05	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	218.03	Reach Len. (m)			
Crit W.S. (m)	218.03	Flow Area (m2)		1.02	
E.G. Slope (m/m)	0.043182	Area (m2)		1.02	
Q Total (m3/s)	0.62	Flow (m3/s)		0.62	
Top Width (m)	31.12	Top Width (m)		31.12	
Vel Total (m/s)	0.61	Avg. Vel. (m/s)		0.61	
Max Chl Dpth (m)	0.04	Hydr. Depth (m)		0.03	
Conv. Total (m3/s)	3.0	Conv. (m3/s)		3.0	
Length Wtd. (m)		Wetted Per. (m)		31.12	
Min Ch El (m)	218.00	Shear (N/m2)		13.88	
Alpha	1.00	Stream Power (N/m s)		8.44	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	218.06	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	218.05	Reach Len. (m)			
Crit W.S. (m)	218.05	Flow Area (m2)		1.45	
E.G. Slope (m/m)	0.020366	Area (m2)		1.45	
Q Total (m3/s)	0.75	Flow (m3/s)		0.75	
Top Width (m)	32.01	Top Width (m)		32.01	
Vel Total (m/s)	0.52	Avg. Vel. (m/s)		0.52	
Max Chl Dpth (m)	0.05	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	5.3	Conv. (m3/s)		5.3	
Length Wtd. (m)		Wetted Per. (m)		32.01	
Min Ch El (m)	218.00	Shear (N/m2)		9.04	
Alpha	1.00	Stream Power (N/m s)		4.68	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	218.07	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	218.05	Reach Len. (m)			
Crit W.S. (m)	218.05	Flow Area (m2)		1.51	
E.G. Slope (m/m)	0.025634	Area (m2)		1.51	
Q Total (m3/s)	0.90	Flow (m3/s)		0.90	
Top Width (m)	32.13	Top Width (m)		32.13	
Vel Total (m/s)	0.60	Avg. Vel. (m/s)		0.60	
Max Chl Dpth (m)	0.05	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	5.6	Conv. (m3/s)		5.6	
Length Wtd. (m)		Wetted Per. (m)		32.13	
Min Ch El (m)	218.00	Shear (N/m2)		11.82	
Alpha	1.00	Stream Power (N/m s)		7.04	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	218.08	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	218.05	Reach Len. (m)			
Crit W.S. (m)	218.05	Flow Area (m2)		1.64	
E.G. Slope (m/m)	0.033242	Area (m2)		1.64	
Q Total (m3/s)	1.17	Flow (m3/s)		1.17	
Top Width (m)	32.40	Top Width (m)		32.40	
Vel Total (m/s)	0.71	Avg. Vel. (m/s)		0.71	
Max Chl Dpth (m)	0.06	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	6.4	Conv. (m3/s)		6.4	
Length Wtd. (m)		Wetted Per. (m)		32.40	
Min Ch El (m)	218.00	Shear (N/m2)		16.51	
Alpha	1.00	Stream Power (N/m s)		11.77	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	218.17	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	218.12	Reach Len. (m)			
Crit W.S. (m)	218.12	Flow Area (m2)		3.96	
E.G. Slope (m/m)	0.025517	Area (m2)		3.96	
Q Total (m3/s)	4.09	Flow (m3/s)		4.09	
Top Width (m)	36.86	Top Width (m)		36.86	
Vel Total (m/s)	1.03	Avg. Vel. (m/s)		1.03	
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.11	
Conv. Total (m3/s)	25.6	Conv. (m3/s)		25.6	

Length Wtd. (m)		Wetted Per. (m)	36.86
Min Ch El (m)	218.00	Shear (N/m2)	26.91
Alpha	1.00	Stream Power (N/m s)	27.77
Frctn Loss (m)		Cum Volume (1000 m3)	
C & E Loss (m)		Cum SA (1000 m2)	

SUMMARY OF MANNING'S N VALUES

River:DUFFINS

Reach	River Sta.	n1	n2	n3
WC37	300	.07	.035	.07
WC37	200	.07	.035	.07
WC37	150	Culvert		
WC37	100	.07	.035	.07
WC37	10	.07	.035	.07

SUMMARY OF REACH LENGTHS

River: DUFFINS

Reach	River Sta.	Left	Channel	Right
WC37	300	18	28	39
WC37	200	39	40	37
WC37	150	Culvert		
WC37	100	33	50	28
WC37	10	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: DUFFINS

Reach	River Sta.	Contr.	Expan.
WC37	300	.3	.5
WC37	200	.3	.5
WC37	150	Culvert	
WC37	100	.3	.5
WC37	10	.3	.5

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
WC37	300	2-yr	0.19	219.00	219.06		219.06	0.006774	0.34	0.57	10.50	0.46
WC37	300	5-yr	0.34	219.00	219.08		219.09	0.007541	0.43	0.79	10.81	0.51
WC37	300	10-yr	0.46	219.00	219.09		219.10	0.007807	0.49	0.94	11.03	0.53
WC37	300	25-yr	0.62	219.00	219.11		219.13	0.006827	0.52	1.19	11.39	0.52
WC37	300	50-yr	0.75	219.00	219.12		219.14	0.007293	0.57	1.31	11.56	0.54
WC37	300	100-yr	0.90	219.00	219.14		219.16	0.007660	0.62	1.45	11.76	0.56
WC37	300	Check Flow	1.17	219.00	219.16		219.18	0.007488	0.67	1.74	12.15	0.57
WC37	300	Regional	4.09	219.00	219.41		219.44	0.003538	0.77	5.29	17.13	0.44
WC37	200	2-yr	0.19	218.70	218.76	218.74	218.77	0.017461	0.56	0.34	7.54	0.75
WC37	200	5-yr	0.34	218.70	218.79	218.77	218.81	0.014358	0.66	0.51	7.82	0.73
WC37	200	10-yr	0.46	218.70	218.81	218.79	218.83	0.011950	0.71	0.65	8.04	0.69
WC37	200	25-yr	0.62	218.70	218.83	218.80	218.86	0.012325	0.81	0.77	8.23	0.72
WC37	200	50-yr	0.75	218.70	218.85	218.82	218.89	0.010409	0.83	0.91	8.45	0.68
WC37	200	100-yr	0.90	218.70	218.87	218.83	218.91	0.010017	0.88	1.02	8.64	0.68
WC37	200	Check Flow	1.17	218.70	218.90	218.86	218.95	0.009480	0.96	1.22	8.95	0.68
WC37	200	Regional	4.09	218.70	219.15	219.06	219.27	0.008003	1.51	2.71	12.88	0.72
WC37	150		Culvert									
WC37	100	2-yr	0.19	218.40	218.49	218.45	218.50	0.003559	0.35	0.55	14.16	0.37
WC37	100	5-yr	0.34	218.40	218.53		218.54	0.003467	0.43	0.78	19.86	0.38
WC37	100	10-yr	0.46	218.40	218.54		218.56	0.004575	0.53	0.87	20.80	0.45
WC37	100	25-yr	0.62	218.40	218.57		218.59	0.004682	0.60	1.03	22.44	0.47
WC37	100	50-yr	0.75	218.40	218.57	218.52	218.60	0.006448	0.72	1.05	22.67	0.55
WC37	100	100-yr	0.90	218.40	218.60	218.53	218.63	0.006130	0.76	1.19	24.36	0.55
WC37	100	Check Flow	1.17	218.40	218.63	218.55	218.67	0.005885	0.83	1.41	27.22	0.55
WC37	100	Regional	4.09	218.40	218.83	218.76	218.96	0.009687	1.60	2.56	35.63	0.78
WC37	10	2-yr	0.19	218.00	218.01	218.01	218.02	0.061763	0.43	0.44	29.88	1.12
WC37	10	5-yr	0.34	218.00	218.02	218.02	218.04	0.113645	0.65	0.52	30.06	1.57
WC37	10	10-yr	0.46	218.00	218.03	218.03	218.04	0.039904	0.53	0.87	30.81	1.01
WC37	10	25-yr	0.62	218.00	218.03	218.03	218.05	0.043182	0.61	1.02	31.12	1.07
WC37	10	50-yr	0.75	218.00	218.05	218.05	218.06	0.020366	0.52	1.45	32.01	0.78
WC37	10	100-yr	0.90	218.00	218.05	218.05	218.07	0.025634	0.60	1.51	32.13	0.88
WC37	10	Check Flow	1.17	218.00	218.05	218.05	218.08	0.033242	0.71	1.64	32.40	1.01
WC37	10	Regional	4.09	218.00	218.12	218.12	218.17	0.025517	1.03	3.96	36.86	1.00

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (m)	W.S. Elev (m)	Vel Head (m)	Frctn Loss (m)	C & E Loss (m)	Q Left (m3/s)	Q Channel (m3/s)	Q Right (m3/s)	Top Width (m)
WC37	300	2-yr	219.06	219.06	0.01	0.29	0.00		0.19		10.50
WC37	300	5-yr	219.09	219.08	0.01	0.28	0.00		0.34		10.81
WC37	300	10-yr	219.10	219.09	0.01	0.27	0.00		0.46		11.03
WC37	300	25-yr	219.13	219.11	0.01	0.25	0.01		0.62		11.39
WC37	300	50-yr	219.14	219.12	0.02	0.24	0.01		0.75		11.56
WC37	300	100-yr	219.16	219.14	0.02	0.24	0.01		0.90		11.76
WC37	300	Check Flow	219.18	219.16	0.02	0.24	0.01		1.17		12.15
WC37	300	Regional	219.44	219.41	0.03	0.14	0.03		4.09		17.13
WC37	200	2-yr	218.77	218.76	0.02				0.19		7.54
WC37	200	5-yr	218.81	218.79	0.02				0.34		7.82
WC37	200	10-yr	218.83	218.81	0.03				0.46		8.04
WC37	200	25-yr	218.86	218.83	0.03				0.62		8.23
WC37	200	50-yr	218.89	218.85	0.03				0.75		8.45
WC37	200	100-yr	218.91	218.87	0.04				0.90		8.64
WC37	200	Check Flow	218.95	218.90	0.05				1.17		8.95
WC37	200	Regional	219.27	219.15	0.12				4.09		12.88
WC37	150		Culvert								
WC37	100	2-yr	218.50	218.49	0.01	0.46	0.00		0.19		14.16
WC37	100	5-yr	218.54	218.53	0.01	0.50	0.00		0.34		19.86
WC37	100	10-yr	218.56	218.54	0.01	0.51	0.00		0.46		20.80
WC37	100	25-yr	218.59	218.57	0.02	0.53	0.00		0.62		22.44
WC37	100	50-yr	218.60	218.57	0.03	0.53	0.01		0.75		22.67
WC37	100	100-yr	218.63	218.60	0.03	0.55	0.01		0.90		24.36
WC37	100	Check Flow	218.67	218.63	0.04	0.58	0.00		1.17		27.22
WC37	100	Regional	218.96	218.83	0.13	0.74	0.04		4.09		35.63
WC37	10	2-yr	218.02	218.01	0.01				0.19		29.88
WC37	10	5-yr	218.04	218.02	0.02				0.34		30.06
WC37	10	10-yr	218.04	218.03	0.01				0.46		30.81
WC37	10	25-yr	218.05	218.03	0.02				0.62		31.12
WC37	10	50-yr	218.06	218.05	0.01				0.75		32.01
WC37	10	100-yr	218.07	218.05	0.02				0.90		32.13
WC37	10	Check Flow	218.08	218.05	0.03				1.17		32.40
WC37	10	Regional	218.17	218.12	0.05				4.09		36.86

Profile Output Table - Culvert Only

Reach	River Sta	Profile	E.G. US. (m)	W.S. US. (m)	E.G. IC (m)	E.G. OC (m)	Min El Weir Flow (m)	Q Culv Group (m3/s)	Q Weir (m3/s)	Delta WS (m)	Culv Vel US (m/s)	Culv Vel DS (m/s)

WC37	150	Culvert #1	2-yr	218.78	218.76	218.77	218.78	221.21	0.19	0.27	0.57	0.35
WC37	150	Culvert #1	5-yr	218.81	218.79	218.81	218.81	221.21	0.34	0.25	0.72	0.43
WC37	150	Culvert #1	10-yr	218.83	218.81	218.83	218.83	221.21	0.46	0.26	0.81	0.53
WC37	150	Culvert #1	25-yr	218.86	218.83	218.86	218.86	221.21	0.62	0.26	0.91	0.60
WC37	150	Culvert #1	50-yr	218.89	218.85	218.88	218.89	221.21	0.75	0.28	0.98	0.72
WC37	150	Culvert #1	100-yr	218.91	218.87	218.91	218.91	221.21	0.90	0.27	1.05	0.76
WC37	150	Culvert #1	Check Flow	218.95	218.90	218.95	218.95	221.21	1.17	0.27	1.16	0.83
WC37	150	Culvert #1	Regional	219.27	219.15	219.27	219.28	221.21	4.09	0.33	1.88	1.60

DUFFINS CREEK

HEC-RAS ANALYSIS WC#41

EXISTING 407 ETR

EX CULVERT (ø750)mm

EX CULVERT 3 x (ø2250)mm

ST 300	209.07	209.05
	208.73	208.76

208.93	208.94	ST 200
208.68	208.64	

PROP CULV WC#41
SPAN x RISE=(6 x 2.5)m
L=43m, S=1.2%
U/S INV=208.48m
D/S INV=207.97m

PROPOSED 407 TWY

PROP CULV WC#40
DIAMETER = 1.000m

16+300 16+400 16+500 16+600

ST 100	208.32	208.30
	208.12	208.12

ST 10	207.29	207.29
	207.09	207.09

POND ID G-1

LEGEND

- EXISTING 407 ETR
- PROPOSED 407 TWY
- CREEK FLOW DIRECTION
- EXISTING CULVERT
- PROPOSED CULVERT
- PROPOSED REGIONAL FLOODLINE

EX REG	PR REG	HEC ST
EX 100	PR 100	

CROSS SECTION NUMBER

PARSONS HEC-RAS SECTION

PROPOSED WL ELEVATION (m)

EXISTING UPDATED WL ELEVATION (m)

5m 0m 10m 20m 30m

SCALE HORIZONTAL 1:1000

DATE: SEPTEMBER 2016

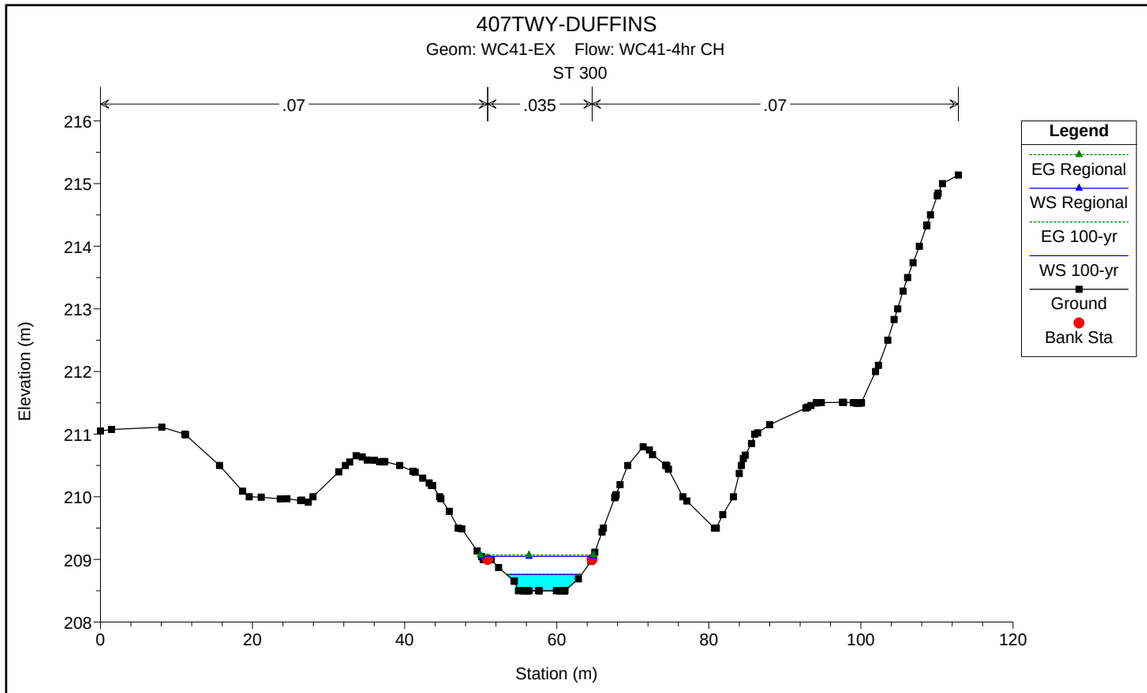
SCALE: 1:1000

Ontario

PARSONS
625 COCHRANE DRIVE, SUITE 500
MARKHAM, ONTARIO L3R 9R9
TEL: 905-943-0500
FAX: 905-943-0400

407 TRANSITWAY FROM KENNEDY RD TO BROCK RD

FIGURE 6.21 - HEC-RAS ANALYSIS - DUFFINS CREEK (WC#41)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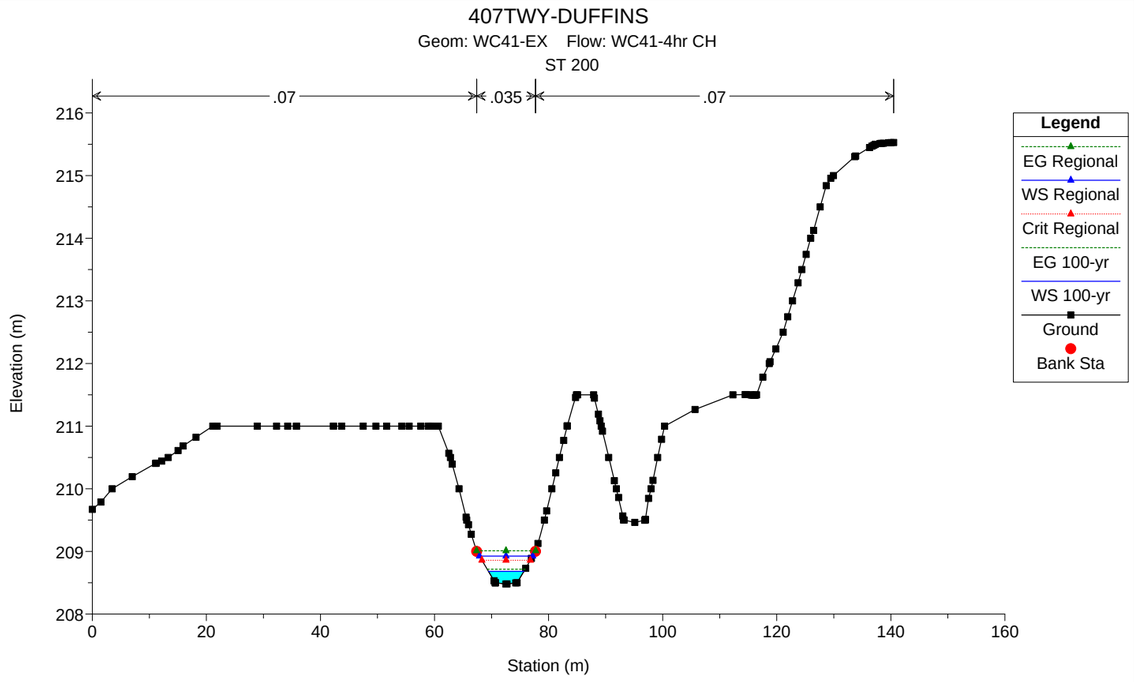
Geom: WC41-EX Flow: WC41-4hr CH
ST 300
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Bank Sta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Geom: WC41-EX Flow: WC41-4hr CH
ST 200
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.035
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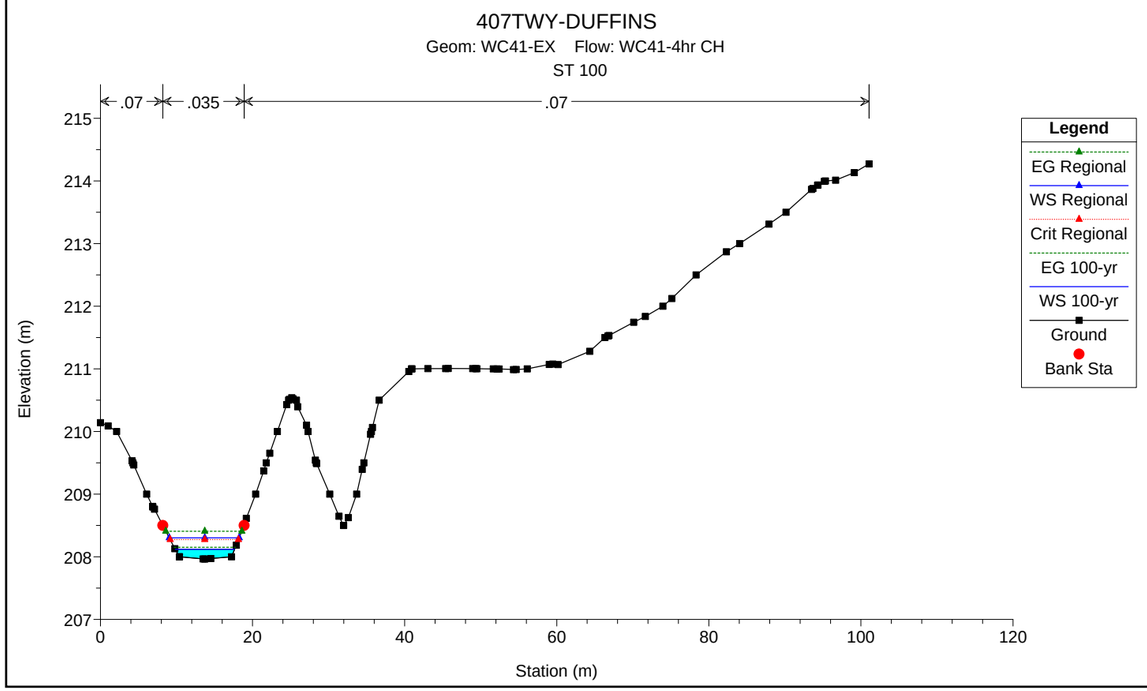
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Ground
Bank Sta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Geom: WC41-EX Flow: WC41-4hr CH
ST 100
.07
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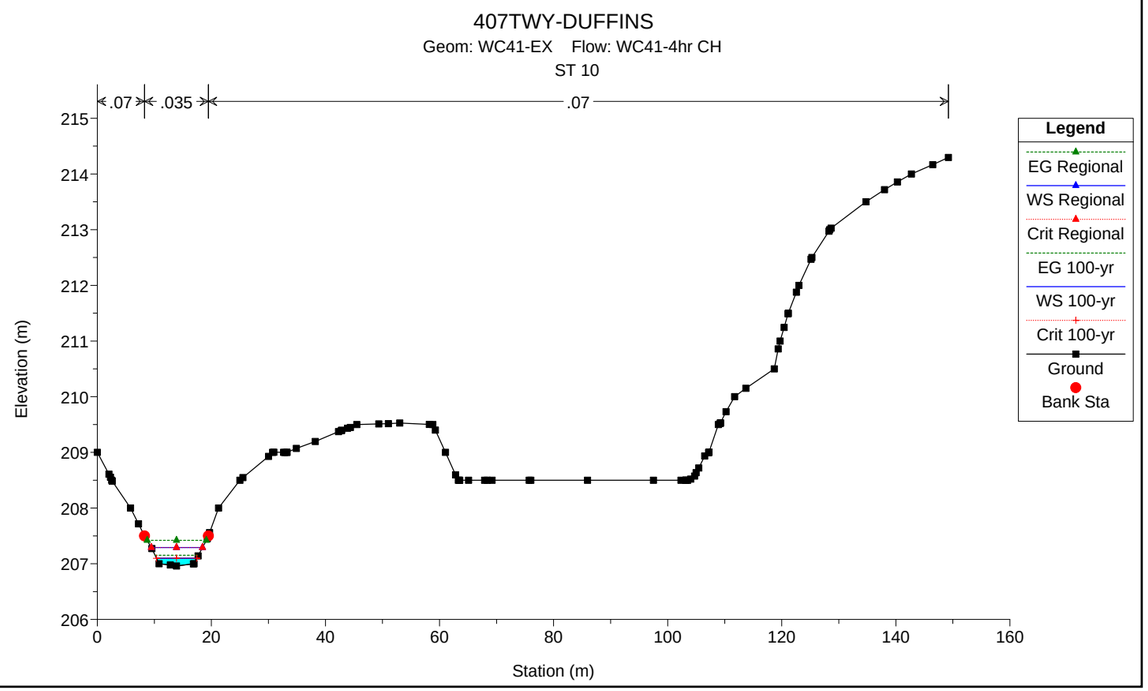
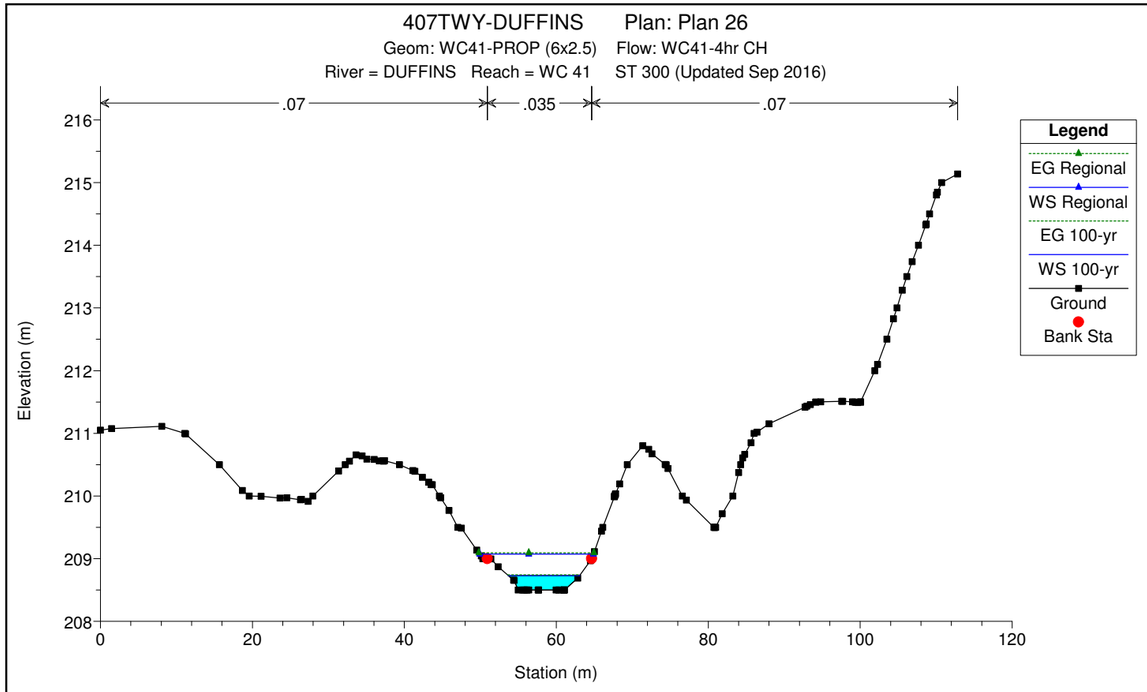
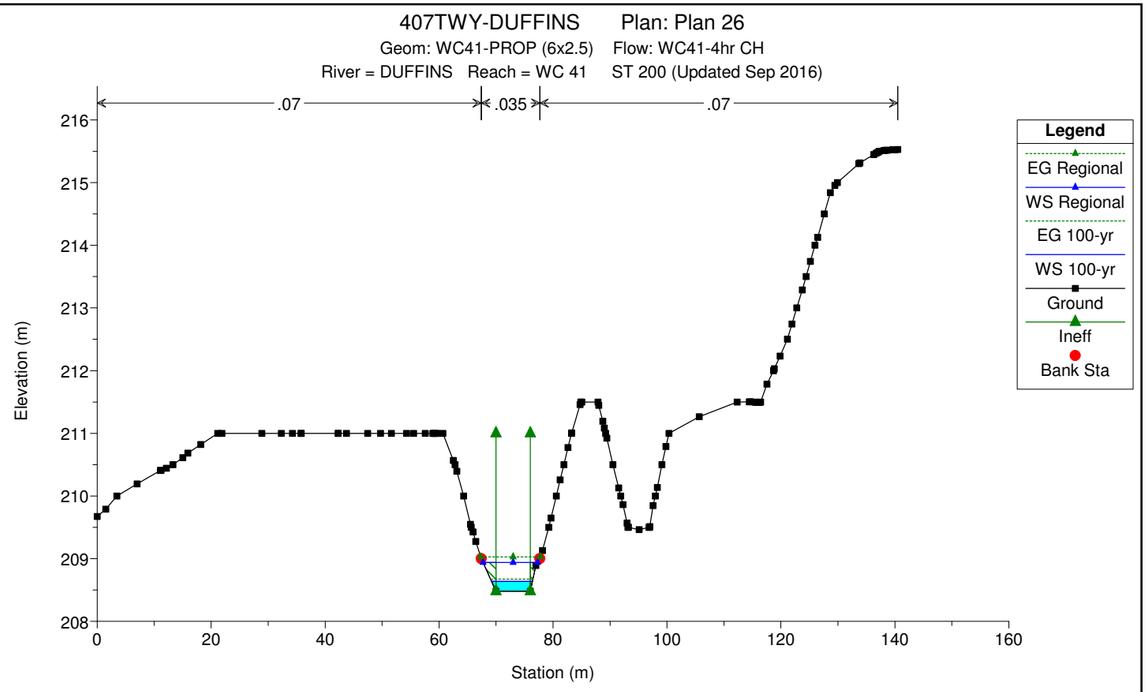
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Ground
Bank Sta

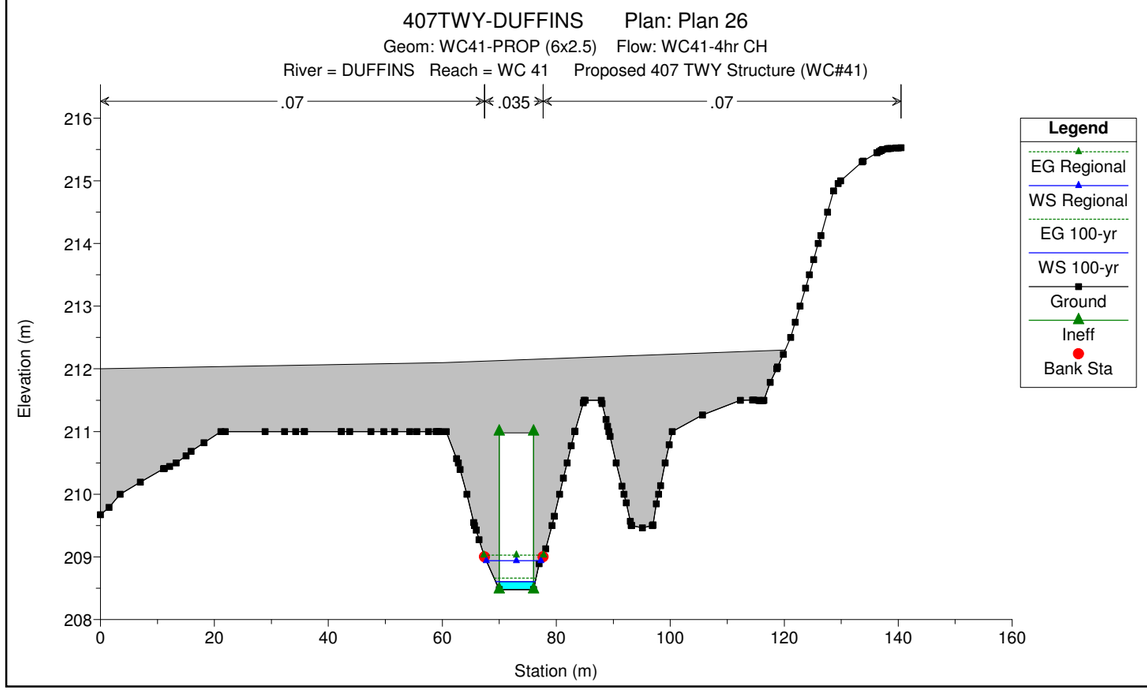

407TWY-DUFFINS
Geom: WC41-EX Flow: WC41-4hr CH
ST 10
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
Crit Regional
EG 100-yr
WS 100-yr
Crit 100-yr
Ground
Bank Sta

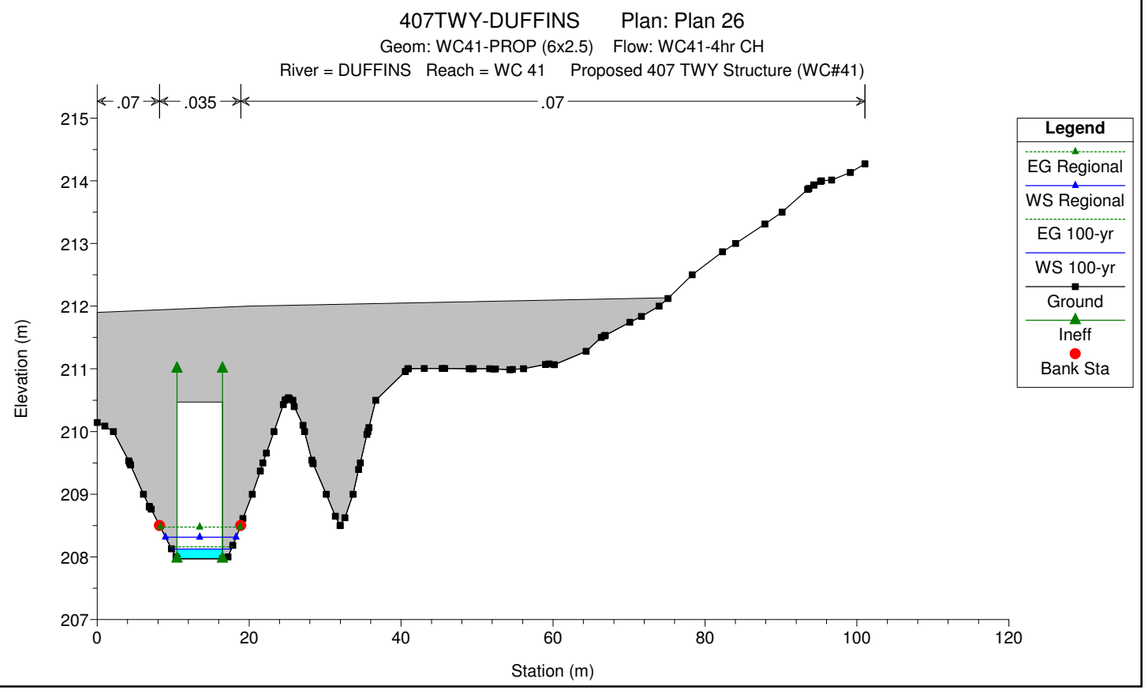
HEC-RAS Plan: WC41 EX 4hr CH River: DUFFINS Reach: WC 41

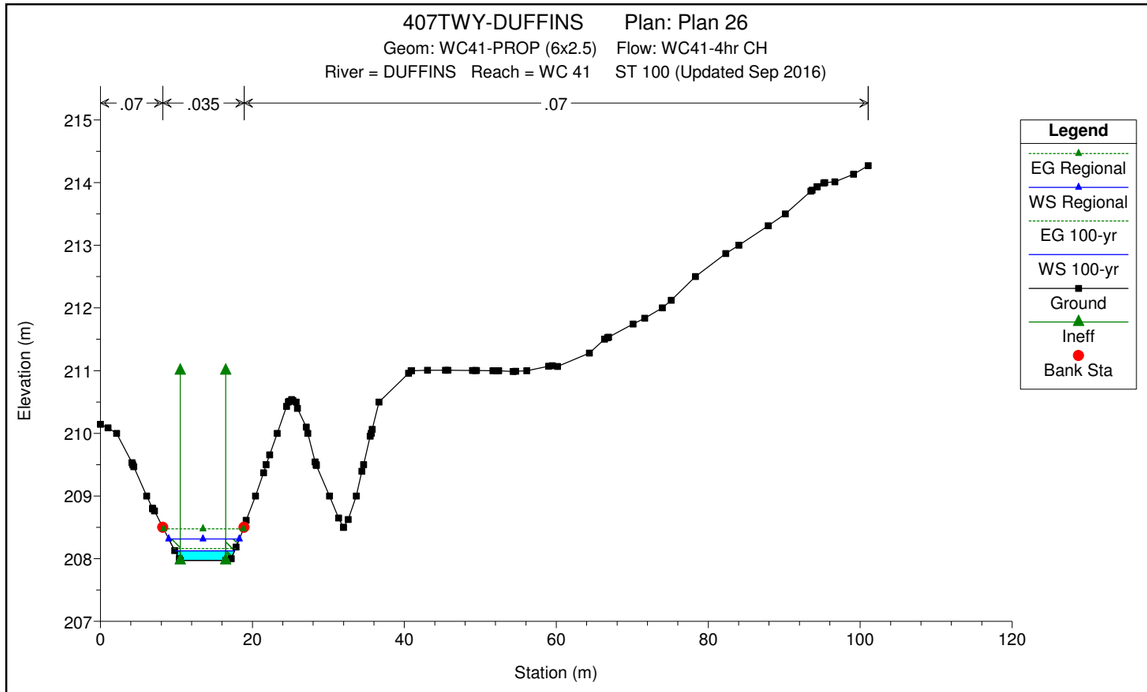
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC 41	300	2-yr	0.20	208.50	208.63		208.63	0.001211	0.23	0.87	7.71	0.22
WC 41	300	5-yr	0.29	208.50	208.66		208.66	0.001199	0.26	1.11	8.16	0.23
WC 41	300	10-yr	0.40	208.50	208.68		208.69	0.001308	0.30	1.35	8.68	0.24
WC 41	300	25-yr	0.55	208.50	208.71		208.72	0.001430	0.34	1.62	9.17	0.26
WC 41	300	50-yr	0.66	208.50	208.74		208.74	0.001472	0.36	1.82	9.50	0.26
WC 41	300	100-yr	0.79	208.50	208.76		208.77	0.001472	0.38	2.06	9.88	0.27
WC 41	300	Check Flow	1.03	208.50	208.80		208.81	0.001554	0.42	2.43	10.43	0.28
WC 41	300	Regional	3.68	208.50	209.05		209.07	0.001848	0.67	5.56	14.72	0.34
WC 41	200	2-yr	0.20	208.48	208.57		208.59	0.011620	0.55	0.36	4.83	0.64
WC 41	200	5-yr	0.29	208.48	208.61		208.62	0.007565	0.54	0.54	5.27	0.54
WC 41	200	10-yr	0.40	208.48	208.63	208.59	208.65	0.008655	0.63	0.64	5.51	0.59
WC 41	200	25-yr	0.55	208.48	208.64		208.67	0.010895	0.75	0.73	5.73	0.67
WC 41	200	50-yr	0.66	208.48	208.66		208.69	0.010659	0.79	0.83	5.96	0.68
WC 41	200	100-yr	0.79	208.48	208.68		208.71	0.011083	0.85	0.93	6.17	0.70
WC 41	200	Check Flow	1.03	208.48	208.71		208.75	0.010302	0.90	1.15	6.61	0.69
WC 41	200	Regional	3.68	208.48	208.93	208.86	209.01	0.009772	1.28	2.88	9.38	0.74
WC 41	100	2-yr	0.20	207.96	208.05		208.06	0.009606	0.44	0.45	7.22	0.56
WC 41	100	5-yr	0.29	207.96	208.05	208.05	208.07	0.016986	0.61	0.48	7.25	0.75
WC 41	100	10-yr	0.40	207.96	208.07		208.09	0.013869	0.64	0.62	7.40	0.71
WC 41	100	25-yr	0.55	207.96	208.10		208.12	0.010710	0.67	0.82	7.62	0.65
WC 41	100	50-yr	0.66	207.96	208.11		208.13	0.011619	0.73	0.90	7.70	0.69
WC 41	100	100-yr	0.79	207.96	208.12		208.15	0.010803	0.77	1.03	7.84	0.67
WC 41	100	Check Flow	1.03	207.96	208.14		208.18	0.012201	0.88	1.17	7.98	0.73
WC 41	100	Regional	3.68	207.96	208.30	208.28	208.41	0.014534	1.45	2.53	9.18	0.88
WC 41	10	2-yr	0.20	206.96	207.03	207.03	207.05	0.036777	0.69	0.29	6.39	1.04
WC 41	10	5-yr	0.29	206.96	207.06	207.06	207.08	0.013048	0.58	0.50	6.71	0.68
WC 41	10	10-yr	0.40	206.96	207.06	207.06	207.09	0.020642	0.75	0.53	6.75	0.86
WC 41	10	25-yr	0.55	206.96	207.07	207.07	207.12	0.028734	0.94	0.59	6.83	1.02
WC 41	10	50-yr	0.66	206.96	207.08	207.08	207.13	0.026206	0.98	0.68	6.95	1.00
WC 41	10	100-yr	0.79	206.96	207.09	207.09	207.15	0.028170	1.07	0.74	7.04	1.05
WC 41	10	Check Flow	1.03	206.96	207.12	207.12	207.18	0.023903	1.11	0.93	7.29	1.00
WC 41	10	Regional	3.68	206.96	207.29	207.29	207.42	0.018946	1.59	2.32	8.99	1.00

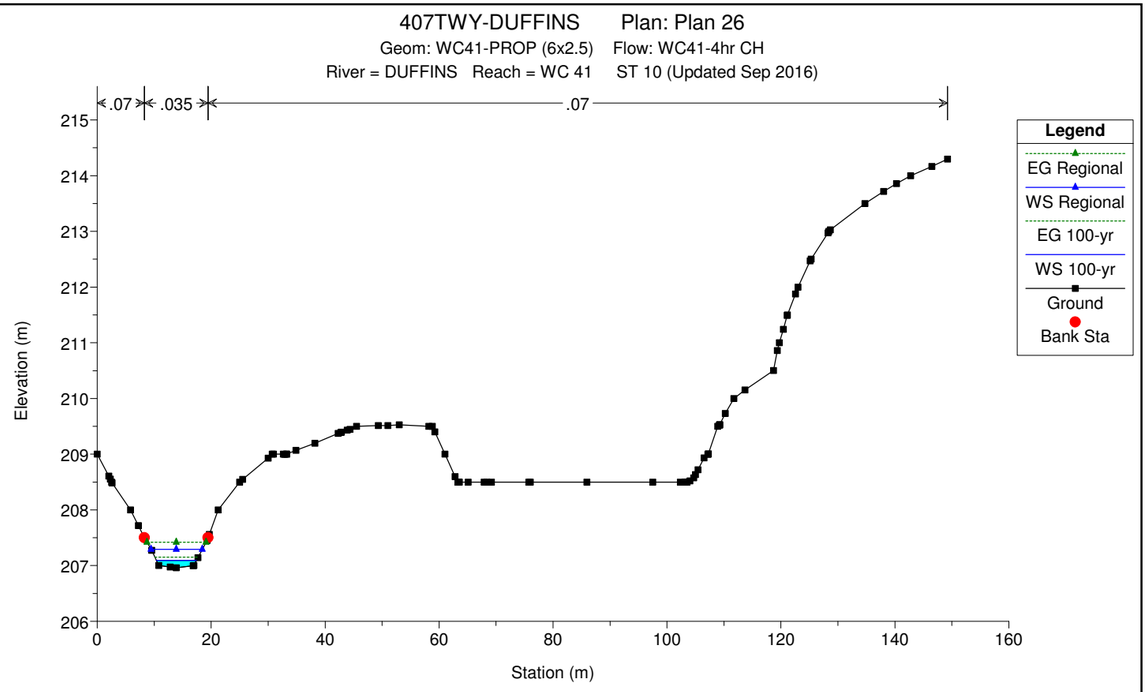

407TWY-DUFFINS Plan: Plan 26
Geom: WC41-PROP (6x2.5) Flow: WC41-4hr CH
River = DUFFINS Reach = WC 41 ST 300 (Updated Sep 2016)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Bank Sta


407TWY-DUFFINS Plan: Plan 26
Geom: WC41-PROP (6x2.5) Flow: WC41-4hr CH
River = DUFFINS Reach = WC 41 ST 200 (Updated Sep 2016)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


407TWY-DUFFINS Plan: Plan 26
Geom: WC41-PROP (6x2.5) Flow: WC41-4hr CH
River = DUFFINS Reach = WC 41 Proposed 407 TWY Structure (WC#41)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


407TWY-DUFFINS Plan: Plan 26
Geom: WC41-PROP (6x2.5) Flow: WC41-4hr CH
River = DUFFINS Reach = WC 41 Proposed 407 TWY Structure (WC#41)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


407TWY-DUFFINS Plan: Plan 26
Geom: WC41-PROP (6x2.5) Flow: WC41-4hr CH
River = DUFFINS Reach = WC 41 ST 100 (Updated Sep 2016)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


407TWY-DUFFINS Plan: Plan 26
Geom: WC41-PROP (6x2.5) Flow: WC41-4hr CH
River = DUFFINS Reach = WC 41 ST 10 (Updated Sep 2016)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Bank Sta

HEC-RAS Plan: WC41 - PROP (4hr CH) River: DUFFINS Reach: WC 41

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC 41	300	2-yr	0.20	208.50	208.61		208.62	0.001761	0.26	0.77	7.54	0.26
WC 41	300	5-yr	0.29	208.50	208.64		208.64	0.001808	0.30	0.97	7.88	0.27
WC 41	300	10-yr	0.40	208.50	208.66		208.67	0.002109	0.35	1.14	8.23	0.30
WC 41	300	25-yr	0.55	208.50	208.69		208.70	0.002265	0.40	1.39	8.77	0.32
WC 41	300	50-yr	0.66	208.50	208.71		208.72	0.002310	0.42	1.56	9.07	0.33
WC 41	300	100-yr	0.79	208.50	208.73		208.74	0.002287	0.45	1.77	9.42	0.33
WC 41	300	Check Flow	1.03	208.50	208.77		208.78	0.002259	0.48	2.13	9.99	0.33
WC 41	300	Regional	3.68	208.50	209.07		209.09	0.001531	0.63	5.90	14.94	0.31
WC 41	200	2-yr	0.20	208.48	208.54	208.52	208.56	0.014311	0.54	0.37	6.46	0.69
WC 41	200	5-yr	0.29	208.48	208.56	208.54	208.58	0.014628	0.63	0.46	6.57	0.72
WC 41	200	10-yr	0.40	208.48	208.58	208.55	208.60	0.012195	0.67	0.59	6.73	0.69
WC 41	200	25-yr	0.55	208.48	208.60	208.57	208.63	0.012540	0.77	0.71	6.88	0.72
WC 41	200	50-yr	0.66	208.48	208.62	208.59	208.65	0.010475	0.79	0.84	7.04	0.67
WC 41	200	100-yr	0.79	208.48	208.64	208.60	208.67	0.010202	0.84	0.94	7.16	0.68
WC 41	200	Check Flow	1.03	208.48	208.67	208.62	208.71	0.009473	0.91	1.13	7.40	0.67
WC 41	200	Regional	3.68	208.48	208.94	208.82	209.03	0.006226	1.34	2.75	9.59	0.63
WC 41	150		Culvert									
WC 41	100	2-yr	0.20	207.97	208.04		208.05	0.009309	0.47	0.42	7.17	0.57
WC 41	100	5-yr	0.29	207.97	208.04	208.03	208.06	0.021239	0.70	0.41	7.16	0.85
WC 41	100	10-yr	0.40	207.97	208.07		208.09	0.013503	0.70	0.58	7.38	0.72
WC 41	100	25-yr	0.55	207.97	208.09		208.12	0.010856	0.74	0.74	7.60	0.67
WC 41	100	50-yr	0.66	207.97	208.11		208.14	0.011619	0.81	0.81	7.70	0.70
WC 41	100	100-yr	0.79	207.97	208.12		208.16	0.011182	0.86	0.92	7.83	0.71
WC 41	100	Check Flow	1.03	207.97	208.14		208.19	0.012474	0.99	1.04	7.99	0.76
WC 41	100	Regional	3.68	207.97	208.32	208.31	208.48	0.015911	1.77	2.07	9.30	0.96
WC 41	10	2-yr	0.20	206.96	207.03	207.03	207.05	0.036924	0.69	0.29	6.39	1.05
WC 41	10	5-yr	0.29	206.96	207.06	207.06	207.08	0.013048	0.58	0.50	6.71	0.68
WC 41	10	10-yr	0.40	206.96	207.06	207.06	207.09	0.021194	0.76	0.53	6.74	0.87
WC 41	10	25-yr	0.55	206.96	207.07	207.07	207.12	0.028952	0.94	0.58	6.82	1.03
WC 41	10	50-yr	0.66	206.96	207.09	207.09	207.13	0.026190	0.98	0.68	6.95	1.00
WC 41	10	100-yr	0.79	206.96	207.09	207.09	207.15	0.028170	1.07	0.74	7.04	1.05
WC 41	10	Check Flow	1.03	206.96	207.12	207.12	207.18	0.023849	1.11	0.93	7.29	1.00
WC 41	10	Regional	3.68	206.96	207.29	207.29	207.42	0.018926	1.59	2.32	8.99	1.00

HEC-RAS HEC-RAS 5.0.1 April 2016
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
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PROJECT DATA
Project Title: 407TWY-DUFFINS
Project File : 407TWY-DUFFINS.prj
Run Date and Time: 9/21/2016 1:41:07 PM

Project in SI units

Project Description:
HEC-RAS Model created for 407 TWY project from Kennedy Rd. to Brock Rd. -
Duffins Creek Watershed

PLAN DATA

Plan Title: Plan 26
Plan File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.p26

Geometry Title: WC41-PROP (6x2.5)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.g21

Flow Title   : WC41-4hr CH
Flow File   : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.f12

Plan Summary Information:
Number of: Cross Sections = 4   Multiple Openings = 0
            Culverts   = 1   Inline Structures = 0
            Bridges   = 0   Lateral Structures = 0

Computational Information
    Water surface calculation tolerance = 0.01
    Critical depth calculation tolerance = 0.01
    Maximum number of iterations   = 20
    Maximum difference tolerance   = 0.3
    Flow tolerance factor   = 0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method: Average Conveyance
    Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: WC41-4hr CH
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.f12

Flow Data (m3/s)

River	Reach	RS	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Check Flow	Regional
DUFFINS	WC 41	300	.2	.29	.4	.55	.66	.79	1.03	3.68

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
DUFFINS	WC 41	2-yr		Critical
DUFFINS	WC 41	5-yr		Critical
DUFFINS	WC 41	10-yr		Critical
DUFFINS	WC 41	25-yr		Critical
DUFFINS	WC 41	50-yr		Critical
DUFFINS	WC 41	100-yr		Critical
DUFFINS	WC 41	Check Flow		Critical
DUFFINS	WC 41	Regional		Critical

GEOMETRY DATA

Geometry Title: WC41-PROP (6x2.5)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.g21

CROSS SECTION

RIVER: DUFFINS
REACH: WC 41   RS: 300

INPUT
Description: ST 300 (Updated Sep 2016)
Station Elevation Data   num=   138

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	211.051	1.458	211.074	8.067	211.11	11.103	211	11.189	210.99
15.652	210.5	18.697	210.088	19.564	210	21.13	209.994	23.65	209.965
24.518	209.97	26.315	209.94	26.404	209.943	26.466	209.946	27.331	209.914
27.941	210	31.356	210.399	32.22	210.5	32.777	210.554	33.631	210.656
34.422	210.638	35.085	210.586	36.025	210.583	36.705	210.56	37.197	210.561
37.208	210.559	37.231	210.558	37.253	210.557	37.395	210.563	39.352	210.5
41.104	210.407	41.382	210.392	42.379	210.298	43.216	210.222	43.518	210.182
43.683	210.18	44.605	210	44.768	209.969	45.882	209.769	47.043	209.5
47.518	209.488	49.525	209.135	50.132	209.043	50.327	209	50.398	208.998
50.923	208.998	51.384	208.996	52.346	208.871	54.377	208.655	54.435	208.652
54.965	208.5	55.532	208.5	55.697	208.5	55.836	208.5	56.125	208.5
56.128	208.5	56.363	208.498	57.61	208.5	57.663	208.5	57.683	208.5
59.952	208.5	60.29	208.5	60.374	208.5	61.008	208.5	61.017	208.5
61.041	208.5	61.044	208.5	61.071	208.5	62.842	208.69	64.494	208.968
64.602	208.985	64.665	209	64.734	209.023	65.013	209.114	65.95	209.438
66.13	209.5	67.637	209.986	67.642	209.989	67.675	210	67.749	210.019
67.807	210.034	68.332	210.194	69.334	210.5	71.369	210.799	72.176	210.746
72.59	210.674	74.328	210.504	74.427	210.5	74.447	210.496	74.685	210.44
76.585	210	77.106	209.933	80.73	209.5	80.807	209.5	80.853	209.5
80.883	209.5	80.977	209.5	81.826	209.715	83.23	210	83.999	210.373
84.264	210.5	84.536	210.608	84.79	210.665	85.615	210.85	86.03	211
86.414	211.02	88.002	211.152	92.757	211.418	92.988	211.432	93.434	211.458
94.132	211.5	94.17	211.5	94.789	211.504	97.571	211.509	97.711	211.509
98.99	211.502	99.3	211.5	99.41	211.496	99.677	211.489	100.049	211.5
100.054	211.5	100.061	211.502	101.91	212	102.296	212.098	103.523	212.5
104.364	212.83	104.832	213	105.542	213.284	106.136	213.5	106.845	213.738
107.675	214	108.638	214.325	108.682	214.338	109.142	214.5	110.032	214.805
110.148	214.846	110.725	215	112.805	215.138				

Manning's n Values   num=   3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	50.923	.035	64.665	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
50.923	64.665	10	15	17	.3	.5

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	208.62	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	208.61	Reach Len. (m)	10.00	15.00	17.00
Crit W.S. (m)		Flow Area (m2)		0.77	
E.G. Slope (m/m)	0.001761	Area (m2)		0.77	
Q Total (m3/s)	0.20	Flow (m3/s)		0.20	
Top Width (m)	7.54	Top Width (m)		7.54	
Vel Total (m/s)	0.26	Avg. Vel. (m/s)		0.26	
Max Chl Dpth (m)	0.11	Hydr. Depth (m)		0.10	
Conv. Total (m3/s)	4.8	Conv. (m3/s)		4.8	
Length Wtd. (m)	15.00	Wetted Per. (m)		7.57	
Min Ch El (m)	208.50	Shear (N/m2)		1.75	
Alpha	1.00	Stream Power (N/m s)		0.46	
Frctn Loss (m)	0.06	Cum Volume (1000 m3)		0.05	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.86	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	208.64	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	208.64	Reach Len. (m)	10.00	15.00	17.00
Crit W.S. (m)		Flow Area (m2)		0.97	
E.G. Slope (m/m)	0.001808	Area (m2)		0.97	
Q Total (m3/s)	0.29	Flow (m3/s)		0.29	
Top Width (m)	7.88	Top Width (m)		7.88	
Vel Total (m/s)	0.30	Avg. Vel. (m/s)		0.30	
Max Chl Dpth (m)	0.14	Hydr. Depth (m)		0.12	
Conv. Total (m3/s)	6.8	Conv. (m3/s)		6.8	
Length Wtd. (m)	15.00	Wetted Per. (m)		7.90	
Min Ch El (m)	208.50	Shear (N/m2)		2.17	
Alpha	1.00	Stream Power (N/m s)		0.65	
Frctn Loss (m)	0.06	Cum Volume (1000 m3)		0.06	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.87	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	208.67	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	208.66	Reach Len. (m)	10.00	15.00	17.00
Crit W.S. (m)		Flow Area (m2)		1.14	
E.G. Slope (m/m)	0.002109	Area (m2)		1.14	
Q Total (m3/s)	0.40	Flow (m3/s)		0.40	
Top Width (m)	8.23	Top Width (m)		8.23	
Vel Total (m/s)	0.35	Avg. Vel. (m/s)		0.35	
Max Chl Dpth (m)	0.16	Hydr. Depth (m)		0.14	
Conv. Total (m3/s)	8.7	Conv. (m3/s)		8.7	
Length Wtd. (m)	15.00	Wetted Per. (m)		8.26	
Min Ch El (m)	208.50	Shear (N/m2)		2.86	
Alpha	1.00	Stream Power (N/m s)		1.00	
Frctn Loss (m)	0.06	Cum Volume (1000 m3)		0.07	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.90	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	208.70	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	208.69	Reach Len. (m)	10.00	15.00	17.00
Crit W.S. (m)		Flow Area (m2)		1.39	
E.G. Slope (m/m)	0.002265	Area (m2)		1.39	
Q Total (m3/s)	0.55	Flow (m3/s)		0.55	
Top Width (m)	8.77	Top Width (m)		8.77	
Vel Total (m/s)	0.40	Avg. Vel. (m/s)		0.40	
Max Chl Dpth (m)	0.19	Hydr. Depth (m)		0.16	
Conv. Total (m3/s)	11.6	Conv. (m3/s)		11.6	
Length Wtd. (m)	15.00	Wetted Per. (m)		8.80	
Min Ch El (m)	208.50	Shear (N/m2)		3.50	
Alpha	1.00	Stream Power (N/m s)		1.39	
Frctn Loss (m)	0.07	Cum Volume (1000 m3)		0.09	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.92	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	208.72	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	208.71	Reach Len. (m)	10.00	15.00	17.00
Crit W.S. (m)		Flow Area (m2)		1.56	
E.G. Slope (m/m)	0.002310	Area (m2)		1.56	
Q Total (m3/s)	0.66	Flow (m3/s)		0.66	
Top Width (m)	9.07	Top Width (m)		9.07	
Vel Total (m/s)	0.42	Avg. Vel. (m/s)		0.42	
Max Chl Dpth (m)	0.21	Hydr. Depth (m)		0.17	
Conv. Total (m3/s)	13.7	Conv. (m3/s)		13.7	
Length Wtd. (m)	15.00	Wetted Per. (m)		9.11	
Min Ch El (m)	208.50	Shear (N/m2)		3.88	
Alpha	1.00	Stream Power (N/m s)		1.64	
Frctn Loss (m)	0.06	Cum Volume (1000 m3)		0.10	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.94	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	208.74	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	208.73	Reach Len. (m)	10.00	15.00	17.00
Crit W.S. (m)		Flow Area (m2)		1.77	
E.G. Slope (m/m)	0.002287	Area (m2)		1.77	
Q Total (m3/s)	0.79	Flow (m3/s)		0.79	
Top Width (m)	9.42	Top Width (m)		9.42	
Vel Total (m/s)	0.45	Avg. Vel. (m/s)		0.45	
Max Chl Dpth (m)	0.23	Hydr. Depth (m)		0.19	
Conv. Total (m3/s)	16.5	Conv. (m3/s)		16.5	
Length Wtd. (m)	15.00	Wetted Per. (m)		9.46	
Min Ch El (m)	208.50	Shear (N/m2)		4.19	
Alpha	1.00	Stream Power (N/m s)		1.87	
Frctn Loss (m)	0.06	Cum Volume (1000 m3)		0.12	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.95	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	208.78	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	208.77	Reach Len. (m)	10.00	15.00	17.00
Crit W.S. (m)		Flow Area (m2)		2.13	
E.G. Slope (m/m)	0.002259	Area (m2)		2.13	
Q Total (m3/s)	1.03	Flow (m3/s)		1.03	
Top Width (m)	9.99	Top Width (m)		9.99	
Vel Total (m/s)	0.48	Avg. Vel. (m/s)		0.48	
Max Chl Dpth (m)	0.27	Hydr. Depth (m)		0.21	
Conv. Total (m3/s)	21.7	Conv. (m3/s)		21.7	
Length Wtd. (m)	15.00	Wetted Per. (m)		10.04	

Min Ch El (m)	208.50	Shear (N/m2)	4.70
Alpha	1.00	Stream Power (N/m s)	2.27
Frctn Loss (m)	0.06	Cum Volume (1000 m3)	0.14
C & E Loss (m)	0.01	Cum SA (1000 m2)	0.98

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	209.09	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.	0.070	0.035	0.070
W.S. Elev (m)	209.07	Reach Len. (m)	10.00	15.00	17.00
Crit W.S. (m)		Flow Area (m2)	0.06	5.84	0.01
E.G. Slope (m/m)	0.001531	Area (m2)	0.06	5.84	0.01
Q Total (m3/s)	3.68	Flow (m3/s)	0.00	3.67	0.00
Top Width (m)	14.94	Top Width (m)	0.98	13.74	0.22
Vel Total (m/s)	0.62	Avg. Vel. (m/s)	0.08	0.63	0.06
Max Chl Dpth (m)	0.57	Hydr. Depth (m)	0.06	0.42	0.04
Conv. Total (m3/s)	94.0	Conv. (m3/s)	0.1	93.9	0.0
Length Wtd. (m)	15.00	Wetted Per. (m)	0.99	13.82	0.23
Min Ch El (m)	208.50	Shear (N/m2)	0.86	6.34	0.51
Alpha	1.02	Stream Power (N/m s)	0.07	3.99	0.03
Frctn Loss (m)	0.04	Cum Volume (1000 m3)	0.00	0.33	0.00
C & E Loss (m)	0.02	Cum SA (1000 m2)	0.00	1.21	0.00

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: DUFFINS
REACH: WC 41 RS: 200

INPUT
Description: ST 200 (Updated Sep 2016)
Station Elevation Data num= 119

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	209.671	1.505	209.789	3.473	210	6.986	210.193	11.091	210.406
11.208	210.41	12.145	210.441	13.301	210.5	15.023	210.611	15.908	210.684
18.181	210.822	21.125	211	21.884	211	28.905	211	32.292	211
34.254	211	35.786	211	35.794	211	42.263	211	42.296	211
43.731	211	47.485	211	49.719	211	51.613	211	54.272	211
55.552	211	57.59	211	58.898	211	59.048	211	59.362	211
59.586	211	60.66	211	62.502	210.567	62.794	210.5	63.095	210.393
64.298	210	65.522	209.547	65.636	209.5	65.958	209.428	66.43	209.274
67.398	209	70	208.48	76	208.48	76.988	208.889	77.699	209
78.131	209.127	79.257	209.5	79.649	209.647	80.564	210	81.242	210.255
81.903	210.5	82.637	210.772	83.254	211	83.272	211.006	84.734	211.457
84.873	211.5	85.072	211.5	87.893	211.5	88.033	211.447	88.734	211.192
89.004	211.085	89.224	211	89.436	210.92	90.517	210.5	91.533	210.129
91.885	210	92.269	209.861	93.002	209.566	93.154	209.505	93.178	209.5
93.216	209.5	95.099	209.464	96.852	209.498	96.947	209.5	96.976	209.513
97.53	209.847	97.97	210	98.307	210.136	99.124	210.5	99.798	210.79
100.326	211	105.665	211.266	112.302	211.5	114.455	211.504	114.664	211.504
115.442	211.5	115.636	211.495	115.919	211.493	116.108	211.493	116.283	211.496
116.445	211.5	117.551	211.783	118.695	212	118.83	212.029	119.831	212.231
121.129	212.5	121.918	212.745	122.759	213	123.735	213.289	124.394	213.5
125.16	213.742	125.958	214	126.466	214.125	127.61	214.5	128.671	214.838
129.476	214.958	129.925	215	133.675	215.302	133.83	215.313	136.273	215.447
136.687	215.47	137.013	215.484	137.28	215.5	138.115	215.513	138.337	215.515
138.693	215.517	139.619	215.524	140.013	215.526	140.486	215.528		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	67.398	.035	77.699	.07

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
67.398 77.699 10 51 53 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	70	211	T
76	140.486	211	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	208.56	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	208.54	Reach Len. (m)	10.00	51.00	53.00
Crit W.S. (m)	208.52	Flow Area (m2)		0.37	
E.G. Slope (m/m)	0.014311	Area (m2)		0.39	
Q Total (m3/s)	0.20	Flow (m3/s)		0.20	
Top Width (m)	6.46	Top Width (m)		6.46	
Vel Total (m/s)	0.54	Avg. Vel. (m/s)		0.54	
Max Chl Dpth (m)	0.06	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	1.7	Conv. (m3/s)		1.7	
Length Wtd. (m)	51.00	Wetted Per. (m)		6.00	
Min Ch El (m)	208.48	Shear (N/m2)		8.72	
Alpha	1.00	Stream Power (N/m s)		4.68	
Frctn Loss (m)		Cum Volume (1000 m3)		0.04	
C & E Loss (m)		Cum SA (1000 m2)		0.75	

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	208.58	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	208.56	Reach Len. (m)	10.00	51.00	53.00
Crit W.S. (m)	208.54	Flow Area (m2)		0.46	
E.G. Slope (m/m)	0.014628	Area (m2)		0.49	
Q Total (m3/s)	0.29	Flow (m3/s)		0.29	
Top Width (m)	6.57	Top Width (m)		6.57	
Vel Total (m/s)	0.63	Avg. Vel. (m/s)		0.63	
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	2.4	Conv. (m3/s)		2.4	
Length Wtd. (m)	51.00	Wetted Per. (m)		6.00	
Min Ch El (m)	208.48	Shear (N/m2)		11.07	
Alpha	1.00	Stream Power (N/m s)		6.93	
Frctn Loss (m)		Cum Volume (1000 m3)		0.05	
C & E Loss (m)		Cum SA (1000 m2)		0.77	

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	208.60	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	208.58	Reach Len. (m)	10.00	51.00	53.00
Crit W.S. (m)	208.55	Flow Area (m2)		0.59	
E.G. Slope (m/m)	0.012195	Area (m2)		0.63	
Q Total (m3/s)	0.40	Flow (m3/s)		0.40	
Top Width (m)	6.73	Top Width (m)		6.73	
Vel Total (m/s)	0.67	Avg. Vel. (m/s)		0.67	
Max Chl Dpth (m)	0.10	Hydr. Depth (m)		0.10	
Conv. Total (m3/s)	3.6	Conv. (m3/s)		3.6	
Length Wtd. (m)	51.00	Wetted Per. (m)		6.00	
Min Ch El (m)	208.48	Shear (N/m2)		11.82	
Alpha	1.00	Stream Power (N/m s)		7.97	
Frctn Loss (m)		Cum Volume (1000 m3)		0.06	
C & E Loss (m)		Cum SA (1000 m2)		0.78	

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	208.63	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	208.60	Reach Len. (m)	10.00	51.00	53.00
Crit W.S. (m)	208.57	Flow Area (m2)		0.71	
E.G. Slope (m/m)	0.012540	Area (m2)		0.76	
Q Total (m3/s)	0.55	Flow (m3/s)		0.55	
Top Width (m)	6.88	Top Width (m)		6.88	
Vel Total (m/s)	0.77	Avg. Vel. (m/s)		0.77	

Max Chl Dpth (m)	0.12	Hydr. Depth (m)	0.12
Conv. Total (m3/s)	4.9	Conv. (m3/s)	4.9
Length Wtd. (m)	51.00	Wetted Per. (m)	6.00
Min Ch El (m)	208.48	Shear (N/m2)	14.59
Alpha	1.00	Stream Power (N/m s)	11.27
Frctn Loss (m)		Cum Volume (1000 m3)	0.07
C & E Loss (m)		Cum SA (1000 m2)	0.80

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	208.65	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	208.62	Reach Len. (m)	10.00	51.00	53.00
Crit W.S. (m)	208.59	Flow Area (m2)		0.84	
E.G. Slope (m/m)	0.010475	Area (m2)		0.91	
Q Total (m3/s)	0.66	Flow (m3/s)		0.66	
Top Width (m)	7.04	Top Width (m)		7.04	
Vel Total (m/s)	0.79	Avg. Vel. (m/s)		0.79	
Max Chl Dpth (m)	0.14	Hydr. Depth (m)		0.14	
Conv. Total (m3/s)	6.4	Conv. (m3/s)		6.4	
Length Wtd. (m)	51.00	Wetted Per. (m)		6.00	
Min Ch El (m)	208.48	Shear (N/m2)		14.35	
Alpha	1.00	Stream Power (N/m s)		11.30	
Frctn Loss (m)		Cum Volume (1000 m3)		0.08	
C & E Loss (m)		Cum SA (1000 m2)		0.82	

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	208.67	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.035	
W.S. Elev (m)	208.64	Reach Len. (m)	10.00	51.00	53.00
Crit W.S. (m)	208.60	Flow Area (m2)		0.94	
E.G. Slope (m/m)	0.010202	Area (m2)		1.03	
Q Total (m3/s)	0.79	Flow (m3/s)		0.79	
Top Width (m)	7.16	Top Width (m)		7.16	
Vel Total (m/s)	0.84	Avg. Vel. (m/s)		0.84	
Max Chl Dpth (m)	0.16	Hydr. Depth (m)		0.16	
Conv. Total (m3/s)	7.8	Conv. (m3/s)		7.8	
Length Wtd. (m)	51.00	Wetted Per. (m)		6.00	
Min Ch El (m)	208.48	Shear (N/m2)		15.69	
Alpha	1.00	Stream Power (N/m s)		13.17	
Frctn Loss (m)		Cum Volume (1000 m3)		0.09	
C & E Loss (m)		Cum SA (1000 m2)		0.83	

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	208.71	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.035	
W.S. Elev (m)	208.67	Reach Len. (m)	10.00	51.00	53.00
Crit W.S. (m)	208.62	Flow Area (m2)		1.13	
E.G. Slope (m/m)	0.009473	Area (m2)		1.26	
Q Total (m3/s)	1.03	Flow (m3/s)		1.03	
Top Width (m)	7.40	Top Width (m)		7.40	
Vel Total (m/s)	0.91	Avg. Vel. (m/s)		0.91	
Max Chl Dpth (m)	0.19	Hydr. Depth (m)		0.19	
Conv. Total (m3/s)	10.6	Conv. (m3/s)		10.6	
Length Wtd. (m)	51.00	Wetted Per. (m)		6.00	
Min Ch El (m)	208.48	Shear (N/m2)		17.47	
Alpha	1.00	Stream Power (N/m s)		15.95	
Frctn Loss (m)		Cum Volume (1000 m3)		0.11	
C & E Loss (m)		Cum SA (1000 m2)		0.85	

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	209.03	Element	Left OB	Channel	Right OB
Vel Head (m)	0.09	Wt. n-Val.		0.035	
W.S. Elev (m)	208.94	Reach Len. (m)	10.00	51.00	53.00
Crit W.S. (m)	208.82	Flow Area (m2)		2.75	
E.G. Slope (m/m)	0.006226	Area (m2)		3.53	
Q Total (m3/s)	3.68	Flow (m3/s)		3.68	
Top Width (m)	9.59	Top Width (m)		9.59	
Vel Total (m/s)	1.34	Avg. Vel. (m/s)		1.34	
Max Chl Dpth (m)	0.46	Hydr. Depth (m)		0.46	
Conv. Total (m3/s)	46.6	Conv. (m3/s)		46.6	
Length Wtd. (m)	51.00	Wetted Per. (m)		6.00	
Min Ch El (m)	208.48	Shear (N/m2)		27.96	
Alpha	1.00	Stream Power (N/m s)		37.45	
Frctn Loss (m)		Cum Volume (1000 m3)		0.26	
C & E Loss (m)		Cum SA (1000 m2)		1.03	

CULVERT

RIVER: DUFFINS
REACH: WC 41 RS: 150

INPUT
Description: Proposed 407 TWY Structure (WC#41)
Distance from Upstream XS = 11
Deck/Roadway Width = 16
Weir Coefficient = 1.4
Upstream Deck/Roadway Coordinates
num= 4

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0	212	60	212.1	120	212.3
140	212.6				

Upstream Bridge Cross Section Data
Station Elevation Data num= 119

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	209.671	1.505	209.789	3.473	210	6.986	210.193	11.091	210.406
11.208	210.41	12.145	210.441	13.301	210.5	15.023	210.611	15.908	210.684
18.181	210.822	21.125	211	21.884	211	28.905	211	32.292	211
34.254	211	35.786	211	35.794	211	42.263	211	42.296	211
43.731	211	47.485	211	49.719	211	51.613	211	54.272	211
55.552	211	57.59	211	58.898	211	59.048	211	59.362	211
59.586	211	60.66	211	62.502	210.567	62.794	210.5	63.095	210.393
64.298	210	65.522	209.547	65.636	209.5	65.958	209.428	66.43	209.274
67.398	209	70	208.48	76	208.48	76.988	208.889	77.699	209
78.131	209.127	79.257	209.5	79.649	209.647	80.564	210	81.242	210.255
81.903	210.5	82.637	210.772	83.254	211	83.272	211.006	84.734	211.457
84.873	211.5	85.072	211.5	87.893	211.5	88.033	211.447	88.734	211.192
89.004	211.085	89.224	211	89.436	210.92	90.517	210.5	91.533	210.129
91.885	210	92.269	209.861	93.002	209.566	93.154	209.505	93.178	209.5
93.216	209.5	95.099	209.464	96.852	209.498	96.947	209.5	96.976	209.513
97.53	209.847	97.97	210	98.307	210.136	99.124	210.5	99.798	210.79
100.326	211	105.665	211.266	112.302	211.5	114.455	211.504	114.664	211.504
115.442	211.5	115.636	211.495	115.919	211.493	116.108	211.493	116.283	211.496
116.445	211.5	117.551	211.783	118.695	212	118.83	212.029	119.831	212.231
121.129	212.5	121.918	212.745	122.759	213	123.735	213.289	124.394	213.5
125.16	213.742	125.958	214	126.466	214.125	127.61	214.5	128.671	214.838
129.476	214.958	129.925	215	133.675	215.302	133.83	215.313	136.273	215.447
136.687	215.47	137.013	215.484	137.28	215.5	138.115	215.513	138.337	215.515
138.693	215.517	139.619	215.524	140.013	215.526	140.486	215.528		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	67.398	.035	77.699	.07

Bank Sta: Left Right Coeff Contr. Expan.
67.398 77.699 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	70	211	T
76	140.486	211	T

Downstream Deck/Roadway Coordinates
num= 3

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord

```
      0   211.9              20     212             101   212.2

Downstream Bridge Cross Section Data
Station Elevation Data    num=       88
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 210.142    1.01 210.089    2.12     210   4.148 209.532   4.262   209.5
   4.388 209.465   6.071     209   6.853 208.805   6.886 208.794   7.103  208.76
   8.198   208.5   9.779  208.13  10.386     208    10.5  207.97    16.5  207.97
  17.232     208  17.863 208.186  18.899   208.5  19.181 208.613    20.4     209
  21.466  209.37    21.8   209.5  22.272 209.654  23.261     210  24.485  210.43
  24.734   210.5  24.845 210.512  25.158 210.538   25.32 210.523  25.763   210.5
  25.936 210.396  27.097 210.101   27.29     210  28.266 209.543  28.372   209.5
  28.422 209.487  30.155     209  31.359 208.647  31.968   208.5  31.985   208.5
  32.593 208.626  33.685     209   34.42 209.395   34.64   209.5  35.512 209.956
   35.63     210  35.766 210.064  36.654   210.5 40.553 210.958  40.899     211
  40.959     211  43.054 211.005  45.399 211.005  45.723 211.006  48.949 211.004
  49.344 211.004  49.503 211.003  51.662     211   52.16 210.998  52.417 210.997
  54.314 210.987  54.659 210.989  56.125     211  59.012 211.071  59.471 211.077
   60.18 211.068  64.348  211.28  66.339   211.5 66.732 211.524  66.865 211.533
  70.114 211.743   71.65 211.836  73.962     212   75.14 212.122  78.328   212.5
  82.313 212.869  84.048     213  87.904  213.31  90.149   213.5 93.507 213.865
  93.679 213.879  94.298 213.932  94.348 213.936  95.197 213.994   95.33     214
  96.676 214.013  99.123 214.133 101.065 214.272

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .07   8.198    .035  18.899     .07

Bank Sta: Left   Right    Coeff Contr.   Expan.
        8.198  18.899           .3         .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0    10.5     211       T
    16.5 101.065     211       T

Upstream Embankment side slope              =       2 horiz. to 1.0 vertical
Downstream Embankment side slope            =       2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1           Box     2.5       6
FHWA Chart # 8 - flared wingwalls
FHWA Scale # 2 - wingwall flared 90 or 15 deg.
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                 4      43     .013     .025        0                  .2               1
Upstream   Elevation =  208.48
           Centerline Station =  73
Downstream Elevation =  207.97
           Centerline Station =  13.5

CULVERT OUTPUT  Profile #2-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.20    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         0.69
  Q Barrel (m3/s)           0.20    Culv Vel DS (m/s)         0.47
  E.G. US. (m)            208.56    Culv Inv El Up (m)      208.48
  W.S. US. (m)            208.54    Culv Inv El Dn (m)      207.97
  E.G. DS (m)             208.05    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             208.04    Culv Exit Loss (m)        0.00
  Delta EG (m)              0.51    Culv Entr Loss (m)        0.00
  Delta WS (m)              0.50    Q Weir (m3/s)
  E.G. IC (m)             208.54    Weir Sta Lft (m)
  E.G. OC (m)             208.56    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       208.53    Weir Max Depth (m)
  Culv WS Outlet (m)      208.04    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.05    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.05    Min El Weir Flow (m)    212.00


Note:    During subcritical analysis, the backwater through the culvert the solution went to critical depth.  The program then
         assumed critical depth at the inlet.

CULVERT OUTPUT  Profile #5-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.29    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         0.72
  Q Barrel (m3/s)           0.29    Culv Vel DS (m/s)         0.70
  E.G. US. (m)            208.58    Culv Inv El Up (m)      208.48
  W.S. US. (m)            208.56    Culv Inv El Dn (m)      207.97
  E.G. DS (m)             208.06    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             208.04    Culv Exit Loss (m)        0.00
  Delta EG (m)              0.52    Culv Entr Loss (m)        0.01
  Delta WS (m)              0.52    Q Weir (m3/s)
  E.G. IC (m)             208.57    Weir Sta Lft (m)
  E.G. OC (m)             208.58    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       208.55    Weir Max Depth (m)
  Culv WS Outlet (m)      208.04    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.07    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.06    Min El Weir Flow (m)    212.00


Note:    During subcritical analysis, the water surface at the outlet was within 0.01 feet of normal depth.  Therefore, the
         inlet will be at normal depth.

CULVERT OUTPUT  Profile #10-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.40    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         0.82
  Q Barrel (m3/s)           0.40    Culv Vel DS (m/s)         0.70
  E.G. US. (m)            208.60    Culv Inv El Up (m)      208.48
  W.S. US. (m)            208.58    Culv Inv El Dn (m)      207.97
  E.G. DS (m)             208.09    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             208.07    Culv Exit Loss (m)        0.00
  Delta EG (m)              0.51    Culv Entr Loss (m)        0.01
  Delta WS (m)              0.51    Q Weir (m3/s)
  E.G. IC (m)             208.59    Weir Sta Lft (m)
  E.G. OC (m)             208.60    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       208.56    Weir Max Depth (m)
  Culv WS Outlet (m)      208.07    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.08    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.08    Min El Weir Flow (m)    212.00


Note:    During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT  Profile #25-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.55    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         0.97
  Q Barrel (m3/s)           0.55    Culv Vel DS (m/s)         0.74
  E.G. US. (m)            208.63    Culv Inv El Up (m)      208.48
  W.S. US. (m)            208.60    Culv Inv El Dn (m)      207.97
  E.G. DS (m)             208.12    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             208.09    Culv Exit Loss (m)        0.00
  Delta EG (m)              0.51    Culv Entr Loss (m)        0.01
  Delta WS (m)              0.50    Q Weir (m3/s)
  E.G. IC (m)             208.62    Weir Sta Lft (m)
  E.G. OC (m)             208.63    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       208.58    Weir Max Depth (m)
  Culv WS Outlet (m)      208.09    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.10    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.09    Min El Weir Flow (m)    212.00
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Note: During subcritical analysis, the backwater through the culvert the solution went to critical depth. The program then assumed critical depth at the inlet.

CULVERT OUTPUT Profile #50-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.66	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.03
Q Barrel (m3/s)	0.66	Culv Vel DS (m/s)	0.81
E.G. US. (m)	208.65	Culv Inv El Up (m)	208.48
W.S. US. (m)	208.62	Culv Inv El Dn (m)	207.97
E.G. DS (m)	208.14	Culv Frctn Ls (m)	0.00
W.S. DS (m)	208.11	Culv Exit Loss (m)	0.00
Delta EG (m)	0.51	Culv Entr Loss (m)	0.01
Delta WS (m)	0.51	Q Weir (m3/s)	
E.G. IC (m)	208.64	Weir Sta Lft (m)	
E.G. OC (m)	208.65	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	208.59	Weir Max Depth (m)	
Culv WS Outlet (m)	208.11	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.11	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.11	Min El Weir Flow (m)	212.00

Note: During subcritical analysis, the backwater through the culvert the solution went to critical depth. The program then assumed critical depth at the inlet.

CULVERT OUTPUT Profile #100-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.79	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.07
Q Barrel (m3/s)	0.79	Culv Vel DS (m/s)	0.86
E.G. US. (m)	208.67	Culv Inv El Up (m)	208.48
W.S. US. (m)	208.64	Culv Inv El Dn (m)	207.97
E.G. DS (m)	208.16	Culv Frctn Ls (m)	0.00
W.S. DS (m)	208.12	Culv Exit Loss (m)	0.00
Delta EG (m)	0.51	Culv Entr Loss (m)	0.01
Delta WS (m)	0.51	Q Weir (m3/s)	
E.G. IC (m)	208.67	Weir Sta Lft (m)	
E.G. OC (m)	208.67	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	208.60	Weir Max Depth (m)	
Culv WS Outlet (m)	208.12	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.12	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.12	Min El Weir Flow (m)	212.00

Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #Check Flow Culv Group: Culvert #1

Q Culv Group (m3/s)	1.03	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.19
Q Barrel (m3/s)	1.03	Culv Vel DS (m/s)	0.99
E.G. US. (m)	208.71	Culv Inv El Up (m)	208.48
W.S. US. (m)	208.67	Culv Inv El Dn (m)	207.97
E.G. DS (m)	208.19	Culv Frctn Ls (m)	0.00
W.S. DS (m)	208.14	Culv Exit Loss (m)	0.00
Delta EG (m)	0.52	Culv Entr Loss (m)	0.01
Delta WS (m)	0.53	Q Weir (m3/s)	
E.G. IC (m)	208.70	Weir Sta Lft (m)	
E.G. OC (m)	208.71	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	208.62	Weir Max Depth (m)	
Culv WS Outlet (m)	208.14	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.15	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.14	Min El Weir Flow (m)	212.00

Note: During subcritical analysis, the backwater through the culvert the solution went to critical depth. The program then assumed critical depth at the inlet.

CULVERT OUTPUT Profile #Regional Culv Group: Culvert #1

Q Culv Group (m3/s)	3.68	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.82
Q Barrel (m3/s)	3.68	Culv Vel DS (m/s)	1.96
E.G. US. (m)	209.03	Culv Inv El Up (m)	208.48
W.S. US. (m)	208.94	Culv Inv El Dn (m)	207.97
E.G. DS (m)	208.48	Culv Frctn Ls (m)	0.00
W.S. DS (m)	208.32	Culv Exit Loss (m)	0.00
Delta EG (m)	0.55	Culv Entr Loss (m)	0.04
Delta WS (m)	0.62	Q Weir (m3/s)	
E.G. IC (m)	209.03	Weir Sta Lft (m)	
E.G. OC (m)	209.02	Weir Sta Rgt (m)	
Culvert Control	Inlet	Weir Submerg	
Culv WS Inlet (m)	208.82	Weir Max Depth (m)	
Culv WS Outlet (m)	208.28	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.31	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.34	Min El Weir Flow (m)	212.00

Warning: Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross section downstream of the culvert has supercritical flow.
Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CROSS SECTION

RIVER: DUFFINS
REACH: WC 41 RS: 100

INPUT
Description: ST 100 (Updated Sep 2016)
Station Elevation Data num= 88

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	210.142	1.01	210.089	2.12	210	4.148	209.532	4.262	209.5
4.388	209.465	6.071	209	6.853	208.805	6.886	208.794	7.103	208.76
8.198	208.5	9.779	208.13	10.386	208	10.5	207.97	16.5	207.97
17.232	208	17.863	208.186	18.899	208.5	19.181	208.613	20.4	209
21.466	209.37	21.8	209.5	22.272	209.654	23.261	210	24.485	210.43
24.734	210.5	24.845	210.512	25.158	210.538	25.32	210.523	25.763	210.5
25.936	210.396	27.097	210.101	27.29	210	28.266	209.543	28.372	209.5
28.422	209.487	30.155	209	31.359	208.647	31.968	208.5	31.985	208.5
32.593	208.626	33.685	209	34.42	209.395	34.64	209.5	35.512	209.956
35.63	210	35.766	210.064	36.654	210.5	40.553	210.958	40.899	211
40.959	211	43.054	211.005	45.399	211.005	45.723	211.006	48.949	211.004
49.344	211.004	49.503	211.003	51.662	211	52.16	210.998	52.417	210.997
54.314	210.987	54.659	210.989	56.125	211	59.012	211.071	59.471	211.077
60.18	211.068	64.348	211.28	66.339	211.5	66.732	211.524	66.865	211.533
70.114	211.743	71.65	211.836	73.962	212	75.14	212.122	78.328	212.5
82.313	212.869	84.048	213	87.904	213.31	90.149	213.5	93.507	213.865
93.679	213.879	94.298	213.932	94.348	213.936	95.197	213.994	95.33	214
96.676	214.013	99.123	214.133	101.065	214.272				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	8.198	.035	18.899	.07

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
8.198 18.899 52 60 62 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	10.5	211	T
16.5	101.065	211	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	208.05	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.01	Wt. n-Val.		0.035		
W.S. Elev (m)	208.04	Reach Len. (m)	52.00	60.00	62.00	
Crit W.S. (m)		Flow Area (m2)		0.42		

E.G. Slope (m/m)	0.009309	Area (m2)	0.48
Q Total (m3/s)	0.20	Flow (m3/s)	0.20
Top Width (m)	7.17	Top Width (m)	7.17
Vel Total (m/s)	0.47	Avg. Vel. (m/s)	0.47
Max Chl Dpth (m)	0.07	Hydr. Depth (m)	0.07
Conv. Total (m3/s)	2.1	Conv. (m3/s)	2.1
Length Wtd. (m)	60.00	Wetted Per. (m)	6.00
Min Ch El (m)	207.97	Shear (N/m2)	6.46
Alpha	1.00	Stream Power (N/m s)	3.04
Frctn Loss (m)	0.99	Cum Volume (1000 m3)	0.02
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.41

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	208.06	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	208.04	Reach Len. (m)	52.00	60.00	62.00
Crit W.S. (m)	208.03	Flow Area (m2)		0.41	
E.G. Slope (m/m)	0.021239	Area (m2)		0.47	
Q Total (m3/s)	0.29	Flow (m3/s)		0.29	
Top Width (m)	7.16	Top Width (m)		7.16	
Vel Total (m/s)	0.70	Avg. Vel. (m/s)		0.70	
Max Chl Dpth (m)	0.07	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	2.0	Conv. (m3/s)		2.0	
Length Wtd. (m)	60.00	Wetted Per. (m)		6.00	
Min Ch El (m)	207.97	Shear (N/m2)		14.37	
Alpha	1.00	Stream Power (N/m s)		10.07	
Frctn Loss (m)	0.98	Cum Volume (1000 m3)		0.03	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.42	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	208.09	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	208.07	Reach Len. (m)	52.00	60.00	62.00
Crit W.S. (m)		Flow Area (m2)		0.58	
E.G. Slope (m/m)	0.013503	Area (m2)		0.66	
Q Total (m3/s)	0.40	Flow (m3/s)		0.40	
Top Width (m)	7.38	Top Width (m)		7.38	
Vel Total (m/s)	0.70	Avg. Vel. (m/s)		0.70	
Max Chl Dpth (m)	0.10	Hydr. Depth (m)		0.10	
Conv. Total (m3/s)	3.4	Conv. (m3/s)		3.4	
Length Wtd. (m)	60.00	Wetted Per. (m)		6.00	
Min Ch El (m)	207.97	Shear (N/m2)		12.69	
Alpha	1.00	Stream Power (N/m s)		8.83	
Frctn Loss (m)	1.00	Cum Volume (1000 m3)		0.04	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.42	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	208.12	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	208.09	Reach Len. (m)	52.00	60.00	62.00
Crit W.S. (m)		Flow Area (m2)		0.74	
E.G. Slope (m/m)	0.010856	Area (m2)		0.87	
Q Total (m3/s)	0.55	Flow (m3/s)		0.55	
Top Width (m)	7.60	Top Width (m)		7.60	
Vel Total (m/s)	0.74	Avg. Vel. (m/s)		0.74	
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.12	
Conv. Total (m3/s)	5.3	Conv. (m3/s)		5.3	
Length Wtd. (m)	60.00	Wetted Per. (m)		6.00	
Min Ch El (m)	207.97	Shear (N/m2)		13.19	
Alpha	1.00	Stream Power (N/m s)		9.76	
Frctn Loss (m)	1.00	Cum Volume (1000 m3)		0.04	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.43	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	208.14	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	208.11	Reach Len. (m)	52.00	60.00	62.00
Crit W.S. (m)		Flow Area (m2)		0.81	
E.G. Slope (m/m)	0.011619	Area (m2)		0.96	
Q Total (m3/s)	0.66	Flow (m3/s)		0.66	
Top Width (m)	7.70	Top Width (m)		7.70	
Vel Total (m/s)	0.81	Avg. Vel. (m/s)		0.81	
Max Chl Dpth (m)	0.14	Hydr. Depth (m)		0.14	
Conv. Total (m3/s)	6.1	Conv. (m3/s)		6.1	
Length Wtd. (m)	60.00	Wetted Per. (m)		6.00	
Min Ch El (m)	207.97	Shear (N/m2)		15.43	
Alpha	1.00	Stream Power (N/m s)		12.53	
Frctn Loss (m)	1.00	Cum Volume (1000 m3)		0.05	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.44	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	208.16	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.035	
W.S. Elev (m)	208.12	Reach Len. (m)	52.00	60.00	62.00
Crit W.S. (m)		Flow Area (m2)		0.92	
E.G. Slope (m/m)	0.011182	Area (m2)		1.09	
Q Total (m3/s)	0.79	Flow (m3/s)		0.79	
Top Width (m)	7.83	Top Width (m)		7.83	
Vel Total (m/s)	0.86	Avg. Vel. (m/s)		0.86	
Max Chl Dpth (m)	0.15	Hydr. Depth (m)		0.15	
Conv. Total (m3/s)	7.5	Conv. (m3/s)		7.5	
Length Wtd. (m)	60.00	Wetted Per. (m)		6.00	
Min Ch El (m)	207.97	Shear (N/m2)		16.73	
Alpha	1.00	Stream Power (N/m s)		14.44	
Frctn Loss (m)	1.01	Cum Volume (1000 m3)		0.05	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.45	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	208.19	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	208.14	Reach Len. (m)	52.00	60.00	62.00
Crit W.S. (m)		Flow Area (m2)		1.04	
E.G. Slope (m/m)	0.012474	Area (m2)		1.26	
Q Total (m3/s)	1.03	Flow (m3/s)		1.03	
Top Width (m)	7.99	Top Width (m)		7.99	
Vel Total (m/s)	0.99	Avg. Vel. (m/s)		0.99	

Max Chl Dpth (m)	0.17	Hydr. Depth (m)	0.17
Conv. Total (m3/s)	9.2	Conv. (m3/s)	9.2
Length Wtd. (m)	60.00	Wetted Per. (m)	6.00
Min Ch El (m)	207.97	Shear (N/m2)	21.18
Alpha	1.00	Stream Power (N/m s)	21.00
Frctn Loss (m)	1.01	Cum Volume (1000 m3)	0.07
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.46

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	208.48	Element	Left OB	Channel	Right OB
Vel Head (m)	0.16	Wt. n-Val.		0.035	
W.S. Elev (m)	208.32	Reach Len. (m)	52.00	60.00	62.00
Crit W.S. (m)	208.31	Flow Area (m2)		2.07	
E.G. Slope (m/m)	0.015911	Area (m2)		2.75	
Q Total (m3/s)	3.68	Flow (m3/s)		3.68	
Top Width (m)	9.30	Top Width (m)		9.30	
Vel Total (m/s)	1.77	Avg. Vel. (m/s)		1.77	
Max Chl Dpth (m)	0.35	Hydr. Depth (m)		0.35	
Conv. Total (m3/s)	29.2	Conv. (m3/s)		29.2	
Length Wtd. (m)	60.00	Wetted Per. (m)		6.00	
Min Ch El (m)	207.97	Shear (N/m2)		53.92	
Alpha	1.00	Stream Power (N/m s)		95.70	
Frctn Loss (m)	1.04	Cum Volume (1000 m3)		0.15	
C & E Loss (m)	0.02	Cum SA (1000 m2)		0.55	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: DUFFINS
REACH: WC 41 RS: 10

INPUT
Description: ST 10 (Updated Sep 2016)
Station Elevation Data num= 94

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	209	2.047	208.608	2.304	208.553	2.533	208.5	2.61	208.484
5.833	208	7.219	207.718	8.28	207.5	9.571	207.272	10.822	207
12.79	206.977	13.884	206.959	16.858	206.999	16.954	207	17.677	207.142
19.277	207.452	19.479	207.5	19.687	207.559	21.248	208	25.006	208.5
25.528	208.546	30.01	208.929	30.733	209	30.95	209.002	32.661	209
32.872	208.999	33.229	209	33.263	209	34.899	209.07	38.215	209.195
42.292	209.373	42.764	209.392	42.843	209.398	43.856	209.433	44.37	209.448
45.5	209.5	49.338	209.512	51.022	209.516	53.029	209.527	58.215	209.502
58.814	209.5	59.256	209.401	61.03	209	62.817	208.598	63.298	208.5
63.484	208.5	63.546	208.5	65.087	208.5	67.907	208.5	68.367	208.5
69.207	208.5	75.726	208.5	76.008	208.5	85.95	208.5	97.492	208.5
102.331	208.5	103.141	208.5	103.191	208.5	103.202	208.5	103.504	208.5
104.028	208.52	104.708	208.574	104.992	208.636	105.451	208.719	106.492	208.935
107.173	208.995	107.225	209	107.243	209.005	108.881	209.5	109.21	209.522
109.233	209.523	109.268	209.531	110.239	209.73	111.739	210	113.699	210.151
118.679	210.5	119.368	210.859	119.708	211	120.424	211.243	121.106	211.49
121.137	211.5	122.559	211.877	123.007	212	125.137	212.468	125.284	212.5
128.268	212.972	128.4	213	128.651	213.026	134.751	213.5	138.011	213.718
140.273	213.856	142.742	214	146.467	214.167	149.208	214.296		

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	8.28	.035	19.479	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
8.28	19.479	0	0	.3	.5

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	207.05	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	207.03	Reach Len. (m)			
Crit W.S. (m)	207.03	Flow Area (m2)		0.29	
E.G. Slope (m/m)	0.036924	Area (m2)		0.29	
Q Total (m3/s)	0.20	Flow (m3/s)		0.20	
Top Width (m)	6.39	Top Width (m)		6.39	
Vel Total (m/s)	0.69	Avg. Vel. (m/s)		0.69	
Max Chl Dpth (m)	0.07	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	1.0	Conv. (m3/s)		1.0	
Length Wtd. (m)		Wetted Per. (m)		6.40	
Min Ch El (m)	206.96	Shear (N/m2)		16.30	
Alpha	1.00	Stream Power (N/m s)		11.32	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	207.08	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	207.06	Reach Len. (m)			
Crit W.S. (m)	207.06	Flow Area (m2)		0.50	
E.G. Slope (m/m)	0.013048	Area (m2)		0.50	
Q Total (m3/s)	0.29	Flow (m3/s)		0.29	
Top Width (m)	6.71	Top Width (m)		6.71	
Vel Total (m/s)	0.58	Avg. Vel. (m/s)		0.58	
Max Chl Dpth (m)	0.10	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	2.5	Conv. (m3/s)		2.5	
Length Wtd. (m)		Wetted Per. (m)		6.72	
Min Ch El (m)	206.96	Shear (N/m2)		9.55	
Alpha	1.00	Stream Power (N/m s)		5.52	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	207.09	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	207.06	Reach Len. (m)			
Crit W.S. (m)	207.06	Flow Area (m2)		0.53	
E.G. Slope (m/m)	0.021194	Area (m2)		0.53	
Q Total (m3/s)	0.40	Flow (m3/s)		0.40	
Top Width (m)	6.74	Top Width (m)		6.74	
Vel Total (m/s)	0.76	Avg. Vel. (m/s)		0.76	
Max Chl Dpth (m)	0.10	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	2.7	Conv. (m3/s)		2.7	
Length Wtd. (m)		Wetted Per. (m)		6.76	
Min Ch El (m)	206.96	Shear (N/m2)		16.21	
Alpha	1.00	Stream Power (N/m s)		12.30	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	207.12	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	207.07	Reach Len. (m)			
Crit W.S. (m)	207.07	Flow Area (m2)		0.58	
E.G. Slope (m/m)	0.028952	Area (m2)		0.58	
Q Total (m3/s)	0.55	Flow (m3/s)		0.55	
Top Width (m)	6.82	Top Width (m)		6.82	
Vel Total (m/s)	0.94	Avg. Vel. (m/s)		0.94	
Max Chl Dpth (m)	0.11	Hydr. Depth (m)		0.09	
Conv. Total (m3/s)	3.2	Conv. (m3/s)		3.2	
Length Wtd. (m)		Wetted Per. (m)		6.84	
Min Ch El (m)	206.96	Shear (N/m2)		24.23	
Alpha	1.00	Stream Power (N/m s)		22.83	
Frctn Loss (m)		Cum Volume (1000 m3)			

C & E Loss (m)		Cum SA (1000 m2)	

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	207.13	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	207.09	Reach Len. (m)			
Crit W.S. (m)	207.09	Flow Area (m2)		0.68	
E.G. Slope (m/m)	0.026190	Area (m2)		0.68	
Q Total (m3/s)	0.66	Flow (m3/s)		0.66	
Top Width (m)	6.95	Top Width (m)		6.95	
Vel Total (m/s)	0.98	Avg. Vel. (m/s)		0.98	
Max Chl Dpth (m)	0.13	Hydr. Depth (m)		0.10	
Conv. Total (m3/s)	4.1	Conv. (m3/s)		4.1	
Length Wtd. (m)		Wetted Per. (m)		6.97	
Min Ch El (m)	206.96	Shear (N/m2)		24.91	
Alpha	1.00	Stream Power (N/m s)		24.31	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	207.15	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.035	
W.S. Elev (m)	207.09	Reach Len. (m)			
Crit W.S. (m)	207.09	Flow Area (m2)		0.74	
E.G. Slope (m/m)	0.028170	Area (m2)		0.74	
Q Total (m3/s)	0.79	Flow (m3/s)		0.79	
Top Width (m)	7.04	Top Width (m)		7.04	
Vel Total (m/s)	1.07	Avg. Vel. (m/s)		1.07	
Max Chl Dpth (m)	0.14	Hydr. Depth (m)		0.11	
Conv. Total (m3/s)	4.7	Conv. (m3/s)		4.7	
Length Wtd. (m)		Wetted Per. (m)		7.06	
Min Ch El (m)	206.96	Shear (N/m2)		28.97	
Alpha	1.00	Stream Power (N/m s)		30.89	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	207.18	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.035	
W.S. Elev (m)	207.12	Reach Len. (m)			
Crit W.S. (m)	207.12	Flow Area (m2)		0.93	
E.G. Slope (m/m)	0.023849	Area (m2)		0.93	
Q Total (m3/s)	1.03	Flow (m3/s)		1.03	
Top Width (m)	7.29	Top Width (m)		7.29	
Vel Total (m/s)	1.11	Avg. Vel. (m/s)		1.11	
Max Chl Dpth (m)	0.16	Hydr. Depth (m)		0.13	
Conv. Total (m3/s)	6.7	Conv. (m3/s)		6.7	
Length Wtd. (m)		Wetted Per. (m)		7.32	
Min Ch El (m)	206.96	Shear (N/m2)		29.59	
Alpha	1.00	Stream Power (N/m s)		32.91	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	207.42	Element	Left OB	Channel	Right OB
Vel Head (m)	0.13	Wt. n-Val.		0.035	
W.S. Elev (m)	207.29	Reach Len. (m)			
Crit W.S. (m)	207.29	Flow Area (m2)		2.32	
E.G. Slope (m/m)	0.018926	Area (m2)		2.32	
Q Total (m3/s)	3.68	Flow (m3/s)		3.68	
Top Width (m)	8.99	Top Width (m)		8.99	
Vel Total (m/s)	1.59	Avg. Vel. (m/s)		1.59	
Max Chl Dpth (m)	0.33	Hydr. Depth (m)		0.26	
Conv. Total (m3/s)	26.7	Conv. (m3/s)		26.7	
Length Wtd. (m)		Wetted Per. (m)		9.05	
Min Ch El (m)	206.96	Shear (N/m2)		47.59	
Alpha	1.00	Stream Power (N/m s)		75.49	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

SUMMARY OF MANNING'S N VALUES

River:DUFFINS

Reach	River Sta.	n1	n2	n3
WC 41	300	.07	.035	.07
WC 41	200	.07	.035	.07
WC 41	150	Culvert		
WC 41	100	.07	.035	.07
WC 41	10	.07	.035	.07

SUMMARY OF REACH LENGTHS

River: DUFFINS

Reach	River Sta.	Left	Channel	Right
WC 41	300	10	15	17
WC 41	200	10	51	53
WC 41	150	Culvert		
WC 41	100	52	60	62
WC 41	10	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: DUFFINS

Reach	River Sta.	Contr.	Expan.
WC 41	300	.3	.5
WC 41	200	.3	.5
WC 41	150	Culvert	
WC 41	100	.3	.5
WC 41	10	.3	.5

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
WC 41	300	2-yr	0.20	208.50	208.61		208.62	0.001761	0.26	0.77	7.54	0.26
WC 41	300	5-yr	0.29	208.50	208.64		208.64	0.001808	0.30	0.97	7.88	0.27
WC 41	300	10-yr	0.40	208.50	208.66		208.67	0.002109	0.35	1.14	8.23	0.30
WC 41	300	25-yr	0.55	208.50	208.69		208.70	0.002265	0.40	1.39	8.77	0.32
WC 41	300	50-yr	0.66	208.50	208.71		208.72	0.002310	0.42	1.56	9.07	0.33
WC 41	300	100-yr	0.79	208.50	208.73		208.74	0.002287	0.45	1.77	9.42	0.33
WC 41	300	Check Flow	1.03	208.50	208.77		208.78	0.002259	0.48	2.13	9.99	0.33
WC 41	300	Regional	3.68	208.50	209.07		209.09	0.001531	0.63	5.90	14.94	0.31
WC 41	200	2-yr	0.20	208.48	208.54	208.52	208.56	0.014311	0.54	0.37	6.46	0.69
WC 41	200	5-yr	0.29	208.48	208.56	208.54	208.58	0.014628	0.63	0.46	6.57	0.72
WC 41	200	10-yr	0.40	208.48	208.58	208.55	208.60	0.012195	0.67	0.59	6.73	0.69
WC 41	200	25-yr	0.55	208.48	208.60	208.57	208.63	0.012540	0.77	0.71	6.88	0.72
WC 41	200	50-yr	0.66	208.48	208.62	208.59	208.65	0.010475	0.79	0.84	7.04	0.67
WC 41	200	100-yr	0.79	208.48	208.64	208.60	208.67	0.010202	0.84	0.94	7.16	0.68

WC 41	200	Check Flow	1.03	208.48	208.67	208.62	208.71	0.009473	0.91	1.13	7.40	0.67
WC 41	200	Regional	3.68	208.48	208.94	208.82	209.03	0.006226	1.34	2.75	9.59	0.63
WC 41	150		Culvert									
WC 41	100	2-yr	0.20	207.97	208.04		208.05	0.009309	0.47	0.42	7.17	0.57
WC 41	100	5-yr	0.29	207.97	208.04	208.03	208.06	0.021239	0.70	0.41	7.16	0.85
WC 41	100	10-yr	0.40	207.97	208.07		208.09	0.013503	0.70	0.58	7.38	0.72
WC 41	100	25-yr	0.55	207.97	208.09		208.12	0.010856	0.74	0.74	7.60	0.67
WC 41	100	50-yr	0.66	207.97	208.11		208.14	0.011619	0.81	0.81	7.70	0.70
WC 41	100	100-yr	0.79	207.97	208.12		208.16	0.011182	0.86	0.92	7.83	0.71
WC 41	100	Check Flow	1.03	207.97	208.14		208.19	0.012474	0.99	1.04	7.99	0.76
WC 41	100	Regional	3.68	207.97	208.32	208.31	208.48	0.015911	1.77	2.07	9.30	0.96
WC 41	10	2-yr	0.20	206.96	207.03	207.03	207.05	0.036924	0.69	0.29	6.39	1.05
WC 41	10	5-yr	0.29	206.96	207.06	207.06	207.08	0.013048	0.58	0.50	6.71	0.68
WC 41	10	10-yr	0.40	206.96	207.06	207.06	207.09	0.021194	0.76	0.53	6.74	0.87
WC 41	10	25-yr	0.55	206.96	207.07	207.07	207.12	0.028952	0.94	0.58	6.82	1.03
WC 41	10	50-yr	0.66	206.96	207.09	207.09	207.13	0.026190	0.98	0.68	6.95	1.00
WC 41	10	100-yr	0.79	206.96	207.09	207.09	207.15	0.028170	1.07	0.74	7.04	1.05
WC 41	10	Check Flow	1.03	206.96	207.12	207.12	207.18	0.023849	1.11	0.93	7.29	1.00
WC 41	10	Regional	3.68	206.96	207.29	207.29	207.42	0.018926	1.59	2.32	8.99	1.00

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (m)	W.S. Elev (m)	Vel Head (m)	Frctn Loss (m)	C & E Loss (m)	Q Left (m3/s)	Q Channel (m3/s)	Q Right (m3/s)	Top Width (m)
WC 41	300	2-yr	208.62	208.61	0.00	0.06	0.00		0.20		7.54
WC 41	300	5-yr	208.64	208.64	0.00	0.06	0.00		0.29		7.88
WC 41	300	10-yr	208.67	208.66	0.01	0.06	0.01		0.40		8.23
WC 41	300	25-yr	208.70	208.69	0.01	0.07	0.01		0.55		8.77
WC 41	300	50-yr	208.72	208.71	0.01	0.06	0.01		0.66		9.07
WC 41	300	100-yr	208.74	208.73	0.01	0.06	0.01		0.79		9.42
WC 41	300	Check Flow	208.78	208.77	0.01	0.06	0.01		1.03		9.99
WC 41	300	Regional	209.09	209.07	0.02	0.04	0.02	0.00	3.67	0.00	14.94
WC 41	200	2-yr	208.56	208.54	0.01				0.20		6.46
WC 41	200	5-yr	208.58	208.56	0.02				0.29		6.57
WC 41	200	10-yr	208.60	208.58	0.02				0.40		6.73
WC 41	200	25-yr	208.63	208.60	0.03				0.55		6.88
WC 41	200	50-yr	208.65	208.62	0.03				0.66		7.04
WC 41	200	100-yr	208.67	208.64	0.04				0.79		7.16
WC 41	200	Check Flow	208.71	208.67	0.04				1.03		7.40
WC 41	200	Regional	209.03	208.94	0.09				3.68		9.59
WC 41	150		Culvert								
WC 41	100	2-yr	208.05	208.04	0.01	0.99	0.00		0.20		7.17
WC 41	100	5-yr	208.06	208.04	0.03	0.98	0.00		0.29		7.16
WC 41	100	10-yr	208.09	208.07	0.02	1.00	0.00		0.40		7.38
WC 41	100	25-yr	208.12	208.09	0.03	1.00	0.01		0.55		7.60
WC 41	100	50-yr	208.14	208.11	0.03	1.00	0.00		0.66		7.70
WC 41	100	100-yr	208.16	208.12	0.04	1.01	0.01		0.79		7.83
WC 41	100	Check Flow	208.19	208.14	0.05	1.01	0.00		1.03		7.99
WC 41	100	Regional	208.48	208.32	0.16	1.04	0.02		3.68		9.30
WC 41	10	2-yr	207.05	207.03	0.02				0.20		6.39
WC 41	10	5-yr	207.08	207.06	0.02				0.29		6.71
WC 41	10	10-yr	207.09	207.06	0.03				0.40		6.74
WC 41	10	25-yr	207.12	207.07	0.05				0.55		6.82
WC 41	10	50-yr	207.13	207.09	0.05				0.66		6.95
WC 41	10	100-yr	207.15	207.09	0.06				0.79		7.04
WC 41	10	Check Flow	207.18	207.12	0.06				1.03		7.29
WC 41	10	Regional	207.42	207.29	0.13				3.68		8.99

Profile Output Table - Culvert Only

Reach	River Sta		Profile	E.G. US. (m)	W.S. US. (m)	E.G. IC (m)	E.G. OC (m)	Min El Weir Flow (m)	Q Culv Group (m3/s)	Q Weir (m3/s)	Delta WS (m)	Culv Vel US (m/s)	Culv Vel DS (m/s)
WC 41	150	Culvert #1	2-yr	208.56	208.54	208.54	208.56	212.00	0.20		0.50	0.69	0.47
WC 41	150	Culvert #1	5-yr	208.58	208.56	208.57	208.58	212.00	0.29		0.52	0.72	0.70
WC 41	150	Culvert #1	10-yr	208.60	208.58	208.59	208.60	212.00	0.40		0.51	0.82	0.70
WC 41	150	Culvert #1	25-yr	208.63	208.60	208.62	208.63	212.00	0.55		0.50	0.97	0.74
WC 41	150	Culvert #1	50-yr	208.65	208.62	208.64	208.65	212.00	0.66		0.51	1.03	0.81
WC 41	150	Culvert #1	100-yr	208.67	208.64	208.67	208.67	212.00	0.79		0.51	1.07	0.86
WC 41	150	Culvert #1	Check Flow	208.71	208.67	208.70	208.71	212.00	1.03		0.53	1.19	0.99
WC 41	150	Culvert #1	Regional	209.03	208.94	209.03	209.02	212.00	3.68		0.62	1.82	1.96

DUFFINS CREEK

HEC-RAS ANALYSIS WC#43

EXISTING 407 ETR

ST 400 | 193.36 | 192.62 | 193.36 | 192.62

ST 300 | 190.27 | 189.81 | 191.05 | 190.58

ST 100 | 189.50 | 189.15 | 189.30 | 189.14

PROP CULV WC#43
SPAN x RISE=(5 x 2)m
L=102m, S=1.5%
U/S INV=192.00m
D/S INV=190.50m

ST 10 | 188.44 | 188.21 | 188.44 | 188.21

PROPOSED 407 TWY

17+400 17+500 17+600 17+700 17+800

17+300 17+200 17+100 17+000

LEGEND

- EXISTING 407 ETR
- PROPOSED 407 TWY
- CREEK FLOW DIRECTION
- EXISTING CULVERT
- PROPOSED CULVERT
- PROPOSED REGIONAL FLOODLINE

EX REG / EX 100 | PR REG / PR 100 | HEC ST

- HEC ST: CROSS SECTION NUMBER
- PR REG / PR 100: PARSONS HEC-RAS SECTION
- PR 100: PROPOSED WL ELEVATION (m)
- EX 100: EXISTING UPDATED WL ELEVATION (m)

SCALE HORIZONTAL
1:1000

5m 0m 10m 20m 30m

DATE: SEPTEMBER 2016

SCALE: 1:1000

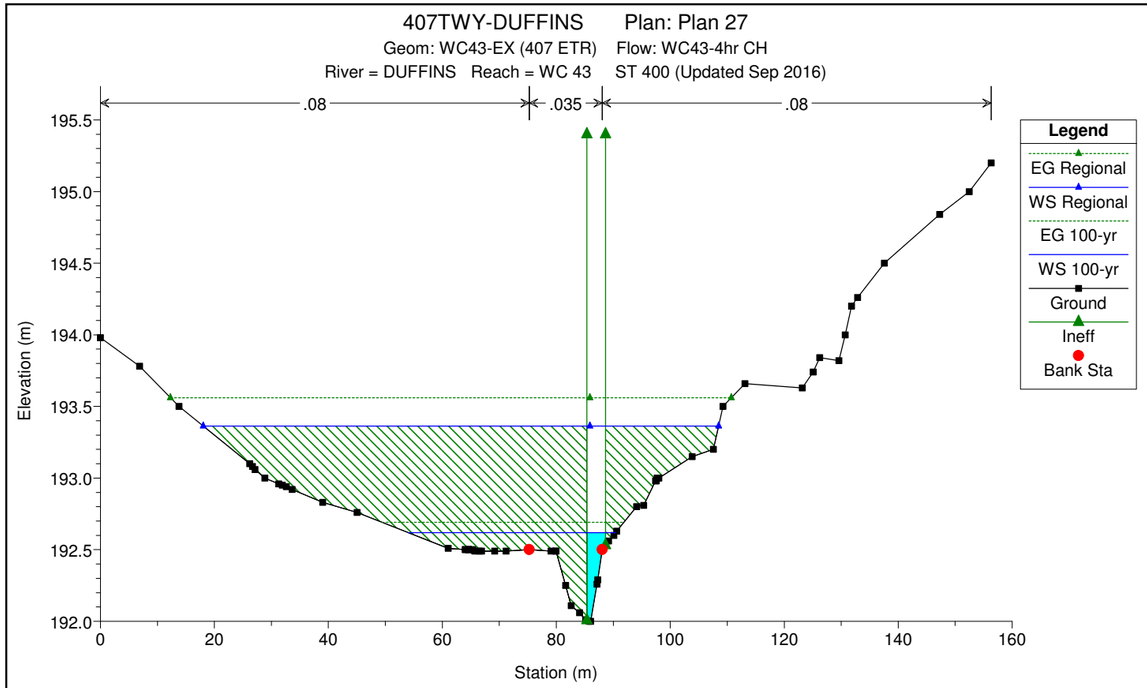
Ontario

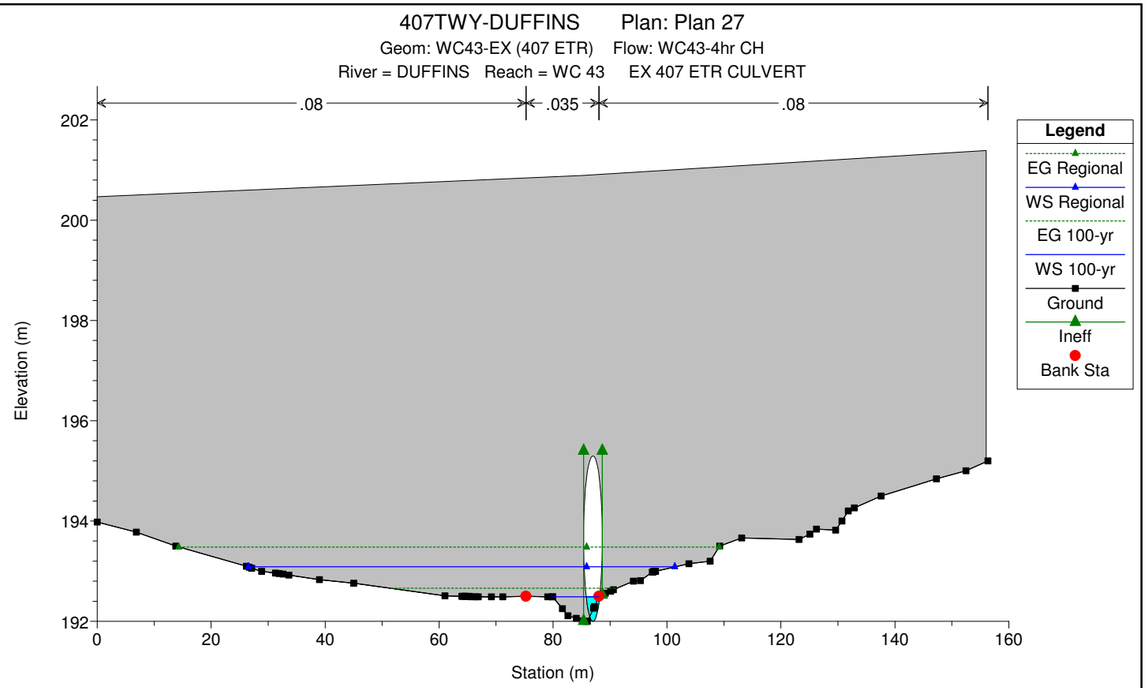
PARSONS

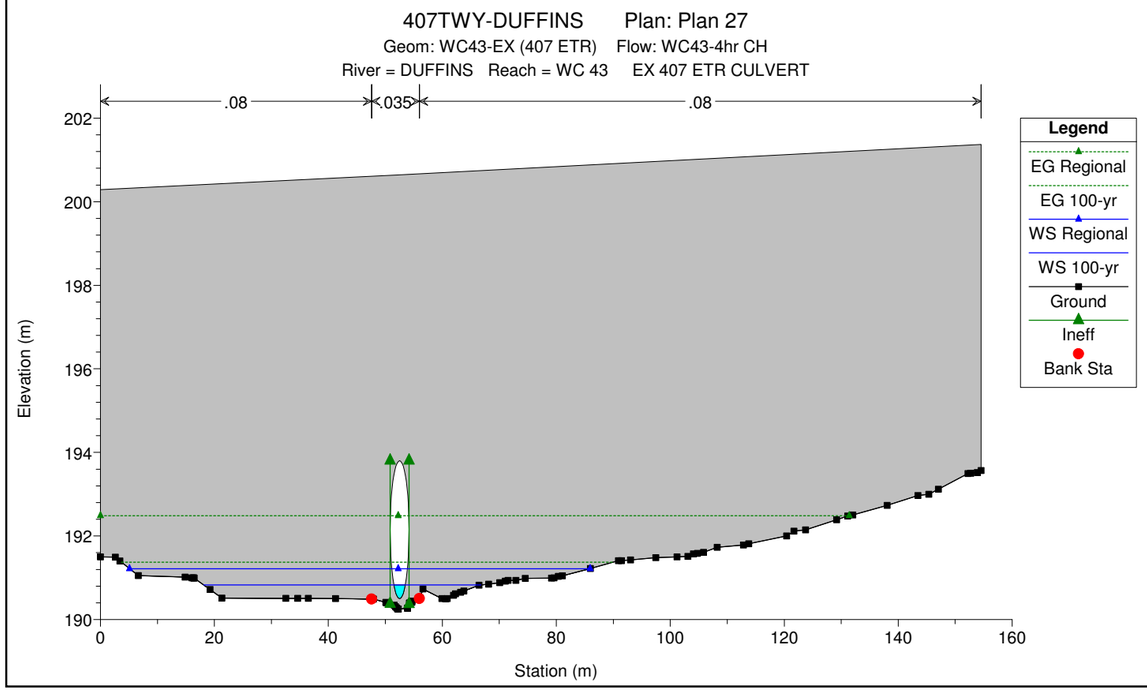
625 COCHRANE DRIVE, SUITE 500
MARKHAM, ONTARIO L3R 9R9
TEL: 905-943-0500
FAX: 905-943-0400

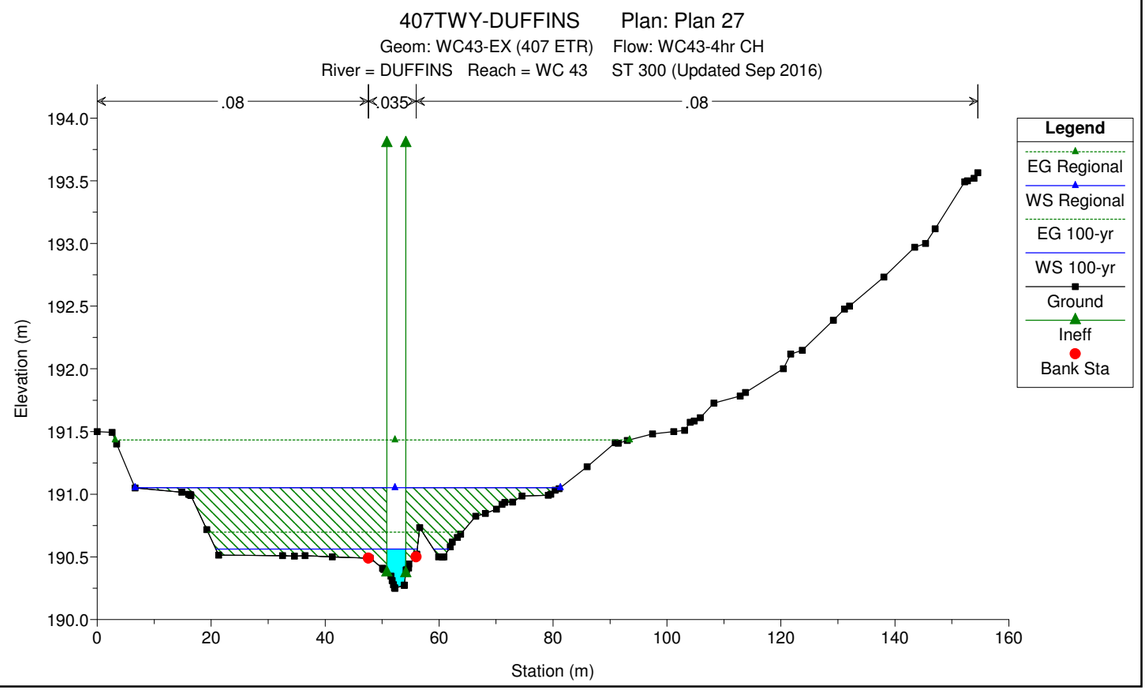
407 TRANSITWAY FROM KENNEDY RD TO BROCK RD

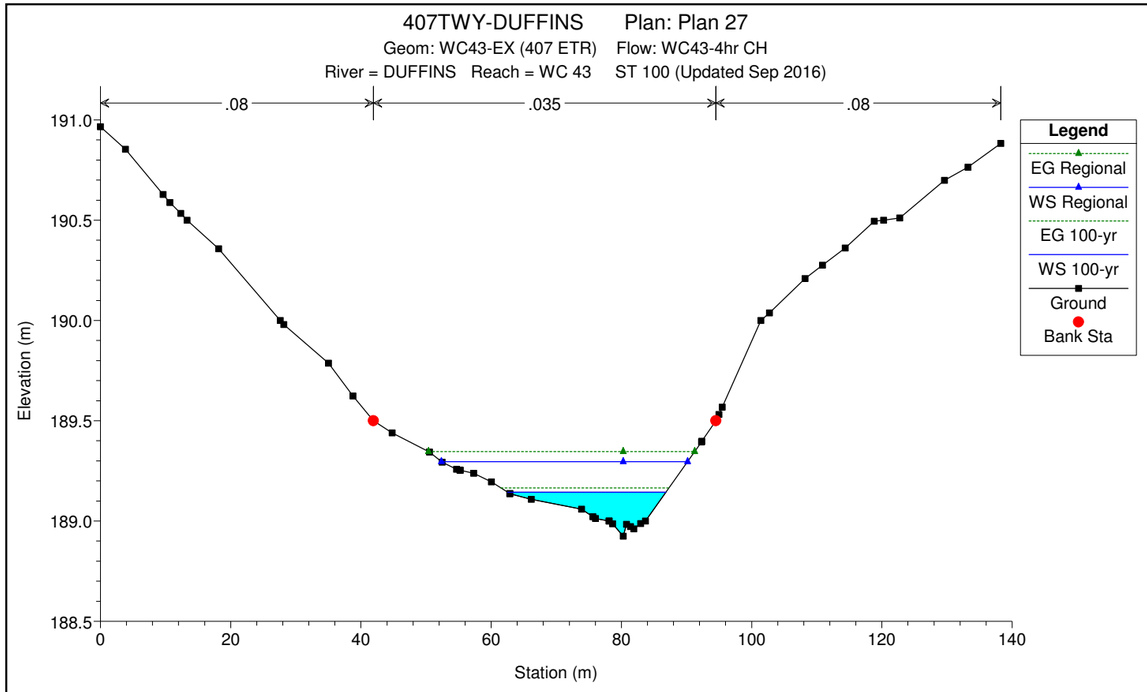
FIGURE 6.22 - HEC-RAS ANALYSIS - DUFFINS CREEK (WC#43)

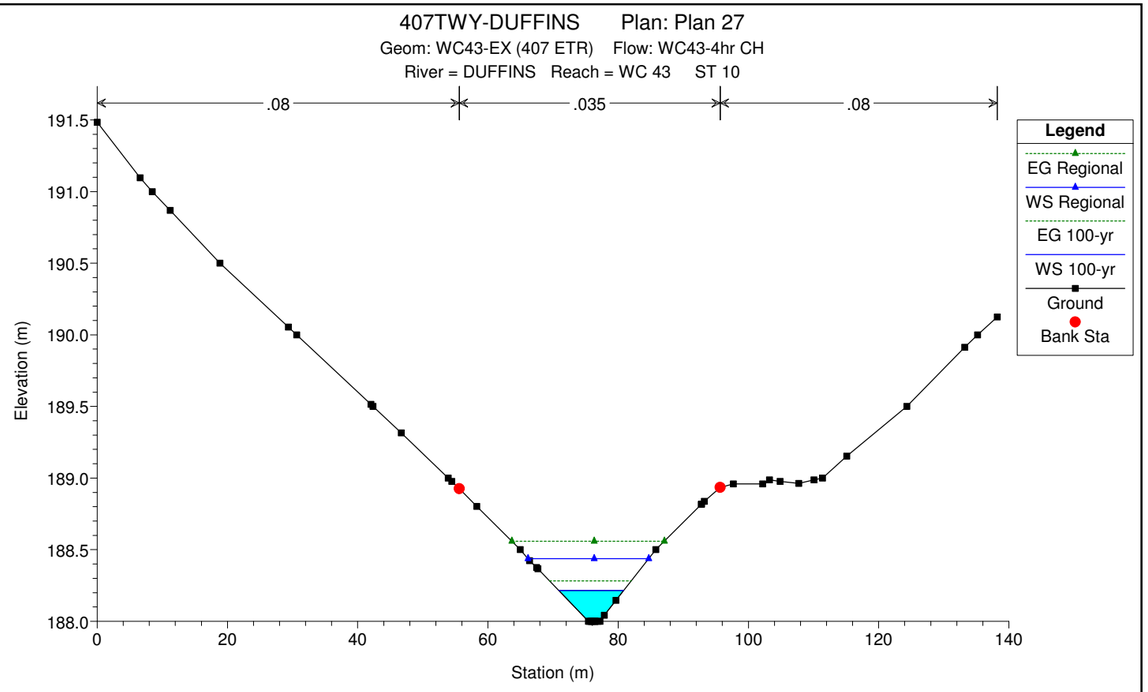

407TWY-DUFFINS Plan: Plan 27
Geom: WC43-EX (407 ETR) Flow: WC43-4hr CH
River = DUFFINS Reach = WC 43 ST 400 (Updated Sep 2016)
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


407TWY-DUFFINS Plan: Plan 27
Geom: WC43-EX (407 ETR) Flow: WC43-4hr CH
River = DUFFINS Reach = WC 43 EX 407 ETR CULVERT
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


407TWY-DUFFINS Plan: Plan 27
Geom: WC43-EX (407 ETR) Flow: WC43-4hr CH
River = DUFFINS Reach = WC 43 EX 407 ETR CULVERT
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
EG 100-yr
WS Regional
WS 100-yr
Ground
Ineff
Bank Sta


407TWY-DUFFINS Plan: Plan 27
Geom: WC43-EX (407 ETR) Flow: WC43-4hr CH
River = DUFFINS Reach = WC 43 ST 300 (Updated Sep 2016)
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


407TWY-DUFFINS Plan: Plan 27
Geom: WC43-EX (407 ETR) Flow: WC43-4hr CH
River = DUFFINS Reach = WC 43 ST 100 (Updated Sep 2016)
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Bank Sta


407TWY-DUFFINS Plan: Plan 27
Geom: WC43-EX (407 ETR) Flow: WC43-4hr CH
River = DUFFINS Reach = WC 43 ST 10
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Bank Sta

HEC-RAS Plan: WC43 - EX (4hr CH) River: DUFFINS Reach: WC 43

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC 43	400	2-yr	0.43	192.00	192.33	192.26	192.37	0.008998	0.96	0.45	6.33	0.66
WC 43	400	5-yr	0.62	192.00	192.39	192.32	192.45	0.008284	1.04	0.60	7.06	0.65
WC 43	400	10-yr	0.75	192.00	192.44	192.35	192.50	0.007871	1.07	0.70	7.51	0.65
WC 43	400	25-yr	1.00	192.00	192.51	192.40	192.57	0.007093	1.12	0.89	27.06	0.63
WC 43	400	50-yr	1.21	192.00	192.56	192.44	192.63	0.006155	1.16	1.07	31.72	0.60
WC 43	400	100-yr	1.44	192.00	192.62	192.48	192.69	0.005519	1.20	1.25	36.32	0.58
WC 43	400	Check Flow	1.88	192.00	192.71	192.55	192.79	0.004865	1.28	1.55	44.08	0.56
WC 43	400	Regional	6.84	192.00	193.36	193.03	193.56	0.004115	2.02	3.70	90.45	0.59
WC 43	350		Culvert									
WC 43	300	2-yr	0.43	190.25	190.41	190.41	190.47	0.024423	1.08	0.40	4.65	1.00
WC 43	300	5-yr	0.62	190.25	190.44	190.44	190.52	0.026180	1.28	0.48	5.41	1.07
WC 43	300	10-yr	0.75	190.25	190.47	190.47	190.55	0.021593	1.30	0.58	6.72	1.00
WC 43	300	25-yr	1.00	190.25	190.50	190.50	190.61	0.020257	1.43	0.70	17.97	1.00
WC 43	300	50-yr	1.21	190.25	190.53	190.53	190.65	0.019739	1.54	0.79	36.80	1.00
WC 43	300	100-yr	1.44	190.25	190.56	190.56	190.70	0.019030	1.63	0.88	37.99	1.01
WC 43	300	Check Flow	1.88	190.25	190.61	190.61	190.78	0.017864	1.78	1.06	39.96	1.00
WC 43	300	Regional	6.84	190.25	191.05	191.05	191.43	0.013327	2.73	2.50	74.64	1.00
WC 43	100	2-yr	0.43	188.93	189.07	189.04	189.09	0.011841	0.49	0.87	13.67	0.63
WC 43	100	5-yr	0.62	188.93	189.09	189.07	189.11	0.012068	0.52	1.18	17.29	0.64
WC 43	100	10-yr	0.75	188.93	189.10		189.12	0.011973	0.54	1.39	19.31	0.64
WC 43	100	25-yr	1.00	188.93	189.12		189.14	0.012184	0.58	1.72	21.68	0.66
WC 43	100	50-yr	1.21	188.93	189.13		189.15	0.011789	0.60	2.01	23.47	0.66
WC 43	100	100-yr	1.44	188.93	189.14		189.16	0.011916	0.64	2.25	24.32	0.67
WC 43	100	Check Flow	1.88	188.93	189.16	189.13	189.19	0.012213	0.70	2.68	25.51	0.69
WC 43	100	Regional	6.84	188.93	189.30		189.35	0.011499	0.99	6.92	37.81	0.74
WC 43	10	2-yr	0.43	188.00	188.12	188.12	188.16	0.028316	0.87	0.49	6.37	1.00
WC 43	10	5-yr	0.62	188.00	188.15	188.15	188.19	0.026812	0.94	0.66	7.30	1.00
WC 43	10	10-yr	0.75	188.00	188.16	188.16	188.21	0.027155	0.99	0.76	7.79	1.02
WC 43	10	25-yr	1.00	188.00	188.18	188.18	188.24	0.025038	1.04	0.96	8.76	1.00
WC 43	10	50-yr	1.21	188.00	188.20	188.20	188.26	0.026019	1.10	1.10	9.32	1.03
WC 43	10	100-yr	1.44	188.00	188.21	188.21	188.28	0.025801	1.15	1.25	9.95	1.04
WC 43	10	Check Flow	1.88	188.00	188.25	188.25	188.32	0.023314	1.19	1.59	11.17	1.01
WC 43	10	Regional	6.84	188.00	188.44	188.44	188.56	0.019909	1.55	4.42	18.52	1.01

HEC-RAS HEC-RAS 5.0.1 April 2016
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X    X
X     X  X        X           X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X           X  X     X    X        X
X     X  X        X    X      X   X    X    X        X
X     X  XXXXXX    XXXX       X    X   X    X   XXXXX
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PROJECT DATA
Project Title: 407TWY-DUFFINS
Project File : 407TWY-DUFFINS.prj
Run Date and Time: 9/21/2016 1:48:31 PM

Project in SI units

Project Description:
HEC-RAS Model created for 407 TWY project from Kennedy Rd. to Brock Rd. -
Duffins Creek Watershed

PLAN DATA

Plan Title: Plan 27
Plan File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.p27

Geometry Title: WC43-EX (407 ETR)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.g13

Flow Title : WC43-4hr CH
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.f14

Plan Summary Information:
Number of: Cross Sections = 4 Multiple Openings = 0
Culverts = 1 Inline Structures = 0
Bridges = 0 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: WC43-4hr CH
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.f14

Flow Data (m3/s)

River	Reach	RS	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Check Flow	Regional
DUFFINS	WC 43	400	.43	.62	.75	1	1.21	1.44	1.88	6.84

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
DUFFINS	WC 43	2-yr		Critical
DUFFINS	WC 43	5-yr		Critical
DUFFINS	WC 43	10-yr		Critical
DUFFINS	WC 43	25-yr		Critical
DUFFINS	WC 43	50-yr		Critical
DUFFINS	WC 43	100-yr		Critical
DUFFINS	WC 43	Check Flow		Critical
DUFFINS	WC 43	Regional		Critical

GEOMETRY DATA

Geometry Title: WC43-EX (407 ETR)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.g13

CROSS SECTION

RIVER: DUFFINS
REACH: WC 43 RS: 400

INPUT
Description: ST 400 (Updated Sep 2016)
Station Elevation Data num= 62

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	193.98	6.87	193.78	13.79	193.5	26.21	193.1	26.67	193.08
27.13	193.06	28.86	193	31.27	192.96	31.89	192.95	32.63	192.94
33.62	192.92	39.02	192.83	45.04	192.76	61.02	192.51	64	192.5
64.1	192.5	64.56	192.5	64.59	192.5	64.62	192.5	65.34	192.5
65.68	192.49	66.49	192.49	66.9	192.49	69.19	192.49	71.2	192.49
75.24	192.5	79.09	192.49	79.85	192.49	79.97	192.49	81.62	192.25
82.61	192.11	84.09	192.06	85.12	192.01	85.78	192	86.02	192
87.14	192.26	87.29	192.29	88.08	192.5	89.19	192.56	90.09	192.6
90.59	192.63	94.09	192.8	95.32	192.81	97.42	192.98	97.56	192.98
97.69	193	98	193	103.84	193.15	107.59	193.2	109.27	193.5
113.11	193.66	123.18	193.63	125.08	193.74	126.21	193.84	129.58	193.82
130.72	194	131.8	194.2	132.89	194.26	137.56	194.5	147.26	194.84
152.45	195	156.34	195.2						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.08	75.24	.035	88.08	.08

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
75.24 88.08 116.7 116.7 116.7 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	85.35	195.4	T
88.65	156.34	195.4	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	192.37	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.05	Wt. n-Val.		0.035		
W.S. Elev (m)	192.33	Reach Len. (m)	116.70	116.70	116.70	
Crit W.S. (m)	192.26	Flow Area (m2)		0.45		
E.G. Slope (m/m)	0.008998	Area (m2)		1.34		
Q Total (m3/s)	0.43	Flow (m3/s)		0.43		
Top Width (m)	6.33	Top Width (m)		6.33		
Vel Total (m/s)	0.96	Avg. Vel. (m/s)		0.96		
Max Chl Dpth (m)	0.33	Hydr. Depth (m)		0.22		
Conv. Total (m3/s)	4.5	Conv. (m3/s)		4.5		

Length Wtd. (m)	116.70	Wetted Per. (m)	2.11
Min Ch El (m)	192.00	Shear (N/m2)	18.66
Alpha	1.00	Stream Power (N/m s)	17.96
Frctn Loss (m)		Cum Volume (1000 m3)	0.12
C & E Loss (m)		Cum SA (1000 m2)	1.86

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	192.45	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	192.39	Reach Len. (m)	116.70	116.70	116.70
Crit W.S. (m)	192.32	Flow Area (m2)		0.60	
E.G. Slope (m/m)	0.008284	Area (m2)		1.80	
Q Total (m3/s)	0.62	Flow (m3/s)		0.62	
Top Width (m)	7.06	Top Width (m)		7.06	
Vel Total (m/s)	1.04	Avg. Vel. (m/s)		1.04	
Max Chl Dpth (m)	0.39	Hydr. Depth (m)		0.26	
Conv. Total (m3/s)	6.8	Conv. (m3/s)		6.8	
Length Wtd. (m)	116.70	Wetted Per. (m)		2.38	
Min Ch El (m)	192.00	Shear (N/m2)		20.42	
Alpha	1.00	Stream Power (N/m s)		21.16	
Frctn Loss (m)		Cum Volume (1000 m3)		0.16	
C & E Loss (m)		Cum SA (1000 m2)		2.23	

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	192.50	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.035	
W.S. Elev (m)	192.44	Reach Len. (m)	116.70	116.70	116.70
Crit W.S. (m)	192.35	Flow Area (m2)		0.70	
E.G. Slope (m/m)	0.007871	Area (m2)		2.11	
Q Total (m3/s)	0.75	Flow (m3/s)		0.75	
Top Width (m)	7.51	Top Width (m)		7.51	
Vel Total (m/s)	1.07	Avg. Vel. (m/s)		1.07	
Max Chl Dpth (m)	0.44	Hydr. Depth (m)		0.28	
Conv. Total (m3/s)	8.5	Conv. (m3/s)		8.5	
Length Wtd. (m)	116.70	Wetted Per. (m)		2.54	
Min Ch El (m)	192.00	Shear (N/m2)		21.23	
Alpha	1.00	Stream Power (N/m s)		22.76	
Frctn Loss (m)		Cum Volume (1000 m3)		0.19	
C & E Loss (m)		Cum SA (1000 m2)		2.52	

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	192.57	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.035	0.001
W.S. Elev (m)	192.51	Reach Len. (m)	116.70	116.70	116.70
Crit W.S. (m)	192.40	Flow Area (m2)		0.89	0.00
E.G. Slope (m/m)	0.007093	Area (m2)	0.19	2.75	0.00
Q Total (m3/s)	1.00	Flow (m3/s)		1.00	0.00
Top Width (m)	27.06	Top Width (m)	14.05	12.84	0.17
Vel Total (m/s)	1.12	Avg. Vel. (m/s)		1.12	0.03
Max Chl Dpth (m)	0.51	Hydr. Depth (m)		0.33	0.00
Conv. Total (m3/s)	11.9	Conv. (m3/s)		11.9	0.0
Length Wtd. (m)	116.70	Wetted Per. (m)		2.79	0.17
Min Ch El (m)	192.00	Shear (N/m2)		22.19	
Alpha	1.00	Stream Power (N/m s)		24.93	
Frctn Loss (m)		Cum Volume (1000 m3)	0.00	0.24	0.00
C & E Loss (m)		Cum SA (1000 m2)	1.65	3.17	0.12

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	192.63	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.035	0.080
W.S. Elev (m)	192.56	Reach Len. (m)	116.70	116.70	116.70
Crit W.S. (m)	192.44	Flow Area (m2)		1.04	0.03
E.G. Slope (m/m)	0.006155	Area (m2)	1.07	3.45	0.04
Q Total (m3/s)	1.21	Flow (m3/s)		1.21	0.00
Top Width (m)	31.72	Top Width (m)	17.68	12.84	1.20
Vel Total (m/s)	1.13	Avg. Vel. (m/s)		1.16	0.13
Max Chl Dpth (m)	0.56	Hydr. Depth (m)		0.38	0.05
Conv. Total (m3/s)	15.4	Conv. (m3/s)		15.4	0.0
Length Wtd. (m)	116.70	Wetted Per. (m)		2.79	0.57
Min Ch El (m)	192.00	Shear (N/m2)		22.49	2.92
Alpha	1.04	Stream Power (N/m s)		26.10	0.38
Frctn Loss (m)		Cum Volume (1000 m3)	0.03	0.30	0.00
C & E Loss (m)		Cum SA (1000 m2)	3.60	3.30	0.26

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	192.69	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.035	0.080
W.S. Elev (m)	192.62	Reach Len. (m)	116.70	116.70	116.70
Crit W.S. (m)	192.48	Flow Area (m2)		1.19	0.06
E.G. Slope (m/m)	0.005519	Area (m2)	2.13	4.15	0.14
Q Total (m3/s)	1.44	Flow (m3/s)		1.43	0.01
Top Width (m)	36.32	Top Width (m)	21.16	12.84	2.32
Vel Total (m/s)	1.15	Avg. Vel. (m/s)		1.20	0.20
Max Chl Dpth (m)	0.62	Hydr. Depth (m)		0.44	0.10
Conv. Total (m3/s)	19.4	Conv. (m3/s)		19.2	0.2
Length Wtd. (m)	116.70	Wetted Per. (m)		2.79	0.57
Min Ch El (m)	192.00	Shear (N/m2)		23.05	5.57
Alpha	1.07	Stream Power (N/m s)		27.70	1.14
Frctn Loss (m)		Cum Volume (1000 m3)	0.06	0.35	0.00
C & E Loss (m)		Cum SA (1000 m2)	3.83	3.37	0.41

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	192.79	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.		0.035	0.080
W.S. Elev (m)	192.71	Reach Len. (m)	116.70	116.70	116.70
Crit W.S. (m)	192.55	Flow Area (m2)		1.44	0.11
E.G. Slope (m/m)	0.004865	Area (m2)	4.35	5.34	0.43
Q Total (m3/s)	1.88	Flow (m3/s)		1.85	0.03
Top Width (m)	44.08	Top Width (m)	27.06	12.84	4.18
Vel Total (m/s)	1.21	Avg. Vel. (m/s)		1.28	0.29
Max Chl Dpth (m)	0.71	Hydr. Depth (m)		0.53	0.20
Conv. Total (m3/s)	27.0	Conv. (m3/s)		26.5	0.5
Length Wtd. (m)	116.70	Wetted Per. (m)		2.79	0.57
Min Ch El (m)	192.00	Shear (N/m2)		24.63	9.31
Alpha	1.10	Stream Power (N/m s)		31.59	2.73
Frctn Loss (m)		Cum Volume (1000 m3)	0.11	0.45	0.01
C & E Loss (m)		Cum SA (1000 m2)	4.23	3.48	0.66

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	193.56	Element	Left OB	Channel	Right OB
Vel Head (m)	0.20	Wt. n-Val.		0.035	0.080
W.S. Elev (m)	193.36	Reach Len. (m)	116.70	116.70	116.70
Crit W.S. (m)	193.03	Flow Area (m2)		3.22	0.48
E.G. Slope (m/m)	0.004115	Area (m2)	33.84	13.71	8.61
Q Total (m3/s)	6.84	Flow (m3/s)		6.49	0.35
Top Width (m)	90.45	Top Width (m)	57.19	12.84	20.42
Vel Total (m/s)	1.85	Avg. Vel. (m/s)		2.02	0.72
Max Chl Dpth (m)	1.36	Hydr. Depth (m)		1.18	0.85
Conv. Total (m3/s)	106.6	Conv. (m3/s)		101.2	5.4
Length Wtd. (m)	116.70	Wetted Per. (m)		2.79	0.57
Min Ch El (m)	192.00	Shear (N/m2)		46.57	34.14
Alpha	1.14	Stream Power (N/m s)		93.92	24.49
Frctn Loss (m)		Cum Volume (1000 m3)	0.62	1.49	0.24
C & E Loss (m)		Cum SA (1000 m2)	7.30	4.46	3.67

CULVERT

RIVER: DUFFINS

REACH: WC 43 RS: 350

INPUT
Description: EX 407 ETR CULVERT
Distance from Upstream XS = 32.6
Deck/Roadway Width = 55
Weir Coefficient = 1.4
Upstream Deck/Roadway Coordinates
num= 3

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0	200.47	85	200.89	156	201.39

Upstream Bridge Cross Section Data
Station Elevation Data num= 62

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	193.98	6.87	193.78	13.79	193.5	26.21	193.1	26.67	193.08
27.13	193.06	28.86	193	31.27	192.96	31.89	192.95	32.63	192.94
33.62	192.92	39.02	192.83	45.04	192.76	61.02	192.51	64	192.5
64.1	192.5	64.56	192.5	64.59	192.5	64.62	192.5	65.34	192.5
65.68	192.49	66.49	192.49	66.9	192.49	69.19	192.49	71.2	192.49
75.24	192.5	79.09	192.49	79.85	192.49	79.97	192.49	81.62	192.25
82.61	192.11	84.09	192.06	85.12	192.01	85.78	192	86.02	192
87.14	192.26	87.29	192.29	88.08	192.5	89.19	192.56	90.09	192.6
90.59	192.63	94.09	192.8	95.32	192.81	97.42	192.98	97.56	192.98
97.69	193	98	193	103.84	193.15	107.59	193.2	109.27	193.5
113.11	193.66	123.18	193.63	125.08	193.74	126.21	193.84	129.58	193.82
130.72	194	131.8	194.2	132.89	194.26	137.56	194.5	147.26	194.84
152.45	195	156.34	195.2						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.08	75.24	.035	88.08	.08

Bank Sta: Left Right Coeff Contr. Expan.
75.24 88.08 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	85.35	195.4	T
88.65	156.34	195.4	T

Downstream Deck/Roadway Coordinates
num= 3

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0	200.29	52	200.64	188	201.61

Downstream Bridge Cross Section Data
Station Elevation Data num= 86

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	191.499	2.622	191.493	3.393	191.401	6.669	191.05	14.851	191.016
16.047	191	16.277	190.995	16.39	190.995	16.455	190.99	19.229	190.718
21.301	190.514	32.529	190.51	34.599	190.506	36.489	190.51	41.272	190.5
47.611	190.49	47.626	190.49	47.635	190.49	47.768	190.49	47.907	190.49
50.102	190.41	50.14	190.408	50.292	190.399	51.533	190.346	51.774	190.311
51.986	190.278	52.158	190.254	52.255	190.249	52.26	190.249	53.899	190.274
53.901	190.274	53.912	190.275	54.217	190.394	54.302	190.396	54.65	190.411
54.685	190.444	55.973	190.5	56.01	190.505	56.059	190.518	56.072	190.522
56.577	190.734	59.935	190.5	60.588	190.497	60.844	190.5	61.978	190.581
62.305	190.619	63.193	190.655	63.772	190.682	66.435	190.824	68.115	190.846
70.084	190.88	71.036	190.918	71.555	190.935	72.888	190.937	74.542	190.986
79.177	190.992	79.614	191	80.337	191.032	81.047	191.044	85.989	191.22
90.882	191.411	91.449	191.407	93.026	191.428	97.47	191.481	101.189	191.5
103.106	191.509	104.045	191.574	104.757	191.584	105.818	191.611	108.236	191.727
112.849	191.783	113.776	191.811	120.412	192	121.709	192.117	123.738	192.149
129.21	192.387	131.157	192.477	132.031	192.5	138.078	192.732	143.484	192.971
145.355	193	147.067	193.118	152.226	193.492	152.712	193.5	153.876	193.52
154.561	193.564								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.08	47.611	.035	55.973	.08

Bank Sta: Left Right Coeff Contr. Expan.
47.611 55.973 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	50.85	193.8	T
54.15	154.561	193.8	T

Upstream Embankment side slope = 2 horiz. to 1.0 vertical
Downstream Embankment side slope = 2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .98
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name	Shape	Rise	Span
Culvert #1	Circular	3.3	

FHWA Chart # 2 - Corrugated Metal Pipe Culvert
FHWA Scale # 1 - Headwall
Solution Criteria = Highest U.S. EG

Culvert Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
9.6	102	.013	.013	0	.2	1

Upstream Elevation = 192
Centerline Station = 87
Downstream Elevation = 190.5
Centerline Station = 52.5

CULVERT OUTPUT Profile #2-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.43	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.33
Q Barrel (m3/s)	0.43	Culv Vel DS (m/s)	2.25
E.G. US. (m)	192.37	Culv Inv El Up (m)	192.00
W.S. US. (m)	192.33	Culv Inv El Dn (m)	190.50
E.G. DS (m)	190.47	Culv Frctn Ls (m)	0.00
W.S. DS (m)	190.41	Culv Exit Loss (m)	0.47
Delta EG (m)	1.90	Culv Entr Loss (m)	0.02
Delta WS (m)	1.91	Q Weir (m3/s)	
E.G. IC (m)	192.33	Weir Sta Lft (m)	
E.G. OC (m)	192.37	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	192.27	Weir Max Depth (m)	
Culv WS Outlet (m)	190.69	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.19	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.27	Min El Weir Flow (m)	200.29

Warning: Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross section downstream of the culvert has supercritical flow.
Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #5-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.62	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.46
Q Barrel (m3/s)	0.62	Culv Vel DS (m/s)	2.55
E.G. US. (m)	192.45	Culv Inv El Up (m)	192.00
W.S. US. (m)	192.39	Culv Inv El Dn (m)	190.50
E.G. DS (m)	190.52	Culv Frctn Ls (m)	0.00
W.S. DS (m)	190.44	Culv Exit Loss (m)	0.53
Delta EG (m)	1.93	Culv Entr Loss (m)	0.02
Delta WS (m)	1.95	Q Weir (m3/s)	
E.G. IC (m)	192.40	Weir Sta Lft (m)	
E.G. OC (m)	192.45	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	192.32	Weir Max Depth (m)	
Culv WS Outlet (m)	190.72	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.22	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.32	Min El Weir Flow (m)	200.29

Warning: Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross section downstream of the culvert has supercritical flow.
Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #10-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.75	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.53
Q Barrel (m3/s)	0.75	Culv Vel DS (m/s)	2.69
E.G. US. (m)	192.50	Culv Inv El Up (m)	192.00
W.S. US. (m)	192.44	Culv Inv El Dn (m)	190.50
E.G. DS (m)	190.55	Culv Frctn Ls (m)	0.00
W.S. DS (m)	190.47	Culv Exit Loss (m)	0.55
Delta EG (m)	1.94	Culv Entr Loss (m)	0.02
Delta WS (m)	1.97	Q Weir (m3/s)	
E.G. IC (m)	192.45	Weir Sta Lft (m)	
E.G. OC (m)	192.50	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	192.35	Weir Max Depth (m)	
Culv WS Outlet (m)	190.74	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.24	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.35	Min El Weir Flow (m)	200.29

Warning: Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross section downstream of the culvert has supercritical flow.
Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #25-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	1.00	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.65
Q Barrel (m3/s)	1.00	Culv Vel DS (m/s)	2.91
E.G. US. (m)	192.57	Culv Inv El Up (m)	192.00
W.S. US. (m)	192.51	Culv Inv El Dn (m)	190.50
E.G. DS (m)	190.61	Culv Frctn Ls (m)	0.00
W.S. DS (m)	190.50	Culv Exit Loss (m)	0.60
Delta EG (m)	1.96	Culv Entr Loss (m)	0.03
Delta WS (m)	2.00	Q Weir (m3/s)	
E.G. IC (m)	192.52	Weir Sta Lft (m)	
E.G. OC (m)	192.57	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	192.41	Weir Max Depth (m)	
Culv WS Outlet (m)	190.78	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.28	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.41	Min El Weir Flow (m)	200.29

Warning: Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross section downstream of the culvert has supercritical flow.
Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #50-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	1.21	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.74
Q Barrel (m3/s)	1.21	Culv Vel DS (m/s)	3.11
E.G. US. (m)	192.63	Culv Inv El Up (m)	192.00
W.S. US. (m)	192.56	Culv Inv El Dn (m)	190.50
E.G. DS (m)	190.65	Culv Frctn Ls (m)	0.00
W.S. DS (m)	190.53	Culv Exit Loss (m)	0.64
Delta EG (m)	1.98	Culv Entr Loss (m)	0.03
Delta WS (m)	2.03	Q Weir (m3/s)	
E.G. IC (m)	192.58	Weir Sta Lft (m)	
E.G. OC (m)	192.63	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	192.45	Weir Max Depth (m)	
Culv WS Outlet (m)	190.80	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.30	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.45	Min El Weir Flow (m)	200.29

Warning: Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross section downstream of the culvert has supercritical flow.
Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #100-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	1.44	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.82
Q Barrel (m3/s)	1.44	Culv Vel DS (m/s)	3.26
E.G. US. (m)	192.69	Culv Inv El Up (m)	192.00
W.S. US. (m)	192.62	Culv Inv El Dn (m)	190.50
E.G. DS (m)	190.70	Culv Frctn Ls (m)	0.00
W.S. DS (m)	190.56	Culv Exit Loss (m)	0.67
Delta EG (m)	2.00	Culv Entr Loss (m)	0.03
Delta WS (m)	2.06	Q Weir (m3/s)	
E.G. IC (m)	192.63	Weir Sta Lft (m)	
E.G. OC (m)	192.69	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	192.49	Weir Max Depth (m)	
Culv WS Outlet (m)	190.83	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.33	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.49	Min El Weir Flow (m)	200.29

Warning: Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross section downstream of the culvert has supercritical flow.
Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #Check Flow Culv Group: Culvert #1

Q Culv Group (m3/s)	1.88	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.95
Q Barrel (m3/s)	1.88	Culv Vel DS (m/s)	3.57
E.G. US. (m)	192.79	Culv Inv El Up (m)	192.00
W.S. US. (m)	192.71	Culv Inv El Dn (m)	190.50
E.G. DS (m)	190.78	Culv Frctn Ls (m)	0.00
W.S. DS (m)	190.61	Culv Exit Loss (m)	0.74
Delta EG (m)	2.02	Culv Entr Loss (m)	0.04
Delta WS (m)	2.10	Q Weir (m3/s)	
E.G. IC (m)	192.73	Weir Sta Lft (m)	
E.G. OC (m)	192.79	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	192.56	Weir Max Depth (m)	
Culv WS Outlet (m)	190.87	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.37	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.56	Min El Weir Flow (m)	200.29

Warning: Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross section downstream of the culvert has supercritical flow.
Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #Regional Culv Group: Culvert #1

Q Culv Group (m3/s)	6.84	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	2.79
Q Barrel (m3/s)	6.84	Culv Vel DS (m/s)	4.98
E.G. US. (m)	193.56	Culv Inv El Up (m)	192.00

W.S. US. (m)	193.36	Culv Inv El Dn (m)	190.50
E.G. DS (m)	191.43	Culv Frctn Ls (m)	0.00
W.S. DS (m)	191.05	Culv Exit Loss (m)	1.05
Delta EG (m)	2.13	Culv Entr Loss (m)	0.08
Delta WS (m)	2.31	Q Weir (m3/s)	
E.G. IC (m)	193.47	Weir Sta Lft (m)	
E.G. OC (m)	193.56	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	193.09	Weir Max Depth (m)	
Culv WS Outlet (m)	191.22	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.70	Weir Flow Area (m2)	
Culv Crt Depth (m)	1.09	Min El Weir Flow (m)	200.29

Warning: Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross section downstream of the culvert has supercritical flow.
Note: The flow in the culvert is entirely supercritical.

CROSS SECTION

RIVER: DUFFINS
REACH: WC 43 RS: 300

INPUT
Description: ST 300 (Updated Sep 2016)
Station Elevation Data num= 86

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	191.499	2.622	191.493	3.393	191.401	6.669	191.05	14.851	191.016
16.047	191	16.277	190.995	16.39	190.995	16.455	190.99	19.229	190.718
21.301	190.514	32.529	190.51	34.599	190.506	36.489	190.51	41.272	190.5
47.611	190.49	47.626	190.49	47.635	190.49	47.768	190.49	47.907	190.49
50.102	190.41	50.14	190.408	50.292	190.399	51.533	190.346	51.774	190.311
51.986	190.278	52.158	190.254	52.255	190.249	52.26	190.249	53.899	190.274
53.901	190.274	53.912	190.275	54.217	190.394	54.302	190.396	54.65	190.411
54.685	190.444	55.973	190.5	56.01	190.505	56.059	190.518	56.072	190.522
56.577	190.734	59.935	190.5	60.588	190.497	60.844	190.5	61.978	190.581
62.305	190.619	63.193	190.655	63.772	190.682	66.435	190.824	68.115	190.846
70.084	190.88	71.036	190.918	71.555	190.935	72.888	190.937	74.542	190.986
79.177	190.992	79.614	191	80.337	191.032	81.047	191.044	85.989	191.22
90.882	191.411	91.449	191.407	93.026	191.428	97.47	191.481	101.189	191.5
103.106	191.509	104.045	191.574	104.757	191.584	105.818	191.611	108.236	191.727
112.849	191.783	113.776	191.811	120.412	192	121.709	192.117	123.738	192.149
129.21	192.387	131.157	192.477	132.031	192.5	138.078	192.732	143.484	192.971
145.355	193	147.067	193.118	152.226	193.492	152.712	193.5	153.876	193.52
154.561	193.564								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.08	47.611	.035	55.973	.08

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
47.611	55.973	77	76	79 .3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	50.85	193.8	T
54.15	154.561	193.8	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	190.47	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.035	
W.S. Elev (m)	190.41	Reach Len. (m)	77.00	76.00	79.00
Crit W.S. (m)	190.41	Flow Area (m2)		0.40	
E.G. Slope (m/m)	0.024423	Area (m2)		0.42	
Q Total (m3/s)	0.43	Flow (m3/s)		0.43	
Top Width (m)	4.65	Top Width (m)		4.65	
Vel Total (m/s)	1.08	Avg. Vel. (m/s)		1.08	
Max Chl Dpth (m)	0.16	Hydr. Depth (m)		0.12	
Conv. Total (m3/s)	2.8	Conv. (m3/s)		2.8	
Length Wtd. (m)	76.00	Wetted Per. (m)		3.32	
Min Ch El (m)	190.25	Shear (N/m2)		28.60	
Alpha	1.00	Stream Power (N/m s)		30.97	
Frctn Loss (m)	1.25	Cum Volume (1000 m3)		0.08	
C & E Loss (m)	0.02	Cum SA (1000 m2)		1.22	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	190.52	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.		0.035	
W.S. Elev (m)	190.44	Reach Len. (m)	77.00	76.00	79.00
Crit W.S. (m)	190.44	Flow Area (m2)		0.48	
E.G. Slope (m/m)	0.026180	Area (m2)		0.55	
Q Total (m3/s)	0.62	Flow (m3/s)		0.62	
Top Width (m)	5.41	Top Width (m)		5.41	
Vel Total (m/s)	1.28	Avg. Vel. (m/s)		1.28	
Max Chl Dpth (m)	0.19	Hydr. Depth (m)		0.15	
Conv. Total (m3/s)	3.8	Conv. (m3/s)		3.8	
Length Wtd. (m)	76.00	Wetted Per. (m)		3.32	
Min Ch El (m)	190.25	Shear (N/m2)		37.40	
Alpha	1.00	Stream Power (N/m s)		47.87	
Frctn Loss (m)	1.30	Cum Volume (1000 m3)		0.11	
C & E Loss (m)	0.03	Cum SA (1000 m2)		1.50	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	190.55	Element	Left OB	Channel	Right OB
Vel Head (m)	0.09	Wt. n-Val.		0.035	
W.S. Elev (m)	190.47	Reach Len. (m)	77.00	76.00	79.00
Crit W.S. (m)	190.47	Flow Area (m2)		0.58	
E.G. Slope (m/m)	0.021593	Area (m2)		0.72	
Q Total (m3/s)	0.75	Flow (m3/s)		0.75	
Top Width (m)	6.72	Top Width (m)		6.72	
Vel Total (m/s)	1.30	Avg. Vel. (m/s)		1.30	
Max Chl Dpth (m)	0.22	Hydr. Depth (m)		0.17	
Conv. Total (m3/s)	5.1	Conv. (m3/s)		5.1	
Length Wtd. (m)	76.00	Wetted Per. (m)		3.32	
Min Ch El (m)	190.25	Shear (N/m2)		36.64	
Alpha	1.00	Stream Power (N/m s)		47.76	
Frctn Loss (m)	1.20	Cum Volume (1000 m3)		0.14	
C & E Loss (m)	0.04	Cum SA (1000 m2)		1.69	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	190.61	Element	Left OB	Channel	Right OB
Vel Head (m)	0.10	Wt. n-Val.		0.035	
W.S. Elev (m)	190.50	Reach Len. (m)	77.00	76.00	79.00
Crit W.S. (m)	190.50	Flow Area (m2)		0.70	
E.G. Slope (m/m)	0.020257	Area (m2)	0.07	1.00	0.01
Q Total (m3/s)	1.00	Flow (m3/s)		1.00	
Top Width (m)	17.97	Top Width (m)	8.53	8.36	1.07
Vel Total (m/s)	1.43	Avg. Vel. (m/s)		1.43	
Max Chl Dpth (m)	0.26	Hydr. Depth (m)		0.21	
Conv. Total (m3/s)	7.0	Conv. (m3/s)		7.0	
Length Wtd. (m)	76.00	Wetted Per. (m)		3.32	
Min Ch El (m)	190.25	Shear (N/m2)		41.64	
Alpha	1.00	Stream Power (N/m s)		59.75	
Frctn Loss (m)	1.17	Cum Volume (1000 m3)	0.00	0.17	0.00
C & E Loss (m)	0.04	Cum SA (1000 m2)	0.33	1.93	0.04

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	190.65	Element	Left OB	Channel	Right OB
Vel Head (m)	0.12	Wt. n-Val.		0.035	
W.S. Elev (m)	190.53	Reach Len. (m)	77.00	76.00	79.00
Crit W.S. (m)	190.53	Flow Area (m2)		0.79	
E.G. Slope (m/m)	0.019739	Area (m2)	0.69	1.23	0.05
Q Total (m3/s)	1.21	Flow (m3/s)		1.21	
Top Width (m)	36.80	Top Width (m)	26.49	8.36	1.94
Vel Total (m/s)	1.54	Avg. Vel. (m/s)		1.54	
Max Chl Dpth (m)	0.28	Hydr. Depth (m)		0.24	
Conv. Total (m3/s)	8.6	Conv. (m3/s)		8.6	
Length Wtd. (m)	76.00	Wetted Per. (m)		3.32	
Min Ch El (m)	190.25	Shear (N/m2)		45.84	
Alpha	1.00	Stream Power (N/m s)		70.44	
Frctn Loss (m)	1.14	Cum Volume (1000 m3)	0.03	0.20	0.00
C & E Loss (m)	0.05	Cum SA (1000 m2)	1.02	2.06	0.08

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	190.70	Element	Left OB	Channel	Right OB
Vel Head (m)	0.14	Wt. n-Val.		0.035	
W.S. Elev (m)	190.56	Reach Len. (m)	77.00	76.00	79.00
Crit W.S. (m)	190.56	Flow Area (m2)		0.88	
E.G. Slope (m/m)	0.019030	Area (m2)	1.46	1.48	0.12
Q Total (m3/s)	1.44	Flow (m3/s)		1.44	
Top Width (m)	37.99	Top Width (m)	26.79	8.36	2.84
Vel Total (m/s)	1.63	Avg. Vel. (m/s)		1.63	
Max Chl Dpth (m)	0.31	Hydr. Depth (m)		0.27	
Conv. Total (m3/s)	10.4	Conv. (m3/s)		10.4	
Length Wtd. (m)	76.00	Wetted Per. (m)		3.32	
Min Ch El (m)	190.25	Shear (N/m2)		49.60	
Alpha	1.00	Stream Power (N/m s)		80.82	
Frctn Loss (m)	1.13	Cum Volume (1000 m3)	0.06	0.23	0.00
C & E Loss (m)	0.06	Cum SA (1000 m2)	1.03	2.13	0.11

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	190.78	Element	Left OB	Channel	Right OB
Vel Head (m)	0.16	Wt. n-Val.		0.035	
W.S. Elev (m)	190.61	Reach Len. (m)	77.00	76.00	79.00
Crit W.S. (m)	190.61	Flow Area (m2)		1.06	
E.G. Slope (m/m)	0.017864	Area (m2)	2.88	1.92	0.31
Q Total (m3/s)	1.88	Flow (m3/s)		1.88	
Top Width (m)	39.96	Top Width (m)	27.32	8.36	4.27
Vel Total (m/s)	1.78	Avg. Vel. (m/s)		1.78	
Max Chl Dpth (m)	0.36	Hydr. Depth (m)		0.32	
Conv. Total (m3/s)	14.1	Conv. (m3/s)		14.1	
Length Wtd. (m)	76.00	Wetted Per. (m)		3.32	
Min Ch El (m)	190.25	Shear (N/m2)		55.69	
Alpha	1.00	Stream Power (N/m s)		99.05	
Frctn Loss (m)	1.11	Cum Volume (1000 m3)	0.11	0.29	0.01
C & E Loss (m)	0.07	Cum SA (1000 m2)	1.05	2.24	0.17

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	191.43	Element	Left OB	Channel	Right OB
Vel Head (m)	0.38	Wt. n-Val.		0.035	
W.S. Elev (m)	191.05	Reach Len. (m)	77.00	76.00	79.00
Crit W.S. (m)	191.05	Flow Area (m2)		2.50	
E.G. Slope (m/m)	0.013327	Area (m2)	16.07	5.58	5.96
Q Total (m3/s)	6.84	Flow (m3/s)		6.84	
Top Width (m)	74.64	Top Width (m)	40.97	8.36	25.31
Vel Total (m/s)	2.73	Avg. Vel. (m/s)		2.73	
Max Chl Dpth (m)	0.80	Hydr. Depth (m)		0.76	
Conv. Total (m3/s)	59.3	Conv. (m3/s)		59.3	
Length Wtd. (m)	76.00	Wetted Per. (m)		3.32	
Min Ch El (m)	190.25	Shear (N/m2)		98.45	
Alpha	1.00	Stream Power (N/m s)		268.86	
Frctn Loss (m)	0.94	Cum Volume (1000 m3)	0.62	0.77	0.24
C & E Loss (m)	0.17	Cum SA (1000 m2)	1.58	3.22	1.00

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: DUFFINS

REACH: WC 43 RS: 100

INPUT
Description: ST 100 (Updated Sep 2016)
Station Elevation Data num= 51

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	190.966	3.842	190.854	9.599	190.628	10.681	190.588	12.316	190.534
13.298	190.5	18.153	190.358	27.621	190	28.165	189.98	35.005	189.787
38.796	189.624	41.904	189.5	44.788	189.44	50.525	189.344	52.462	189.294
54.684	189.258	55.175	189.254	55.248	189.253	57.336	189.238	60.045	189.195
62.858	189.137	62.88	189.136	66.178	189.108	73.892	189.059	75.611	189.021
76.013	189.012	78.086	189	78.095	189	78.629	188.986	80.262	188.925
80.766	188.983	81.388	188.972	81.92	188.961	82.945	188.987	83.696	189
92.287	189.394	92.345	189.398	94.515	189.5	94.994	189.532	95.469	189.568
101.403	190	102.714	190.038	108.203	190.209	110.861	190.276	114.376	190.361
118.833	190.495	120.25	190.5	122.759	190.511	129.609	190.699	133.23	190.765
138.239	190.883								

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.08	41.904	.035	94.515	.08

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
41.904	94.515	21	52	50	.3	.5

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	189.09	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.01	Wt. n-Val.		0.035		
W.S. Elev (m)	189.07	Reach Len. (m)	21.00	52.00	50.00	
Crit W.S. (m)	189.04	Flow Area (m2)		0.87		
E.G. Slope (m/m)	0.011841	Area (m2)		0.87		
Q Total (m3/s)	0.43	Flow (m3/s)		0.43		
Top Width (m)	13.67	Top Width (m)		13.67		
Vel Total (m/s)	0.49	Avg. Vel. (m/s)		0.49		
Max Chl Dpth (m)	0.15	Hydr. Depth (m)		0.06		
Conv. Total (m3/s)	4.0	Conv. (m3/s)		4.0		
Length Wtd. (m)	52.00	Wetted Per. (m)		13.68		
Min Ch El (m)	188.93	Shear (N/m2)		7.37		
Alpha	1.00	Stream Power (N/m s)		3.65		
Frctn Loss (m)	0.91	Cum Volume (1000 m3)		0.04		
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.52		

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	189.11	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.01	Wt. n-Val.		0.035		
W.S. Elev (m)	189.09	Reach Len. (m)	21.00	52.00	50.00	
Crit W.S. (m)	189.07	Flow Area (m2)		1.18		
E.G. Slope (m/m)	0.012068	Area (m2)		1.18		
Q Total (m3/s)	0.62	Flow (m3/s)		0.62		
Top Width (m)	17.29	Top Width (m)		17.29		
Vel Total (m/s)	0.52	Avg. Vel. (m/s)		0.52		
Max Chl Dpth (m)	0.17	Hydr. Depth (m)		0.07		
Conv. Total (m3/s)	5.6	Conv. (m3/s)		5.6		
Length Wtd. (m)	52.00	Wetted Per. (m)		17.30		
Min Ch El (m)	188.93	Shear (N/m2)		8.08		
Alpha	1.00	Stream Power (N/m s)		4.24		
Frctn Loss (m)	0.90	Cum Volume (1000 m3)		0.05		
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.64		

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	189.12	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.01	Wt. n-Val.		0.035		
W.S. Elev (m)	189.10	Reach Len. (m)	21.00	52.00	50.00	
Crit W.S. (m)		Flow Area (m2)		1.39		
E.G. Slope (m/m)	0.011973	Area (m2)		1.39		
Q Total (m3/s)	0.75	Flow (m3/s)		0.75		
Top Width (m)	19.31	Top Width (m)		19.31		
Vel Total (m/s)	0.54	Avg. Vel. (m/s)		0.54		
Max Chl Dpth (m)	0.18	Hydr. Depth (m)		0.07		
Conv. Total (m3/s)	6.9	Conv. (m3/s)		6.9		
Length Wtd. (m)	52.00	Wetted Per. (m)		19.32		
Min Ch El (m)	188.93	Shear (N/m2)		8.44		
Alpha	1.00	Stream Power (N/m s)		4.56		
Frctn Loss (m)	0.90	Cum Volume (1000 m3)		0.06		
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.70		

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	189.14	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.02	Wt. n-Val.		0.035		
W.S. Elev (m)	189.12	Reach Len. (m)	21.00	52.00	50.00	
Crit W.S. (m)		Flow Area (m2)		1.72		
E.G. Slope (m/m)	0.012184	Area (m2)		1.72		
Q Total (m3/s)	1.00	Flow (m3/s)		1.00		
Top Width (m)	21.68	Top Width (m)		21.68		
Vel Total (m/s)	0.58	Avg. Vel. (m/s)		0.58		
Max Chl Dpth (m)	0.20	Hydr. Depth (m)		0.08		
Conv. Total (m3/s)	9.1	Conv. (m3/s)		9.1		
Length Wtd. (m)	52.00	Wetted Per. (m)		21.69		
Min Ch El (m)	188.93	Shear (N/m2)		9.47		
Alpha	1.00	Stream Power (N/m s)		5.51		
Frctn Loss (m)	0.88	Cum Volume (1000 m3)		0.07		
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.79		

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	189.15	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.02	Wt. n-Val.		0.035		
W.S. Elev (m)	189.13	Reach Len. (m)	21.00	52.00	50.00	
Crit W.S. (m)		Flow Area (m2)		2.01		
E.G. Slope (m/m)	0.011789	Area (m2)		2.01		
Q Total (m3/s)	1.21	Flow (m3/s)		1.21		
Top Width (m)	23.47	Top Width (m)		23.47		
Vel Total (m/s)	0.60	Avg. Vel. (m/s)		0.60		
Max Chl Dpth (m)	0.21	Hydr. Depth (m)		0.09		
Conv. Total (m3/s)	11.1	Conv. (m3/s)		11.1		
Length Wtd. (m)	52.00	Wetted Per. (m)		23.48		
Min Ch El (m)	188.93	Shear (N/m2)		9.89		
Alpha	1.00	Stream Power (N/m s)		5.96		
Frctn Loss (m)	0.88	Cum Volume (1000 m3)		0.08		
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.85		

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	189.16	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	189.14	Reach Len. (m)	21.00	52.00	50.00
Crit W.S. (m)		Flow Area (m2)		2.25	
E.G. Slope (m/m)	0.011916	Area (m2)		2.25	
Q Total (m3/s)	1.44	Flow (m3/s)		1.44	
Top Width (m)	24.32	Top Width (m)		24.32	
Vel Total (m/s)	0.64	Avg. Vel. (m/s)		0.64	
Max Chl Dpth (m)	0.22	Hydr. Depth (m)		0.09	
Conv. Total (m3/s)	13.2	Conv. (m3/s)		13.2	
Length Wtd. (m)	52.00	Wetted Per. (m)		24.33	
Min Ch El (m)	188.93	Shear (N/m2)		10.83	
Alpha	1.00	Stream Power (N/m s)		6.92	
Frctn Loss (m)	0.88	Cum Volume (1000 m3)		0.09	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.89	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	189.19	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	189.16	Reach Len. (m)	21.00	52.00	50.00
Crit W.S. (m)	189.13	Flow Area (m2)		2.68	
E.G. Slope (m/m)	0.012213	Area (m2)		2.68	
Q Total (m3/s)	1.88	Flow (m3/s)		1.88	
Top Width (m)	25.51	Top Width (m)		25.51	
Vel Total (m/s)	0.70	Avg. Vel. (m/s)		0.70	
Max Chl Dpth (m)	0.24	Hydr. Depth (m)		0.10	
Conv. Total (m3/s)	17.0	Conv. (m3/s)		17.0	
Length Wtd. (m)	52.00	Wetted Per. (m)		25.52	
Min Ch El (m)	188.93	Shear (N/m2)		12.56	
Alpha	1.00	Stream Power (N/m s)		8.82	
Frctn Loss (m)	0.85	Cum Volume (1000 m3)		0.11	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.95	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	189.35	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	189.30	Reach Len. (m)	21.00	52.00	50.00
Crit W.S. (m)		Flow Area (m2)		6.92	
E.G. Slope (m/m)	0.011499	Area (m2)		6.92	
Q Total (m3/s)	6.84	Flow (m3/s)		6.84	
Top Width (m)	37.81	Top Width (m)		37.81	
Vel Total (m/s)	0.99	Avg. Vel. (m/s)		0.99	
Max Chl Dpth (m)	0.37	Hydr. Depth (m)		0.18	
Conv. Total (m3/s)	63.8	Conv. (m3/s)		63.8	
Length Wtd. (m)	52.00	Wetted Per. (m)		37.82	
Min Ch El (m)	188.93	Shear (N/m2)		20.65	
Alpha	1.00	Stream Power (N/m s)		20.39	
Frctn Loss (m)	0.77	Cum Volume (1000 m3)		0.29	
C & E Loss (m)	0.02	Cum SA (1000 m2)		1.46	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: DUFFINS
REACH: WC 43 RS: 10

INPUT
Description: ST 10
Station Elevation Data num= 48

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	191.484	6.6	191.096	8.45	191	11.2	190.868	18.86	190.5
29.34	190.054	30.64	190	42.02	189.514	42.36	189.5	46.69	189.315
53.92	189	54.43	188.977	55.62	188.925	58.29	188.802	64.97	188.5
66.41	188.424	67.46	188.376	67.66	188.366	75.44	188	75.6	188
75.78	188	75.91	188	75.95	188	76.2	188	76.43	188
76.44	188	76.47	188	76.91	188	77.23	188	77.89	188.042
79.65	188.146	85.79	188.5	92.78	188.817	92.82	188.819	93.22	188.837
95.69	188.935	97.7	188.959	102.18	188.96	103.22	188.988	104.85	188.977
107.72	188.962	110.07	188.988	111.39	189	115.12	189.154	124.32	189.5
133.22	189.913	135.21	190	138.23	190.124				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.08	55.62	.035	95.69	.08

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
55.62	95.69	0	0	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	188.16	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.035	
W.S. Elev (m)	188.12	Reach Len. (m)			
Crit W.S. (m)	188.12	Flow Area (m2)		0.49	
E.G. Slope (m/m)	0.028316	Area (m2)		0.49	
Q Total (m3/s)	0.43	Flow (m3/s)		0.43	
Top Width (m)	6.37	Top Width (m)		6.37	
Vel Total (m/s)	0.87	Avg. Vel. (m/s)		0.87	
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	2.6	Conv. (m3/s)		2.6	
Length Wtd. (m)		Wetted Per. (m)		6.38	
Min Ch El (m)	188.00	Shear (N/m2)		21.46	
Alpha	1.00	Stream Power (N/m s)		18.72	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	188.19	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	188.15	Reach Len. (m)			
Crit W.S. (m)	188.15	Flow Area (m2)		0.66	
E.G. Slope (m/m)	0.026812	Area (m2)		0.66	
Q Total (m3/s)	0.62	Flow (m3/s)		0.62	
Top Width (m)	7.30	Top Width (m)		7.30	
Vel Total (m/s)	0.94	Avg. Vel. (m/s)		0.94	
Max Chl Dpth (m)	0.15	Hydr. Depth (m)		0.09	
Conv. Total (m3/s)	3.8	Conv. (m3/s)		3.8	
Length Wtd. (m)		Wetted Per. (m)		7.31	
Min Ch El (m)	188.00	Shear (N/m2)		23.72	
Alpha	1.00	Stream Power (N/m s)		22.31	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	188.21	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	188.16	Reach Len. (m)			
Crit W.S. (m)	188.16	Flow Area (m2)		0.76	
E.G. Slope (m/m)	0.027155	Area (m2)		0.76	
Q Total (m3/s)	0.75	Flow (m3/s)		0.75	
Top Width (m)	7.79	Top Width (m)		7.79	

Vel Total (m/s)	0.99	Avg. Vel. (m/s)	0.99
Max Chl Dpth (m)	0.16	Hydr. Depth (m)	0.10
Conv. Total (m3/s)	4.6	Conv. (m3/s)	4.6
Length Wtd. (m)		Wetted Per. (m)	7.80
Min Ch El (m)	188.00	Shear (N/m2)	25.79
Alpha	1.00	Stream Power (N/m s)	25.61
Frctn Loss (m)		Cum Volume (1000 m3)	
C & E Loss (m)		Cum SA (1000 m2)	

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	188.24	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	188.18	Reach Len. (m)			
Crit W.S. (m)	188.18	Flow Area (m2)		0.96	
E.G. Slope (m/m)	0.025038	Area (m2)		0.96	
Q Total (m3/s)	1.00	Flow (m3/s)		1.00	
Top Width (m)	8.76	Top Width (m)		8.76	
Vel Total (m/s)	1.04	Avg. Vel. (m/s)		1.04	
Max Chl Dpth (m)	0.18	Hydr. Depth (m)		0.11	
Conv. Total (m3/s)	6.3	Conv. (m3/s)		6.3	
Length Wtd. (m)		Wetted Per. (m)		8.77	
Min Ch El (m)	188.00	Shear (N/m2)		26.98	
Alpha	1.00	Stream Power (N/m s)		27.98	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	188.26	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.035	
W.S. Elev (m)	188.20	Reach Len. (m)			
Crit W.S. (m)	188.20	Flow Area (m2)		1.10	
E.G. Slope (m/m)	0.026019	Area (m2)		1.10	
Q Total (m3/s)	1.21	Flow (m3/s)		1.21	
Top Width (m)	9.32	Top Width (m)		9.32	
Vel Total (m/s)	1.10	Avg. Vel. (m/s)		1.10	
Max Chl Dpth (m)	0.20	Hydr. Depth (m)		0.12	
Conv. Total (m3/s)	7.5	Conv. (m3/s)		7.5	
Length Wtd. (m)		Wetted Per. (m)		9.34	
Min Ch El (m)	188.00	Shear (N/m2)		29.94	
Alpha	1.00	Stream Power (N/m s)		33.07	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	188.28	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.035	
W.S. Elev (m)	188.21	Reach Len. (m)			
Crit W.S. (m)	188.21	Flow Area (m2)		1.25	
E.G. Slope (m/m)	0.025801	Area (m2)		1.25	
Q Total (m3/s)	1.44	Flow (m3/s)		1.44	
Top Width (m)	9.95	Top Width (m)		9.95	
Vel Total (m/s)	1.15	Avg. Vel. (m/s)		1.15	
Max Chl Dpth (m)	0.21	Hydr. Depth (m)		0.13	
Conv. Total (m3/s)	9.0	Conv. (m3/s)		9.0	
Length Wtd. (m)		Wetted Per. (m)		9.96	
Min Ch El (m)	188.00	Shear (N/m2)		31.78	
Alpha	1.00	Stream Power (N/m s)		36.58	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	188.32	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.035	
W.S. Elev (m)	188.25	Reach Len. (m)			
Crit W.S. (m)	188.25	Flow Area (m2)		1.59	
E.G. Slope (m/m)	0.023314	Area (m2)		1.59	
Q Total (m3/s)	1.88	Flow (m3/s)		1.88	
Top Width (m)	11.17	Top Width (m)		11.17	
Vel Total (m/s)	1.19	Avg. Vel. (m/s)		1.19	
Max Chl Dpth (m)	0.25	Hydr. Depth (m)		0.14	
Conv. Total (m3/s)	12.3	Conv. (m3/s)		12.3	
Length Wtd. (m)		Wetted Per. (m)		11.18	
Min Ch El (m)	188.00	Shear (N/m2)		32.41	
Alpha	1.00	Stream Power (N/m s)		38.43	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	188.56	Element	Left OB	Channel	Right OB
Vel Head (m)	0.12	Wt. n-Val.		0.035	
W.S. Elev (m)	188.44	Reach Len. (m)			
Crit W.S. (m)	188.44	Flow Area (m2)		4.42	
E.G. Slope (m/m)	0.019909	Area (m2)		4.42	
Q Total (m3/s)	6.84	Flow (m3/s)		6.84	
Top Width (m)	18.52	Top Width (m)		18.52	
Vel Total (m/s)	1.55	Avg. Vel. (m/s)		1.55	
Max Chl Dpth (m)	0.44	Hydr. Depth (m)		0.24	
Conv. Total (m3/s)	48.5	Conv. (m3/s)		48.5	
Length Wtd. (m)		Wetted Per. (m)		18.54	
Min Ch El (m)	188.00	Shear (N/m2)		46.50	
Alpha	1.00	Stream Power (N/m s)		72.02	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

SUMMARY OF MANNING'S N VALUES

River:DUFFINS

Reach	River Sta.	n1	n2	n3
WC 43	400	.08	.035	.08
WC 43	350	Culvert		
WC 43	300	.08	.035	.08
WC 43	100	.08	.035	.08
WC 43	10	.08	.035	.08

SUMMARY OF REACH LENGTHS

River: DUFFINS

Reach	River Sta.	Left	Channel	Right
WC 43	400	116.7	116.7	116.7
WC 43	350	Culvert		
WC 43	300	77	76	79
WC 43	100	21	52	50
WC 43	10	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: DUFFINS

Reach	River Sta.	Contr.	Expan.
WC 43	400	.3	.5

WC 43	350	Culvert		
WC 43	300		.3	.5
WC 43	100		.3	.5
WC 43	10		.1	.3

Profile Output Table - Standard Table 1

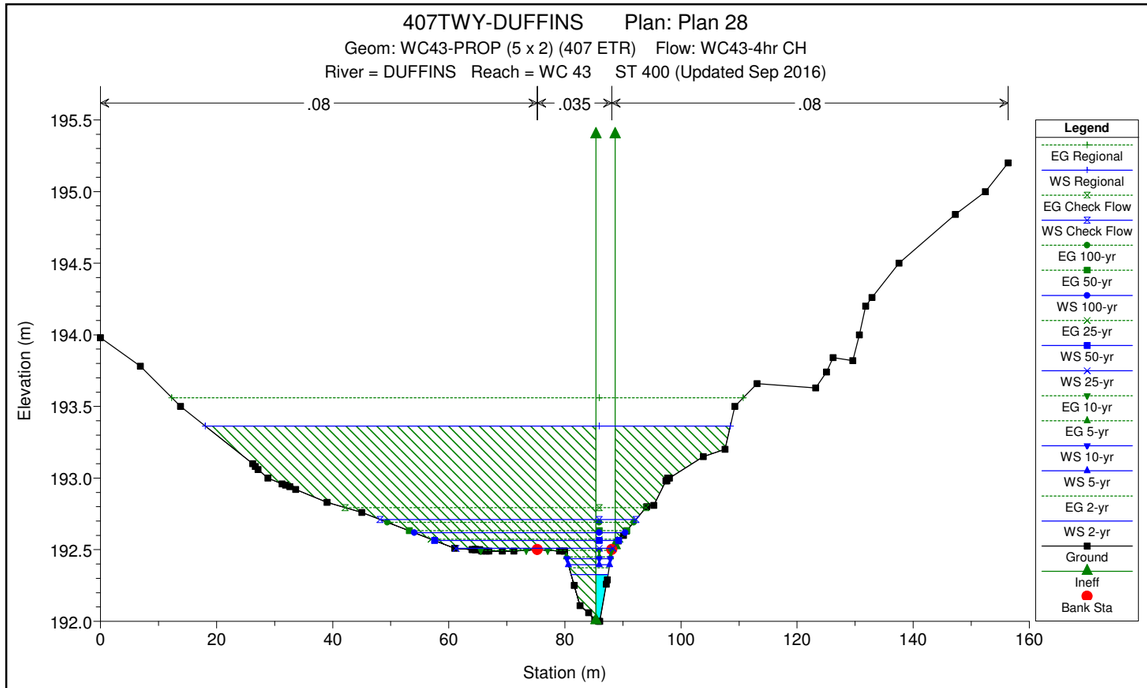
Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
WC 43	400	2-yr	0.43	192.00	192.33	192.26	192.37	0.008998	0.96	0.45	6.33	0.66
WC 43	400	5-yr	0.62	192.00	192.39	192.32	192.45	0.008284	1.04	0.60	7.06	0.65
WC 43	400	10-yr	0.75	192.00	192.44	192.35	192.50	0.007871	1.07	0.70	7.51	0.65
WC 43	400	25-yr	1.00	192.00	192.51	192.40	192.57	0.007093	1.12	0.89	27.06	0.63
WC 43	400	50-yr	1.21	192.00	192.56	192.44	192.63	0.006155	1.16	1.07	31.72	0.60
WC 43	400	100-yr	1.44	192.00	192.62	192.48	192.69	0.005519	1.20	1.25	36.32	0.58
WC 43	400	Check Flow	1.88	192.00	192.71	192.55	192.79	0.004865	1.28	1.55	44.08	0.56
WC 43	400	Regional	6.84	192.00	193.36	193.03	193.56	0.004115	2.02	3.70	90.45	0.59
WC 43	350		Culvert									
WC 43	300	2-yr	0.43	190.25	190.41	190.41	190.47	0.024423	1.08	0.40	4.65	1.00
WC 43	300	5-yr	0.62	190.25	190.44	190.44	190.52	0.026180	1.28	0.48	5.41	1.07
WC 43	300	10-yr	0.75	190.25	190.47	190.47	190.55	0.021593	1.30	0.58	6.72	1.00
WC 43	300	25-yr	1.00	190.25	190.50	190.50	190.61	0.020257	1.43	0.70	17.97	1.00
WC 43	300	50-yr	1.21	190.25	190.53	190.53	190.65	0.019739	1.54	0.79	36.80	1.00
WC 43	300	100-yr	1.44	190.25	190.56	190.56	190.70	0.019030	1.63	0.88	37.99	1.01
WC 43	300	Check Flow	1.88	190.25	190.61	190.61	190.78	0.017864	1.78	1.06	39.96	1.00
WC 43	300	Regional	6.84	190.25	191.05	191.05	191.43	0.013327	2.73	2.50	74.64	1.00
WC 43	100	2-yr	0.43	188.93	189.07	189.04	189.09	0.011841	0.49	0.87	13.67	0.63
WC 43	100	5-yr	0.62	188.93	189.09	189.07	189.11	0.012068	0.52	1.18	17.29	0.64
WC 43	100	10-yr	0.75	188.93	189.10		189.12	0.011973	0.54	1.39	19.31	0.64
WC 43	100	25-yr	1.00	188.93	189.12		189.14	0.012184	0.58	1.72	21.68	0.66
WC 43	100	50-yr	1.21	188.93	189.13		189.15	0.011789	0.60	2.01	23.47	0.66
WC 43	100	100-yr	1.44	188.93	189.14		189.16	0.011916	0.64	2.25	24.32	0.67
WC 43	100	Check Flow	1.88	188.93	189.16	189.13	189.19	0.012213	0.70	2.68	25.51	0.69
WC 43	100	Regional	6.84	188.93	189.30		189.35	0.011499	0.99	6.92	37.81	0.74
WC 43	10	2-yr	0.43	188.00	188.12	188.12	188.16	0.028316	0.87	0.49	6.37	1.00
WC 43	10	5-yr	0.62	188.00	188.15	188.15	188.19	0.026812	0.94	0.66	7.30	1.00
WC 43	10	10-yr	0.75	188.00	188.16	188.16	188.21	0.027155	0.99	0.76	7.79	1.02
WC 43	10	25-yr	1.00	188.00	188.18	188.18	188.24	0.025038	1.04	0.96	8.76	1.00
WC 43	10	50-yr	1.21	188.00	188.20	188.20	188.26	0.026019	1.10	1.10	9.32	1.03
WC 43	10	100-yr	1.44	188.00	188.21	188.21	188.28	0.025801	1.15	1.25	9.95	1.04
WC 43	10	Check Flow	1.88	188.00	188.25	188.25	188.32	0.023314	1.19	1.59	11.17	1.01
WC 43	10	Regional	6.84	188.00	188.44	188.44	188.56	0.019909	1.55	4.42	18.52	1.01

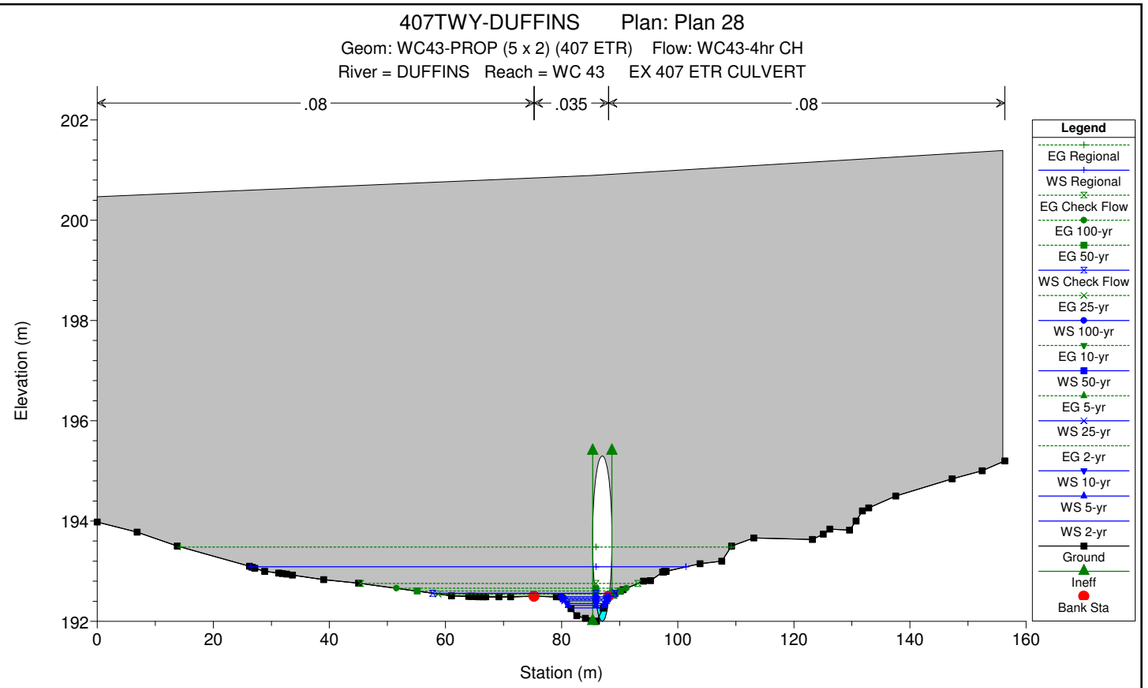
Profile Output Table - Standard Table 2

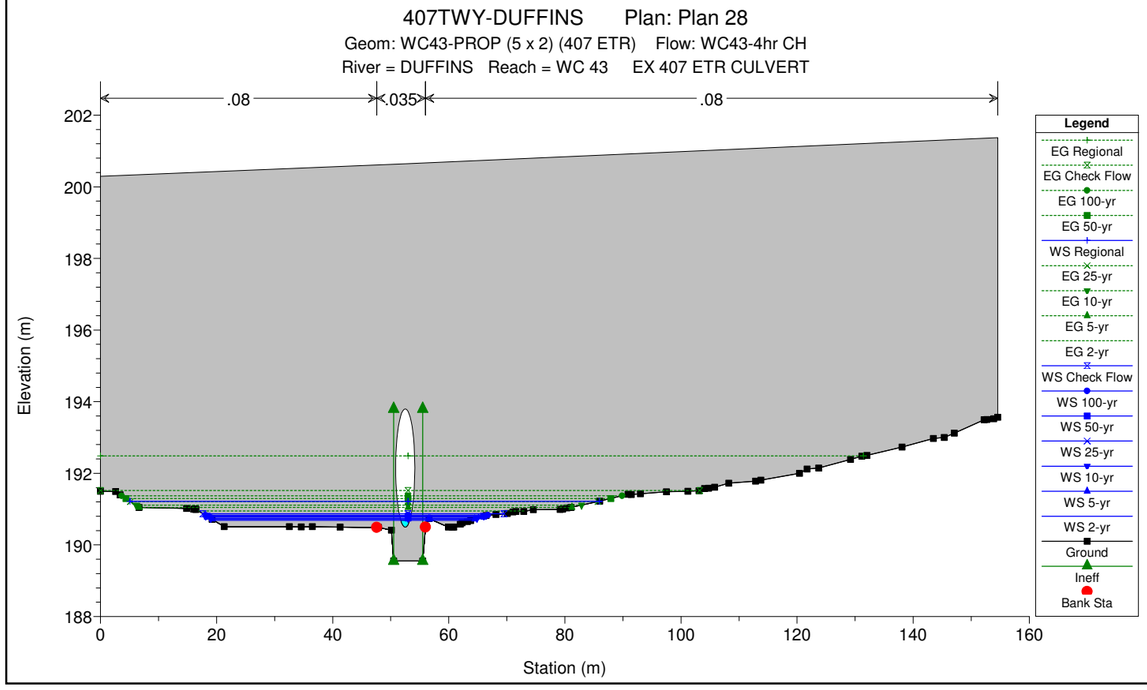
Reach	River Sta	Profile	E.G. Elev (m)	W.S. Elev (m)	Vel Head (m)	Frctn Loss (m)	C & E Loss (m)	Q Left (m3/s)	Q Channel (m3/s)	Q Right (m3/s)	Top Width (m)
WC 43	400	2-yr	192.37	192.33	0.05				0.43		6.33
WC 43	400	5-yr	192.45	192.39	0.05				0.62		7.06
WC 43	400	10-yr	192.50	192.44	0.06				0.75		7.51
WC 43	400	25-yr	192.57	192.51	0.06				1.00	0.00	27.06
WC 43	400	50-yr	192.63	192.56	0.07				1.21	0.00	31.72
WC 43	400	100-yr	192.69	192.62	0.07				1.43	0.01	36.32
WC 43	400	Check Flow	192.79	192.71	0.08				1.85	0.03	44.08
WC 43	400	Regional	193.56	193.36	0.20				6.49	0.35	90.45
WC 43	350		Culvert								
WC 43	300	2-yr	190.47	190.41	0.06	1.25	0.02		0.43		4.65
WC 43	300	5-yr	190.52	190.44	0.08	1.30	0.03		0.62		5.41
WC 43	300	10-yr	190.55	190.47	0.09	1.20	0.04		0.75		6.72
WC 43	300	25-yr	190.61	190.50	0.10	1.17	0.04		1.00		17.97
WC 43	300	50-yr	190.65	190.53	0.12	1.14	0.05		1.21		36.80
WC 43	300	100-yr	190.70	190.56	0.14	1.13	0.06		1.44		37.99
WC 43	300	Check Flow	190.78	190.61	0.16	1.11	0.07		1.88		39.96
WC 43	300	Regional	191.43	191.05	0.38	0.94	0.17		6.84		74.64
WC 43	100	2-yr	189.09	189.07	0.01	0.91	0.01		0.43		13.67
WC 43	100	5-yr	189.11	189.09	0.01	0.90	0.01		0.62		17.29
WC 43	100	10-yr	189.12	189.10	0.01	0.90	0.01		0.75		19.31
WC 43	100	25-yr	189.14	189.12	0.02	0.88	0.01		1.00		21.68
WC 43	100	50-yr	189.15	189.13	0.02	0.88	0.01		1.21		23.47
WC 43	100	100-yr	189.16	189.14	0.02	0.88	0.01		1.44		24.32
WC 43	100	Check Flow	189.19	189.16	0.03	0.85	0.01		1.88		25.51
WC 43	100	Regional	189.35	189.30	0.05	0.77	0.02		6.84		37.81
WC 43	10	2-yr	188.16	188.12	0.04				0.43		6.37
WC 43	10	5-yr	188.19	188.15	0.05				0.62		7.30
WC 43	10	10-yr	188.21	188.16	0.05				0.75		7.79
WC 43	10	25-yr	188.24	188.18	0.05				1.00		8.76
WC 43	10	50-yr	188.26	188.20	0.06				1.21		9.32
WC 43	10	100-yr	188.28	188.21	0.07				1.44		9.95
WC 43	10	Check Flow	188.32	188.25	0.07				1.88		11.17
WC 43	10	Regional	188.56	188.44	0.12				6.84		18.52

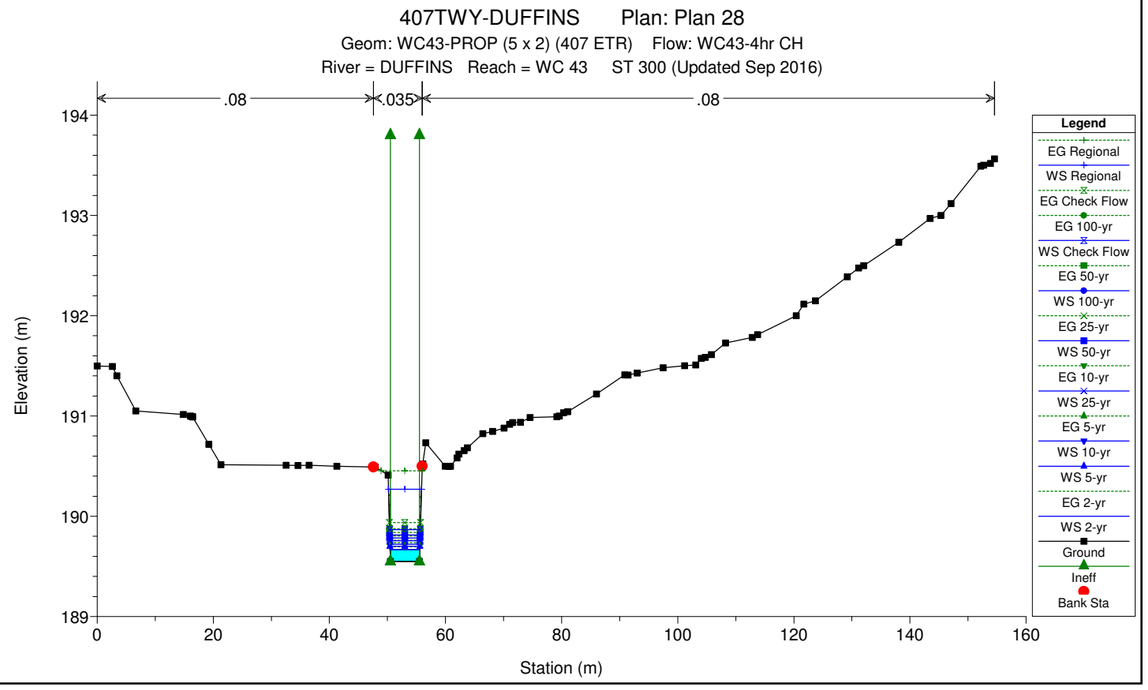
Profile Output Table - Culvert Only

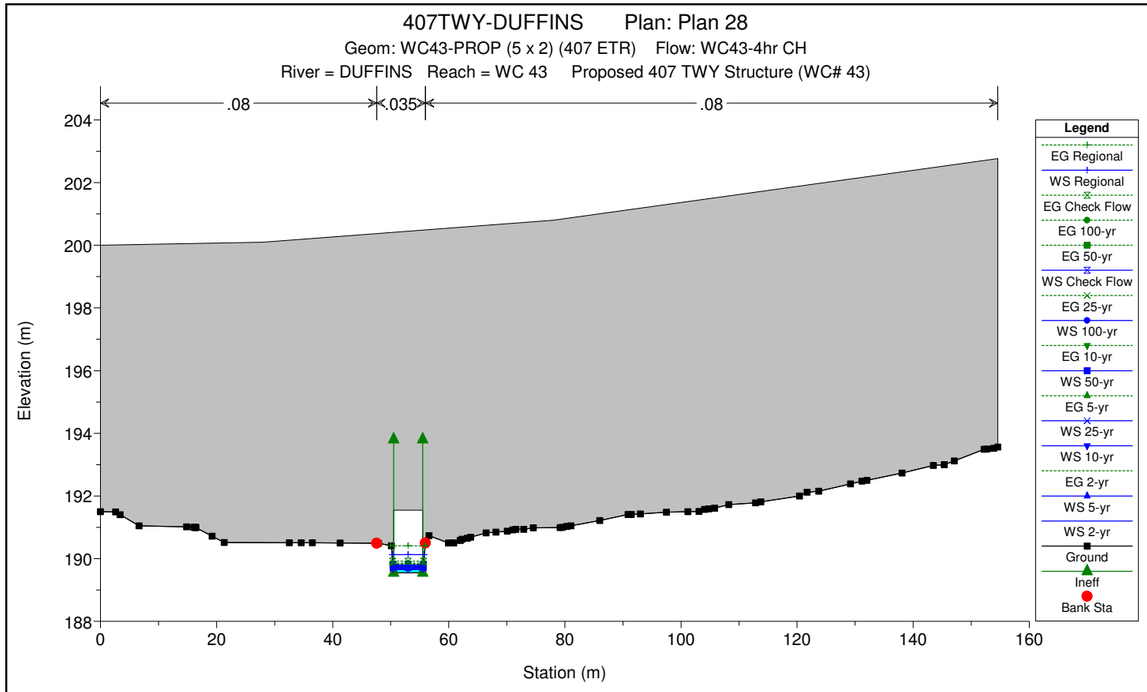
Reach	River Sta		Profile	E.G. US. (m)	W.S. US. (m)	E.G. IC (m)	E.G. OC (m)	Min El Weir Flow (m)	Q Culv Group (m3/s)	Q Weir (m3/s)	Delta WS (m)	Culv Vel US (m/s)	Culv Vel DS (m/s)
WC 43	350	Culvert #1	2-yr	192.37	192.33	192.33	192.37	200.29	0.43		1.91	1.33	2.25
WC 43	350	Culvert #1	5-yr	192.45	192.39	192.40	192.45	200.29	0.62		1.95	1.46	2.55
WC 43	350	Culvert #1	10-yr	192.50	192.44	192.45	192.50	200.29	0.75		1.97	1.53	2.69
WC 43	350	Culvert #1	25-yr	192.57	192.51	192.52	192.57	200.29	1.00		2.00	1.65	2.91
WC 43	350	Culvert #1	50-yr	192.63	192.56	192.58	192.63	200.29	1.21		2.03	1.74	3.11
WC 43	350	Culvert #1	100-yr	192.69	192.62	192.63	192.69	200.29	1.44		2.06	1.82	3.26
WC 43	350	Culvert #1	Check Flow	192.79	192.71	192.73	192.79	200.29	1.88		2.10	1.95	3.57
WC 43	350	Culvert #1	Regional	193.56	193.36	193.47	193.56	200.29	6.84		2.31	2.79	4.98

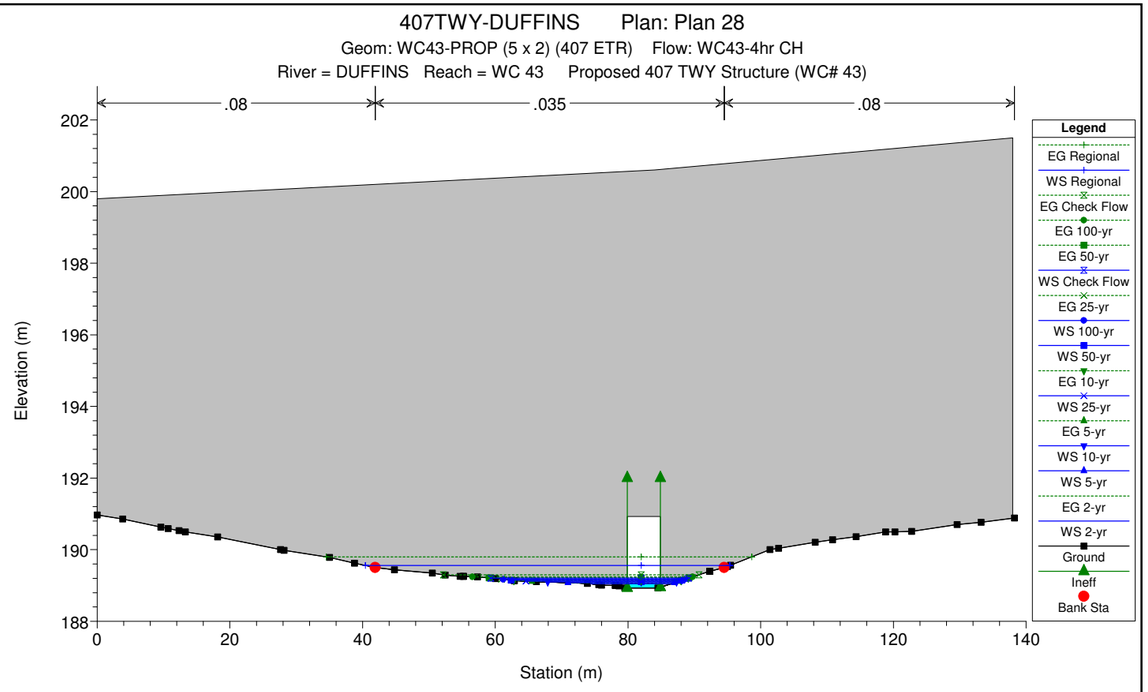

407TWY-DUFFINS Plan: Plan 28
Geom: WC43-PROP (5 x 2) (407 ETR) Flow: WC43-4hr CH
River = DUFFINS Reach = WC 43 ST 400 (Updated Sep 2016)
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG Check Flow
WS Check Flow
EG 100-yr
EG 50-yr
WS 100-yr
EG 25-yr
WS 50-yr
WS 25-yr
EG 10-yr
EG 5-yr
WS 10-yr
WS 5-yr
EG 2-yr
WS 2-yr
Ground
Ineff
Bank Sta

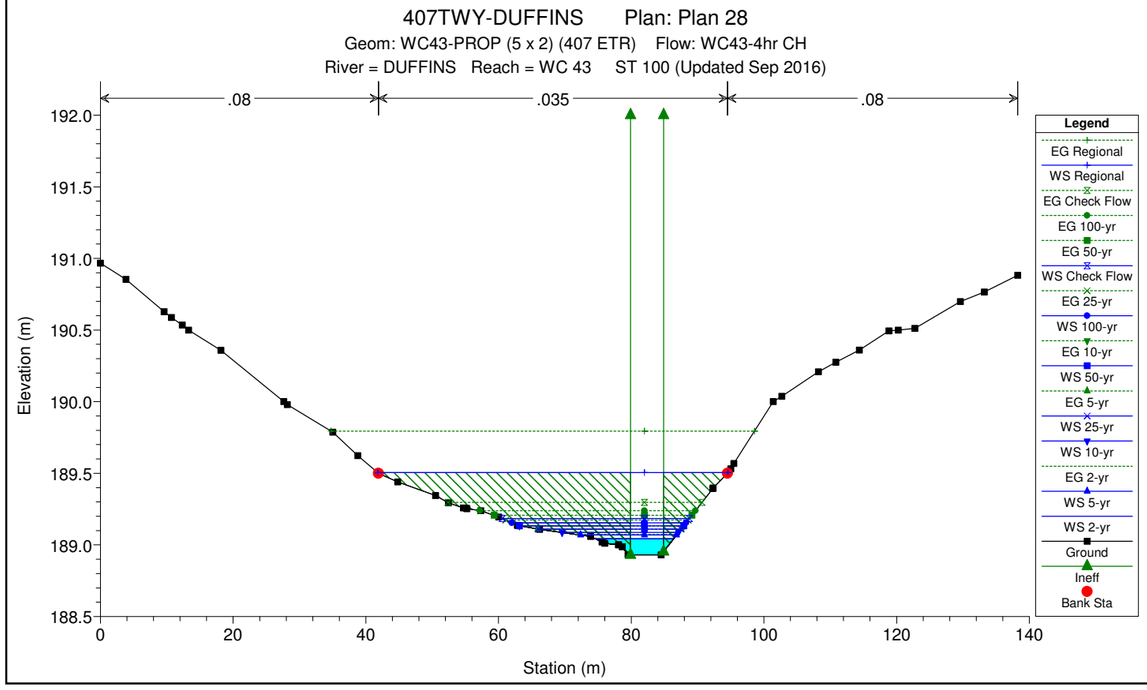

407TWY-DUFFINS Plan: Plan 28
Geom: WC43-PROP (5 x 2) (407 ETR) Flow: WC43-4hr CH
River = DUFFINS Reach = WC 43 EX 407 ETR CULVERT
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG Check Flow
EG 100-yr
EG 50-yr
WS Check Flow
EG 25-yr
WS 100-yr
EG 10-yr
WS 50-yr
EG 5-yr
WS 25-yr
EG 2-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta

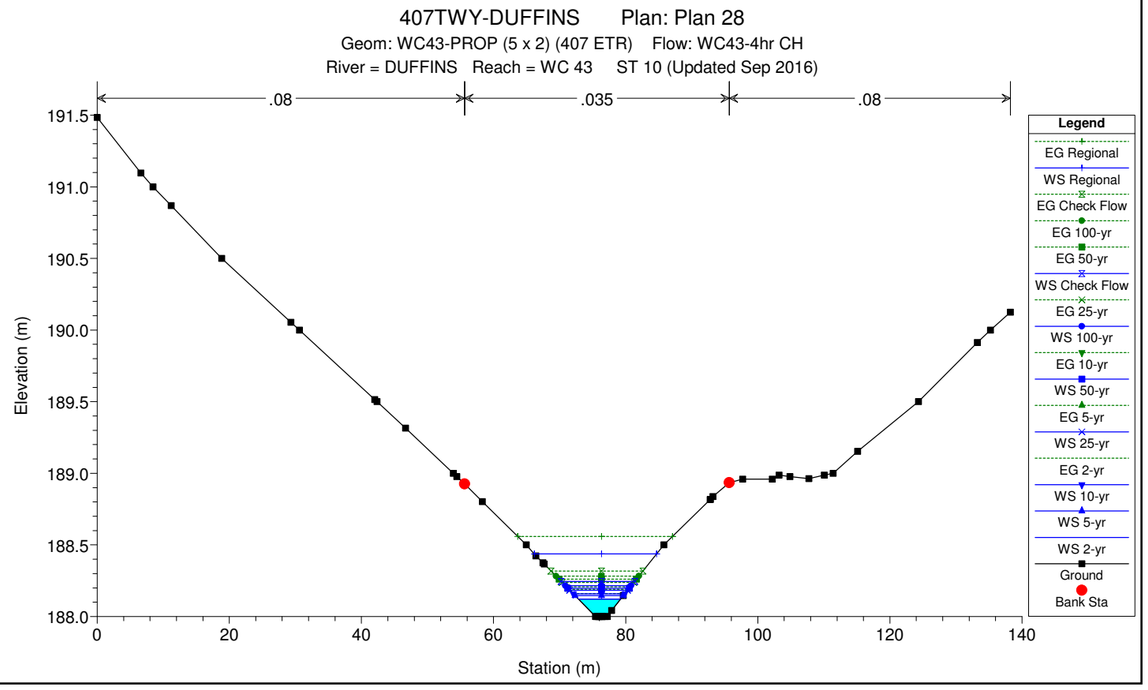

407TWY-DUFFINS Plan: Plan 28
Geom: WC43-PROP (5 x 2) (407 ETR) Flow: WC43-4hr CH
River = DUFFINS Reach = WC 43 EX 407 ETR CULVERT
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
EG Check Flow
EG 100-yr
EG 50-yr
WS Regional
EG 25-yr
EG 10-yr
EG 5-yr
EG 2-yr
WS Check Flow
WS 100-yr
WS 50-yr
WS 25-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta


407TWY-DUFFINS Plan: Plan 28
Geom: WC43-PROP (5 x 2) (407 ETR) Flow: WC43-4hr CH
River = DUFFINS Reach = WC 43 ST 300 (Updated Sep 2016)
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG Check Flow
EG 100-yr
WS Check Flow
EG 50-yr
WS 100-yr
EG 25-yr
WS 50-yr
EG 10-yr
WS 25-yr
EG 5-yr
WS 10-yr
WS 5-yr
EG 2-yr
WS 2-yr
Ground
Ineff
Bank Sta


407TWY-DUFFINS Plan: Plan 28
Geom: WC43-PROP (5 x 2) (407 ETR) Flow: WC43-4hr CH
River = DUFFINS Reach = WC 43 Proposed 407 TWY Structure (WC# 43)
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG Check Flow
EG 100-yr
EG 50-yr
WS Check Flow
EG 25-yr
WS 100-yr
EG 10-yr
WS 50-yr
EG 5-yr
WS 25-yr
WS 10-yr
EG 2-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta


407TWY-DUFFINS Plan: Plan 28
Geom: WC43-PROP (5 x 2) (407 ETR) Flow: WC43-4hr CH
River = DUFFINS Reach = WC 43 Proposed 407 TWY Structure (WC# 43)
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG Check Flow
EG 100-yr
EG 50-yr
WS Check Flow
EG 25-yr
WS 100-yr
WS 50-yr
EG 10-yr
WS 25-yr
EG 5-yr
WS 10-yr
WS 5-yr
EG 2-yr
WS 2-yr
Ground
Ineff
Bank Sta


407TWY-DUFFINS Plan: Plan 28
Geom: WC43-PROP (5 x 2) (407 ETR) Flow: WC43-4hr CH
River = DUFFINS Reach = WC 43 ST 100 (Updated Sep 2016)
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG Check Flow
EG 100-yr
EG 50-yr
WS Check Flow
EG 25-yr
WS 100-yr
EG 10-yr
WS 50-yr
EG 5-yr
WS 25-yr
WS 10-yr
EG 2-yr
WS 5-yr
WS 2-yr
Ground
Ineff
Bank Sta


407TWY-DUFFINS Plan: Plan 28
Geom: WC43-PROP (5 x 2) (407 ETR) Flow: WC43-4hr CH
River = DUFFINS Reach = WC 43 ST 10 (Updated Sep 2016)
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG Check Flow
EG 100-yr
EG 50-yr
WS Check Flow
EG 25-yr
WS 100-yr
EG 10-yr
WS 50-yr
EG 5-yr
WS 25-yr
EG 2-yr
WS 10-yr
WS 5-yr
WS 2-yr
Ground
Bank Sta

HEC-RAS Plan: WC43 - PROP (4hr CH) River: DUFFINS Reach: WC 43

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC 43	400	2-yr	0.43	192.00	192.33	192.26	192.37	0.008998	0.96	0.45	6.33	0.66
WC 43	400	5-yr	0.62	192.00	192.39	192.32	192.45	0.008284	1.04	0.60	7.06	0.65
WC 43	400	10-yr	0.75	192.00	192.44	192.35	192.50	0.007871	1.07	0.70	7.51	0.65
WC 43	400	25-yr	1.00	192.00	192.51	192.40	192.57	0.007093	1.12	0.89	27.06	0.63
WC 43	400	50-yr	1.21	192.00	192.56	192.44	192.63	0.006155	1.16	1.07	31.72	0.60
WC 43	400	100-yr	1.44	192.00	192.62	192.49	192.69	0.005519	1.20	1.25	36.32	0.58
WC 43	400	Check Flow	1.88	192.00	192.71	192.55	192.79	0.004865	1.28	1.55	44.07	0.56
WC 43	400	Regional	6.84	192.00	193.36	193.03	193.56	0.004115	2.02	3.70	90.45	0.59
WC 43	350		Culvert									
WC 43	300	2-yr	0.43	189.55	189.67	189.66	189.70	0.011229	0.73	0.59	5.11	0.68
WC 43	300	5-yr	0.62	189.55	189.70	189.66	189.73	0.010529	0.83	0.75	5.14	0.68
WC 43	300	10-yr	0.75	189.55	189.72	189.68	189.76	0.010042	0.88	0.85	5.16	0.68
WC 43	300	25-yr	1.00	189.55	189.76	189.71	189.80	0.009425	0.97	1.03	5.20	0.68
WC 43	300	50-yr	1.21	189.55	189.78	189.73	189.84	0.009024	1.03	1.17	5.23	0.68
WC 43	300	100-yr	1.44	189.55	189.81	189.75	189.87	0.008660	1.09	1.32	5.25	0.68
WC 43	300	Check Flow	1.88	189.55	189.87	189.79	189.94	0.008106	1.19	1.58	5.30	0.68
WC 43	300	Regional	6.84	189.55	190.27	190.12	190.45	0.006836	1.90	3.60	5.69	0.71
WC 43	150		Culvert									
WC 43	100	2-yr	0.43	188.93	189.04		189.07	0.013253	0.77	0.56	11.80	0.73
WC 43	100	5-yr	0.62	188.93	189.07	189.04	189.11	0.013955	0.90	0.69	14.47	0.77
WC 43	100	10-yr	0.75	188.93	189.09	189.06	189.13	0.013650	0.96	0.78	17.55	0.78
WC 43	100	25-yr	1.00	188.93	189.11	189.09	189.17	0.015158	1.12	0.90	21.57	0.84
WC 43	100	50-yr	1.21	188.93	189.13	189.13	189.21	0.014672	1.19	1.01	24.75	0.85
WC 43	100	100-yr	1.44	188.93	189.15	189.13	189.24	0.015021	1.29	1.12	26.25	0.87
WC 43	100	Check Flow	1.88	188.93	189.18	189.17	189.30	0.016804	1.48	1.27	28.21	0.94
WC 43	100	Regional	6.84	188.93	189.50	189.50	189.79	0.014609	2.38	2.87	52.80	1.01
WC 43	10	2-yr	0.43	188.00	188.12	188.12	188.16	0.028316	0.87	0.49	6.37	1.00
WC 43	10	5-yr	0.62	188.00	188.15	188.15	188.19	0.026812	0.94	0.66	7.30	1.00
WC 43	10	10-yr	0.75	188.00	188.16	188.16	188.21	0.027155	0.99	0.76	7.79	1.02
WC 43	10	25-yr	1.00	188.00	188.18	188.18	188.24	0.025038	1.04	0.96	8.76	1.00
WC 43	10	50-yr	1.21	188.00	188.20	188.20	188.26	0.026019	1.10	1.10	9.32	1.03
WC 43	10	100-yr	1.44	188.00	188.21	188.21	188.28	0.025801	1.15	1.25	9.95	1.04
WC 43	10	Check Flow	1.88	188.00	188.25	188.25	188.32	0.023503	1.19	1.58	11.15	1.01
WC 43	10	Regional	6.84	188.00	188.44	188.44	188.56	0.019880	1.55	4.42	18.52	1.01

HEC-RAS HEC-RAS 5.0.1 April 2016
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

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X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X      X   X     X  X    X
X     X  X        X           X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X           X  X     X    X        X
X     X  X        X    X      X   X    X    X        X
X     X  XXXXXX    XXXX       X    X   X    X   XXXXX
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PROJECT DATA
Project Title: 407TWY-DUFFINS
Project File : 407TWY-DUFFINS.prj
Run Date and Time: 9/21/2016 1:51:01 PM

Project in SI units

Project Description:
HEC-RAS Model created for 407 TWY project from Kennedy Rd. to Brock Rd. -
Duffins Creek Watershed

PLAN DATA

Plan Title: Plan 28
Plan File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.p28

Geometry Title: WC43-PROP (5 x 2) (407 ETR)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.g14

Flow Title   : WC43-4hr CH
Flow File   : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.f14

Plan Summary Information:
Number of: Cross Sections = 4   Multiple Openings = 0
            Culverts   = 2   Inline Structures = 0
            Bridges   = 0   Lateral Structures = 0

Computational Information
    Water surface calculation tolerance = 0.01
    Critical depth calculation tolerance = 0.01
    Maximum number of iterations   = 20
    Maximum difference tolerance   = 0.3
    Flow tolerance factor   = 0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method: Average Conveyance
    Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: WC43-4hr CH
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.f14

Flow Data (m3/s)

River	Reach	RS	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Check Flow	Regional
DUFFINS	WC 43	400	.43	.62	.75	1	1.21	1.44	1.88	6.84

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
DUFFINS	WC 43	2-yr		Critical
DUFFINS	WC 43	5-yr		Critical
DUFFINS	WC 43	10-yr		Critical
DUFFINS	WC 43	25-yr		Critical
DUFFINS	WC 43	50-yr		Critical
DUFFINS	WC 43	100-yr		Critical
DUFFINS	WC 43	Check Flow		Critical
DUFFINS	WC 43	Regional		Critical

GEOMETRY DATA

Geometry Title: WC43-PROP (5 x 2) (407 ETR)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.g14

CROSS SECTION

RIVER: DUFFINS
REACH: WC 43 RS: 400

INPUT
Description: ST 400 (Updated Sep 2016)
Station Elevation Data num= 62

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	193.98	6.87	193.78	13.79	193.5	26.21	193.1	26.67	193.08
27.13	193.06	28.86	193	31.27	192.96	31.89	192.95	32.63	192.94
33.62	192.92	39.02	192.83	45.04	192.76	61.02	192.51	64	192.5
64.1	192.5	64.56	192.5	64.59	192.5	64.62	192.5	65.34	192.5
65.68	192.49	66.49	192.49	66.9	192.49	69.19	192.49	71.2	192.49
75.24	192.5	79.09	192.49	79.85	192.49	79.97	192.49	81.62	192.25
82.61	192.11	84.09	192.06	85.12	192.01	85.78	192	86.02	192
87.14	192.26	87.29	192.29	88.08	192.5	89.19	192.56	90.09	192.6
90.59	192.63	94.09	192.8	95.32	192.81	97.42	192.98	97.56	192.98
97.69	193	98	193	103.84	193.15	107.59	193.2	109.27	193.5
113.11	193.66	123.18	193.63	125.08	193.74	126.21	193.84	129.58	193.82
130.72	194	131.8	194.2	132.89	194.26	137.56	194.5	147.26	194.84
152.45	195	156.34	195.2						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.08	75.24	.035	88.08	.08

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
75.24 88.08 116.7 116.7 116.7 .3 .5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	85.35	195.4	T
88.65	156.34	195.4	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	192.37	Element	Left OB	Channel	Right OB	
Vel Head (m)	0.05	Wt. n-Val.		0.035		
W.S. Elev (m)	192.33	Reach Len. (m)	116.70	116.70	116.70	
Crit W.S. (m)	192.26	Flow Area (m2)		0.45		
E.G. Slope (m/m)	0.008998	Area (m2)		1.34		
Q Total (m3/s)	0.43	Flow (m3/s)		0.43		
Top Width (m)	6.33	Top Width (m)		6.33		
Vel Total (m/s)	0.96	Avg. Vel. (m/s)		0.96		
Max Chl Dpth (m)	0.33	Hydr. Depth (m)		0.22		
Conv. Total (m3/s)	4.5	Conv. (m3/s)		4.5		

Length Wtd. (m)	116.70	Wetted Per. (m)	2.11
Min Ch El (m)	192.00	Shear (N/m2)	18.66
Alpha	1.00	Stream Power (N/m s)	17.96
Frctn Loss (m)		Cum Volume (1000 m3)	0.11
C & E Loss (m)		Cum SA (1000 m2)	1.76

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	192.45	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	192.39	Reach Len. (m)	116.70	116.70	116.70
Crit W.S. (m)	192.32	Flow Area (m2)		0.60	
E.G. Slope (m/m)	0.008284	Area (m2)		1.80	
Q Total (m3/s)	0.62	Flow (m3/s)		0.62	
Top Width (m)	7.06	Top Width (m)		7.06	
Vel Total (m/s)	1.04	Avg. Vel. (m/s)		1.04	
Max Chl Dpth (m)	0.39	Hydr. Depth (m)		0.26	
Conv. Total (m3/s)	6.8	Conv. (m3/s)		6.8	
Length Wtd. (m)	116.70	Wetted Per. (m)		2.38	
Min Ch El (m)	192.00	Shear (N/m2)		20.42	
Alpha	1.00	Stream Power (N/m s)		21.16	
Frctn Loss (m)		Cum Volume (1000 m3)		0.14	
C & E Loss (m)		Cum SA (1000 m2)		1.99	

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	192.50	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.035	
W.S. Elev (m)	192.44	Reach Len. (m)	116.70	116.70	116.70
Crit W.S. (m)	192.35	Flow Area (m2)		0.70	
E.G. Slope (m/m)	0.007871	Area (m2)		2.11	
Q Total (m3/s)	0.75	Flow (m3/s)		0.75	
Top Width (m)	7.51	Top Width (m)		7.51	
Vel Total (m/s)	1.07	Avg. Vel. (m/s)		1.07	
Max Chl Dpth (m)	0.44	Hydr. Depth (m)		0.28	
Conv. Total (m3/s)	8.5	Conv. (m3/s)		8.5	
Length Wtd. (m)	116.70	Wetted Per. (m)		2.54	
Min Ch El (m)	192.00	Shear (N/m2)		21.23	
Alpha	1.00	Stream Power (N/m s)		22.76	
Frctn Loss (m)		Cum Volume (1000 m3)		0.16	
C & E Loss (m)		Cum SA (1000 m2)		2.22	

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	192.57	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.035	0.001
W.S. Elev (m)	192.51	Reach Len. (m)	116.70	116.70	116.70
Crit W.S. (m)	192.40	Flow Area (m2)		0.89	0.00
E.G. Slope (m/m)	0.007093	Area (m2)	0.19	2.75	0.00
Q Total (m3/s)	1.00	Flow (m3/s)		1.00	0.00
Top Width (m)	27.06	Top Width (m)	14.05	12.84	0.17
Vel Total (m/s)	1.12	Avg. Vel. (m/s)		1.12	0.03
Max Chl Dpth (m)	0.51	Hydr. Depth (m)		0.33	0.00
Conv. Total (m3/s)	11.9	Conv. (m3/s)		11.9	0.0
Length Wtd. (m)	116.70	Wetted Per. (m)		2.79	0.17
Min Ch El (m)	192.00	Shear (N/m2)		22.19	
Alpha	1.00	Stream Power (N/m s)		24.93	
Frctn Loss (m)		Cum Volume (1000 m3)		0.21	
C & E Loss (m)		Cum SA (1000 m2)	0.82	2.81	0.01

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	192.63	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.035	0.080
W.S. Elev (m)	192.56	Reach Len. (m)	116.70	116.70	116.70
Crit W.S. (m)	192.44	Flow Area (m2)		1.04	0.03
E.G. Slope (m/m)	0.006155	Area (m2)	1.07	3.45	0.04
Q Total (m3/s)	1.21	Flow (m3/s)		1.21	0.00
Top Width (m)	31.72	Top Width (m)	17.68	12.84	1.20
Vel Total (m/s)	1.13	Avg. Vel. (m/s)		1.16	0.13
Max Chl Dpth (m)	0.56	Hydr. Depth (m)		0.38	0.05
Conv. Total (m3/s)	15.4	Conv. (m3/s)		15.4	0.0
Length Wtd. (m)	116.70	Wetted Per. (m)		2.79	0.57
Min Ch El (m)	192.00	Shear (N/m2)		22.49	2.92
Alpha	1.04	Stream Power (N/m s)		26.10	0.38
Frctn Loss (m)		Cum Volume (1000 m3)		0.25	
C & E Loss (m)		Cum SA (1000 m2)	1.03	3.03	0.07

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	192.69	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.035	0.080
W.S. Elev (m)	192.62	Reach Len. (m)	116.70	116.70	116.70
Crit W.S. (m)	192.49	Flow Area (m2)		1.19	0.06
E.G. Slope (m/m)	0.005519	Area (m2)	2.13	4.15	0.14
Q Total (m3/s)	1.44	Flow (m3/s)		1.43	0.01
Top Width (m)	36.32	Top Width (m)	21.16	12.84	2.32
Vel Total (m/s)	1.15	Avg. Vel. (m/s)		1.20	0.20
Max Chl Dpth (m)	0.62	Hydr. Depth (m)		0.44	0.10
Conv. Total (m3/s)	19.4	Conv. (m3/s)		19.2	0.2
Length Wtd. (m)	116.70	Wetted Per. (m)		2.79	0.57
Min Ch El (m)	192.00	Shear (N/m2)		23.05	5.57
Alpha	1.07	Stream Power (N/m s)		27.70	1.14
Frctn Loss (m)		Cum Volume (1000 m3)		0.30	
C & E Loss (m)		Cum SA (1000 m2)	1.23	3.14	0.14

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	192.79	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.		0.035	0.080
W.S. Elev (m)	192.71	Reach Len. (m)	116.70	116.70	116.70
Crit W.S. (m)	192.55	Flow Area (m2)		1.44	0.11
E.G. Slope (m/m)	0.004865	Area (m2)	4.35	5.34	0.43
Q Total (m3/s)	1.88	Flow (m3/s)		1.85	0.03
Top Width (m)	44.07	Top Width (m)	27.06	12.84	4.18
Vel Total (m/s)	1.21	Avg. Vel. (m/s)		1.28	0.29
Max Chl Dpth (m)	0.71	Hydr. Depth (m)		0.53	0.20
Conv. Total (m3/s)	27.0	Conv. (m3/s)		26.5	0.5
Length Wtd. (m)	116.70	Wetted Per. (m)		2.79	0.57
Min Ch El (m)	192.00	Shear (N/m2)		24.63	9.31
Alpha	1.10	Stream Power (N/m s)		31.59	2.73
Frctn Loss (m)		Cum Volume (1000 m3)		0.40	
C & E Loss (m)		Cum SA (1000 m2)	1.58	3.30	0.24

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	193.56	Element	Left OB	Channel	Right OB
Vel Head (m)	0.20	Wt. n-Val.		0.035	0.080
W.S. Elev (m)	193.36	Reach Len. (m)	116.70	116.70	116.70
Crit W.S. (m)	193.03	Flow Area (m2)		3.22	0.48
E.G. Slope (m/m)	0.004115	Area (m2)	33.84	13.71	8.61
Q Total (m3/s)	6.84	Flow (m3/s)		6.49	0.35
Top Width (m)	90.45	Top Width (m)	57.19	12.84	20.42
Vel Total (m/s)	1.85	Avg. Vel. (m/s)		2.02	0.72
Max Chl Dpth (m)	1.36	Hydr. Depth (m)		1.18	0.85
Conv. Total (m3/s)	106.6	Conv. (m3/s)		101.2	5.4
Length Wtd. (m)	116.70	Wetted Per. (m)		2.79	0.57
Min Ch El (m)	192.00	Shear (N/m2)		46.57	34.14
Alpha	1.14	Stream Power (N/m s)		93.92	24.49
Frctn Loss (m)		Cum Volume (1000 m3)	0.00	1.46	0.00
C & E Loss (m)		Cum SA (1000 m2)	3.34	5.04	1.20

CULVERT

RIVER: DUFFINS

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REACH: WC 43              RS: 350

INPUT
Description: EX 407 ETR CULVERT
Distance from Upstream XS =    32.6
Deck/Roadway Width        =      55
Weir Coefficient          =     1.4
Upstream  Deck/Roadway Coordinates
    num=       3
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0  200.47              85  200.89             156  201.39

Upstream Bridge Cross Section Data
Station Elevation Data    num=      62
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0  193.98    6.87  193.78   13.79   193.5   26.21   193.1   26.67  193.08
   27.13  193.06   28.86     193   31.27  192.96   31.89  192.95   32.63  192.94
   33.62  192.92   39.02  192.83   45.04  192.76   61.02  192.51      64   192.5
    64.1   192.5   64.56   192.5   64.59   192.5   64.62   192.5   65.34   192.5
   65.68  192.49   66.49  192.49    66.9  192.49   69.19  192.49    71.2  192.49
   75.24   192.5   79.09  192.49   79.85  192.49   79.97  192.49   81.62  192.25
   82.61  192.11   84.09  192.06   85.12  192.01   85.78     192   86.02     192
   87.14  192.26   87.29  192.29   88.08   192.5   89.19  192.56   90.09   192.6
   90.59  192.63   94.09   192.8   95.32  192.81   97.42  192.98   97.56  192.98
   97.69     193      98     193  103.84  193.15  107.59   193.2  109.27   193.5
  113.11  193.66  123.18  193.63  125.08  193.74  126.21  193.84  129.58  193.82
  130.72     194   131.8   194.2  132.89  194.26  137.56   194.5  147.26  194.84
  152.45     195  156.34   195.2

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .08   75.24    .035   88.08     .08

Bank Sta: Left   Right    Coeff Contr.   Expan.
          75.24   88.08          .3        .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0   85.35  195.4       T
   88.65  156.34  195.4       T

Downstream  Deck/Roadway Coordinates
    num=       3
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0  200.29              52  200.64             188  201.61

Downstream Bridge Cross Section Data
Station Elevation Data    num=      73
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0 191.499   2.622 191.493   3.393 191.401   6.669  191.05  14.851 191.016
  16.047     191  16.277 190.995   16.39 190.995  16.455  190.99  19.229 190.718
  21.301 190.514  32.529  190.51  34.599 190.506  36.489  190.51  41.272   190.5
  47.611  190.49  47.626  190.49  47.635  190.49  47.768  190.49  47.907  190.49
  50.102  190.41    50.5  189.55    55.5  189.55  55.973   190.5   56.01 190.505
  56.059 190.518  56.072 190.522  56.577 190.734  59.935   190.5  60.588 190.497
  60.844   190.5  61.978 190.581  62.305 190.619  63.193 190.655  63.772 190.682
  66.435 190.824  68.115 190.846  70.084  190.88  71.036 190.918  71.555 190.935
  72.888 190.937  74.542 190.986  79.177 190.992  79.614     191  80.337 191.032
  81.047 191.044  85.989  191.22  90.882 191.411  91.449 191.407  93.026 191.428
   97.47 191.481 101.189   191.5 103.106 191.509 104.045 191.574 104.757 191.584
 105.818 191.611 108.236 191.727 112.849 191.783 113.776 191.811 120.412     192
 121.709 192.117 123.738 192.149  129.21 192.387 131.157 192.477 132.031   192.5
 138.078 192.732 143.484 192.971 145.355     193 147.067 193.118 152.226 193.492
 152.712   193.5 153.876  193.52 154.561 193.564

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .08  47.611    .035  55.973     .08

Bank Sta: Left   Right    Coeff Contr.   Expan.
         47.611  55.973          .3        .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0    50.5   193.8       T
    55.5 154.561   193.8       T

Upstream Embankment side slope              =       2 horiz. to 1.0 vertical
Downstream Embankment side slope            =       2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Culverts =  1

Culvert Name     Shape      Rise    Span
Culvert #1      Circular     3.3
FHWA Chart # 2 - Corrugated Metal Pipe Culvert
FHWA Scale # 1 - Headwall
Solution Criteria = Highest U.S. EG
Culvert Upstrm Dist  Length    Top n  Bottom n  Depth Blocked  Entrance Loss Coef   Exit Loss Coef
                9.6     102     .013     .013        0                    .2                1
Upstream   Elevation =  192
           Centerline Station =  87
Downstream Elevation =  190.5
           Centerline Station =  52.5

CULVERT OUTPUT  Profile #2-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.43    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         1.33
  Q Barrel (m3/s)           0.43    Culv Vel DS (m/s)         2.25
  E.G. US. (m)            192.37    Culv Inv El Up (m)      192.00
  W.S. US. (m)            192.33    Culv Inv El Dn (m)      190.50
  E.G. DS (m)             189.70    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             189.67    Culv Exit Loss (m)        1.25
  Delta EG (m)              2.68    Culv Entr Loss (m)        0.02
  Delta WS (m)              2.66    Q Weir (m3/s)
  E.G. IC (m)             192.33    Weir Sta Lft (m)
  E.G. OC (m)             192.37    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       192.27    Weir Max Depth (m)
  Culv WS Outlet (m)      190.69    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.19    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.27    Min El Weir Flow (m)    200.29


Warning: Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross section
         downstream of the culvert has supercritical flow.
Note:    During supercritical analysis, the culvert direct step method went to normal depth.  The program then assumed
         normal depth at the outlet.
Note:    The flow in the culvert is entirely supercritical.

CULVERT OUTPUT  Profile #5-yr  Culv Group:  Culvert #1

  Q Culv Group (m3/s)       0.62    Culv Full Len (m)
  # Barrels                    1    Culv Vel US (m/s)         1.46
  Q Barrel (m3/s)           0.62    Culv Vel DS (m/s)         2.55
  E.G. US. (m)            192.45    Culv Inv El Up (m)      192.00
  W.S. US. (m)            192.39    Culv Inv El Dn (m)      190.50
  E.G. DS (m)             189.73    Culv Frctn Ls (m)         0.00
  W.S. DS (m)             189.70    Culv Exit Loss (m)        1.31
  Delta EG (m)              2.72    Culv Entr Loss (m)        0.02
  Delta WS (m)              2.70    Q Weir (m3/s)
  E.G. IC (m)             192.40    Weir Sta Lft (m)
  E.G. OC (m)             192.45    Weir Sta Rgt (m)
  Culvert Control         Outlet    Weir Submerg
  Culv WS Inlet (m)       192.32    Weir Max Depth (m)
  Culv WS Outlet (m)      190.72    Weir Avg Depth (m)
  Culv Nml Depth (m)        0.22    Weir Flow Area (m2)
  Culv Crt Depth (m)        0.32    Min El Weir Flow (m)    200.29


Warning: Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross section
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downstream of the culvert has supercritical flow.
Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #10-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.75	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.53
Q Barrel (m3/s)	0.75	Culv Vel DS (m/s)	2.69
E.G. US. (m)	192.50	Culv Inv El Up (m)	192.00
W.S. US. (m)	192.44	Culv Inv El Dn (m)	190.50
E.G. DS (m)	189.76	Culv Frctn Ls (m)	0.00
W.S. DS (m)	189.72	Culv Exit Loss (m)	1.35
Delta EG (m)	2.74	Culv Entr Loss (m)	0.02
Delta WS (m)	2.72	Q Weir (m3/s)	
E.G. IC (m)	192.45	Weir Sta Lft (m)	
E.G. OC (m)	192.50	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	192.35	Weir Max Depth (m)	
Culv WS Outlet (m)	190.74	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.24	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.35	Min El Weir Flow (m)	200.29

Warning: Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross section downstream of the culvert has supercritical flow.
Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #25-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	1.00	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.65
Q Barrel (m3/s)	1.00	Culv Vel DS (m/s)	2.91
E.G. US. (m)	192.57	Culv Inv El Up (m)	192.00
W.S. US. (m)	192.51	Culv Inv El Dn (m)	190.50
E.G. DS (m)	189.80	Culv Frctn Ls (m)	0.00
W.S. DS (m)	189.76	Culv Exit Loss (m)	1.40
Delta EG (m)	2.77	Culv Entr Loss (m)	0.03
Delta WS (m)	2.75	Q Weir (m3/s)	
E.G. IC (m)	192.52	Weir Sta Lft (m)	
E.G. OC (m)	192.57	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	192.41	Weir Max Depth (m)	
Culv WS Outlet (m)	190.78	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.28	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.41	Min El Weir Flow (m)	200.29

Warning: Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross section downstream of the culvert has supercritical flow.
Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #50-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	1.21	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.74
Q Barrel (m3/s)	1.21	Culv Vel DS (m/s)	3.11
E.G. US. (m)	192.63	Culv Inv El Up (m)	192.00
W.S. US. (m)	192.56	Culv Inv El Dn (m)	190.50
E.G. DS (m)	189.84	Culv Frctn Ls (m)	0.00
W.S. DS (m)	189.78	Culv Exit Loss (m)	1.46
Delta EG (m)	2.79	Culv Entr Loss (m)	0.03
Delta WS (m)	2.78	Q Weir (m3/s)	
E.G. IC (m)	192.58	Weir Sta Lft (m)	
E.G. OC (m)	192.63	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	192.45	Weir Max Depth (m)	
Culv WS Outlet (m)	190.80	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.30	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.45	Min El Weir Flow (m)	200.29

Warning: Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross section downstream of the culvert has supercritical flow.
Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #100-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	1.44	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.82
Q Barrel (m3/s)	1.44	Culv Vel DS (m/s)	3.26
E.G. US. (m)	192.69	Culv Inv El Up (m)	192.00
W.S. US. (m)	192.62	Culv Inv El Dn (m)	190.50
E.G. DS (m)	189.87	Culv Frctn Ls (m)	0.00
W.S. DS (m)	189.81	Culv Exit Loss (m)	1.50
Delta EG (m)	2.82	Culv Entr Loss (m)	0.03
Delta WS (m)	2.81	Q Weir (m3/s)	
E.G. IC (m)	192.63	Weir Sta Lft (m)	
E.G. OC (m)	192.69	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	192.49	Weir Max Depth (m)	
Culv WS Outlet (m)	190.83	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.33	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.49	Min El Weir Flow (m)	200.29

Warning: Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross section downstream of the culvert has supercritical flow.
Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #Check Flow Culv Group: Culvert #1

Q Culv Group (m3/s)	1.88	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.95
Q Barrel (m3/s)	1.88	Culv Vel DS (m/s)	3.57
E.G. US. (m)	192.79	Culv Inv El Up (m)	192.00
W.S. US. (m)	192.71	Culv Inv El Dn (m)	190.50
E.G. DS (m)	189.94	Culv Frctn Ls (m)	0.00
W.S. DS (m)	189.87	Culv Exit Loss (m)	1.58
Delta EG (m)	2.86	Culv Entr Loss (m)	0.04
Delta WS (m)	2.85	Q Weir (m3/s)	
E.G. IC (m)	192.73	Weir Sta Lft (m)	
E.G. OC (m)	192.79	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	192.56	Weir Max Depth (m)	
Culv WS Outlet (m)	190.87	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.37	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.56	Min El Weir Flow (m)	200.29

Warning: Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross section downstream of the culvert has supercritical flow.
Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: The flow in the culvert is entirely supercritical.

CULVERT OUTPUT Profile #Regional Culv Group: Culvert #1

Q Culv Group (m3/s)	6.84	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	2.79
Q Barrel (m3/s)	6.84	Culv Vel DS (m/s)	4.98
E.G. US. (m)	193.56	Culv Inv El Up (m)	192.00
W.S. US. (m)	193.36	Culv Inv El Dn (m)	190.50
E.G. DS (m)	190.45	Culv Frctn Ls (m)	0.00
W.S. DS (m)	190.27	Culv Exit Loss (m)	2.03

Delta EG (m)	3.11	Culv Entr Loss (m)	0.08
Delta WS (m)	3.09	Q Weir (m3/s)	
E.G. IC (m)	193.47	Weir Sta Lft (m)	
E.G. OC (m)	193.56	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	193.09	Weir Max Depth (m)	
Culv WS Outlet (m)	191.22	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.70	Weir Flow Area (m2)	
Culv Crt Depth (m)	1.09	Min El Weir Flow (m)	200.29

Warning: Since the culvert has supercritical flow, the program should be run in mixed flow in order to check if the cross section downstream of the culvert has supercritical flow.
Note: The flow in the culvert is entirely supercritical.

CROSS SECTION

RIVER: DUFFINS
REACH: WC 43 RS: 300

INPUT
Description: ST 300 (Updated Sep 2016)
Station Elevation Data num= 73

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	191.499	2.622	191.493	3.393	191.401	6.669	191.05	14.851	191.016
16.047	191	16.277	190.995	16.39	190.995	16.455	190.99	19.229	190.718
21.301	190.514	32.529	190.51	34.599	190.506	36.489	190.51	41.272	190.5
47.611	190.49	47.626	190.49	47.635	190.49	47.768	190.49	47.907	190.49
50.102	190.41	50.5	189.55	55.5	189.55	55.973	190.5	56.01	190.505
56.059	190.518	56.072	190.522	56.577	190.734	59.935	190.5	60.588	190.497
60.844	190.5	61.978	190.581	62.305	190.619	63.193	190.655	63.772	190.682
66.435	190.824	68.115	190.846	70.084	190.88	71.036	190.918	71.555	190.935
72.888	190.937	74.542	190.986	79.177	190.992	79.614	191	80.337	191.032
81.047	191.044	85.989	191.22	90.882	191.411	91.449	191.407	93.026	191.428
97.47	191.481	101.189	191.5	103.106	191.509	104.045	191.574	104.757	191.584
105.818	191.611	108.236	191.727	112.849	191.783	113.776	191.811	120.412	192
121.709	192.117	123.738	192.149	129.21	192.387	131.157	192.477	132.031	192.5
138.078	192.732	143.484	192.971	145.355	193	147.067	193.118	152.226	193.492
152.712	193.5	153.876	193.52	154.561	193.564				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.08	47.611	.035	55.973	.08

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
47.611 55.973 77 76 79 .3 .5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	50.5	193.8	T
55.5	154.561	193.8	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	189.70	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	189.67	Reach Len. (m)	77.00	76.00	79.00
Crit W.S. (m)	189.66	Flow Area (m2)		0.59	
E.G. Slope (m/m)	0.011229	Area (m2)		0.60	
Q Total (m3/s)	0.43	Flow (m3/s)		0.43	
Top Width (m)	5.11	Top Width (m)		5.11	
Vel Total (m/s)	0.73	Avg. Vel. (m/s)		0.73	
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.12	
Conv. Total (m3/s)	4.1	Conv. (m3/s)		4.1	
Length Wtd. (m)	76.00	Wetted Per. (m)		5.00	
Min Ch El (m)	189.55	Shear (N/m2)		13.00	
Alpha	1.00	Stream Power (N/m s)		9.47	
Frctn Loss (m)		Cum Volume (1000 m3)		0.07	
C & E Loss (m)		Cum SA (1000 m2)		1.09	

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	189.73	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	189.70	Reach Len. (m)	77.00	76.00	79.00
Crit W.S. (m)	189.66	Flow Area (m2)		0.75	
E.G. Slope (m/m)	0.010529	Area (m2)		0.76	
Q Total (m3/s)	0.62	Flow (m3/s)		0.62	
Top Width (m)	5.14	Top Width (m)		5.14	
Vel Total (m/s)	0.83	Avg. Vel. (m/s)		0.83	
Max Chl Dpth (m)	0.15	Hydr. Depth (m)		0.15	
Conv. Total (m3/s)	6.0	Conv. (m3/s)		6.0	
Length Wtd. (m)	76.00	Wetted Per. (m)		5.00	
Min Ch El (m)	189.55	Shear (N/m2)		15.48	
Alpha	1.00	Stream Power (N/m s)		12.80	
Frctn Loss (m)		Cum Volume (1000 m3)		0.09	
C & E Loss (m)		Cum SA (1000 m2)		1.28	

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	189.76	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.035	
W.S. Elev (m)	189.72	Reach Len. (m)	77.00	76.00	79.00
Crit W.S. (m)	189.68	Flow Area (m2)		0.85	
E.G. Slope (m/m)	0.010042	Area (m2)		0.87	
Q Total (m3/s)	0.75	Flow (m3/s)		0.75	
Top Width (m)	5.16	Top Width (m)		5.16	
Vel Total (m/s)	0.88	Avg. Vel. (m/s)		0.88	
Max Chl Dpth (m)	0.17	Hydr. Depth (m)		0.17	
Conv. Total (m3/s)	7.5	Conv. (m3/s)		7.5	
Length Wtd. (m)	76.00	Wetted Per. (m)		5.00	
Min Ch El (m)	189.55	Shear (N/m2)		16.78	
Alpha	1.00	Stream Power (N/m s)		14.77	
Frctn Loss (m)		Cum Volume (1000 m3)		0.11	
C & E Loss (m)		Cum SA (1000 m2)		1.48	

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	189.80	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	189.76	Reach Len. (m)	77.00	76.00	79.00
Crit W.S. (m)	189.71	Flow Area (m2)		1.03	
E.G. Slope (m/m)	0.009425	Area (m2)		1.05	
Q Total (m3/s)	1.00	Flow (m3/s)		1.00	
Top Width (m)	5.20	Top Width (m)		5.20	
Vel Total (m/s)	0.97	Avg. Vel. (m/s)		0.97	
Max Chl Dpth (m)	0.21	Hydr. Depth (m)		0.21	
Conv. Total (m3/s)	10.3	Conv. (m3/s)		10.3	
Length Wtd. (m)	76.00	Wetted Per. (m)		5.00	
Min Ch El (m)	189.55	Shear (N/m2)		19.08	
Alpha	1.00	Stream Power (N/m s)		18.48	
Frctn Loss (m)		Cum Volume (1000 m3)		0.14	
C & E Loss (m)		Cum SA (1000 m2)		1.76	

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	189.84	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	189.78	Reach Len. (m)	77.00	76.00	79.00
Crit W.S. (m)	189.73	Flow Area (m2)		1.17	
E.G. Slope (m/m)	0.009024	Area (m2)		1.20	
Q Total (m3/s)	1.21	Flow (m3/s)		1.21	
Top Width (m)	5.23	Top Width (m)		5.23	
Vel Total (m/s)	1.03	Avg. Vel. (m/s)		1.03	
Max Chl Dpth (m)	0.23	Hydr. Depth (m)		0.23	
Conv. Total (m3/s)	12.7	Conv. (m3/s)		12.7	
Length Wtd. (m)	76.00	Wetted Per. (m)		5.00	
Min Ch El (m)	189.55	Shear (N/m2)		20.75	
Alpha	1.00	Stream Power (N/m s)		21.41	
Frctn Loss (m)		Cum Volume (1000 m3)		0.16	

C & E Loss (m)	Cum SA (1000 m2)	1.97	

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	189.87	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.035	
W.S. Elev (m)	189.81	Reach Len. (m)	77.00	76.00	79.00
Crit W.S. (m)	189.75	Flow Area (m2)		1.32	
E.G. Slope (m/m)	0.008660	Area (m2)		1.35	
Q Total (m3/s)	1.44	Flow (m3/s)		1.44	
Top Width (m)	5.25	Top Width (m)		5.25	
Vel Total (m/s)	1.09	Avg. Vel. (m/s)		1.09	
Max Chl Dpth (m)	0.26	Hydr. Depth (m)		0.26	
Conv. Total (m3/s)	15.5	Conv. (m3/s)		15.5	
Length Wtd. (m)	76.00	Wetted Per. (m)		5.00	
Min Ch El (m)	189.55	Shear (N/m2)		22.38	
Alpha	1.00	Stream Power (N/m s)		24.46	
Frctn Loss (m)		Cum Volume (1000 m3)		0.19	
C & E Loss (m)		Cum SA (1000 m2)		2.08	

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	189.94	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.035	
W.S. Elev (m)	189.87	Reach Len. (m)	77.00	76.00	79.00
Crit W.S. (m)	189.79	Flow Area (m2)		1.58	
E.G. Slope (m/m)	0.008106	Area (m2)		1.62	
Q Total (m3/s)	1.88	Flow (m3/s)		1.88	
Top Width (m)	5.30	Top Width (m)		5.30	
Vel Total (m/s)	1.19	Avg. Vel. (m/s)		1.19	
Max Chl Dpth (m)	0.32	Hydr. Depth (m)		0.32	
Conv. Total (m3/s)	20.9	Conv. (m3/s)		20.9	
Length Wtd. (m)	76.00	Wetted Per. (m)		5.00	
Min Ch El (m)	189.55	Shear (N/m2)		25.07	
Alpha	1.00	Stream Power (N/m s)		29.89	
Frctn Loss (m)		Cum Volume (1000 m3)		0.23	
C & E Loss (m)		Cum SA (1000 m2)		2.24	

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	190.45	Element	Left OB	Channel	Right OB
Vel Head (m)	0.18	Wt. n-Val.		0.035	
W.S. Elev (m)	190.27	Reach Len. (m)	77.00	76.00	79.00
Crit W.S. (m)	190.12	Flow Area (m2)		3.60	
E.G. Slope (m/m)	0.006836	Area (m2)		3.85	
Q Total (m3/s)	6.84	Flow (m3/s)		6.84	
Top Width (m)	5.69	Top Width (m)		5.69	
Vel Total (m/s)	1.90	Avg. Vel. (m/s)		1.90	
Max Chl Dpth (m)	0.72	Hydr. Depth (m)		0.72	
Conv. Total (m3/s)	82.7	Conv. (m3/s)		82.7	
Length Wtd. (m)	76.00	Wetted Per. (m)		5.00	
Min Ch El (m)	189.55	Shear (N/m2)		48.30	
Alpha	1.00	Stream Power (N/m s)		91.70	
Frctn Loss (m)		Cum Volume (1000 m3)	0.00	0.74	0.00
C & E Loss (m)		Cum SA (1000 m2)	0.01	3.96	0.00

CULVERT

RIVER: DUFFINS
REACH: WC 43 RS: 150

INPUT
Description: Proposed 407 TWY Structure (WC# 43)
Distance from Upstream XS = 29.5
Deck/Roadway Width = 12.3
Weir Coefficient = 1.4
Upstream Deck/Roadway Coordinates
num= 5

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0	200	28	200.1	78	200.8
183	203.5	231	204		

Upstream Bridge Cross Section Data
Station Elevation Data num= 73

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	191.499	2.622	191.493	3.393	191.401	6.669	191.05	14.851	191.016
16.047	191	16.277	190.995	16.39	190.995	16.455	190.99	19.229	190.718
21.301	190.514	32.529	190.51	34.599	190.506	36.489	190.51	41.272	190.5
47.611	190.49	47.626	190.49	47.635	190.49	47.768	190.49	47.907	190.49
50.102	190.41	50.5	189.55	55.5	189.55	55.973	190.5	56.01	190.505
56.059	190.518	56.072	190.522	56.577	190.734	59.935	190.5	60.588	190.497
60.844	190.5	61.978	190.581	62.305	190.619	63.193	190.655	63.772	190.682
66.435	190.824	68.115	190.846	70.084	190.88	71.036	190.918	71.555	190.935
72.888	190.937	74.542	190.986	79.177	190.992	79.614	191	80.337	191.032
81.047	191.044	85.989	191.22	90.882	191.411	91.449	191.407	93.026	191.428
97.47	191.481	101.189	191.5	103.106	191.509	104.045	191.574	104.757	191.584
105.818	191.611	108.236	191.727	112.849	191.783	113.776	191.811	120.412	192
121.709	192.117	123.738	192.149	129.21	192.387	131.157	192.477	132.031	192.5
138.078	192.732	143.484	192.971	145.355	193	147.067	193.118	152.226	193.492
152.712	193.5	153.876	193.52	154.561	193.564				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.08	47.611	.035	55.973	.08

Bank Sta: Left Right Coeff Contr. Expan.
47.611 55.973 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	50.5	193.8	T
55.5	154.561	193.8	T

Downstream Deck/Roadway Coordinates
num= 3

Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord	Sta Hi Cord	Lo Cord
0	199.8	84	200.6	138	201.5

Downstream Bridge Cross Section Data
Station Elevation Data num= 47

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	190.966	3.842	190.854	9.599	190.628	10.681	190.588	12.316	190.534
13.298	190.5	18.153	190.358	27.621	190	28.165	189.98	35.005	189.787
38.796	189.624	41.904	189.5	44.788	189.44	50.525	189.344	52.462	189.294
54.684	189.258	55.175	189.254	55.248	189.253	57.336	189.238	60.045	189.195
62.858	189.137	62.88	189.136	66.178	189.108	73.892	189.059	75.611	189.021
76.013	189.012	78.086	189	78.095	189	78.629	188.986	79.5	188.93
84.5	188.93	92.287	189.394	92.345	189.398	94.515	189.5	94.994	189.532
95.469	189.568	101.403	190	102.714	190.038	108.203	190.209	110.861	190.276
114.376	190.361	118.833	190.495	120.25	190.5	122.759	190.511	129.609	190.699
133.23	190.765	138.239	190.883						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.08	41.904	.035	94.515	.08

Bank Sta: Left Right Coeff Contr. Expan.
41.904 94.515 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	79.9	192	T
84.9	138.239	192	T

Upstream Embankment side slope = 2 horiz. to 1.0 vertical
Downstream Embankment side slope = 2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow = .98
Elevation at which weir flow begins =
Energy head used in spillway design =
Spillway height used in design =
Weir crest shape = Broad Crested

Number of Culverts = 1

Culvert Name	Shape	Rise	Span
Culvert #1	Box	2	5

FHWA Chart # 10- 90 degree headwall; Chamfered or beveled inlet
FHWA Scale # 2 - Inlet edges beveled 1/2 inch at 45 degrees (1:1)
Solution Criteria = Highest U.S. EG

Culvert Upstrm Dist	Length	Top n	Bottom n	Depth Blocked	Entrance Loss Coef	Exit Loss Coef
6	64	.013	.025	0	.2	1

Upstream Elevation = 189.55
Centerline Station = 53
Downstream Elevation = 188.93
Centerline Station = 82.4

CULVERT OUTPUT Profile #2-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.43	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	0.84
Q Barrel (m3/s)	0.43	Culv Vel DS (m/s)	0.72
E.G. US. (m)	189.70	Culv Inv El Up (m)	189.55
W.S. US. (m)	189.67	Culv Inv El Dn (m)	188.93
E.G. DS (m)	189.07	Culv Frctn Ls (m)	0.00
W.S. DS (m)	189.04	Culv Exit Loss (m)	0.00
Delta EG (m)	0.62	Culv Entr Loss (m)	0.01
Delta WS (m)	0.62	Q Weir (m3/s)	
E.G. IC (m)	189.69	Weir Sta Lft (m)	
E.G. OC (m)	189.70	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	189.65	Weir Max Depth (m)	
Culv WS Outlet (m)	189.05	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.10	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.09	Min El Weir Flow (m)	200.00

Warning: During subcritical analysis, with the exit loss set =1.0, the projected WSEL in culvert has a lower energy than the downstream energy. Most likely, the downstream cross section blocks part of the culvert or the ineffective area is set too far in. Instead of projecting the WSEL, the program did an energy balance to get the WSEL inside the culvert at the downstream end.
Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #5-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.62	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	0.99
Q Barrel (m3/s)	0.62	Culv Vel DS (m/s)	0.84
E.G. US. (m)	189.74	Culv Inv El Up (m)	189.55
W.S. US. (m)	189.70	Culv Inv El Dn (m)	188.93
E.G. DS (m)	189.11	Culv Frctn Ls (m)	0.00
W.S. DS (m)	189.07	Culv Exit Loss (m)	0.00
Delta EG (m)	0.63	Culv Entr Loss (m)	0.01
Delta WS (m)	0.63	Q Weir (m3/s)	
E.G. IC (m)	189.73	Weir Sta Lft (m)	
E.G. OC (m)	189.74	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	189.68	Weir Max Depth (m)	
Culv WS Outlet (m)	189.08	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.13	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.12	Min El Weir Flow (m)	200.00

Warning: During subcritical analysis, with the exit loss set =1.0, the projected WSEL in culvert has a lower energy than the downstream energy. Most likely, the downstream cross section blocks part of the culvert or the ineffective area is set too far in. Instead of projecting the WSEL, the program did an energy balance to get the WSEL inside the culvert at the downstream end.
Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #10-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	0.75	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.06
Q Barrel (m3/s)	0.75	Culv Vel DS (m/s)	0.90
E.G. US. (m)	189.76	Culv Inv El Up (m)	189.55
W.S. US. (m)	189.72	Culv Inv El Dn (m)	188.93
E.G. DS (m)	189.13	Culv Frctn Ls (m)	0.00
W.S. DS (m)	189.09	Culv Exit Loss (m)	0.00
Delta EG (m)	0.63	Culv Entr Loss (m)	0.01
Delta WS (m)	0.63	Q Weir (m3/s)	
E.G. IC (m)	189.76	Weir Sta Lft (m)	
E.G. OC (m)	189.76	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	189.69	Weir Max Depth (m)	
Culv WS Outlet (m)	189.10	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.14	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.13	Min El Weir Flow (m)	200.00

Warning: During subcritical analysis, with the exit loss set =1.0, the projected WSEL in culvert has a lower energy than the downstream energy. Most likely, the downstream cross section blocks part of the culvert or the ineffective area is set too far in. Instead of projecting the WSEL, the program did an energy balance to get the WSEL inside the culvert at the downstream end.
Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #25-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	1.00	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.19
Q Barrel (m3/s)	1.00	Culv Vel DS (m/s)	1.05
E.G. US. (m)	189.80	Culv Inv El Up (m)	189.55
W.S. US. (m)	189.76	Culv Inv El Dn (m)	188.93
E.G. DS (m)	189.17	Culv Frctn Ls (m)	0.00
W.S. DS (m)	189.11	Culv Exit Loss (m)	0.00
Delta EG (m)	0.63	Culv Entr Loss (m)	0.01
Delta WS (m)	0.65	Q Weir (m3/s)	
E.G. IC (m)	189.80	Weir Sta Lft (m)	
E.G. OC (m)	189.80	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	189.72	Weir Max Depth (m)	
Culv WS Outlet (m)	189.12	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.17	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.16	Min El Weir Flow (m)	200.00

Warning: During subcritical analysis, with the exit loss set =1.0, the projected WSEL in culvert has a lower energy than the downstream energy. Most likely, the downstream cross section blocks part of the culvert or the ineffective area is set too far in. Instead of projecting the WSEL, the program did an energy balance to get the WSEL inside the culvert at the downstream end.
Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #50-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	1.21	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.27
Q Barrel (m3/s)	1.21	Culv Vel DS (m/s)	1.12
E.G. US. (m)	189.84	Culv Inv El Up (m)	189.55
W.S. US. (m)	189.78	Culv Inv El Dn (m)	188.93
E.G. DS (m)	189.21	Culv Frctn Ls (m)	0.00
W.S. DS (m)	189.13	Culv Exit Loss (m)	0.00
Delta EG (m)	0.63	Culv Entr Loss (m)	0.02
Delta WS (m)	0.65	Q Weir (m3/s)	
E.G. IC (m)	189.84	Weir Sta Lft (m)	
E.G. OC (m)	189.84	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	189.74	Weir Max Depth (m)	
Culv WS Outlet (m)	189.15	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.19	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.18	Min El Weir Flow (m)	200.00

Warning: During subcritical analysis, with the exit loss set =1.0, the projected WSEL in culvert has a lower energy than the downstream energy. Most likely, the downstream cross section blocks part of the culvert or the ineffective area is set too far in. Instead of projecting the WSEL, the program did an energy balance to get the WSEL inside the culvert at the downstream end.
Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #100-yr Culv Group: Culvert #1

Q Culv Group (m3/s)	1.44	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.36
Q Barrel (m3/s)	1.44	Culv Vel DS (m/s)	1.20
E.G. US. (m)	189.87	Culv Inv El Up (m)	189.55
W.S. US. (m)	189.81	Culv Inv El Dn (m)	188.93
E.G. DS (m)	189.24	Culv Frctn Ls (m)	0.00
W.S. DS (m)	189.15	Culv Exit Loss (m)	0.00
Delta EG (m)	0.64	Culv Entr Loss (m)	0.02
Delta WS (m)	0.66	Q Weir (m3/s)	
E.G. IC (m)	189.87	Weir Sta Lft (m)	
E.G. OC (m)	189.87	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	189.76	Weir Max Depth (m)	
Culv WS Outlet (m)	189.17	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.21	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.20	Min El Weir Flow (m)	200.00

Warning: During subcritical analysis, with the exit loss set =1.0, the projected WSEL in culvert has a lower energy than the downstream energy. Most likely, the downstream cross section blocks part of the culvert or the ineffective area is set too far in. Instead of projecting the WSEL, the program did an energy balance to get the WSEL inside the culvert at the downstream end.
Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #Check Flow Culv Group: Culvert #1

Q Culv Group (m3/s)	1.88	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	1.51
Q Barrel (m3/s)	1.88	Culv Vel DS (m/s)	1.36
E.G. US. (m)	189.94	Culv Inv El Up (m)	189.55
W.S. US. (m)	189.87	Culv Inv El Dn (m)	188.93
E.G. DS (m)	189.30	Culv Frctn Ls (m)	0.00
W.S. DS (m)	189.18	Culv Exit Loss (m)	0.00
Delta EG (m)	0.64	Culv Entr Loss (m)	0.02
Delta WS (m)	0.68	Q Weir (m3/s)	
E.G. IC (m)	189.93	Weir Sta Lft (m)	
E.G. OC (m)	189.94	Weir Sta Rgt (m)	
Culvert Control	Outlet	Weir Submerg	
Culv WS Inlet (m)	189.80	Weir Max Depth (m)	
Culv WS Outlet (m)	189.21	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.25	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.24	Min El Weir Flow (m)	200.00

Warning: During subcritical analysis, with the exit loss set =1.0, the projected WSEL in culvert has a lower energy than the downstream energy. Most likely, the downstream cross section blocks part of the culvert or the ineffective area is set too far in. Instead of projecting the WSEL, the program did an energy balance to get the WSEL inside the culvert at the downstream end.
Note: During subcritical analysis, the culvert direct step method, the solution went to normal depth.

CULVERT OUTPUT Profile #Regional Culv Group: Culvert #1

Q Culv Group (m3/s)	6.84	Culv Full Len (m)	
# Barrels	1	Culv Vel US (m/s)	2.38
Q Barrel (m3/s)	6.84	Culv Vel DS (m/s)	2.17
E.G. US. (m)	190.46	Culv Inv El Up (m)	189.55
W.S. US. (m)	190.27	Culv Inv El Dn (m)	188.93
E.G. DS (m)	189.79	Culv Frctn Ls (m)	0.00
W.S. DS (m)	189.50	Culv Exit Loss (m)	0.01
Delta EG (m)	0.66	Culv Entr Loss (m)	0.04
Delta WS (m)	0.77	Q Weir (m3/s)	
E.G. IC (m)	190.46	Weir Sta Lft (m)	
E.G. OC (m)	190.47	Weir Sta Rgt (m)	
Culvert Control	Inlet	Weir Submerg	
Culv WS Inlet (m)	190.13	Weir Max Depth (m)	
Culv WS Outlet (m)	189.56	Weir Avg Depth (m)	
Culv Nml Depth (m)	0.55	Weir Flow Area (m2)	
Culv Crt Depth (m)	0.58	Min El Weir Flow (m)	200.00

Note: During supercritical analysis, the culvert direct step method went to normal depth. The program then assumed normal depth at the outlet.
Note: During the supercritical calculations a hydraulic jump occurred inside of the culvert.

CROSS SECTION

RIVER: DUFFINS
REACH: WC 43 RS: 100

INPUT
Description: ST 100 (Updated Sep 2016)
Station Elevation Data num= 47

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	190.966	3.842	190.854	9.599	190.628	10.681	190.588	12.316	190.534
13.298	190.5	18.153	190.358	27.621	190	28.165	189.98	35.005	189.787
38.796	189.624	41.904	189.5	44.788	189.44	50.525	189.344	52.462	189.294
54.684	189.258	55.175	189.254	55.248	189.253	57.336	189.238	60.045	189.195
62.858	189.137	62.88	189.136	66.178	189.108	73.892	189.059	75.611	189.021
76.013	189.012	78.086	189	78.095	189	78.629	188.986	79.5	188.93
84.5	188.93	92.287	189.394	92.345	189.398	94.515	189.5	94.994	189.532
95.469	189.568	101.403	190	102.714	190.038	108.203	190.209	110.861	190.276
114.376	190.361	118.833	190.495	120.25	190.5	122.759	190.511	129.609	190.699
133.23	190.765	138.239	190.883						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.08	41.904	.035	94.515	.08

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
41.904 94.515 21 49 50 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	79.9	192	T
84.9	138.239	192	T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	189.07	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	189.04	Reach Len. (m)	21.00	49.00	50.00
Crit W.S. (m)		Flow Area (m2)		0.56	
E.G. Slope (m/m)	0.013253	Area (m2)		0.87	
Q Total (m3/s)	0.43	Flow (m3/s)		0.43	
Top Width (m)	11.80	Top Width (m)		11.80	
Vel Total (m/s)	0.77	Avg. Vel. (m/s)		0.77	
Max Chl Dpth (m)	0.11	Hydr. Depth (m)		0.11	
Conv. Total (m3/s)	3.7	Conv. (m3/s)		3.7	
Length Wtd. (m)	49.00	Wetted Per. (m)		5.00	
Min Ch El (m)	188.93	Shear (N/m2)		14.60	
Alpha	1.00	Stream Power (N/m s)		11.18	
Frctn Loss (m)	0.92	Cum Volume (1000 m3)		0.03	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.45	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	189.11	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.035	
W.S. Elev (m)	189.07	Reach Len. (m)	21.00	49.00	50.00
Crit W.S. (m)	189.04	Flow Area (m2)		0.69	
E.G. Slope (m/m)	0.013955	Area (m2)		1.20	
Q Total (m3/s)	0.62	Flow (m3/s)		0.62	
Top Width (m)	14.47	Top Width (m)		14.47	
Vel Total (m/s)	0.90	Avg. Vel. (m/s)		0.90	
Max Chl Dpth (m)	0.14	Hydr. Depth (m)		0.14	

Conv. Total (m3/s)	5.2	Conv. (m3/s)	5.2
Length Wtd. (m)	49.00	Wetted Per. (m)	5.00
Min Ch El (m)	188.93	Shear (N/m2)	18.85
Alpha	1.00	Stream Power (N/m s)	16.97
Frctn Loss (m)	0.92	Cum Volume (1000 m3)	0.05
C & E Loss (m)	0.00	Cum SA (1000 m2)	0.53

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	189.13	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	189.09	Reach Len. (m)	21.00	49.00	50.00
Crit W.S. (m)	189.06	Flow Area (m2)		0.78	
E.G. Slope (m/m)	0.013650	Area (m2)		1.48	
Q Total (m3/s)	0.75	Flow (m3/s)		0.75	
Top Width (m)	17.55	Top Width (m)		17.55	
Vel Total (m/s)	0.96	Avg. Vel. (m/s)		0.96	
Max Chl Dpth (m)	0.16	Hydr. Depth (m)		0.16	
Conv. Total (m3/s)	6.4	Conv. (m3/s)		6.4	
Length Wtd. (m)	49.00	Wetted Per. (m)		5.00	
Min Ch El (m)	188.93	Shear (N/m2)		20.81	
Alpha	1.00	Stream Power (N/m s)		20.08	
Frctn Loss (m)	0.92	Cum Volume (1000 m3)		0.05	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.62	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	189.17	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.035	
W.S. Elev (m)	189.11	Reach Len. (m)	21.00	49.00	50.00
Crit W.S. (m)	189.09	Flow Area (m2)		0.90	
E.G. Slope (m/m)	0.015158	Area (m2)		1.95	
Q Total (m3/s)	1.00	Flow (m3/s)		1.00	
Top Width (m)	21.57	Top Width (m)		21.57	
Vel Total (m/s)	1.12	Avg. Vel. (m/s)		1.12	
Max Chl Dpth (m)	0.18	Hydr. Depth (m)		0.18	
Conv. Total (m3/s)	8.1	Conv. (m3/s)		8.1	
Length Wtd. (m)	49.00	Wetted Per. (m)		5.00	
Min Ch El (m)	188.93	Shear (N/m2)		26.61	
Alpha	1.00	Stream Power (N/m s)		29.73	
Frctn Loss (m)	0.94	Cum Volume (1000 m3)		0.07	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.74	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	189.21	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.035	
W.S. Elev (m)	189.13	Reach Len. (m)	21.00	49.00	50.00
Crit W.S. (m)	189.13	Flow Area (m2)		1.01	
E.G. Slope (m/m)	0.014672	Area (m2)		2.49	
Q Total (m3/s)	1.21	Flow (m3/s)		1.21	
Top Width (m)	24.75	Top Width (m)		24.75	
Vel Total (m/s)	1.19	Avg. Vel. (m/s)		1.19	
Max Chl Dpth (m)	0.20	Hydr. Depth (m)		0.20	
Conv. Total (m3/s)	10.0	Conv. (m3/s)		10.0	
Length Wtd. (m)	49.00	Wetted Per. (m)		5.00	
Min Ch El (m)	188.93	Shear (N/m2)		29.16	
Alpha	1.00	Stream Power (N/m s)		34.81	
Frctn Loss (m)	0.94	Cum Volume (1000 m3)		0.09	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.83	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	189.24	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.		0.035	
W.S. Elev (m)	189.15	Reach Len. (m)	21.00	49.00	50.00
Crit W.S. (m)	189.13	Flow Area (m2)		1.12	
E.G. Slope (m/m)	0.015021	Area (m2)		3.02	
Q Total (m3/s)	1.44	Flow (m3/s)		1.44	
Top Width (m)	26.25	Top Width (m)		26.25	
Vel Total (m/s)	1.29	Avg. Vel. (m/s)		1.29	
Max Chl Dpth (m)	0.22	Hydr. Depth (m)		0.22	
Conv. Total (m3/s)	11.7	Conv. (m3/s)		11.7	
Length Wtd. (m)	49.00	Wetted Per. (m)		5.00	
Min Ch El (m)	188.93	Shear (N/m2)		32.90	
Alpha	1.00	Stream Power (N/m s)		42.42	
Frctn Loss (m)	0.95	Cum Volume (1000 m3)		0.10	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.89	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	189.30	Element	Left OB	Channel	Right OB
Vel Head (m)	0.11	Wt. n-Val.		0.035	
W.S. Elev (m)	189.18	Reach Len. (m)	21.00	49.00	50.00
Crit W.S. (m)	189.17	Flow Area (m2)		1.27	
E.G. Slope (m/m)	0.016804	Area (m2)		3.84	
Q Total (m3/s)	1.88	Flow (m3/s)		1.88	
Top Width (m)	28.21	Top Width (m)		28.21	
Vel Total (m/s)	1.48	Avg. Vel. (m/s)		1.48	
Max Chl Dpth (m)	0.25	Hydr. Depth (m)		0.25	
Conv. Total (m3/s)	14.5	Conv. (m3/s)		14.5	
Length Wtd. (m)	49.00	Wetted Per. (m)		5.00	
Min Ch El (m)	188.93	Shear (N/m2)		41.77	
Alpha	1.00	Stream Power (N/m s)		61.95	
Frctn Loss (m)	0.97	Cum Volume (1000 m3)		0.13	
C & E Loss (m)	0.02	Cum SA (1000 m2)		0.96	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	189.79	Element	Left OB	Channel	Right OB
Vel Head (m)	0.29	Wt. n-Val.		0.035	
W.S. Elev (m)	189.50	Reach Len. (m)	21.00	49.00	50.00
Crit W.S. (m)	189.50	Flow Area (m2)		2.87	
E.G. Slope (m/m)	0.014609	Area (m2)	0.00	17.00	0.00
Q Total (m3/s)	6.84	Flow (m3/s)		6.84	
Top Width (m)	52.80	Top Width (m)	0.12	52.61	0.07
Vel Total (m/s)	2.38	Avg. Vel. (m/s)		2.38	
Max Chl Dpth (m)	0.57	Hydr. Depth (m)		0.57	
Conv. Total (m3/s)	56.6	Conv. (m3/s)		56.6	
Length Wtd. (m)	49.00	Wetted Per. (m)		5.00	
Min Ch El (m)	188.93	Shear (N/m2)		82.19	
Alpha	1.00	Stream Power (N/m s)		195.96	
Frctn Loss (m)	0.83	Cum Volume (1000 m3)	0.00	0.52	0.00
C & E Loss (m)	0.08	Cum SA (1000 m2)	0.00	1.74	0.00

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.

Warning: The velocity head has changed by more than 0.5 ft (0.15 m). This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: DUFFINS
REACH: WC 43 RS: 10

INPUT
Description: ST 10 (Updated Sep 2016)
Station Elevation Data num= 48

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	191.484	6.6	191.096	8.45	191	11.2	190.868	18.86	190.5
29.34	190.054	30.64	190	42.02	189.514	42.36	189.5	46.69	189.315
53.92	189	54.43	188.977	55.62	188.925	58.29	188.802	64.97	188.5
66.41	188.424	67.46	188.376	67.66	188.366	75.44	188	75.6	188
75.78	188	75.91	188	75.95	188	76.2	188	76.43	188
76.44	188	76.47	188	76.91	188	77.23	188	77.89	188.042
79.65	188.146	85.79	188.5	92.78	188.817	92.82	188.819	93.22	188.837
95.69	188.935	97.7	188.959	102.18	188.96	103.22	188.988	104.85	188.977
107.72	188.962	110.07	188.988	111.39	189	115.12	189.154	124.32	189.5
133.22	189.913	135.21	190	138.23	190.124				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.08	55.62	.035	95.69	.08

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
55.62	95.69	0	0	.3	.5

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	188.16	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.035	
W.S. Elev (m)	188.12	Reach Len. (m)			
Crit W.S. (m)	188.12	Flow Area (m2)		0.49	
E.G. Slope (m/m)	0.028316	Area (m2)		0.49	
Q Total (m3/s)	0.43	Flow (m3/s)		0.43	
Top Width (m)	6.37	Top Width (m)		6.37	
Vel Total (m/s)	0.87	Avg. Vel. (m/s)		0.87	
Max Chl Dpth (m)	0.12	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	2.6	Conv. (m3/s)		2.6	
Length Wtd. (m)		Wetted Per. (m)		6.38	
Min Ch El (m)	188.00	Shear (N/m2)		21.46	
Alpha	1.00	Stream Power (N/m s)		18.72	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	188.19	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	188.15	Reach Len. (m)			
Crit W.S. (m)	188.15	Flow Area (m2)		0.66	
E.G. Slope (m/m)	0.026812	Area (m2)		0.66	
Q Total (m3/s)	0.62	Flow (m3/s)		0.62	
Top Width (m)	7.30	Top Width (m)		7.30	
Vel Total (m/s)	0.94	Avg. Vel. (m/s)		0.94	
Max Chl Dpth (m)	0.15	Hydr. Depth (m)		0.09	
Conv. Total (m3/s)	3.8	Conv. (m3/s)		3.8	
Length Wtd. (m)		Wetted Per. (m)		7.31	
Min Ch El (m)	188.00	Shear (N/m2)		23.72	
Alpha	1.00	Stream Power (N/m s)		22.31	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	188.21	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	188.16	Reach Len. (m)			
Crit W.S. (m)	188.16	Flow Area (m2)		0.76	
E.G. Slope (m/m)	0.027155	Area (m2)		0.76	
Q Total (m3/s)	0.75	Flow (m3/s)		0.75	
Top Width (m)	7.79	Top Width (m)		7.79	
Vel Total (m/s)	0.99	Avg. Vel. (m/s)		0.99	
Max Chl Dpth (m)	0.16	Hydr. Depth (m)		0.10	
Conv. Total (m3/s)	4.6	Conv. (m3/s)		4.6	
Length Wtd. (m)		Wetted Per. (m)		7.80	
Min Ch El (m)	188.00	Shear (N/m2)		25.79	
Alpha	1.00	Stream Power (N/m s)		25.61	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	188.24	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	188.18	Reach Len. (m)			
Crit W.S. (m)	188.18	Flow Area (m2)		0.96	
E.G. Slope (m/m)	0.025038	Area (m2)		0.96	
Q Total (m3/s)	1.00	Flow (m3/s)		1.00	
Top Width (m)	8.76	Top Width (m)		8.76	
Vel Total (m/s)	1.04	Avg. Vel. (m/s)		1.04	
Max Chl Dpth (m)	0.18	Hydr. Depth (m)		0.11	
Conv. Total (m3/s)	6.3	Conv. (m3/s)		6.3	
Length Wtd. (m)		Wetted Per. (m)		8.77	
Min Ch El (m)	188.00	Shear (N/m2)		26.98	
Alpha	1.00	Stream Power (N/m s)		27.98	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	188.26	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.035	
W.S. Elev (m)	188.20	Reach Len. (m)			
Crit W.S. (m)	188.20	Flow Area (m2)		1.10	
E.G. Slope (m/m)	0.026019	Area (m2)		1.10	
Q Total (m3/s)	1.21	Flow (m3/s)		1.21	
Top Width (m)	9.32	Top Width (m)		9.32	
Vel Total (m/s)	1.10	Avg. Vel. (m/s)		1.10	
Max Chl Dpth (m)	0.20	Hydr. Depth (m)		0.12	
Conv. Total (m3/s)	7.5	Conv. (m3/s)		7.5	
Length Wtd. (m)		Wetted Per. (m)		9.34	
Min Ch El (m)	188.00	Shear (N/m2)		29.94	
Alpha	1.00	Stream Power (N/m s)		33.07	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	188.28	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.035	
W.S. Elev (m)	188.21	Reach Len. (m)			
Crit W.S. (m)	188.21	Flow Area (m2)		1.25	
E.G. Slope (m/m)	0.025801	Area (m2)		1.25	
Q Total (m3/s)	1.44	Flow (m3/s)		1.44	
Top Width (m)	9.95	Top Width (m)		9.95	
Vel Total (m/s)	1.15	Avg. Vel. (m/s)		1.15	
Max Chl Dpth (m)	0.21	Hydr. Depth (m)		0.13	
Conv. Total (m3/s)	9.0	Conv. (m3/s)		9.0	
Length Wtd. (m)		Wetted Per. (m)		9.96	

Min Ch El (m)	188.00	Shear (N/m2)	31.78
Alpha	1.00	Stream Power (N/m s)	36.58
Frctn Loss (m)		Cum Volume (1000 m3)	
C & E Loss (m)		Cum SA (1000 m2)	

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	188.32	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.035	
W.S. Elev (m)	188.25	Reach Len. (m)			
Crit W.S. (m)	188.25	Flow Area (m2)		1.58	
E.G. Slope (m/m)	0.023503	Area (m2)		1.58	
Q Total (m3/s)	1.88	Flow (m3/s)		1.88	
Top Width (m)	11.15	Top Width (m)		11.15	
Vel Total (m/s)	1.19	Avg. Vel. (m/s)		1.19	
Max Chl Dpth (m)	0.25	Hydr. Depth (m)		0.14	
Conv. Total (m3/s)	12.3	Conv. (m3/s)		12.3	
Length Wtd. (m)		Wetted Per. (m)		11.17	
Min Ch El (m)	188.00	Shear (N/m2)		32.62	
Alpha	1.00	Stream Power (N/m s)		38.80	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	188.56	Element	Left OB	Channel	Right OB
Vel Head (m)	0.12	Wt. n-Val.		0.035	
W.S. Elev (m)	188.44	Reach Len. (m)			
Crit W.S. (m)	188.44	Flow Area (m2)		4.42	
E.G. Slope (m/m)	0.019880	Area (m2)		4.42	
Q Total (m3/s)	6.84	Flow (m3/s)		6.84	
Top Width (m)	18.52	Top Width (m)		18.52	
Vel Total (m/s)	1.55	Avg. Vel. (m/s)		1.55	
Max Chl Dpth (m)	0.44	Hydr. Depth (m)		0.24	
Conv. Total (m3/s)	48.5	Conv. (m3/s)		48.5	
Length Wtd. (m)		Wetted Per. (m)		18.55	
Min Ch El (m)	188.00	Shear (N/m2)		46.44	
Alpha	1.00	Stream Power (N/m s)		71.90	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

SUMMARY OF MANNING'S N VALUES

River:DUFFINS

Reach	River Sta.	n1	n2	n3
WC 43	400	.08	.035	.08
WC 43	350	Culvert		
WC 43	300	.08	.035	.08
WC 43	150	Culvert		
WC 43	100	.08	.035	.08
WC 43	10	.08	.035	.08

SUMMARY OF REACH LENGTHS

River: DUFFINS

Reach	River Sta.	Left	Channel	Right
WC 43	400	116.7	116.7	116.7
WC 43	350	Culvert		
WC 43	300	77	76	79
WC 43	150	Culvert		
WC 43	100	21	49	50
WC 43	10	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: DUFFINS

Reach	River Sta.	Contr.	Expan.
WC 43	400	.3	.5
WC 43	350	Culvert	
WC 43	300	.3	.5
WC 43	150	Culvert	
WC 43	100	.3	.5
WC 43	10	.3	.5

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
WC 43	400	2-yr	0.43	192.00	192.33	192.26	192.37	0.008998	0.96	0.45	6.33	0.66
WC 43	400	5-yr	0.62	192.00	192.39	192.32	192.45	0.008284	1.04	0.60	7.06	0.65
WC 43	400	10-yr	0.75	192.00	192.44	192.35	192.50	0.007871	1.07	0.70	7.51	0.65
WC 43	400	25-yr	1.00	192.00	192.51	192.40	192.57	0.007093	1.12	0.89	27.06	0.63
WC 43	400	50-yr	1.21	192.00	192.56	192.44	192.63	0.006155	1.16	1.07	31.72	0.60
WC 43	400	100-yr	1.44	192.00	192.62	192.49	192.69	0.005519	1.20	1.25	36.32	0.58
WC 43	400	Check Flow	1.88	192.00	192.71	192.55	192.79	0.004865	1.28	1.55	44.07	0.56
WC 43	400	Regional	6.84	192.00	193.36	193.03	193.56	0.004115	2.02	3.70	90.45	0.59
WC 43	350		Culvert									
WC 43	300	2-yr	0.43	189.55	189.67	189.66	189.70	0.011229	0.73	0.59	5.11	0.68
WC 43	300	5-yr	0.62	189.55	189.70	189.66	189.73	0.010529	0.83	0.75	5.14	0.68
WC 43	300	10-yr	0.75	189.55	189.72	189.68	189.76	0.010042	0.88	0.85	5.16	0.68
WC 43	300	25-yr	1.00	189.55	189.76	189.71	189.80	0.009425	0.97	1.03	5.20	0.68
WC 43	300	50-yr	1.21	189.55	189.78	189.73	189.84	0.009024	1.03	1.17	5.23	0.68
WC 43	300	100-yr	1.44	189.55	189.81	189.75	189.87	0.008660	1.09	1.32	5.25	0.68
WC 43	300	Check Flow	1.88	189.55	189.87	189.79	189.94	0.008106	1.19	1.58	5.30	0.68
WC 43	300	Regional	6.84	189.55	190.27	190.12	190.45	0.006836	1.90	3.60	5.69	0.71
WC 43	150		Culvert									
WC 43	100	2-yr	0.43	188.93	189.04		189.07	0.013253	0.77	0.56	11.80	0.73
WC 43	100	5-yr	0.62	188.93	189.07	189.04	189.11	0.013955	0.90	0.69	14.47	0.77
WC 43	100	10-yr	0.75	188.93	189.09	189.06	189.13	0.013650	0.96	0.78	17.55	0.78
WC 43	100	25-yr	1.00	188.93	189.11	189.09	189.17	0.015158	1.12	0.90	21.57	0.84
WC 43	100	50-yr	1.21	188.93	189.13	189.13	189.21	0.014672	1.19	1.01	24.75	0.85
WC 43	100	100-yr	1.44	188.93	189.15	189.13	189.24	0.015021	1.29	1.12	26.25	0.87
WC 43	100	Check Flow	1.88	188.93	189.18	189.17	189.30	0.016804	1.48	1.27	28.21	0.94
WC 43	100	Regional	6.84	188.93	189.50	189.50	189.79	0.014609	2.38	2.87	52.80	1.01
WC 43	10	2-yr	0.43	188.00	188.12	188.12	188.16	0.028316	0.87	0.49	6.37	1.00
WC 43	10	5-yr	0.62	188.00	188.15	188.15	188.19	0.026812	0.94	0.66	7.30	1.00
WC 43	10	10-yr	0.75	188.00	188.16	188.16	188.21	0.027155	0.99	0.76	7.79	1.02
WC 43	10	25-yr	1.00	188.00	188.18	188.18	188.24	0.025038	1.04	0.96	8.76	1.00
WC 43	10	50-yr	1.21	188.00	188.20	188.20	188.26	0.026019	1.10	1.10	9.32	1.03
WC 43	10	100-yr	1.44	188.00	188.21	188.21	188.28	0.025801	1.15	1.25	9.95	1.04
WC 43	10	Check Flow	1.88	188.00	188.25	188.25	188.32	0.023503	1.19	1.58	11.15	1.01
WC 43	10	Regional	6.84	188.00	188.44	188.44	188.56	0.019880	1.55	4.42	18.52	1.01

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (m)	W.S. Elev (m)	Vel Head (m)	Frctn Loss (m)	C & E Loss (m)	Q Left (m3/s)	Q Channel (m3/s)	Q Right (m3/s)	Top Width (m)
WC 43	400	2-yr	192.37	192.33	0.05				0.43		6.33

WC 43	400	5-yr	192.45	192.39	0.05				0.62		7.06
WC 43	400	10-yr	192.50	192.44	0.06				0.75		7.51
WC 43	400	25-yr	192.57	192.51	0.06				1.00	0.00	27.06
WC 43	400	50-yr	192.63	192.56	0.07				1.21	0.00	31.72
WC 43	400	100-yr	192.69	192.62	0.07				1.43	0.01	36.32
WC 43	400	Check Flow	192.79	192.71	0.08				1.85	0.03	44.07
WC 43	400	Regional	193.56	193.36	0.20				6.49	0.35	90.45
WC 43	350		Culvert								
WC 43	300	2-yr	189.70	189.67	0.03				0.43		5.11
WC 43	300	5-yr	189.73	189.70	0.03				0.62		5.14
WC 43	300	10-yr	189.76	189.72	0.04				0.75		5.16
WC 43	300	25-yr	189.80	189.76	0.05				1.00		5.20
WC 43	300	50-yr	189.84	189.78	0.05				1.21		5.23
WC 43	300	100-yr	189.87	189.81	0.06				1.44		5.25
WC 43	300	Check Flow	189.94	189.87	0.07				1.88		5.30
WC 43	300	Regional	190.45	190.27	0.18				6.84		5.69
WC 43	150		Culvert								
WC 43	100	2-yr	189.07	189.04	0.03	0.92	0.00		0.43		11.80
WC 43	100	5-yr	189.11	189.07	0.04	0.92	0.00		0.62		14.47
WC 43	100	10-yr	189.13	189.09	0.05	0.92	0.00		0.75		17.55
WC 43	100	25-yr	189.17	189.11	0.06	0.94	0.00		1.00		21.57
WC 43	100	50-yr	189.21	189.13	0.07	0.94	0.01		1.21		24.75
WC 43	100	100-yr	189.24	189.15	0.08	0.95	0.01		1.44		26.25
WC 43	100	Check Flow	189.30	189.18	0.11	0.97	0.02		1.88		28.21
WC 43	100	Regional	189.79	189.50	0.29	0.83	0.08		6.84		52.80
WC 43	10	2-yr	188.16	188.12	0.04				0.43		6.37
WC 43	10	5-yr	188.19	188.15	0.05				0.62		7.30
WC 43	10	10-yr	188.21	188.16	0.05				0.75		7.79
WC 43	10	25-yr	188.24	188.18	0.05				1.00		8.76
WC 43	10	50-yr	188.26	188.20	0.06				1.21		9.32
WC 43	10	100-yr	188.28	188.21	0.07				1.44		9.95
WC 43	10	Check Flow	188.32	188.25	0.07				1.88		11.15
WC 43	10	Regional	188.56	188.44	0.12				6.84		18.52

Profile Output Table - Culvert Only

Reach	River Sta		Profile	E.G. US. (m)	W.S. US. (m)	E.G. IC (m)	E.G. OC (m)	Min El Weir Flow (m)	Q Culv Group (m3/s)	Q Weir (m3/s)	Delta WS (m)	Culv Vel US (m/s)	Culv Vel DS (m/s)
WC 43	350	Culvert #1	2-yr	192.37	192.33	192.33	192.37	200.29	0.43		2.66	1.33	2.25
WC 43	350	Culvert #1	5-yr	192.45	192.39	192.40	192.45	200.29	0.62		2.70	1.46	2.55
WC 43	350	Culvert #1	10-yr	192.50	192.44	192.45	192.50	200.29	0.75		2.72	1.53	2.69
WC 43	350	Culvert #1	25-yr	192.57	192.51	192.52	192.57	200.29	1.00		2.75	1.65	2.91
WC 43	350	Culvert #1	50-yr	192.63	192.56	192.58	192.63	200.29	1.21		2.78	1.74	3.11
WC 43	350	Culvert #1	100-yr	192.69	192.62	192.63	192.69	200.29	1.44		2.81	1.82	3.26
WC 43	350	Culvert #1	Check Flow	192.79	192.71	192.73	192.79	200.29	1.88		2.85	1.95	3.57
WC 43	350	Culvert #1	Regional	193.56	193.36	193.47	193.56	200.29	6.84		3.09	2.79	4.98
WC 43	150	Culvert #1	2-yr	189.70	189.67	189.69	189.70	200.00	0.43		0.62	0.84	0.72
WC 43	150	Culvert #1	5-yr	189.74	189.70	189.73	189.74	200.00	0.62		0.63	0.99	0.84
WC 43	150	Culvert #1	10-yr	189.76	189.72	189.76	189.76	200.00	0.75		0.63	1.06	0.90
WC 43	150	Culvert #1	25-yr	189.80	189.76	189.80	189.80	200.00	1.00		0.65	1.19	1.05
WC 43	150	Culvert #1	50-yr	189.84	189.78	189.84	189.84	200.00	1.21		0.65	1.27	1.12
WC 43	150	Culvert #1	100-yr	189.87	189.81	189.87	189.87	200.00	1.44		0.66	1.36	1.20
WC 43	150	Culvert #1	Check Flow	189.94	189.87	189.93	189.94	200.00	1.88		0.68	1.51	1.36
WC 43	150	Culvert #1	Regional	190.46	190.27	190.46	190.47	200.00	6.84		0.77	2.38	2.17

DUFFINS CREEK

HEC-RAS ANALYSIS WC#44

ST 400 | 192.13 | 192.13
191.79 | 191.79

EXISTING 407 ETR BRIDGE
SPAN = 42m

EXISTING 407 ETR

ST 300 | 190.00 | 190.00
189.70 | 189.71

ST 200 | 189.25 | 189.08
189.03 | 188.89

PROPOSED 407 TWY

17+600 17+700 17+800 17+900 18+000 18+100 18+200 18+300 18+400

ST 100 | 187.69 | 187.68
187.36 | 187.36

PROPOSED 407 TWY BRIDGE
SPAN= 42m

ST 10 | 186.93 | 186.93
186.66 | 186.66

LEGEND

- EXISTING 407 ETR
- PROPOSED 407 TWY
- CREEK FLOW DIRECTION
- EXISTING CULVERT
- PROPOSED CULVERT
- PROPOSED REGIONAL FLOODLINE
- PROPOSED BRIDGE

EX REG | PR REG | HEC ST — CROSS SECTION NUMBER
EX 100 | PR 100 — PARSONS HEC-RAS SECTION
PROPOSED WL ELEVATION (m)
EXISTING UPDATED WL ELEVATION (m)

SCALE HORIZONTAL
1:1000

5m 0m 10m 20m 30m

DATE: SEPTEMBER 2016

SCALE: 1:1000

Ontario

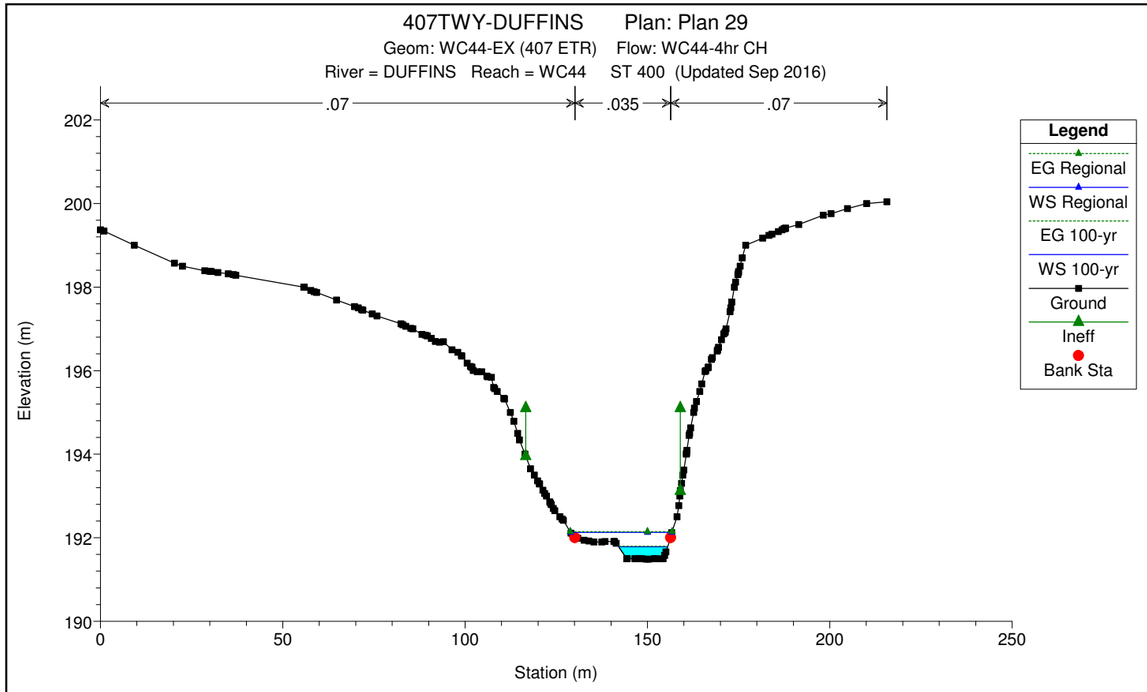
PARSONS

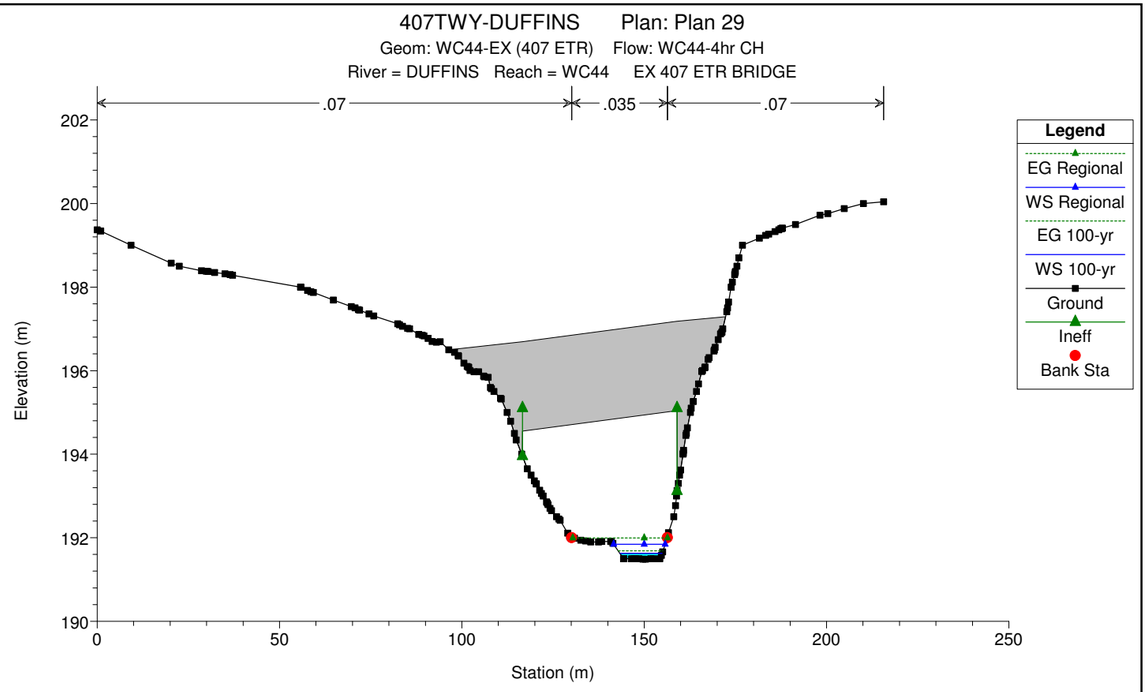
625 COCHRANE DRIVE, SUITE 500
MARKHAM, ONTARIO L3R 9R9
TEL: 905-943-0500
FAX: 905-943-0400

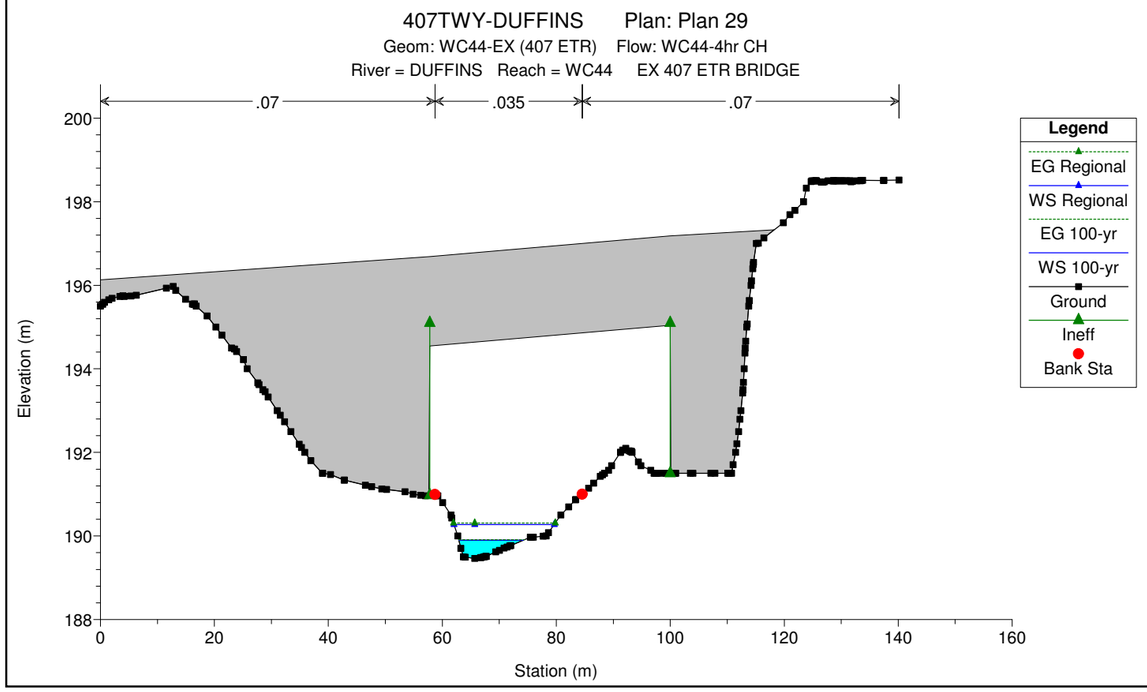
407 TRANSITWAY FROM KENNEDY RD TO BROCK RD

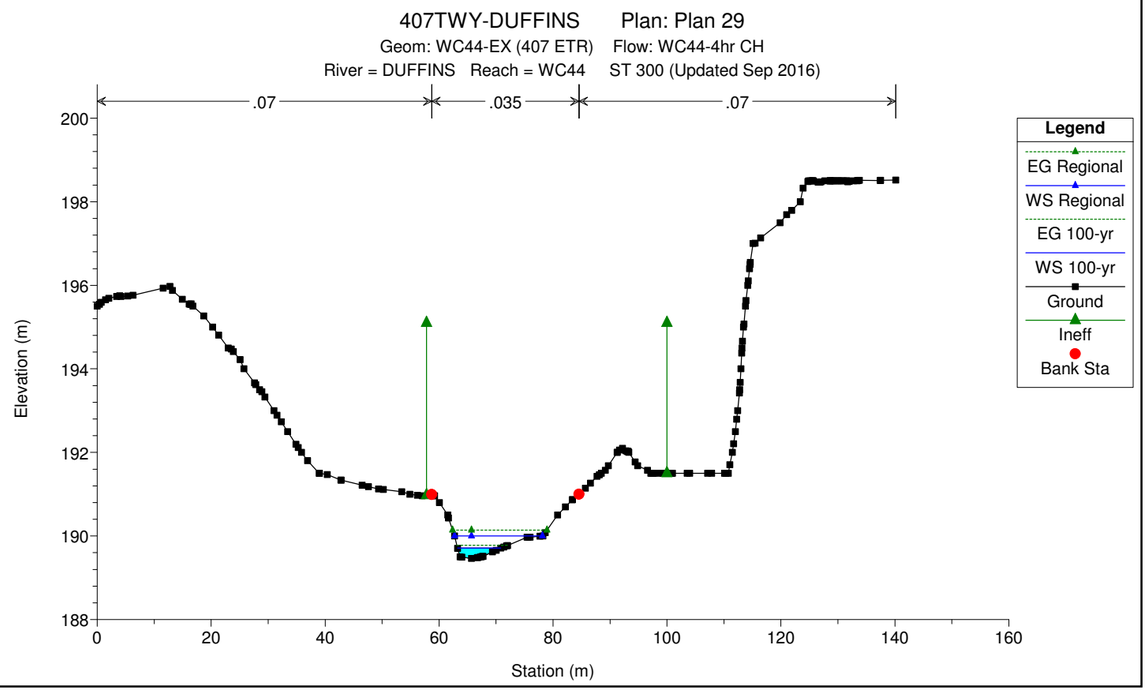
FIGURE 6.23 - PROPOSED FLOODPLAIN MAPPING - DUFFINS CREEK (WC#44)

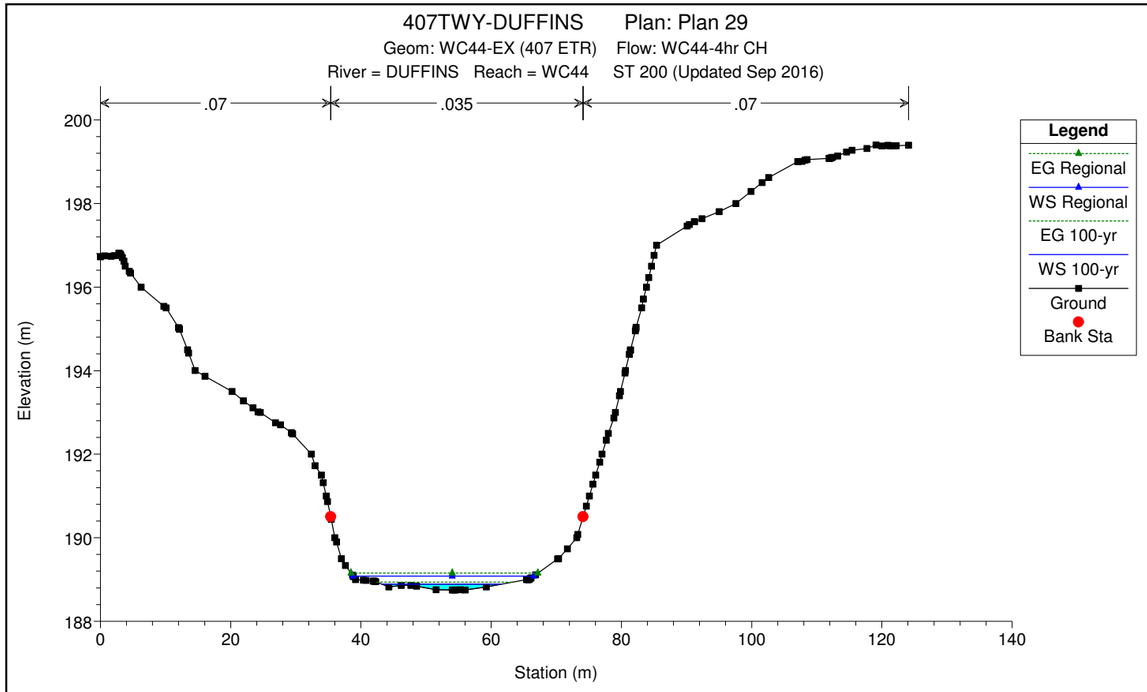
File: G:\TT\60224\PAWING\SUBS\REBAL\SHEETS\60202-S-HEC-DUF-1.DWG Revised by: <PROXATT> - 10/3/2016 4:52 PM

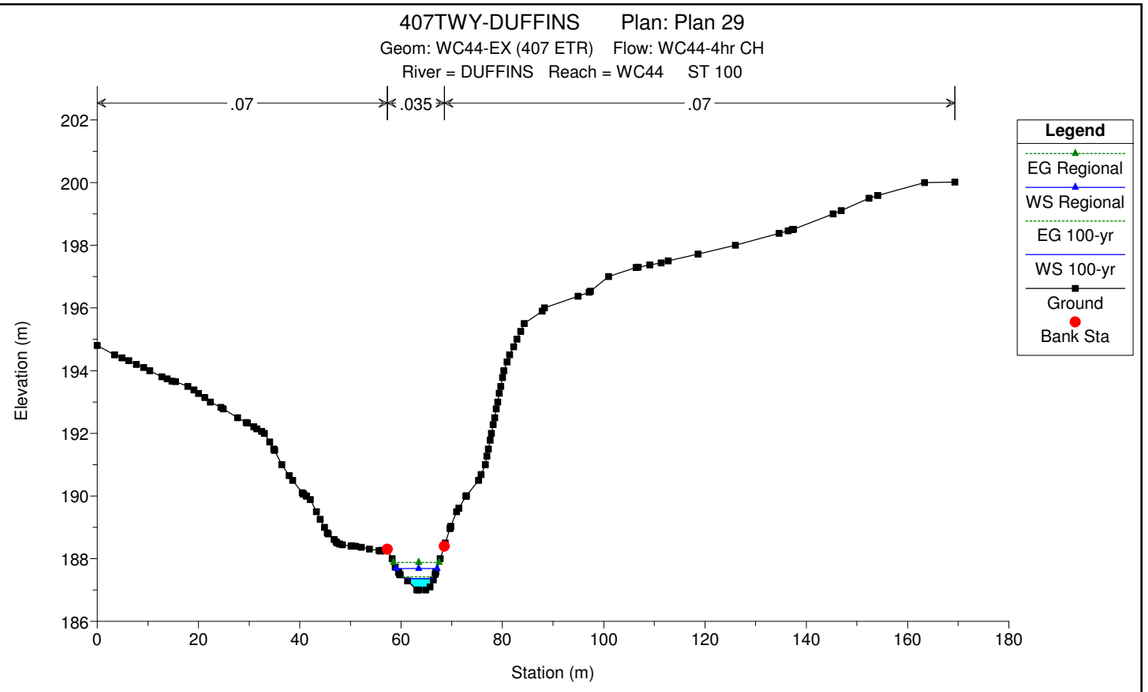

407TWY-DUFFINS Plan: Plan 29
Geom: WC44-EX (407 ETR) Flow: WC44-4hr CH
River = DUFFINS Reach = WC44 ST 400 (Updated Sep 2016)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta

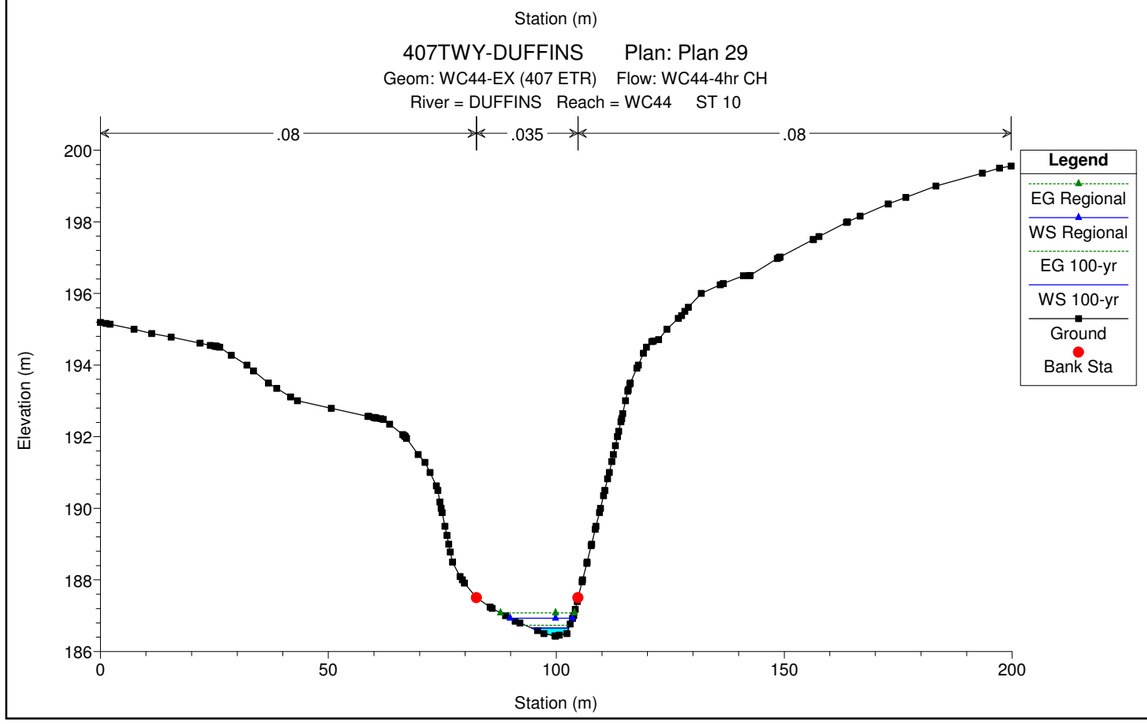

407TWY-DUFFINS Plan: Plan 29
Geom: WC44-EX (407 ETR) Flow: WC44-4hr CH
River = DUFFINS Reach = WC44 EX 407 ETR BRIDGE
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


407TWY-DUFFINS Plan: Plan 29
Geom: WC44-EX (407 ETR) Flow: WC44-4hr CH
River = DUFFINS Reach = WC44 EX 407 ETR BRIDGE
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


407TWY-DUFFINS Plan: Plan 29
Geom: WC44-EX (407 ETR) Flow: WC44-4hr CH
River = DUFFINS Reach = WC44 ST 300 (Updated Sep 2016)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


407TWY-DUFFINS Plan: Plan 29
Geom: WC44-EX (407 ETR) Flow: WC44-4hr CH
River = DUFFINS Reach = WC44 ST 200 (Updated Sep 2016)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Bank Sta


407TWY-DUFFINS Plan: Plan 29
Geom: WC44-EX (407 ETR) Flow: WC44-4hr CH
River = DUFFINS Reach = WC44 ST 100
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Bank Sta


407TWY-DUFFINS Plan: Plan 29
Geom: WC44-EX (407 ETR) Flow: WC44-4hr CH
River = DUFFINS Reach = WC44 ST 10
.08
.035
.08
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Bank Sta

HEC-RAS Plan: WC4 - EX (4hr CH) River: DUFFINS Reach: WC44

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC44	400	2-yr	0.30	191.49	191.63	191.55	191.63	0.000840	0.21	1.45	11.64	0.19
WC44	400	5-yr	0.55	191.49	191.68	191.56	191.68	0.001011	0.27	2.01	12.19	0.21
WC44	400	10-yr	0.75	191.49	191.71	191.57	191.72	0.001101	0.31	2.39	12.55	0.23
WC44	400	25-yr	1.02	191.49	191.74	191.61	191.75	0.001279	0.37	2.78	12.91	0.25
WC44	400	50-yr	1.23	191.49	191.76	191.61	191.77	0.001393	0.40	3.06	13.16	0.27
WC44	400	100-yr	1.47	191.49	191.79	191.62	191.80	0.001471	0.44	3.38	13.44	0.28
WC44	400	Check Flow	1.92	191.49	191.82	191.65	191.84	0.001610	0.49	3.91	13.90	0.30
WC44	400	Regional	7.22	191.49	192.13	191.85	192.15	0.001892	0.68	10.74	27.77	0.34
WC44	350		Bridge									
WC44	300	2-yr	0.30	189.46	189.57	189.56	189.60	0.023609	0.78	0.38	5.06	0.91
WC44	300	5-yr	0.55	189.46	189.62	189.60	189.65	0.016803	0.85	0.65	5.88	0.82
WC44	300	10-yr	0.75	189.46	189.65	189.63	189.69	0.015695	0.91	0.83	6.45	0.81
WC44	300	25-yr	1.02	189.46	189.66	189.66	189.72	0.023532	1.14	0.89	6.65	1.00
WC44	300	50-yr	1.23	189.46	189.68	189.68	189.75	0.022796	1.20	1.03	6.99	1.00
WC44	300	100-yr	1.47	189.46	189.71	189.70	189.78	0.017268	1.14	1.29	7.58	0.89
WC44	300	Check Flow	1.92	189.46	189.73	189.73	189.82	0.021707	1.33	1.45	8.10	1.00
WC44	300	Regional	7.22	189.46	190.00	190.00	190.14	0.018779	1.67	4.33	15.42	1.01
WC44	200	2-yr	0.30	188.75	188.82	188.82	188.84	0.020119	0.57	0.53	10.19	0.79
WC44	200	5-yr	0.55	188.75	188.84	188.84	188.87	0.030947	0.75	0.73	12.69	1.00
WC44	200	10-yr	0.75	188.75	188.85	188.85	188.89	0.035874	0.85	0.89	14.37	1.09
WC44	200	25-yr	1.02	188.75	188.88	188.88	188.91	0.021614	0.75	1.36	17.95	0.87
WC44	200	50-yr	1.23	188.75	188.89	188.89	188.92	0.022122	0.81	1.52	18.43	0.90
WC44	200	100-yr	1.47	188.75	188.89	188.89	188.94	0.034842	1.00	1.48	18.29	1.12
WC44	200	Check Flow	1.92	188.75	188.91	188.91	188.96	0.025727	0.98	1.95	19.59	1.00
WC44	200	Regional	7.22	188.75	189.08	189.05	189.15	0.012596	1.17	6.15	27.76	0.80
WC44	100	2-yr	0.30	187.00	187.17	187.12	187.19	0.006484	0.59	0.51	3.92	0.52
WC44	100	5-yr	0.55	187.00	187.23	187.17	187.26	0.006975	0.73	0.76	4.46	0.56
WC44	100	10-yr	0.75	187.00	187.26	187.20	187.30	0.007632	0.82	0.91	4.77	0.60
WC44	100	25-yr	1.02	187.00	187.31	187.24	187.35	0.008083	0.92	1.11	5.16	0.63
WC44	100	50-yr	1.23	187.00	187.33	187.26	187.38	0.008434	0.98	1.25	5.42	0.65
WC44	100	100-yr	1.47	187.00	187.36	187.29	187.41	0.008826	1.05	1.40	5.67	0.67
WC44	100	Check Flow	1.92	187.00	187.40	187.34	187.47	0.009420	1.16	1.66	6.09	0.71
WC44	100	Regional	7.22	187.00	187.68	187.66	187.88	0.013829	1.96	3.68	8.06	0.93
WC44	10	2-yr	0.30	186.43	186.54	186.54	186.57	0.030213	0.80	0.37	5.74	1.00
WC44	10	5-yr	0.55	186.43	186.57	186.57	186.62	0.028703	0.97	0.57	6.35	1.03

HEC-RAS Plan: WC4 - EX (4hr CH) River: DUFFINS Reach: WC44 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC44	10	10-yr	0.75	186.43	186.59	186.59	186.65	0.025903	1.03	0.73	6.82	1.01
WC44	10	25-yr	1.02	186.43	186.62	186.62	186.68	0.024048	1.10	0.92	7.39	1.00
WC44	10	50-yr	1.23	186.43	186.64	186.64	186.71	0.023254	1.15	1.07	7.78	1.00
WC44	10	100-yr	1.47	186.43	186.66	186.66	186.73	0.022624	1.21	1.22	8.18	1.00
WC44	10	Check Flow	1.92	186.43	186.69	186.69	186.78	0.021773	1.28	1.49	8.85	1.00
WC44	10	Regional	7.22	186.43	186.93	186.93	187.08	0.017938	1.73	4.18	13.68	1.00

HEC-RAS HEC-RAS 5.0.1 April 2016
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
```

PROJECT DATA
Project Title: 407TWY-DUFFINS
Project File : 407TWY-DUFFINS.prj
Run Date and Time: 9/21/2016 2:01:49 PM

Project in SI units

Project Description:
HEC-RAS Model created for 407 TWY project from Kennedy Rd. to Brock Rd. -
Duffins Creek Watershed

PLAN DATA

Plan Title: Plan 29
Plan File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.p29

Geometry Title: WC44-EX (407 ETR)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.g15

Flow Title : WC44-4hr CH
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.f15

Plan Summary Information:
Number of: Cross Sections = 5 Multiple Openings = 0
Culverts = 0 Inline Structures = 0
Bridges = 1 Lateral Structures = 0

Computational Information
Water surface calculation tolerance = 0.01
Critical depth calculation tolerance = 0.01
Maximum number of iterations = 20
Maximum difference tolerance = 0.3
Flow tolerance factor = 0.001

Computation Options
Critical depth computed only where necessary
Conveyance Calculation Method: At breaks in n values only
Friction Slope Method: Average Conveyance
Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: WC44-4hr CH
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.f15

Flow Data (m3/s)

River	Reach	RS	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Check Flow	Regional
DUFFINS	WC44	400	.3	.55	.75	1.02	1.23	1.47	1.92	7.22

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
DUFFINS	WC44	2-yr		Critical
DUFFINS	WC44	5-yr		Critical
DUFFINS	WC44	10-yr		Critical
DUFFINS	WC44	25-yr		Critical
DUFFINS	WC44	50-yr		Critical
DUFFINS	WC44	100-yr		Critical
DUFFINS	WC44	Check Flow		Critical
DUFFINS	WC44	Regional		Critical

GEOMETRY DATA

Geometry Title: WC44-EX (407 ETR)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.g15

CROSS SECTION

RIVER: DUFFINS
REACH: WC44 RS: 400

INPUT
Description: ST 400 (Updated Sep 2016)
Station Elevation Data num= 165

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	199.37	.95	199.34	9.29	199	20.31	198.57	22.48	198.5
28.57	198.39	29.9	198.38	30.37	198.37	32.21	198.35	35.01	198.32
36.42	198.3	37.15	198.28	55.78	198	55.88	198	57.7	197.92
58.56	197.89	59.31	197.87	64.76	197.69	69.7	197.53	70.72	197.5
71.64	197.46	71.95	197.45	74.54	197.36	75.83	197.31	82.38	197.12
82.87	197.1	83.74	197.06	85.14	197.01	85.69	197	88.19	196.87
89.16	196.85	89.6	196.83	90.69	196.77	91.86	196.7	93.02	196.68
94.06	196.69	96.43	196.5	97.98	196.44	98.95	196.36	99.07	196.35
100.58	196.18	101.43	196.1	101.82	196.08	101.86	196.08	102.24	196
103.29	195.97	104.56	195.97	105.98	195.87	106.13	195.85	107.21	195.84
107.86	195.6	108.11	195.57	108.82	195.5	110.62	195.34	110.81	195.32
112.38	195	113.35	194.79	114.37	194.5	114.9	194.34	116.39	194
117.92	193.65	118.96	193.5	119.9	193.36	120.39	193.29	120.42	193.29
121.34	193.14	121.84	193.06	122.27	193	123.18	192.86	123.4	192.83
123.63	192.79	124.2	192.7	124.61	192.65	125.96	192.5	126.56	192.45
126.93	192.42	129.04	192.11	129.58	192.03	129.68	192.02	129.82	192
129.99	192	130.12	192	130.92	191.99	132.61	191.94	133.96	191.92
135.33	191.9	137.44	191.9	138.38	191.91	140.78	191.91	140.93	191.91
141.44	191.87	144.3	191.5	144.44	191.5	146.55	191.5	147.13	191.5
147.65	191.5	148.57	191.5	149.64	191.49	150.33	191.49	151.78	191.5
152.44	191.5	154.3	191.5	154.7	191.58	155.03	191.66	156.39	192
156.68	192.12	158.08	192.5	158.56	192.77	158.85	193	159.01	193.13
159.33	193.3	159.72	193.5	159.94	193.62	160.66	194	160.68	194.01
160.73	194.03	160.81	194.09	161.42	194.45	161.54	194.5	161.83	194.63
162.66	195	162.86	195.1	163.44	195.26	164.34	195.5	164.88	195.68
165.8	195.98	165.97	196	166.64	196.07	166.72	196.09	167.52	196.27
167.81	196.31	169.14	196.47	169.26	196.5	169.46	196.56	170.3	196.74
170.92	196.88	171.27	196.91	171.32	196.93	171.53	197	172.66	197.41
172.83	197.5	173.12	197.64	173.84	198	174.14	198.12	174.78	198.3
174.92	198.34	175.01	198.37	175.4	198.5	176	198.7	176.93	199
181.59	199.17	183.3	199.24	184.14	199.27	185.87	199.33	186.91	199.37
187.5	199.4	187.63	199.4	187.71	199.4	187.91	199.41	191.48	199.5
198.17	199.72	200.32	199.76	204.87	199.88	210.1	200	215.65	200.04

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	130.12	.035	156.39	.07

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
130.12 156.39 77 83 75 .3 .5
Ineffective Flow num= 2
Sta L Sta R Elev Permanent
0 116.6 195.1 T
159 215.65 195.1 T

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	191.63	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	191.63	Reach Len. (m)	25.50	25.50	25.50
Crit W.S. (m)	191.55	Flow Area (m2)		1.45	
E.G. Slope (m/m)	0.000840	Area (m2)		1.45	
Q Total (m3/s)	0.30	Flow (m3/s)		0.30	
Top Width (m)	11.64	Top Width (m)		11.64	
Vel Total (m/s)	0.21	Avg. Vel. (m/s)		0.21	
Max Chl Dpth (m)	0.14	Hydr. Depth (m)		0.12	
Conv. Total (m3/s)	10.4	Conv. (m3/s)		10.4	
Length Wtd. (m)	25.50	Wetted Per. (m)		11.66	
Min Ch El (m)	191.49	Shear (N/m2)		1.03	
Alpha	1.00	Stream Power (N/m s)		0.21	
Frctn Loss (m)	0.06	Cum Volume (1000 m3)		0.16	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.89	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	191.68	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	191.68	Reach Len. (m)	25.50	25.50	25.50
Crit W.S. (m)	191.56	Flow Area (m2)		2.01	
E.G. Slope (m/m)	0.001011	Area (m2)		2.01	
Q Total (m3/s)	0.55	Flow (m3/s)		0.55	
Top Width (m)	12.19	Top Width (m)		12.19	
Vel Total (m/s)	0.27	Avg. Vel. (m/s)		0.27	
Max Chl Dpth (m)	0.19	Hydr. Depth (m)		0.17	
Conv. Total (m3/s)	17.3	Conv. (m3/s)		17.3	
Length Wtd. (m)	25.50	Wetted Per. (m)		12.23	
Min Ch El (m)	191.49	Shear (N/m2)		1.63	
Alpha	1.00	Stream Power (N/m s)		0.45	
Frctn Loss (m)	0.07	Cum Volume (1000 m3)		0.23	
C & E Loss (m)	0.01	Cum SA (1000 m2)		2.18	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	191.72	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	191.71	Reach Len. (m)	25.50	25.50	25.50
Crit W.S. (m)	191.57	Flow Area (m2)		2.39	
E.G. Slope (m/m)	0.001101	Area (m2)		2.39	
Q Total (m3/s)	0.75	Flow (m3/s)		0.75	
Top Width (m)	12.55	Top Width (m)		12.55	
Vel Total (m/s)	0.31	Avg. Vel. (m/s)		0.31	
Max Chl Dpth (m)	0.22	Hydr. Depth (m)		0.19	
Conv. Total (m3/s)	22.6	Conv. (m3/s)		22.6	
Length Wtd. (m)	25.50	Wetted Per. (m)		12.59	
Min Ch El (m)	191.49	Shear (N/m2)		2.05	
Alpha	1.00	Stream Power (N/m s)		0.64	
Frctn Loss (m)	0.08	Cum Volume (1000 m3)		0.28	
C & E Loss (m)	0.01	Cum SA (1000 m2)		2.37	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	191.75	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	191.74	Reach Len. (m)	25.50	25.50	25.50
Crit W.S. (m)	191.61	Flow Area (m2)		2.78	
E.G. Slope (m/m)	0.001279	Area (m2)		2.78	
Q Total (m3/s)	1.02	Flow (m3/s)		1.02	
Top Width (m)	12.91	Top Width (m)		12.91	
Vel Total (m/s)	0.37	Avg. Vel. (m/s)		0.37	
Max Chl Dpth (m)	0.25	Hydr. Depth (m)		0.22	
Conv. Total (m3/s)	28.5	Conv. (m3/s)		28.5	
Length Wtd. (m)	25.50	Wetted Per. (m)		12.96	
Min Ch El (m)	191.49	Shear (N/m2)		2.69	
Alpha	1.00	Stream Power (N/m s)		0.99	
Frctn Loss (m)	0.09	Cum Volume (1000 m3)		0.35	
C & E Loss (m)	0.01	Cum SA (1000 m2)		2.69	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	191.77	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	191.76	Reach Len. (m)	25.50	25.50	25.50
Crit W.S. (m)	191.61	Flow Area (m2)		3.06	
E.G. Slope (m/m)	0.001393	Area (m2)		3.06	
Q Total (m3/s)	1.23	Flow (m3/s)		1.23	
Top Width (m)	13.16	Top Width (m)		13.16	
Vel Total (m/s)	0.40	Avg. Vel. (m/s)		0.40	
Max Chl Dpth (m)	0.27	Hydr. Depth (m)		0.23	
Conv. Total (m3/s)	33.0	Conv. (m3/s)		33.0	
Length Wtd. (m)	25.50	Wetted Per. (m)		13.21	
Min Ch El (m)	191.49	Shear (N/m2)		3.16	
Alpha	1.00	Stream Power (N/m s)		1.27	
Frctn Loss (m)	0.09	Cum Volume (1000 m3)		0.40	
C & E Loss (m)	0.01	Cum SA (1000 m2)		2.78	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	191.80	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	191.79	Reach Len. (m)	25.50	25.50	25.50
Crit W.S. (m)	191.62	Flow Area (m2)		3.38	
E.G. Slope (m/m)	0.001471	Area (m2)		3.38	
Q Total (m3/s)	1.47	Flow (m3/s)		1.47	
Top Width (m)	13.44	Top Width (m)		13.44	
Vel Total (m/s)	0.44	Avg. Vel. (m/s)		0.44	
Max Chl Dpth (m)	0.30	Hydr. Depth (m)		0.25	
Conv. Total (m3/s)	38.3	Conv. (m3/s)		38.3	
Length Wtd. (m)	25.50	Wetted Per. (m)		13.49	
Min Ch El (m)	191.49	Shear (N/m2)		3.61	
Alpha	1.00	Stream Power (N/m s)		1.57	
Frctn Loss (m)	0.10	Cum Volume (1000 m3)		0.44	
C & E Loss (m)	0.01	Cum SA (1000 m2)		2.85	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	191.84	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	

W.S. Elev (m)	191.82	Reach Len. (m)	25.50	25.50	25.50
Crit W.S. (m)	191.65	Flow Area (m2)		3.91	
E.G. Slope (m/m)	0.001610	Area (m2)		3.91	
Q Total (m3/s)	1.92	Flow (m3/s)		1.92	
Top Width (m)	13.90	Top Width (m)		13.90	
Vel Total (m/s)	0.49	Avg. Vel. (m/s)		0.49	
Max Chl Dpth (m)	0.33	Hydr. Depth (m)		0.28	
Conv. Total (m3/s)	47.8	Conv. (m3/s)		47.8	
Length Wtd. (m)	25.50	Wetted Per. (m)		13.96	
Min Ch El (m)	191.49	Shear (N/m2)		4.42	
Alpha	1.00	Stream Power (N/m s)		2.17	
Frctn Loss (m)	0.10	Cum Volume (1000 m3)		0.53	
C & E Loss (m)	0.02	Cum SA (1000 m2)		3.04	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	192.15	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.	0.070	0.035	0.070
W.S. Elev (m)	192.13	Reach Len. (m)	25.50	25.50	25.50
Crit W.S. (m)	191.85	Flow Area (m2)	0.09	10.63	0.02
E.G. Slope (m/m)	0.001892	Area (m2)	0.09	10.63	0.02
Q Total (m3/s)	7.22	Flow (m3/s)	0.01	7.21	0.00
Top Width (m)	27.77	Top Width (m)	1.19	26.27	0.31
Vel Total (m/s)	0.67	Avg. Vel. (m/s)	0.11	0.68	0.09
Max Chl Dpth (m)	0.64	Hydr. Depth (m)	0.08	0.40	0.06
Conv. Total (m3/s)	166.0	Conv. (m3/s)	0.2	165.7	0.0
Length Wtd. (m)	25.50	Wetted Per. (m)	1.19	26.36	0.33
Min Ch El (m)	191.49	Shear (N/m2)	1.47	7.48	1.06
Alpha	1.02	Stream Power (N/m s)	0.17	5.07	0.10
Frctn Loss (m)	0.11	Cum Volume (1000 m3)	0.00	1.41	0.00
C & E Loss (m)	0.04	Cum SA (1000 m2)	0.02	4.43	0.00

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

BRIDGE

RIVER: DUFFINS
REACH: WC44 RS: 350

INPUT
Description: EX 407 ETR BRIDGE
Distance from Upstream XS = 25.5
Deck/Roadway Width = 28
Weir Coefficient = 1.4
Upstream Deck/Roadway Coordinates
num= 4

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	195.59		116.6	196.69	194.55	159	197.18	195.04
216	197.65							

Upstream Bridge Cross Section Data
Station Elevation Data num= 165

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	199.37	.95	199.34	9.29	199	20.31	198.57	22.48	198.5
28.57	198.39	29.9	198.38	30.37	198.37	32.21	198.35	35.01	198.32
36.42	198.3	37.15	198.28	55.78	198	55.88	198	57.7	197.92
58.56	197.89	59.31	197.87	64.76	197.69	69.7	197.53	70.72	197.5
71.64	197.46	71.95	197.45	74.54	197.36	75.83	197.31	82.38	197.12
82.87	197.1	83.74	197.06	85.14	197.01	85.69	197	88.19	196.87
89.16	196.85	89.6	196.83	90.69	196.77	91.86	196.7	93.02	196.68
94.06	196.69	96.43	196.5	97.98	196.44	98.95	196.36	99.07	196.35
100.58	196.18	101.43	196.1	101.82	196.08	101.86	196.08	102.24	196
103.29	195.97	104.56	195.97	105.98	195.87	106.13	195.85	107.21	195.84
107.86	195.6	108.11	195.57	108.82	195.5	110.62	195.34	110.81	195.32
112.38	195	113.35	194.79	114.37	194.5	114.9	194.34	116.39	194
117.92	193.65	118.96	193.5	119.9	193.36	120.39	193.29	120.42	193.29
121.34	193.14	121.84	193.06	122.27	193	123.18	192.86	123.4	192.83
123.63	192.79	124.2	192.7	124.61	192.65	125.96	192.5	126.56	192.45
126.93	192.42	129.04	192.11	129.58	192.03	129.68	192.02	129.82	192
129.99	192	130.12	192	130.92	191.99	132.61	191.94	133.96	191.92
135.33	191.9	137.44	191.9	138.38	191.91	140.78	191.91	140.93	191.91
141.44	191.87	144.3	191.5	144.44	191.5	146.55	191.5	147.13	191.5
147.65	191.5	148.57	191.5	149.64	191.49	150.33	191.49	151.78	191.5
152.44	191.5	154.3	191.5	154.7	191.58	155.03	191.66	156.39	192
156.68	192.12	158.08	192.5	158.56	192.77	158.85	193	159.01	193.13
159.33	193.3	159.72	193.5	159.94	193.62	160.66	194	160.68	194.01
160.73	194.03	160.81	194.09	161.42	194.45	161.54	194.5	161.83	194.63
162.66	195	162.86	195.1	163.44	195.26	164.34	195.5	164.88	195.68
165.8	195.98	165.97	196	166.64	196.07	166.72	196.09	167.52	196.27
167.81	196.31	169.14	196.47	169.26	196.5	169.46	196.56	170.3	196.74
170.92	196.88	171.27	196.91	171.32	196.93	171.53	197	172.66	197.41
172.83	197.5	173.12	197.64	173.84	198	174.14	198.12	174.78	198.3
174.92	198.34	175.01	198.37	175.4	198.5	176	198.7	176.93	199
181.59	199.17	183.3	199.24	184.14	199.27	185.87	199.33	186.91	199.37
187.5	199.4	187.63	199.4	187.71	199.4	187.91	199.41	191.48	199.5
198.17	199.72	200.32	199.76	204.87	199.88	210.1	200	215.65	200.04

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	130.12	.035	156.39	.07

Bank Sta: Left Right Coeff Contr. Expan.
130.12 156.39 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	116.6	195.1	T
159	215.65	195.1	T

Downstream Deck/Roadway Coordinates
num= 4

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	196.13		57.8	196.69	194.55	100	197.18	195.04
140	197.5							

Downstream Bridge Cross Section Data
Station Elevation Data num= 192

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	195.5	.381	195.546	.726	195.595	1.482	195.651	2.06	195.69
3.411	195.729	3.945	195.75	4.181	195.731	5.362	195.746	6.288	195.764
11.555	195.929	12.771	195.974	13.205	195.875	14.957	195.667	16.129	195.549
16.392	195.546	16.408	195.547	16.505	195.555	16.781	195.5	18.718	195.269
20.234	195	21.312	194.808	23.015	194.5	23.538	194.475	23.874	194.413
25.078	194.218	25.768	194	27.592	193.666	27.822	193.624	28.502	193.5
28.88	193.45	29.432	193.325	31.018	193	31.554	192.89	32.316	192.734
33.405	192.5	34.896	192.194	35.286	192.117	35.873	192	36.93	191.801
38.942	191.5	39.018	191.499	40.393	191.473	42.75	191.339	42.812	191.336
46.482	191.217	47.594	191.182	49.362	191.126	50.214	191.111	53.448	191.056
54.859	191	56.201	190.977	57.024	190.96	58.709	190.994	59.028	190.964
59.231	190.963	60.077	190.796	61.51	190.5	61.659	190.429	62.727	190
63.268	189.702	63.679	189.5	64.008	189.496	65.671	189.46	66.718	189.479
66.879	189.485	67.271	189.5	67.449	189.505	67.635	189.51	67.742	189.511
69.365	189.621	70.036	189.658	70.811	189.711	71.374	189.735	71.83	189.763
72.002	189.772	75.426	189.97	75.669	189.971	75.976	189.971	77.711	189.994
78.221	190	78.626	190.079	80.776	190.5	82.169	190.697	83.366	190.866
83.43	190.873	84.561	191	85.653	191.145	86.553	191.265	87.717	191.429
88.129	191.467	88.484	191.5	89.159	191.571	89.694	191.68	91.253	192
91.258	192.001	91.652	192.055	92.203	192.1	92.822	192.04	93.047	192.018
93.131	192.03	93.219	192.018	93.282	192	94.386	191.775	94.839	191.682
96.566	191.573	97.146	191.5	97.4	191.5	97.44	191.5	97.618	191.5
97.689	191.5	98.82	191.5	99.262	191.5	100.25	191.5	100.727	191.5
100.742	191.5	100.756	191.5	100.981	191.5	103.551	191.5	103.957	191.5
107.138	191.5	107.822	191.5	110.082	191.5	110.321	191.5	110.392	191.5
110.754	191.5	111.036	191.704	111.453	192	111.677	192.208	112.014	192.5
112.23	192.796	112.378	193	112.687	193.423	112.743	193.5	112.849	193.675
112.976	194	113.126	194.377	113.173	194.5	113.24	194.662	113.433	195
113.485	195.076	113.768	195.5	113.878	195.637	114.168	196	114.255	196.108
114.483	196.394	114.573	196.5	114.628	196.547	115.119	197	115.442	197.009

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 116.437 197.137 119.849   197.5 120.982 197.689 121.905 197.794 123.378     198
 123.857 198.326 124.711 198.481 124.861   198.5 125.169   198.5 125.478   198.5
 125.573   198.5 125.575   198.5 125.689   198.5 126.477 198.473 126.818 198.469
 127.028 198.478 127.688   198.5 128.602 198.501 128.644 198.501 128.661 198.501
  128.68 198.501  128.89 198.501   129.1 198.501 129.355   198.5 129.751 198.499
 130.011 198.499 130.324 198.499 130.561 198.499 130.924 198.498 131.483 198.498
 131.647 198.499 131.743 198.478 131.969  198.49 132.743   198.5 133.349   198.5
 133.493 198.504 133.495 198.504  133.77  198.51 137.426 198.509 137.451  198.51
 137.494  198.51 140.165 198.518

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .07  58.709    .035  84.561     .07

Bank Sta: Left   Right    Coeff Contr.   Expan.
         58.709  84.561          .3       .5
Ineffective Flow     num=       2
   Sta L    Sta R    Elev  Permanent
       0     57.8   195.1       T
      100 140.165   195.1       T

Upstream Embankment side slope              =       2 horiz. to 1.0 vertical
Downstream Embankment side slope            =       2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Energy Only

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION


RIVER: DUFFINS
REACH: WC44               RS: 300

INPUT
Description: ST 300 (Updated Sep 2016)
Station Elevation Data     num=     192
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0   195.5    .381 195.546    .726 195.595   1.482 195.651    2.06  195.69
   3.411 195.729   3.945  195.75   4.181 195.731   5.362 195.746   6.288 195.764
  11.555 195.929  12.771 195.974  13.205 195.875  14.957 195.667  16.129 195.549
  16.392 195.546  16.408 195.547  16.505 195.555  16.781   195.5  18.718 195.269
  20.234     195  21.312 194.808  23.015   194.5  23.538 194.475  23.874 194.413
  25.078 194.218  25.768     194  27.592 193.666  27.822 193.624  28.502   193.5
   28.88  193.45  29.432 193.325  31.018     193  31.554  192.89  32.316 192.734
  33.405   192.5  34.896 192.194  35.286 192.117  35.873     192   36.93 191.801
  38.942   191.5  39.018 191.499  40.393 191.473   42.75 191.339  42.812 191.336
  46.482 191.217  47.594 191.182  49.362 191.126  50.214 191.111  53.448 191.056
  54.859     191  56.201 190.977  57.024  190.96  58.709 190.994  59.028 190.964
  59.231 190.963  60.077 190.796   61.51   190.5  61.659 190.429  62.727     190
  63.268 189.702  63.679   189.5  64.008 189.496  65.671  189.46  66.718 189.479
  66.879 189.485  67.271   189.5  67.449 189.505  67.635  189.51  67.742 189.511
  69.365 189.621  70.036 189.658  70.811 189.711  71.374 189.735   71.83 189.763
  72.002 189.772  75.426  189.97  75.669 189.971  75.976 189.971  77.711 189.994
  78.221     190  78.626 190.079  80.776   190.5  82.169 190.697  83.366 190.866
   83.43 190.873  84.561     191  85.653 191.145  86.553 191.265  87.717 191.429
  88.129 191.467  88.484   191.5  89.159 191.571  89.694  191.68  91.253     192
  91.258 192.001  91.652 192.055  92.203   192.1  92.822  192.04  93.047 192.018
  93.131  192.03  93.219 192.018  93.282     192  94.386 191.775  94.839 191.682
  96.566 191.573  97.146   191.5    97.4   191.5   97.44   191.5  97.618   191.5
  97.689   191.5   98.82   191.5  99.262   191.5  100.25   191.5 100.727   191.5
 100.742   191.5 100.756   191.5 100.981   191.5 103.551   191.5 103.957   191.5
 107.138   191.5 107.822   191.5 110.082   191.5 110.321   191.5 110.392   191.5
 110.754   191.5 111.036 191.704 111.453     192 111.677 192.208 112.014   192.5
  112.23 192.796 112.378     193 112.687 193.423 112.743   193.5 112.849 193.675
 112.976     194 113.126 194.377 113.173   194.5  113.24 194.662 113.433     195
 113.485 195.076 113.768   195.5 113.878 195.637 114.168     196 114.255 196.108
 114.483 196.394 114.573   196.5 114.628 196.547 115.119     197 115.442 197.009
 116.437 197.137 119.849   197.5 120.982 197.689 121.905 197.794 123.378     198
 123.857 198.326 124.711 198.481 124.861   198.5 125.169   198.5 125.478   198.5
 125.573   198.5 125.575   198.5 125.689   198.5 126.477 198.473 126.818 198.469
 127.028 198.478 127.688   198.5 128.602 198.501 128.644 198.501 128.661 198.501
  128.68 198.501  128.89 198.501   129.1 198.501 129.355   198.5 129.751 198.499
 130.011 198.499 130.324 198.499 130.561 198.499 130.924 198.498 131.483 198.498
 131.647 198.499 131.743 198.478 131.969  198.49 132.743   198.5 133.349   198.5
 133.493 198.504 133.495 198.504  133.77  198.51 137.426 198.509 137.451  198.51
 137.494  198.51 140.165 198.518

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .07  58.709    .035  84.561     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
         58.709  84.561            34      35    33.1             .3       .5
Ineffective Flow     num=       2
   Sta L    Sta R    Elev  Permanent
       0     57.8   195.1       T
      100 140.165   195.1       T

CROSS SECTION OUTPUT  Profile #2-yr

  E.G. Elev (m)           189.60    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.03    Wt. n-Val.                          0.035
  W.S. Elev (m)           189.57    Reach Len. (m)           34.00      35.00      33.10
  Crit W.S. (m)           189.56    Flow Area (m2)                       0.38
  E.G. Slope (m/m)      0.023609    Area (m2)                            0.38
  Q Total (m3/s)            0.30    Flow (m3/s)                          0.30
  Top Width (m)             5.06    Top Width (m)                        5.06
  Vel Total (m/s)           0.78    Avg. Vel. (m/s)                      0.78
  Max Chl Dpth (m)          0.11    Hydr. Depth (m)                      0.08
  Conv. Total (m3/s)         2.0    Conv. (m3/s)                          2.0
  Length Wtd. (m)          35.00    Wetted Per. (m)                      5.08
  Min Ch El (m)           189.46    Shear (N/m2)                        17.45
  Alpha                     1.00    Stream Power (N/m s)                13.67
  Frctn Loss (m)            0.76    Cum Volume (1000 m3)                 0.09
  C & E Loss (m)            0.01    Cum SA (1000 m2)                     1.17


Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate
         the need for additional cross sections.

CROSS SECTION OUTPUT  Profile #5-yr

  E.G. Elev (m)           189.65    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.04    Wt. n-Val.                          0.035
  W.S. Elev (m)           189.62    Reach Len. (m)           34.00      35.00      33.10
  Crit W.S. (m)           189.60    Flow Area (m2)                       0.65
  E.G. Slope (m/m)      0.016803    Area (m2)                            0.65
  Q Total (m3/s)            0.55    Flow (m3/s)                          0.55
  Top Width (m)             5.88    Top Width (m)                        5.88
  Vel Total (m/s)           0.85    Avg. Vel. (m/s)                      0.85
  Max Chl Dpth (m)          0.16    Hydr. Depth (m)                      0.11
  Conv. Total (m3/s)         4.2    Conv. (m3/s)                          4.2
  Length Wtd. (m)          35.00    Wetted Per. (m)                      5.91
  Min Ch El (m)           189.46    Shear (N/m2)                        18.08
  Alpha                     1.00    Stream Power (N/m s)                15.34
  Frctn Loss (m)            0.78    Cum Volume (1000 m3)                 0.13
```

C & E Loss (m)	0.00	Cum SA (1000 m2)	1.40

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	189.69	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.035	
W.S. Elev (m)	189.65	Reach Len. (m)	34.00	35.00	33.10
Crit W.S. (m)	189.63	Flow Area (m2)		0.83	
E.G. Slope (m/m)	0.015695	Area (m2)		0.83	
Q Total (m3/s)	0.75	Flow (m3/s)		0.75	
Top Width (m)	6.45	Top Width (m)		6.45	
Vel Total (m/s)	0.91	Avg. Vel. (m/s)		0.91	
Max Chl Dpth (m)	0.19	Hydr. Depth (m)		0.13	
Conv. Total (m3/s)	6.0	Conv. (m3/s)		6.0	
Length Wtd. (m)	35.00	Wetted Per. (m)		6.49	
Min Ch El (m)	189.46	Shear (N/m2)		19.62	
Alpha	1.00	Stream Power (N/m s)		17.79	
Frctn Loss (m)	0.80	Cum Volume (1000 m3)		0.16	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.56	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	189.72	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.035	
W.S. Elev (m)	189.66	Reach Len. (m)	34.00	35.00	33.10
Crit W.S. (m)	189.66	Flow Area (m2)		0.89	
E.G. Slope (m/m)	0.023532	Area (m2)		0.89	
Q Total (m3/s)	1.02	Flow (m3/s)		1.02	
Top Width (m)	6.65	Top Width (m)		6.65	
Vel Total (m/s)	1.14	Avg. Vel. (m/s)		1.14	
Max Chl Dpth (m)	0.20	Hydr. Depth (m)		0.13	
Conv. Total (m3/s)	6.6	Conv. (m3/s)		6.6	
Length Wtd. (m)	35.00	Wetted Per. (m)		6.69	
Min Ch El (m)	189.46	Shear (N/m2)		30.76	
Alpha	1.00	Stream Power (N/m s)		35.18	
Frctn Loss (m)	0.79	Cum Volume (1000 m3)		0.21	
C & E Loss (m)	0.02	Cum SA (1000 m2)		1.83	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	189.75	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.035	
W.S. Elev (m)	189.68	Reach Len. (m)	34.00	35.00	33.10
Crit W.S. (m)	189.68	Flow Area (m2)		1.03	
E.G. Slope (m/m)	0.022796	Area (m2)		1.03	
Q Total (m3/s)	1.23	Flow (m3/s)		1.23	
Top Width (m)	6.99	Top Width (m)		6.99	
Vel Total (m/s)	1.20	Avg. Vel. (m/s)		1.20	
Max Chl Dpth (m)	0.22	Hydr. Depth (m)		0.15	
Conv. Total (m3/s)	8.1	Conv. (m3/s)		8.1	
Length Wtd. (m)	35.00	Wetted Per. (m)		7.03	
Min Ch El (m)	189.46	Shear (N/m2)		32.66	
Alpha	1.00	Stream Power (N/m s)		39.09	
Frctn Loss (m)	0.79	Cum Volume (1000 m3)		0.23	
C & E Loss (m)	0.02	Cum SA (1000 m2)		1.90	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	189.78	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.035	
W.S. Elev (m)	189.71	Reach Len. (m)	34.00	35.00	33.10
Crit W.S. (m)	189.70	Flow Area (m2)		1.29	
E.G. Slope (m/m)	0.017268	Area (m2)		1.29	
Q Total (m3/s)	1.47	Flow (m3/s)		1.47	
Top Width (m)	7.58	Top Width (m)		7.58	
Vel Total (m/s)	1.14	Avg. Vel. (m/s)		1.14	
Max Chl Dpth (m)	0.25	Hydr. Depth (m)		0.17	
Conv. Total (m3/s)	11.2	Conv. (m3/s)		11.2	
Length Wtd. (m)	35.00	Wetted Per. (m)		7.64	
Min Ch El (m)	189.46	Shear (N/m2)		28.48	
Alpha	1.00	Stream Power (N/m s)		32.58	
Frctn Loss (m)	0.83	Cum Volume (1000 m3)		0.25	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.93	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	189.82	Element	Left OB	Channel	Right OB
Vel Head (m)	0.09	Wt. n-Val.		0.035	
W.S. Elev (m)	189.73	Reach Len. (m)	34.00	35.00	33.10
Crit W.S. (m)	189.73	Flow Area (m2)		1.45	
E.G. Slope (m/m)	0.021707	Area (m2)		1.45	
Q Total (m3/s)	1.92	Flow (m3/s)		1.92	
Top Width (m)	8.10	Top Width (m)		8.10	
Vel Total (m/s)	1.33	Avg. Vel. (m/s)		1.33	
Max Chl Dpth (m)	0.27	Hydr. Depth (m)		0.18	
Conv. Total (m3/s)	13.0	Conv. (m3/s)		13.0	
Length Wtd. (m)	35.00	Wetted Per. (m)		8.16	
Min Ch El (m)	189.46	Shear (N/m2)		37.71	
Alpha	1.00	Stream Power (N/m s)		50.06	
Frctn Loss (m)	0.83	Cum Volume (1000 m3)		0.31	
C & E Loss (m)	0.02	Cum SA (1000 m2)		2.07	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	190.14	Element	Left OB	Channel	Right OB
Vel Head (m)	0.14	Wt. n-Val.		0.035	
W.S. Elev (m)	190.00	Reach Len. (m)	34.00	35.00	33.10
Crit W.S. (m)	190.00	Flow Area (m2)		4.33	
E.G. Slope (m/m)	0.018779	Area (m2)		4.33	
Q Total (m3/s)	7.22	Flow (m3/s)		7.22	
Top Width (m)	15.42	Top Width (m)		15.42	

Vel Total (m/s)	1.67	Avg. Vel. (m/s)	1.67
Max Chl Dpth (m)	0.54	Hydr. Depth (m)	0.28
Conv. Total (m3/s)	52.7	Conv. (m3/s)	52.7
Length Wtd. (m)	35.00	Wetted Per. (m)	15.56
Min Ch El (m)	189.46	Shear (N/m2)	51.22
Alpha	1.00	Stream Power (N/m s)	85.45
Frctn Loss (m)	0.53	Cum Volume (1000 m3)	0.84
C & E Loss (m)	0.04	Cum SA (1000 m2)	2.99

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: DUFFINS
REACH: WC44 RS: 200

INPUT
Description: ST 200 (Updated Sep 2016)
Station Elevation Data num= 142

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	196.722	.634	196.747	1.614	196.737	2.133	196.756	2.813	196.811
2.859	196.813	3.025	196.785	3.053	196.782	3.065	196.785	3.192	196.747
3.358	196.703	3.604	196.622	3.806	196.5	4.42	196.376	4.625	196.339
6.247	196	9.752	195.54	10.098	195.5	11.987	195.028	12.1	195
12.106	194.998	12.131	194.989	13.368	194.5	13.552	194.422	14.546	194
16.068	193.861	20.221	193.5	21.965	193.279	23.426	193.109	24.192	193.012
24.556	193	26.861	192.75	27.645	192.706	29.316	192.518	29.416	192.5
29.506	192.485	32.396	192	32.949	191.722	33.937	191.5	34.197	191.32
34.658	191	34.854	190.864	35.379	190.5	35.415	190.475	35.463	190.442
35.98	190	36.241	189.898	37.009	189.5	37.636	189.334	38.695	189.108
38.835	189.07	39.166	189	40.372	188.984	40.798	188.979	41.887	188.964
41.956	188.964	42.068	188.963	42.255	188.947	44.294	188.825	46.18	188.86
47.674	188.861	48.559	188.839	51.526	188.758	54.03	188.747	54.304	188.749
54.501	188.752	55.281	188.753	56	188.749	59.249	188.824	65.431	188.999
65.605	188.999	65.822	189	65.983	189.021	66.138	189.039	66.807	189.112
70.208	189.492	70.367	189.5	71.725	189.738	73.149	190	73.303	190.08
74.107	190.5	74.61	190.758	75.077	191	75.634	191.285	76.049	191.5
76.655	191.811	77.021	192	77.673	192.334	77.995	192.5	78.828	192.868
79.083	193	79.697	193.399	79.862	193.5	80.534	193.943	80.621	194
81.212	194.39	81.371	194.488	81.391	194.5	82.128	194.953	82.204	195
82.254	195.035	83.09	195.5	83.394	195.714	83.864	196	84.188	196.229
84.631	196.5	85.001	196.761	85.389	197	90.074	197.463	90.438	197.5
91.198	197.561	91.232	197.564	92.376	197.635	95	197.808	97.558	198
99.883	198.288	101.594	198.5	102.63	198.622	107.092	199	107.108	199.001
107.716	199.007	108.213	199.041	108.495	199.051	111.873	199.082	111.934	199.082
111.952	199.083	112.153	199.089	112.202	199.092	112.421	199.104	113.183	199.133
114.574	199.23	115.423	199.276	117.684	199.319	119.08	199.403	120.003	199.38
120.865	199.39	120.978	199.391	121.295	199.383	121.385	199.379	122.064	199.385
122.186	199.384	124.11	199.394						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	35.379	.035	74.107	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
35.379	74.107	20	94	63.5	.3	.5

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	188.84	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	188.82	Reach Len. (m)	20.00	94.00	63.50
Crit W.S. (m)	188.82	Flow Area (m2)		0.53	
E.G. Slope (m/m)	0.020119	Area (m2)		0.53	
Q Total (m3/s)	0.30	Flow (m3/s)		0.30	
Top Width (m)	10.19	Top Width (m)		10.19	
Vel Total (m/s)	0.57	Avg. Vel. (m/s)		0.57	
Max Chl Dpth (m)	0.08	Hydr. Depth (m)		0.05	
Conv. Total (m3/s)	2.1	Conv. (m3/s)		2.1	
Length Wtd. (m)	94.00	Wetted Per. (m)		10.19	
Min Ch El (m)	188.75	Shear (N/m2)		10.28	
Alpha	1.00	Stream Power (N/m s)		5.81	
Frctn Loss (m)	0.99	Cum Volume (1000 m3)		0.07	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.91	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	188.87	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	188.84	Reach Len. (m)	20.00	94.00	63.50
Crit W.S. (m)	188.84	Flow Area (m2)		0.73	
E.G. Slope (m/m)	0.030947	Area (m2)		0.73	
Q Total (m3/s)	0.55	Flow (m3/s)		0.55	
Top Width (m)	12.69	Top Width (m)		12.69	
Vel Total (m/s)	0.75	Avg. Vel. (m/s)		0.75	
Max Chl Dpth (m)	0.10	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	3.1	Conv. (m3/s)		3.1	
Length Wtd. (m)	94.00	Wetted Per. (m)		12.69	
Min Ch El (m)	188.75	Shear (N/m2)		17.52	
Alpha	1.00	Stream Power (N/m s)		13.15	
Frctn Loss (m)	1.21	Cum Volume (1000 m3)		0.10	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.08	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	188.89	Element	Left OB	Channel	Right OB
Vel Head (m)	0.04	Wt. n-Val.		0.035	
W.S. Elev (m)	188.85	Reach Len. (m)	20.00	94.00	63.50
Crit W.S. (m)	188.85	Flow Area (m2)		0.89	
E.G. Slope (m/m)	0.035874	Area (m2)		0.89	
Q Total (m3/s)	0.75	Flow (m3/s)		0.75	
Top Width (m)	14.37	Top Width (m)		14.37	
Vel Total (m/s)	0.85	Avg. Vel. (m/s)		0.85	
Max Chl Dpth (m)	0.11	Hydr. Depth (m)		0.06	
Conv. Total (m3/s)	4.0	Conv. (m3/s)		4.0	
Length Wtd. (m)	94.00	Wetted Per. (m)		14.37	
Min Ch El (m)	188.75	Shear (N/m2)		21.72	
Alpha	1.00	Stream Power (N/m s)		18.36	
Frctn Loss (m)	1.34	Cum Volume (1000 m3)		0.13	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.19	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical

depth for the water surface and continued on with the calculations.
Warning: Divided flow computed for this cross-section.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	188.91	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	188.88	Reach Len. (m)	20.00	94.00	63.50
Crit W.S. (m)	188.88	Flow Area (m2)		1.36	
E.G. Slope (m/m)	0.021614	Area (m2)		1.36	
Q Total (m3/s)	1.02	Flow (m3/s)		1.02	
Top Width (m)	17.95	Top Width (m)		17.95	
Vel Total (m/s)	0.75	Avg. Vel. (m/s)		0.75	
Max Chl Dpth (m)	0.13	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	6.9	Conv. (m3/s)		6.9	
Length Wtd. (m)	94.00	Wetted Per. (m)		17.95	
Min Ch El (m)	188.75	Shear (N/m2)		16.03	
Alpha	1.00	Stream Power (N/m s)		12.04	
Frctn Loss (m)	1.17	Cum Volume (1000 m3)		0.17	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.40	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	188.92	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	188.89	Reach Len. (m)	20.00	94.00	63.50
Crit W.S. (m)	188.89	Flow Area (m2)		1.52	
E.G. Slope (m/m)	0.022122	Area (m2)		1.52	
Q Total (m3/s)	1.23	Flow (m3/s)		1.23	
Top Width (m)	18.43	Top Width (m)		18.43	
Vel Total (m/s)	0.81	Avg. Vel. (m/s)		0.81	
Max Chl Dpth (m)	0.14	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	8.3	Conv. (m3/s)		8.3	
Length Wtd. (m)	94.00	Wetted Per. (m)		18.43	
Min Ch El (m)	188.75	Shear (N/m2)		17.95	
Alpha	1.00	Stream Power (N/m s)		14.48	
Frctn Loss (m)	1.21	Cum Volume (1000 m3)		0.19	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.45	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	188.94	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	188.89	Reach Len. (m)	20.00	94.00	63.50
Crit W.S. (m)	188.89	Flow Area (m2)		1.48	
E.G. Slope (m/m)	0.034842	Area (m2)		1.48	
Q Total (m3/s)	1.47	Flow (m3/s)		1.47	
Top Width (m)	18.29	Top Width (m)		18.29	
Vel Total (m/s)	1.00	Avg. Vel. (m/s)		1.00	
Max Chl Dpth (m)	0.14	Hydr. Depth (m)		0.08	
Conv. Total (m3/s)	7.9	Conv. (m3/s)		7.9	
Length Wtd. (m)	94.00	Wetted Per. (m)		18.29	
Min Ch El (m)	188.75	Shear (N/m2)		27.57	
Alpha	1.00	Stream Power (N/m s)		27.46	
Frctn Loss (m)	1.47	Cum Volume (1000 m3)		0.20	
C & E Loss (m)	0.00	Cum SA (1000 m2)		1.48	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	188.96	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	188.91	Reach Len. (m)	20.00	94.00	63.50
Crit W.S. (m)	188.91	Flow Area (m2)		1.95	
E.G. Slope (m/m)	0.025727	Area (m2)		1.95	
Q Total (m3/s)	1.92	Flow (m3/s)		1.92	
Top Width (m)	19.59	Top Width (m)		19.59	
Vel Total (m/s)	0.98	Avg. Vel. (m/s)		0.98	
Max Chl Dpth (m)	0.17	Hydr. Depth (m)		0.10	
Conv. Total (m3/s)	12.0	Conv. (m3/s)		12.0	
Length Wtd. (m)	94.00	Wetted Per. (m)		19.60	
Min Ch El (m)	188.75	Shear (N/m2)		25.11	
Alpha	1.00	Stream Power (N/m s)		24.72	
Frctn Loss (m)	1.37	Cum Volume (1000 m3)		0.25	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.58	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	189.15	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.035	
W.S. Elev (m)	189.08	Reach Len. (m)	20.00	94.00	63.50
Crit W.S. (m)	189.05	Flow Area (m2)		6.15	
E.G. Slope (m/m)	0.012596	Area (m2)		6.15	
Q Total (m3/s)	7.22	Flow (m3/s)		7.22	
Top Width (m)	27.76	Top Width (m)		27.76	
Vel Total (m/s)	1.17	Avg. Vel. (m/s)		1.17	
Max Chl Dpth (m)	0.34	Hydr. Depth (m)		0.22	
Conv. Total (m3/s)	64.3	Conv. (m3/s)		64.3	
Length Wtd. (m)	94.00	Wetted Per. (m)		27.78	
Min Ch El (m)	188.75	Shear (N/m2)		27.35	
Alpha	1.00	Stream Power (N/m s)		32.10	
Frctn Loss (m)	1.24	Cum Volume (1000 m3)		0.66	
C & E Loss (m)	0.04	Cum SA (1000 m2)		2.23	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: DUFFINS
REACH: WC44 RS: 100

INPUT
Description: ST 100
Station Elevation Data num= 130

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	194.799	3.44	194.5	4.903	194.408	6.217	194.316	7.707	194.2
9.176	194.103	10.383	194	12.789	193.801	13.806	193.74	14.778	193.669
15.452	193.648	17.918	193.5	19.083	193.385	19.979	193.27	21.221	193.145
22.332	193	24.445	192.829	24.895	192.781	27.729	192.5	29.406	192.34
29.653	192.325	30.913	192.205	31.525	192.14	32.447	192.063	33.003	192
34.04	191.719	34.847	191.5	34.983	191.463	35.018	191.454	36.469	191
37.888	190.654	38.61	190.5	40.507	190.102	40.708	190.065	40.807	190.051
41.308	190.001	41.313	190	42.097	189.884	43.298	189.5	44.052	189.255
44.852	189	45.407	188.82	45.624	188.787	46.79	188.612	47.154	188.543
47.384	188.5	47.875	188.47	48.423	188.441	50.09	188.405	50.208	188.408
50.309	188.41	51.035	188.393	52.174	188.358	53.761	188.307	55.621	188.259
55.963	188.244	56.151	188.262	56.514	188.249	56.892	188.265	57.15	188.249
57.295	188.296	58.248	188	58.828	187.732	59.487	187.575	59.559	187.557
59.695	187.5	59.822	187.487	61.272	187.288	63.144	187	63.463	186.999
64.866	187	65.727	187.094	66.343	187.319	66.732	187.5	66.855	187.569
67.736	188	68.538	188.396	68.727	188.5	69.674	188.961	69.745	189
69.802	189.031	70.952	189.5	71.378	189.613	72.821	189.991	72.862	190
72.881	190.004	75.273	190.5	75.784	190.684	76.621	191	76.934	191.273
77.242	191.5	77.565	191.782	77.852	192	78.174	192.282	78.461	192.5
78.784	192.782	79.071	193	79.393	193.282	79.68	193.5	80.003	193.782
80.289	194	80.903	194.277	81.423	194.5	82.23	194.765	82.874	195
83.639	195.252	84.318	195.5	87.862	195.901	88.297	196	94.914	196.375
97.122	196.5	97.375	196.532	100.958	197	106.417	197.292	106.808	197.3
109.078	197.375	111.339	197.437	112.754	197.5	118.63	197.72	126.008	198
134.602	198.381	136.434	198.462	137.219	198.5	137.478	198.512	145.292	199
146.883	199.106	152.396	199.5	154.11	199.589	163.351	200	169.315	200.014

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	57.295	.035	68.538	.07

Bank Sta: Left Right Lengths: Left Channel Right Coeff Contr. Expan.
57.295 68.538 40.5 50.5 64.5 .1 .3

CROSS SECTION OUTPUT Profile #2-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	187.19	Element			
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	187.17	Reach Len. (m)	40.50	50.50	64.50
Crit W.S. (m)	187.12	Flow Area (m2)		0.51	
E.G. Slope (m/m)	0.006484	Area (m2)		0.51	
Q Total (m3/s)	0.30	Flow (m3/s)		0.30	
Top Width (m)	3.92	Top Width (m)		3.92	
Vel Total (m/s)	0.59	Avg. Vel. (m/s)		0.59	
Max Chl Dpth (m)	0.17	Hydr. Depth (m)		0.13	
Conv. Total (m3/s)	3.7	Conv. (m3/s)		3.7	
Length Wtd. (m)	50.50	Wetted Per. (m)		3.95	
Min Ch El (m)	187.00	Shear (N/m2)		8.22	
Alpha	1.00	Stream Power (N/m s)		4.83	
Frctn Loss (m)	0.61	Cum Volume (1000 m3)		0.02	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.24	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	187.26	Element			
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	187.23	Reach Len. (m)	40.50	50.50	64.50
Crit W.S. (m)	187.17	Flow Area (m2)		0.76	
E.G. Slope (m/m)	0.006975	Area (m2)		0.76	
Q Total (m3/s)	0.55	Flow (m3/s)		0.55	
Top Width (m)	4.46	Top Width (m)		4.46	
Vel Total (m/s)	0.73	Avg. Vel. (m/s)		0.73	
Max Chl Dpth (m)	0.23	Hydr. Depth (m)		0.17	
Conv. Total (m3/s)	6.6	Conv. (m3/s)		6.6	
Length Wtd. (m)	50.50	Wetted Per. (m)		4.51	
Min Ch El (m)	187.00	Shear (N/m2)		11.49	
Alpha	1.00	Stream Power (N/m s)		8.34	
Frctn Loss (m)	0.63	Cum Volume (1000 m3)		0.03	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.27	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	187.30	Element			
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	187.26	Reach Len. (m)	40.50	50.50	64.50
Crit W.S. (m)	187.20	Flow Area (m2)		0.91	
E.G. Slope (m/m)	0.007632	Area (m2)		0.91	
Q Total (m3/s)	0.75	Flow (m3/s)		0.75	
Top Width (m)	4.77	Top Width (m)		4.77	
Vel Total (m/s)	0.82	Avg. Vel. (m/s)		0.82	
Max Chl Dpth (m)	0.27	Hydr. Depth (m)		0.19	
Conv. Total (m3/s)	8.6	Conv. (m3/s)		8.6	
Length Wtd. (m)	50.50	Wetted Per. (m)		4.83	
Min Ch El (m)	187.00	Shear (N/m2)		14.14	
Alpha	1.00	Stream Power (N/m s)		11.63	
Frctn Loss (m)	0.65	Cum Volume (1000 m3)		0.04	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.29	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	187.35	Element			
Vel Head (m)	0.04	Wt. n-Val.		0.035	
W.S. Elev (m)	187.31	Reach Len. (m)	40.50	50.50	64.50
Crit W.S. (m)	187.24	Flow Area (m2)		1.11	
E.G. Slope (m/m)	0.008083	Area (m2)		1.11	
Q Total (m3/s)	1.02	Flow (m3/s)		1.02	
Top Width (m)	5.16	Top Width (m)		5.16	
Vel Total (m/s)	0.92	Avg. Vel. (m/s)		0.92	
Max Chl Dpth (m)	0.31	Hydr. Depth (m)		0.22	
Conv. Total (m3/s)	11.3	Conv. (m3/s)		11.3	
Length Wtd. (m)	50.50	Wetted Per. (m)		5.22	
Min Ch El (m)	187.00	Shear (N/m2)		16.89	
Alpha	1.00	Stream Power (N/m s)		15.47	
Frctn Loss (m)	0.65	Cum Volume (1000 m3)		0.05	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.32	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	187.38	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	187.33	Reach Len. (m)	40.50	50.50	64.50
Crit W.S. (m)	187.26	Flow Area (m2)		1.25	
E.G. Slope (m/m)	0.008434	Area (m2)		1.25	
Q Total (m3/s)	1.23	Flow (m3/s)		1.23	
Top Width (m)	5.42	Top Width (m)		5.42	
Vel Total (m/s)	0.98	Avg. Vel. (m/s)		0.98	
Max Chl Dpth (m)	0.33	Hydr. Depth (m)		0.23	
Conv. Total (m3/s)	13.4	Conv. (m3/s)		13.4	
Length Wtd. (m)	50.50	Wetted Per. (m)		5.49	
Min Ch El (m)	187.00	Shear (N/m2)		18.89	
Alpha	1.00	Stream Power (N/m s)		18.52	
Frctn Loss (m)	0.66	Cum Volume (1000 m3)		0.06	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.33	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	187.41	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.035	
W.S. Elev (m)	187.36	Reach Len. (m)	40.50	50.50	64.50
Crit W.S. (m)	187.29	Flow Area (m2)		1.40	
E.G. Slope (m/m)	0.008826	Area (m2)		1.40	
Q Total (m3/s)	1.47	Flow (m3/s)		1.47	
Top Width (m)	5.67	Top Width (m)		5.67	
Vel Total (m/s)	1.05	Avg. Vel. (m/s)		1.05	
Max Chl Dpth (m)	0.36	Hydr. Depth (m)		0.25	
Conv. Total (m3/s)	15.6	Conv. (m3/s)		15.6	
Length Wtd. (m)	50.50	Wetted Per. (m)		5.75	
Min Ch El (m)	187.00	Shear (N/m2)		21.11	
Alpha	1.00	Stream Power (N/m s)		22.12	
Frctn Loss (m)	0.68	Cum Volume (1000 m3)		0.07	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.35	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	187.47	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.035	
W.S. Elev (m)	187.40	Reach Len. (m)	40.50	50.50	64.50
Crit W.S. (m)	187.34	Flow Area (m2)		1.66	
E.G. Slope (m/m)	0.009420	Area (m2)		1.66	
Q Total (m3/s)	1.92	Flow (m3/s)		1.92	
Top Width (m)	6.09	Top Width (m)		6.09	
Vel Total (m/s)	1.16	Avg. Vel. (m/s)		1.16	
Max Chl Dpth (m)	0.40	Hydr. Depth (m)		0.27	
Conv. Total (m3/s)	19.8	Conv. (m3/s)		19.8	
Length Wtd. (m)	50.50	Wetted Per. (m)		6.18	
Min Ch El (m)	187.00	Shear (N/m2)		24.84	
Alpha	1.00	Stream Power (N/m s)		28.70	
Frctn Loss (m)	0.69	Cum Volume (1000 m3)		0.08	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.38	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	187.88	Element	Left OB	Channel	Right OB
Vel Head (m)	0.20	Wt. n-Val.		0.035	
W.S. Elev (m)	187.68	Reach Len. (m)	40.50	50.50	64.50
Crit W.S. (m)	187.66	Flow Area (m2)		3.68	
E.G. Slope (m/m)	0.013829	Area (m2)		3.68	
Q Total (m3/s)	7.22	Flow (m3/s)		7.22	
Top Width (m)	8.06	Top Width (m)		8.06	
Vel Total (m/s)	1.96	Avg. Vel. (m/s)		1.96	
Max Chl Dpth (m)	0.69	Hydr. Depth (m)		0.46	
Conv. Total (m3/s)	61.4	Conv. (m3/s)		61.4	
Length Wtd. (m)	50.50	Wetted Per. (m)		8.25	
Min Ch El (m)	187.00	Shear (N/m2)		60.48	
Alpha	1.00	Stream Power (N/m s)		118.62	
Frctn Loss (m)	0.79	Cum Volume (1000 m3)		0.20	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.55	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.

CROSS SECTION

RIVER: DUFFINS
REACH: WC44 RS: 10

INPUT
Description: ST 10
Station Elevation Data num= 128

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	195.19	1.225	195.162	2.114	195.141	7.369	195	11.233	194.881
15.526	194.78	21.821	194.612	24.115	194.548	25.048	194.526	25.198	194.526
25.378	194.524	25.541	194.523	26.156	194.5	28.719	194.274	32.116	194
33.592	193.835	36.867	193.5	38.665	193.351	41.709	193.107	43.189	193
50.658	192.79	58.667	192.568	58.901	192.563	59.947	192.535	60.14	192.529
60.413	192.522	60.559	192.519	61.503	192.5	62.033	192.482	63.419	192.346
66.306	192.061	66.621	192.03	66.896	192	67.171	191.951	69.696	191.5
71.183	191.285	72.307	191	73.681	190.627	73.989	190.5	74.481	190.173
74.764	190	74.959	189.88	75.579	189.5	76.001	189.241	76.394	189
76.758	188.777	77.21	188.5	78.901	188.092	79.366	188	79.823	187.91
82.507	187.5	85.498	187.238	85.942	187.205	88.888	187	90.956	186.849
92.037	186.799	95.881	186.586	97.299	186.5	99.7	186.434	99.827	186.431
100.691	186.455	102.331	186.5	103.031	186.771	103.528	186.921	103.797	187
104.172	187.176	104.59	187.4	104.788	187.5	105.671	187.946	105.779	188
106.688	188.459	106.77	188.5	107.662	188.953	107.753	189	108.554	189.416
108.717	189.5	109.45	189.88	109.681	190	110.356	190.35	110.646	190.5
111.27	190.824	111.607	191	112.17	191.305	112.523	191.5	112.97	191.746
113.43	192	113.7	192.149	114.193	192.421	114.328	192.5	114.57	192.642
115.182	193	115.684	193.274	115.768	193.313	116.122	193.467	116.236	193.5
117.671	193.914	117.984	194	119.123	194.326	119.766	194.5	120.949	194.653
121.292	194.666	122.441	194.71	124.241	195	126.762	195.304	127.504	195.383
128.179	195.5	128.987	195.614	131.8	196	135.937	196.24	136.636	196.279
141.073	196.494	142.368	196.497	142.478	196.5	148.473	196.971	148.85	197
149.089	197.02	156.363	197.5	156.404	197.503	157.635	197.586	163.671	197.986
163.892	198	166.622	198.157	172.797	198.5	176.687	198.681	183.273	199
193.477	199.359	197.24	199.5	199.799	199.553				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.08	82.507	.035	104.788	.08

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
82.507	104.788	0	0	.1	.3

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	186.57	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	186.54	Reach Len. (m)			
Crit W.S. (m)	186.54	Flow Area (m2)		0.37	

E.G. Slope (m/m)	0.030213	Area (m2)	0.37
Q Total (m3/s)	0.30	Flow (m3/s)	0.30
Top Width (m)	5.74	Top Width (m)	5.74
Vel Total (m/s)	0.80	Avg. Vel. (m/s)	0.80
Max Chl Dpth (m)	0.11	Hydr. Depth (m)	0.07
Conv. Total (m3/s)	1.7	Conv. (m3/s)	1.7
Length Wtd. (m)		Wetted Per. (m)	5.75
Min Ch El (m)	186.43	Shear (N/m2)	19.26
Alpha	1.00	Stream Power (N/m s)	15.46
Frctn Loss (m)		Cum Volume (1000 m3)	
C & E Loss (m)		Cum SA (1000 m2)	

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	186.62	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	186.57	Reach Len. (m)			
Crit W.S. (m)	186.57	Flow Area (m2)		0.57	
E.G. Slope (m/m)	0.028703	Area (m2)		0.57	
Q Total (m3/s)	0.55	Flow (m3/s)		0.55	
Top Width (m)	6.35	Top Width (m)		6.35	
Vel Total (m/s)	0.97	Avg. Vel. (m/s)		0.97	
Max Chl Dpth (m)	0.14	Hydr. Depth (m)		0.09	
Conv. Total (m3/s)	3.2	Conv. (m3/s)		3.2	
Length Wtd. (m)		Wetted Per. (m)		6.37	
Min Ch El (m)	186.43	Shear (N/m2)		25.13	
Alpha	1.00	Stream Power (N/m s)		24.30	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	186.65	Element	Left OB	Channel	Right OB
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	186.59	Reach Len. (m)			
Crit W.S. (m)	186.59	Flow Area (m2)		0.73	
E.G. Slope (m/m)	0.025903	Area (m2)		0.73	
Q Total (m3/s)	0.75	Flow (m3/s)		0.75	
Top Width (m)	6.82	Top Width (m)		6.82	
Vel Total (m/s)	1.03	Avg. Vel. (m/s)		1.03	
Max Chl Dpth (m)	0.16	Hydr. Depth (m)		0.11	
Conv. Total (m3/s)	4.7	Conv. (m3/s)		4.7	
Length Wtd. (m)		Wetted Per. (m)		6.85	
Min Ch El (m)	186.43	Shear (N/m2)		26.98	
Alpha	1.00	Stream Power (N/m s)		27.83	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	186.68	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.035	
W.S. Elev (m)	186.62	Reach Len. (m)			
Crit W.S. (m)	186.62	Flow Area (m2)		0.92	
E.G. Slope (m/m)	0.024048	Area (m2)		0.92	
Q Total (m3/s)	1.02	Flow (m3/s)		1.02	
Top Width (m)	7.39	Top Width (m)		7.39	
Vel Total (m/s)	1.10	Avg. Vel. (m/s)		1.10	
Max Chl Dpth (m)	0.19	Hydr. Depth (m)		0.12	
Conv. Total (m3/s)	6.6	Conv. (m3/s)		6.6	
Length Wtd. (m)		Wetted Per. (m)		7.42	
Min Ch El (m)	186.43	Shear (N/m2)		29.35	
Alpha	1.00	Stream Power (N/m s)		32.41	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	186.71	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.035	
W.S. Elev (m)	186.64	Reach Len. (m)			
Crit W.S. (m)	186.64	Flow Area (m2)		1.07	
E.G. Slope (m/m)	0.023254	Area (m2)		1.07	
Q Total (m3/s)	1.23	Flow (m3/s)		1.23	
Top Width (m)	7.78	Top Width (m)		7.78	
Vel Total (m/s)	1.15	Avg. Vel. (m/s)		1.15	
Max Chl Dpth (m)	0.21	Hydr. Depth (m)		0.14	
Conv. Total (m3/s)	8.1	Conv. (m3/s)		8.1	
Length Wtd. (m)		Wetted Per. (m)		7.81	
Min Ch El (m)	186.43	Shear (N/m2)		31.10	
Alpha	1.00	Stream Power (N/m s)		35.90	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	186.73	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.035	
W.S. Elev (m)	186.66	Reach Len. (m)			
Crit W.S. (m)	186.66	Flow Area (m2)		1.22	
E.G. Slope (m/m)	0.022624	Area (m2)		1.22	
Q Total (m3/s)	1.47	Flow (m3/s)		1.47	
Top Width (m)	8.18	Top Width (m)		8.18	
Vel Total (m/s)	1.21	Avg. Vel. (m/s)		1.21	
Max Chl Dpth (m)	0.23	Hydr. Depth (m)		0.15	
Conv. Total (m3/s)	9.8	Conv. (m3/s)		9.8	
Length Wtd. (m)		Wetted Per. (m)		8.22	
Min Ch El (m)	186.43	Shear (N/m2)		32.94	
Alpha	1.00	Stream Power (N/m s)		39.70	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	186.78	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.		0.035	
W.S. Elev (m)	186.69	Reach Len. (m)			
Crit W.S. (m)	186.69	Flow Area (m2)		1.49	
E.G. Slope (m/m)	0.021773	Area (m2)		1.49	
Q Total (m3/s)	1.92	Flow (m3/s)		1.92	
Top Width (m)	8.85	Top Width (m)		8.85	
Vel Total (m/s)	1.28	Avg. Vel. (m/s)		1.28	
Max Chl Dpth (m)	0.26	Hydr. Depth (m)		0.17	
Conv. Total (m3/s)	13.0	Conv. (m3/s)		13.0	
Length Wtd. (m)		Wetted Per. (m)		8.89	
Min Ch El (m)	186.43	Shear (N/m2)		35.91	
Alpha	1.00	Stream Power (N/m s)		46.12	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	187.08	Element	Left OB	Channel	Right OB
Vel Head (m)	0.15	Wt. n-Val.		0.035	
W.S. Elev (m)	186.93	Reach Len. (m)			
Crit W.S. (m)	186.93	Flow Area (m2)		4.18	
E.G. Slope (m/m)	0.017938	Area (m2)		4.18	
Q Total (m3/s)	7.22	Flow (m3/s)		7.22	
Top Width (m)	13.68	Top Width (m)		13.68	
Vel Total (m/s)	1.73	Avg. Vel. (m/s)		1.73	
Max Chl Dpth (m)	0.50	Hydr. Depth (m)		0.31	
Conv. Total (m3/s)	53.9	Conv. (m3/s)		53.9	
Length Wtd. (m)		Wetted Per. (m)		13.76	
Min Ch El (m)	186.43	Shear (N/m2)		53.39	
Alpha	1.00	Stream Power (N/m s)		92.27	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

SUMMARY OF MANNING'S N VALUES

River:DUFFINS

Reach	River Sta.	n1	n2	n3
WC44	400	.07	.035	.07
WC44	350	Bridge		
WC44	300	.07	.035	.07
WC44	200	.07	.035	.07
WC44	100	.07	.035	.07
WC44	10	.08	.035	.08

SUMMARY OF REACH LENGTHS

River: DUFFINS

Reach	River Sta.	Left	Channel	Right
WC44	400	77	83	75
WC44	350	Bridge		
WC44	300	34	35	33.1
WC44	200	20	94	63.5
WC44	100	40.5	50.5	64.5
WC44	10	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: DUFFINS

Reach	River Sta.	Contr.	Expan.
WC44	400	.3	.5
WC44	350	Bridge	
WC44	300	.3	.5
WC44	200	.3	.5
WC44	100	.1	.3
WC44	10	.1	.3

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
WC44	400	2-yr	0.30	191.49	191.63	191.55	191.63	0.000840	0.21	1.45	11.64	0.19
WC44	400	5-yr	0.55	191.49	191.68	191.56	191.68	0.001011	0.27	2.01	12.19	0.21
WC44	400	10-yr	0.75	191.49	191.71	191.57	191.72	0.001101	0.31	2.39	12.55	0.23
WC44	400	25-yr	1.02	191.49	191.74	191.61	191.75	0.001279	0.37	2.78	12.91	0.25
WC44	400	50-yr	1.23	191.49	191.76	191.61	191.77	0.001393	0.40	3.06	13.16	0.27
WC44	400	100-yr	1.47	191.49	191.79	191.62	191.80	0.001471	0.44	3.38	13.44	0.28
WC44	400	Check Flow	1.92	191.49	191.82	191.65	191.84	0.001610	0.49	3.91	13.90	0.30
WC44	400	Regional	7.22	191.49	192.13	191.85	192.15	0.001892	0.68	10.74	27.77	0.34
WC44	350		Bridge									
WC44	300	2-yr	0.30	189.46	189.57	189.56	189.60	0.023609	0.78	0.38	5.06	0.91
WC44	300	5-yr	0.55	189.46	189.62	189.60	189.65	0.016803	0.85	0.65	5.88	0.82
WC44	300	10-yr	0.75	189.46	189.65	189.63	189.69	0.015695	0.91	0.83	6.45	0.81
WC44	300	25-yr	1.02	189.46	189.66	189.66	189.72	0.023532	1.14	0.89	6.65	1.00
WC44	300	50-yr	1.23	189.46	189.68	189.68	189.75	0.022796	1.20	1.03	6.99	1.00
WC44	300	100-yr	1.47	189.46	189.71	189.70	189.78	0.017268	1.14	1.29	7.58	0.89
WC44	300	Check Flow	1.92	189.46	189.73	189.73	189.82	0.021707	1.33	1.45	8.10	1.00
WC44	300	Regional	7.22	189.46	190.00	190.00	190.14	0.018779	1.67	4.33	15.42	1.01
WC44	200	2-yr	0.30	188.75	188.82	188.82	188.84	0.020119	0.57	0.53	10.19	0.79
WC44	200	5-yr	0.55	188.75	188.84	188.84	188.87	0.030947	0.75	0.73	12.69	1.00
WC44	200	10-yr	0.75	188.75	188.85	188.85	188.89	0.035874	0.85	0.89	14.37	1.09
WC44	200	25-yr	1.02	188.75	188.88	188.88	188.91	0.021614	0.75	1.36	17.95	0.87
WC44	200	50-yr	1.23	188.75	188.89	188.89	188.92	0.022122	0.81	1.52	18.43	0.90
WC44	200	100-yr	1.47	188.75	188.89	188.89	188.94	0.034842	1.00	1.48	18.29	1.12
WC44	200	Check Flow	1.92	188.75	188.91	188.91	188.96	0.025727	0.98	1.95	19.59	1.00
WC44	200	Regional	7.22	188.75	189.08	189.05	189.15	0.012596	1.17	6.15	27.76	0.80
WC44	100	2-yr	0.30	187.00	187.17	187.12	187.19	0.006484	0.59	0.51	3.92	0.52
WC44	100	5-yr	0.55	187.00	187.23	187.17	187.26	0.006975	0.73	0.76	4.46	0.56
WC44	100	10-yr	0.75	187.00	187.26	187.20	187.30	0.007632	0.82	0.91	4.77	0.60
WC44	100	25-yr	1.02	187.00	187.31	187.24	187.35	0.008083	0.92	1.11	5.16	0.63
WC44	100	50-yr	1.23	187.00	187.33	187.26	187.38	0.008434	0.98	1.25	5.42	0.65
WC44	100	100-yr	1.47	187.00	187.36	187.29	187.41	0.008826	1.05	1.40	5.67	0.67
WC44	100	Check Flow	1.92	187.00	187.40	187.34	187.47	0.009420	1.16	1.66	6.09	0.71
WC44	100	Regional	7.22	187.00	187.68	187.66	187.88	0.013829	1.96	3.68	8.06	0.93
WC44	10	2-yr	0.30	186.43	186.54	186.54	186.57	0.030213	0.80	0.37	5.74	1.00
WC44	10	5-yr	0.55	186.43	186.57	186.57	186.62	0.028703	0.97	0.57	6.35	1.03
WC44	10	10-yr	0.75	186.43	186.59	186.59	186.65	0.025903	1.03	0.73	6.82	1.01
WC44	10	25-yr	1.02	186.43	186.62	186.62	186.68	0.024048	1.10	0.92	7.39	1.00
WC44	10	50-yr	1.23	186.43	186.64	186.64	186.71	0.023254	1.15	1.07	7.78	1.00
WC44	10	100-yr	1.47	186.43	186.66	186.66	186.73	0.022624	1.21	1.22	8.18	1.00
WC44	10	Check Flow	1.92	186.43	186.69	186.69	186.78	0.021773	1.28	1.49	8.85	1.00
WC44	10	Regional	7.22	186.43	186.93	186.93	187.08	0.017938	1.73	4.18	13.68	1.00

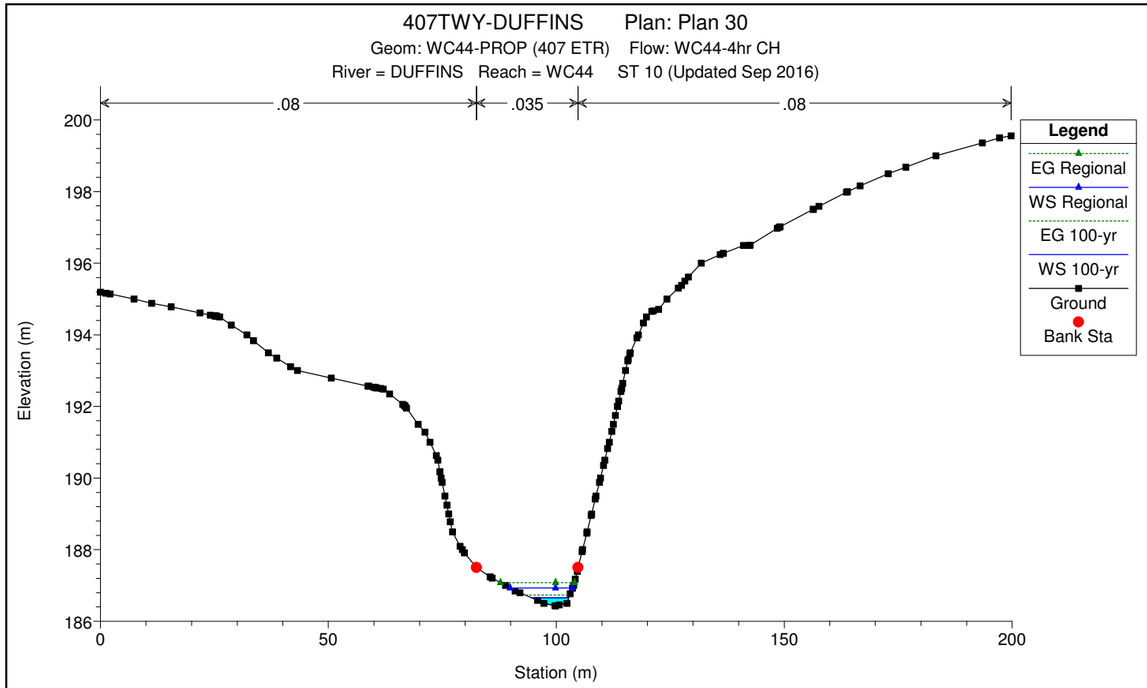
Profile Output Table - Standard Table 2

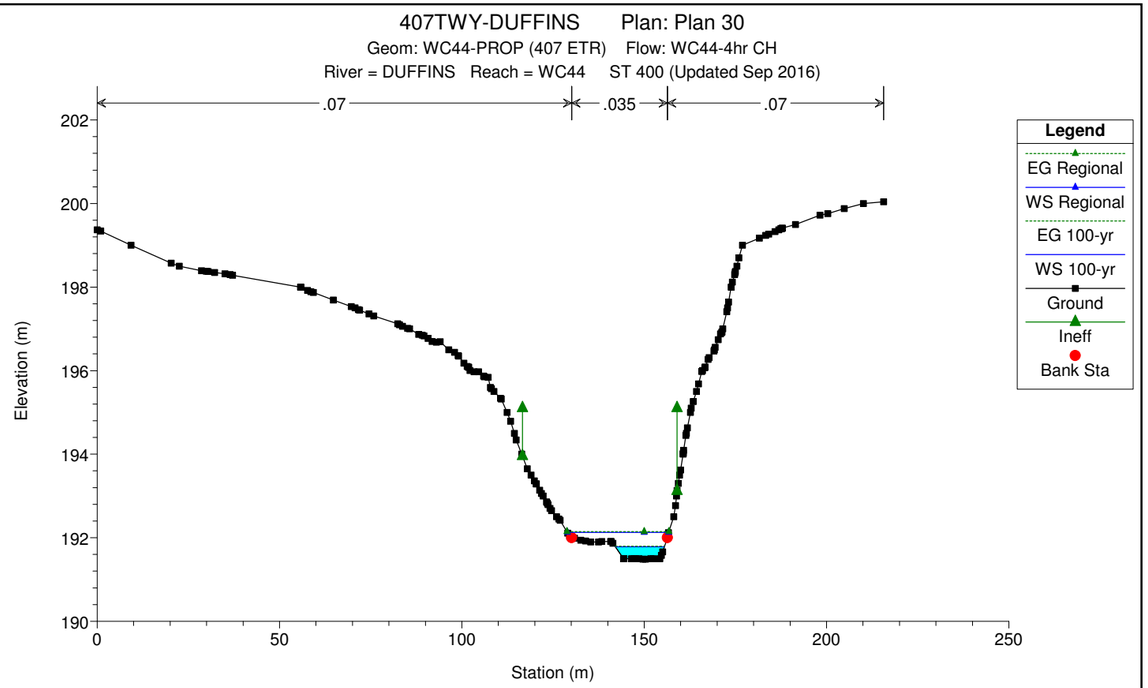
Reach	River Sta	Profile	E.G. Elev (m)	W.S. Elev (m)	Vel Head (m)	Frctn Loss (m)	C & E Loss (m)	Q Left (m3/s)	Q Channel (m3/s)	Q Right (m3/s)	Top Width (m)
WC44	400	2-yr	191.63	191.63	0.00	0.06	0.01		0.30		11.64
WC44	400	5-yr	191.68	191.68	0.00	0.07	0.01		0.55		12.19
WC44	400	10-yr	191.72	191.71	0.01	0.08	0.01		0.75		12.55
WC44	400	25-yr	191.75	191.74	0.01	0.09	0.01		1.02		12.91
WC44	400	50-yr	191.77	191.76	0.01	0.09	0.01		1.23		13.16
WC44	400	100-yr	191.80	191.79	0.01	0.10	0.01		1.47		13.44
WC44	400	Check Flow	191.84	191.82	0.01	0.10	0.02		1.92		13.90
WC44	400	Regional	192.15	192.13	0.02	0.11	0.04	0.01	7.21	0.00	27.77
WC44	350		Bridge								
WC44	300	2-yr	189.60	189.57	0.03	0.76	0.01		0.30		5.06
WC44	300	5-yr	189.65	189.62	0.04	0.78	0.00		0.55		5.88
WC44	300	10-yr	189.69	189.65	0.04	0.80	0.00		0.75		6.45
WC44	300	25-yr	189.72	189.66	0.07	0.79	0.02		1.02		6.65
WC44	300	50-yr	189.75	189.68	0.07	0.79	0.02		1.23		6.99
WC44	300	100-yr	189.78	189.71	0.07	0.83	0.01		1.47		7.58
WC44	300	Check Flow	189.82	189.73	0.09	0.83	0.02		1.92		8.10
WC44	300	Regional	190.14	190.00	0.14	0.53	0.04		7.22		15.42
WC44	200	2-yr	188.84	188.82	0.02	0.99	0.00		0.30		10.19
WC44	200	5-yr	188.87	188.84	0.03	1.21	0.00		0.55		12.69
WC44	200	10-yr	188.89	188.85	0.04	1.34	0.00		0.75		14.37
WC44	200	25-yr	188.91	188.88	0.03	1.17	0.00		1.02		17.95
WC44	200	50-yr	188.92	188.89	0.03	1.21	0.00		1.23		18.43
WC44	200	100-yr	188.94	188.89	0.05	1.47	0.00		1.47		18.29
WC44	200	Check Flow	188.96	188.91	0.05	1.37	0.01		1.92		19.59
WC44	200	Regional	189.15	189.08	0.07	1.24	0.04		7.22		27.76
WC44	100	2-yr	187.19	187.17	0.02	0.61	0.00		0.30		3.92
WC44	100	5-yr	187.26	187.23	0.03	0.63	0.00		0.55		4.46
WC44	100	10-yr	187.30	187.26	0.03	0.65	0.00		0.75		4.77
WC44	100	25-yr	187.35	187.31	0.04	0.65	0.00		1.02		5.16
WC44	100	50-yr	187.38	187.33	0.05	0.66	0.00		1.23		5.42
WC44	100	100-yr	187.41	187.36	0.06	0.68	0.00		1.47		5.67
WC44	100	Check Flow	187.47	187.40	0.07	0.69	0.00		1.92		6.09

WC44	100	Regional	187.88	187.68	0.20	0.79	0.01	7.22	8.06
WC44	10	2-yr	186.57	186.54	0.03			0.30	5.74
WC44	10	5-yr	186.62	186.57	0.05			0.55	6.35
WC44	10	10-yr	186.65	186.59	0.05			0.75	6.82
WC44	10	25-yr	186.68	186.62	0.06			1.02	7.39
WC44	10	50-yr	186.71	186.64	0.07			1.23	7.78
WC44	10	100-yr	186.73	186.66	0.07			1.47	8.18
WC44	10	Check Flow	186.78	186.69	0.08			1.92	8.85
WC44	10	Regional	187.08	186.93	0.15			7.22	13.68

Profile Output Table - Six XS Bridge

Reach	River Sta		Profile	E.G. Elev (m)	W.S. Elev (m)	Crit W.S. (m)	Frctn Loss (m)	C & E Loss (m)	Top Width (m)	Q Left (m3/s)	Q Channel (m3/s)	Q Right (m3/s)	Vel Chnl (m/s)
WC44	400		2-yr	191.63	191.63	191.55	0.06	0.01	11.64		0.30		0.21
WC44	400		5-yr	191.68	191.68	191.56	0.07	0.01	12.19		0.55		0.27
WC44	400		10-yr	191.72	191.71	191.57	0.08	0.01	12.55		0.75		0.31
WC44	400		25-yr	191.75	191.74	191.61	0.09	0.01	12.91		1.02		0.37
WC44	400		50-yr	191.77	191.76	191.61	0.09	0.01	13.16		1.23		0.40
WC44	400		100-yr	191.80	191.79	191.62	0.10	0.01	13.44		1.47		0.44
WC44	400		Check Flow	191.84	191.82	191.65	0.10	0.02	13.90		1.92		0.49
WC44	400		Regional	192.15	192.13	191.85	0.11	0.04	27.77	0.01	7.21	0.00	0.68
WC44	350	BR U	2-yr	191.56	191.55	191.55	0.08	0.01	10.58		0.30		0.61
WC44	350	BR U	5-yr	191.60	191.56	191.56	0.10	0.01	10.81		0.55		0.81
WC44	350	BR U	10-yr	191.62	191.58	191.58	0.11	0.02	10.98		0.75		0.91
WC44	350	BR U	25-yr	191.65	191.60	191.60	0.10	0.02	11.22		1.02		0.97
WC44	350	BR U	50-yr	191.66	191.61	191.61	0.11	0.02	11.41		1.23		1.00
WC44	350	BR U	100-yr	191.68	191.63	191.63	0.12	0.02	11.56		1.47		1.07
WC44	350	BR U	Check Flow	191.72	191.65	191.65	0.12	0.03	11.87		1.92		1.14
WC44	350	BR U	Regional	192.00	191.84	191.84	0.13	0.06	14.12		7.22		1.73
WC44	350	BR D	2-yr	189.70	189.69	189.56	0.08	0.01	7.28		0.30		0.26
WC44	350	BR D	5-yr	189.76	189.75	189.60	0.10	0.01	8.47		0.55		0.34
WC44	350	BR D	10-yr	189.80	189.79	189.63	0.10	0.01	9.18		0.75		0.39
WC44	350	BR D	25-yr	189.85	189.85	189.66	0.11	0.02	10.26		1.02		0.41
WC44	350	BR D	50-yr	189.88	189.87	189.68	0.11	0.02	10.77		1.23		0.44
WC44	350	BR D	100-yr	189.91	189.90	189.69	0.11	0.02	11.28		1.47		0.48
WC44	350	BR D	Check Flow	189.96	189.95	189.73	0.12	0.02	12.27		1.92		0.52
WC44	350	BR D	Regional	190.31	190.28	190.00	0.14	0.03	17.59		7.22		0.81
WC44	300		2-yr	189.60	189.57	189.56	0.76	0.01	5.06		0.30		0.78
WC44	300		5-yr	189.65	189.62	189.60	0.78	0.00	5.88		0.55		0.85
WC44	300		10-yr	189.69	189.65	189.63	0.80	0.00	6.45		0.75		0.91
WC44	300		25-yr	189.72	189.66	189.66	0.79	0.02	6.65		1.02		1.14
WC44	300		50-yr	189.75	189.68	189.68	0.79	0.02	6.99		1.23		1.20
WC44	300		100-yr	189.78	189.71	189.70	0.83	0.01	7.58		1.47		1.14
WC44	300		Check Flow	189.82	189.73	189.73	0.83	0.02	8.10		1.92		1.33
WC44	300		Regional	190.14	190.00	190.00	0.53	0.04	15.42		7.22		1.67
WC44	200		2-yr	188.84	188.82	188.82	0.99	0.00	10.19		0.30		0.57
WC44	200		5-yr	188.87	188.84	188.84	1.21	0.00	12.69		0.55		0.75
WC44	200		10-yr	188.89	188.85	188.85	1.34	0.00	14.37		0.75		0.85
WC44	200		25-yr	188.91	188.88	188.88	1.17	0.00	17.95		1.02		0.75
WC44	200		50-yr	188.92	188.89	188.89	1.21	0.00	18.43		1.23		0.81
WC44	200		100-yr	188.94	188.89	188.89	1.47	0.00	18.29		1.47		1.00
WC44	200		Check Flow	188.96	188.91	188.91	1.37	0.01	19.59		1.92		0.98
WC44	200		Regional	189.15	189.08	189.05	1.24	0.04	27.76		7.22		1.17


407TWY-DUFFINS Plan: Plan 30
Geom: WC44-PROP (407 ETR) Flow: WC44-4hr CH
River = DUFFINS Reach = WC44 ST 10 (Updated Sep 2016)
.08
.035
.08
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Bank Sta
Elevation (m)
Station (m)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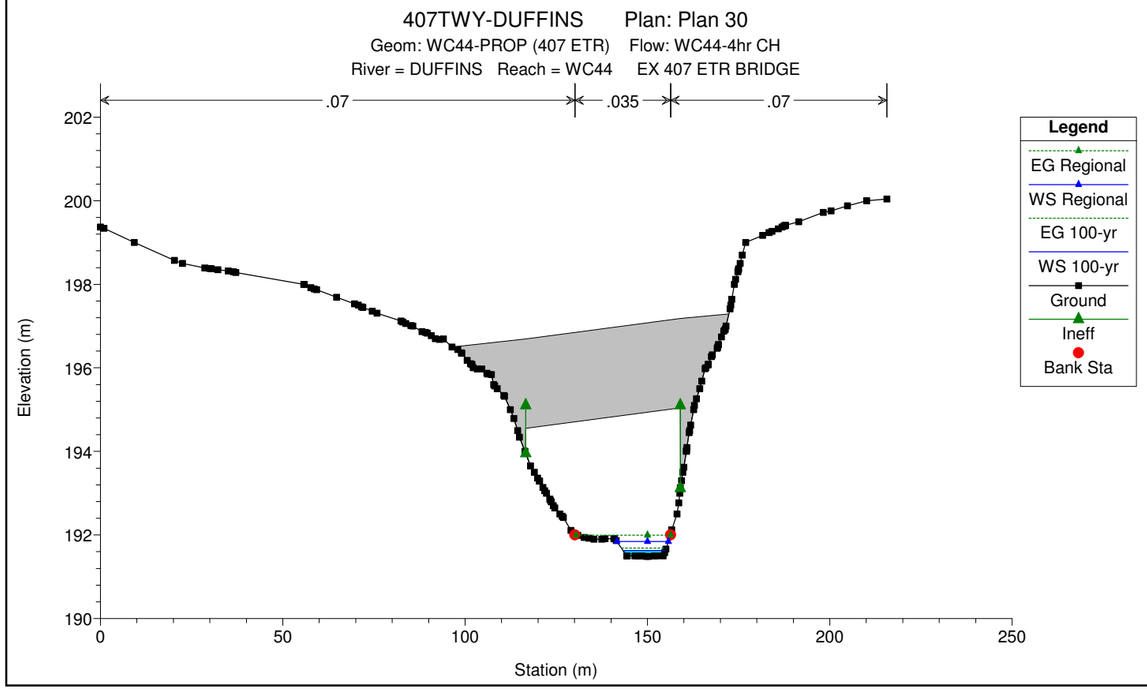
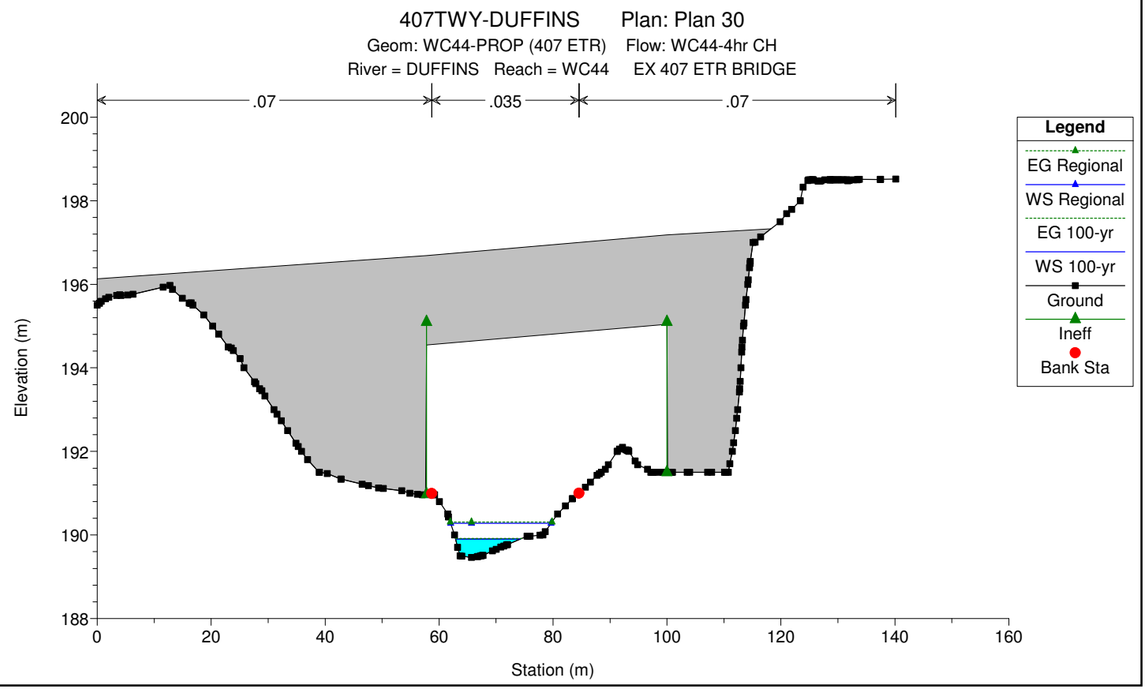
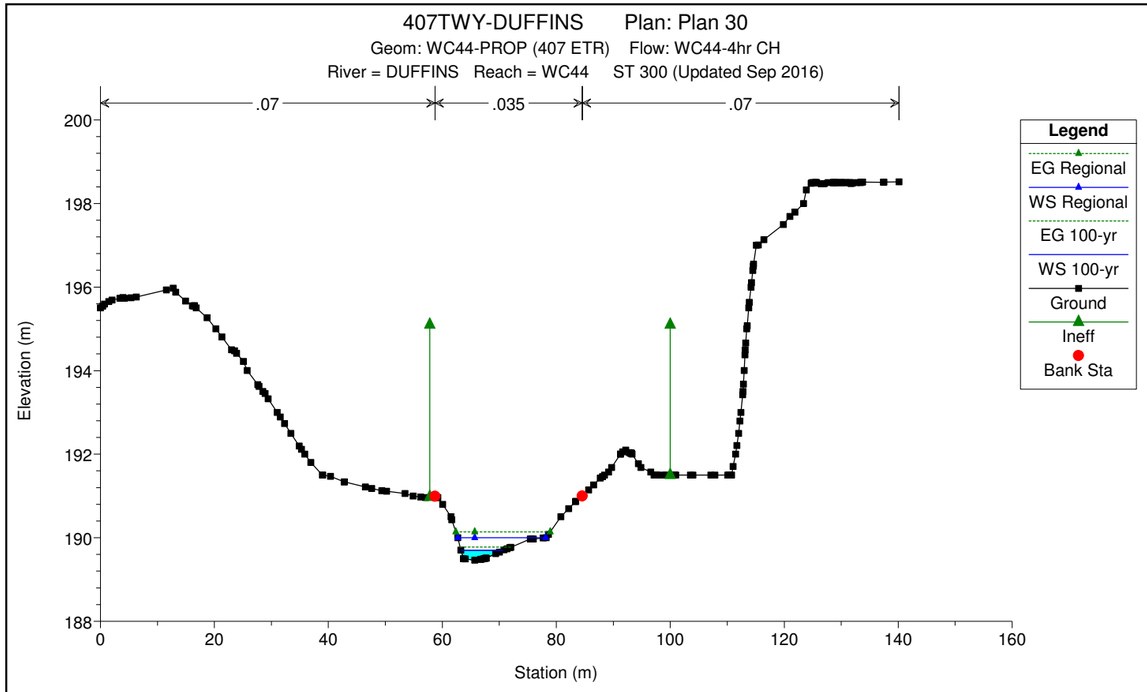
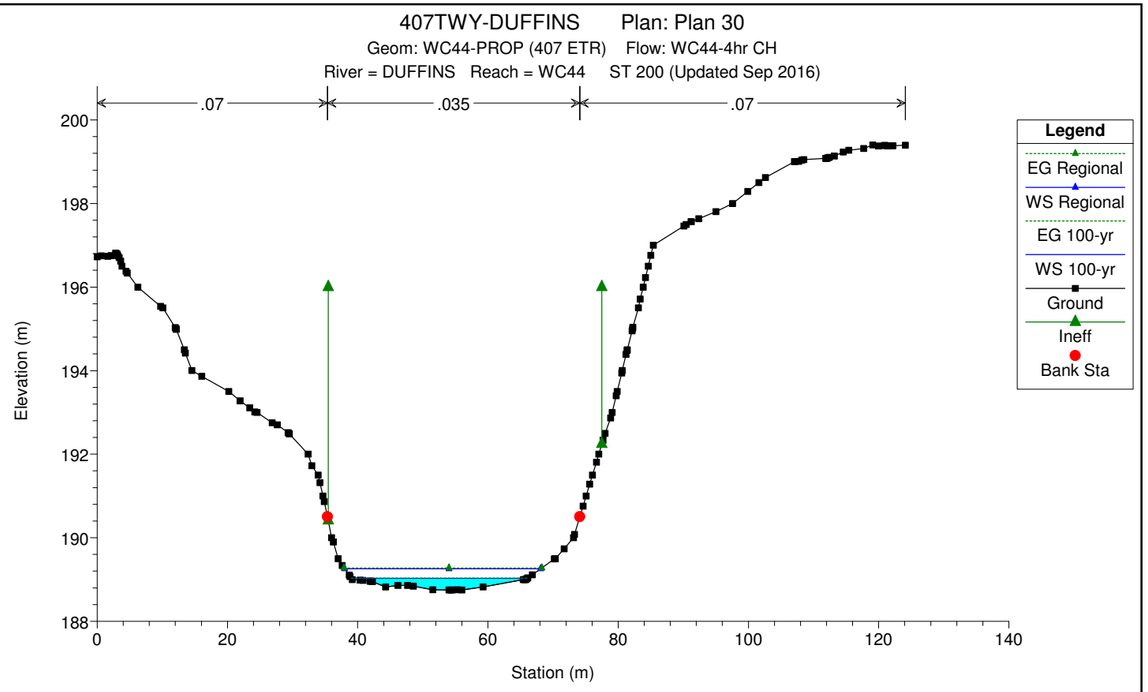
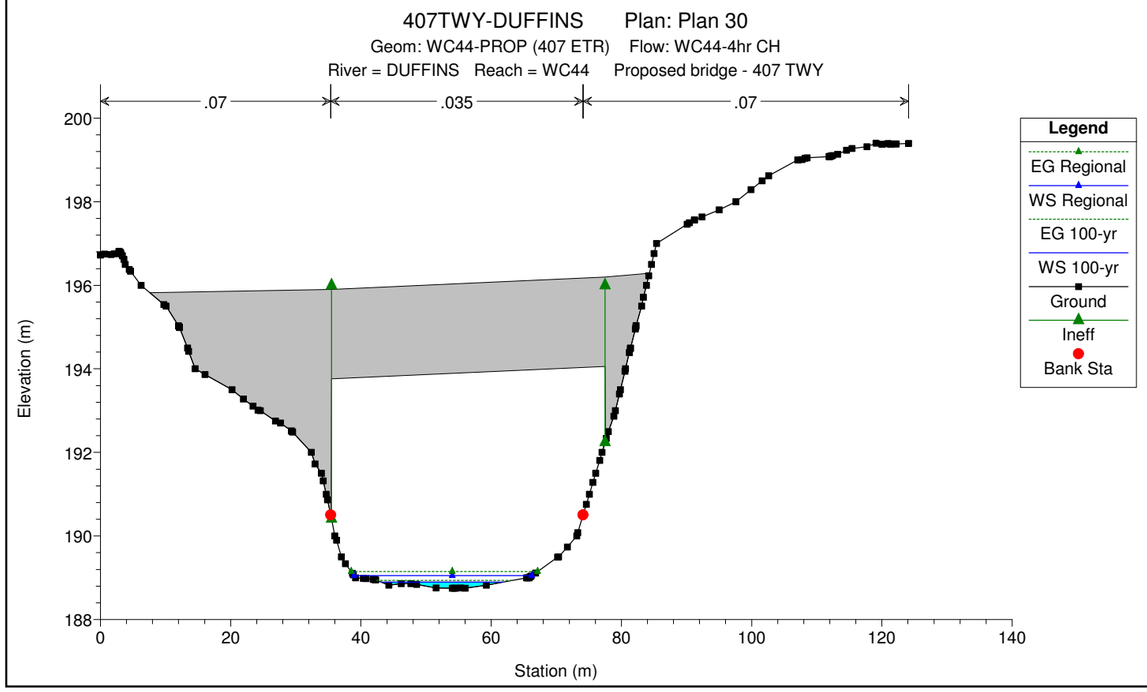
Geom: WC44-PROP (407 ETR) Flow: WC44-4hr CH
River = DUFFINS Reach = WC44 ST 400 (Updated Sep 2016)
.07
.035
.07
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta
Elevation (m)
Station (m)

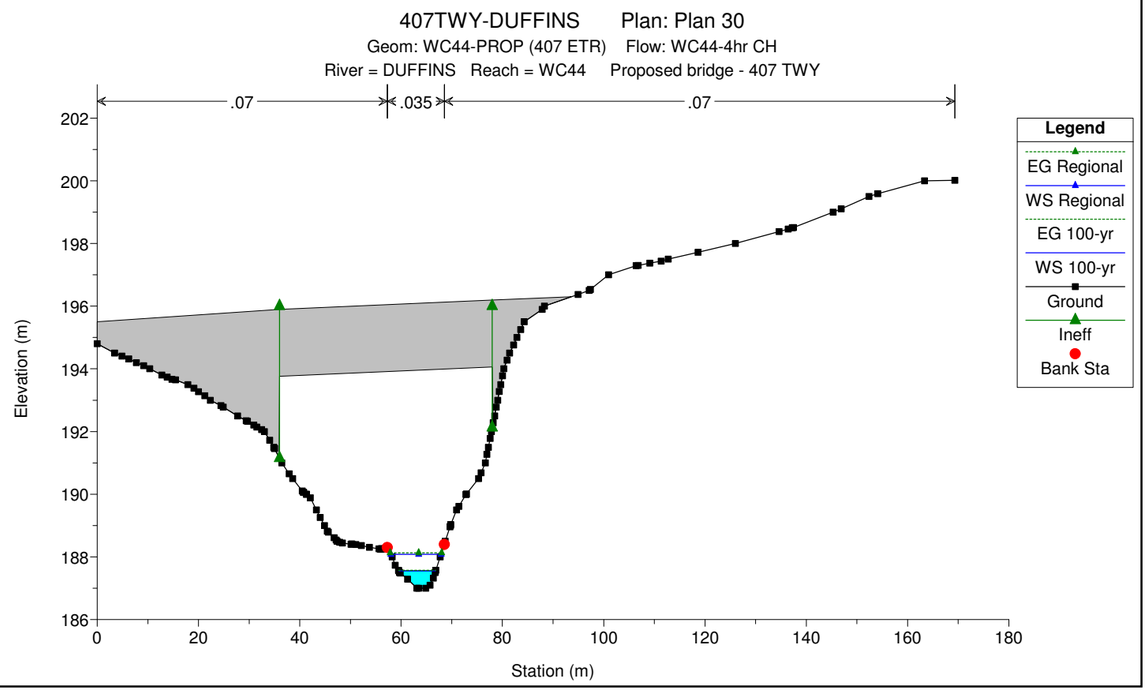

407TWY-DUFFINS Plan: Plan 30
Geom: WC44-PROP (407 ETR) Flow: WC44-4hr CH
River = DUFFINS Reach = WC44 EX 407 ETR BRIDGE
.07
.035
.07
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta
Elevation (m)
Station (m)

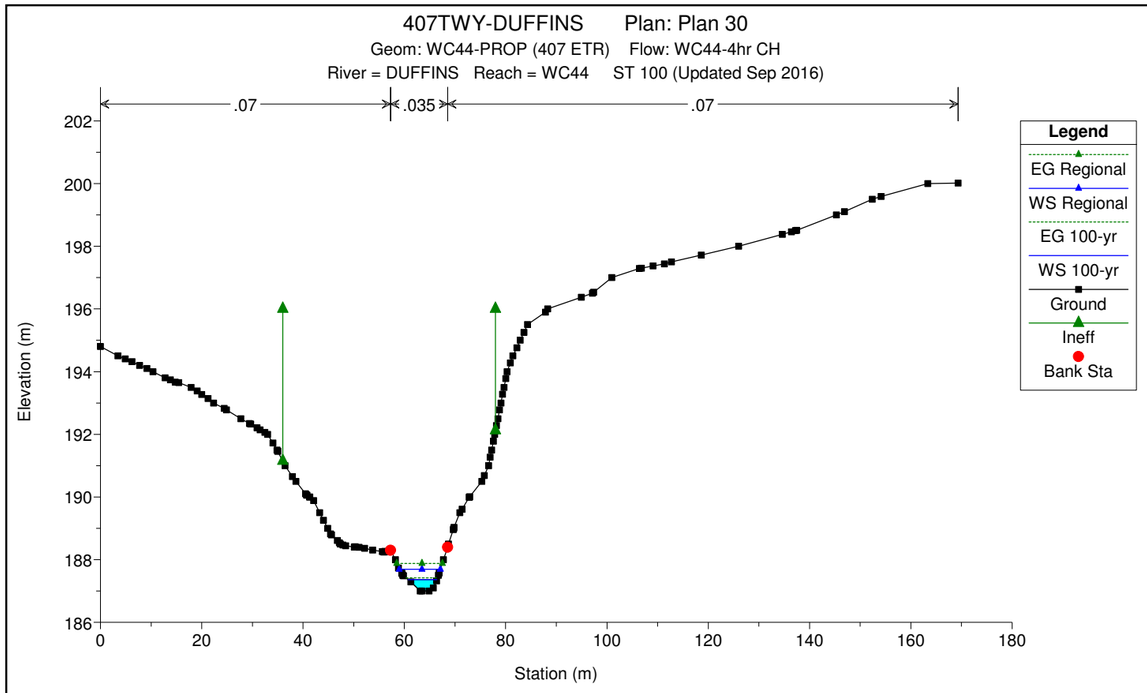

407TWY-DUFFINS Plan: Plan 30
Geom: WC44-PROP (407 ETR) Flow: WC44-4hr CH
River = DUFFINS Reach = WC44 EX 407 ETR BRIDGE
.07
.035
.07
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta
Elevation (m)
Station (m)


407TWY-DUFFINS Plan: Plan 30
Geom: WC44-PROP (407 ETR) Flow: WC44-4hr CH
River = DUFFINS Reach = WC44 ST 300 (Updated Sep 2016)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


407TWY-DUFFINS Plan: Plan 30
Geom: WC44-PROP (407 ETR) Flow: WC44-4hr CH
River = DUFFINS Reach = WC44 ST 200 (Updated Sep 2016)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


407TWY-DUFFINS Plan: Plan 30
Geom: WC44-PROP (407 ETR) Flow: WC44-4hr CH
River = DUFFINS Reach = WC44 Proposed bridge - 407 TWY
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


407TWY-DUFFINS Plan: Plan 30
Geom: WC44-PROP (407 ETR) Flow: WC44-4hr CH
River = DUFFINS Reach = WC44 Proposed bridge - 407 TWY
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta


407TWY-DUFFINS Plan: Plan 30
Geom: WC44-PROP (407 ETR) Flow: WC44-4hr CH
River = DUFFINS Reach = WC44 ST 100 (Updated Sep 2016)
.07
.035
.07
Elevation (m)
Station (m)
Legend
EG Regional
WS Regional
EG 100-yr
WS 100-yr
Ground
Ineff
Bank Sta

HEC-RAS Plan: WC4 - PROP (4hr CH) River: DUFFINS Reach: WC44

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC44	400	2-yr	0.30	191.49	191.63	191.55	191.64	0.000823	0.21	1.46	11.65	0.18
WC44	400	5-yr	0.55	191.49	191.68	191.56	191.69	0.000956	0.27	2.05	12.23	0.21
WC44	400	10-yr	0.75	191.49	191.71	191.57	191.71	0.001130	0.32	2.37	12.54	0.23
WC44	400	25-yr	1.02	191.49	191.74	191.61	191.75	0.001280	0.37	2.78	12.91	0.25
WC44	400	50-yr	1.23	191.49	191.76	191.61	191.77	0.001392	0.40	3.06	13.16	0.27
WC44	400	100-yr	1.47	191.49	191.79	191.62	191.80	0.001467	0.43	3.38	13.44	0.28
WC44	400	Check Flow	1.92	191.49	191.83	191.65	191.84	0.001608	0.49	3.91	13.90	0.30
WC44	400	Regional	7.22	191.49	192.13	191.85	192.15	0.001892	0.68	10.74	27.77	0.34
WC44	350		Bridge									
WC44	300	2-yr	0.30	189.46	189.56	189.56	189.60	0.042317	0.95	0.32	4.83	1.19
WC44	300	5-yr	0.55	189.46	189.60	189.60	189.65	0.026003	0.99	0.56	5.61	1.00
WC44	300	10-yr	0.75	189.46	189.63	189.63	189.68	0.024694	1.07	0.70	6.05	1.00
WC44	300	25-yr	1.02	189.46	189.66	189.66	189.72	0.023532	1.14	0.89	6.65	1.00
WC44	300	50-yr	1.23	189.46	189.68	189.68	189.75	0.022796	1.20	1.03	6.99	1.00
WC44	300	100-yr	1.47	189.46	189.70	189.70	189.78	0.022316	1.25	1.17	7.33	1.00
WC44	300	Check Flow	1.92	189.46	189.73	189.73	189.82	0.021707	1.33	1.45	8.10	1.00
WC44	300	Regional	7.22	189.46	190.00	190.00	190.14	0.018779	1.67	4.33	15.42	1.01
WC44	200	2-yr	0.30	188.75	188.91	188.82	188.91	0.000787	0.17	1.81	19.21	0.17
WC44	200	5-yr	0.55	188.75	188.94	188.84	188.95	0.000930	0.21	2.57	21.18	0.20
WC44	200	10-yr	0.75	188.75	188.97	188.86	188.97	0.001030	0.24	3.09	22.70	0.21
WC44	200	25-yr	1.02	188.75	189.00	188.87	189.00	0.001123	0.27	3.83	26.07	0.22
WC44	200	50-yr	1.23	188.75	189.01	188.88	189.02	0.001203	0.29	4.24	26.82	0.23
WC44	200	100-yr	1.47	188.75	189.03	188.90	189.03	0.001316	0.32	4.61	27.00	0.25
WC44	200	Check Flow	1.92	188.75	189.06	188.91	189.06	0.001354	0.36	5.40	27.39	0.26
WC44	200	Regional	7.22	188.75	189.25	189.05	189.28	0.001960	0.65	11.10	30.08	0.34
WC44	150		Bridge									
WC44	100	2-yr	0.30	187.00	187.17	187.12	187.19	0.006444	0.59	0.51	3.92	0.52
WC44	100	5-yr	0.55	187.00	187.23	187.17	187.26	0.006897	0.72	0.76	4.47	0.56
WC44	100	10-yr	0.75	187.00	187.27	187.20	187.30	0.007563	0.82	0.92	4.78	0.60
WC44	100	25-yr	1.02	187.00	187.31	187.24	187.35	0.007993	0.91	1.12	5.17	0.63
WC44	100	50-yr	1.23	187.00	187.33	187.26	187.38	0.008346	0.98	1.26	5.43	0.65
WC44	100	100-yr	1.47	187.00	187.36	187.29	187.42	0.008744	1.04	1.41	5.68	0.67
WC44	100	Check Flow	1.92	187.00	187.40	187.33	187.47	0.009353	1.15	1.67	6.09	0.70
WC44	100	Regional	7.22	187.00	187.69	187.65	187.88	0.013385	1.94	3.72	8.09	0.91

HEC-RAS Plan: WC4 - PROP (4hr CH) River: DUFFINS Reach: WC44 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
WC44	10	2-yr	0.30	186.43	186.54	186.54	186.57	0.030213	0.80	0.37	5.74	1.00
WC44	10	5-yr	0.55	186.43	186.57	186.57	186.62	0.028703	0.97	0.57	6.35	1.03
WC44	10	10-yr	0.75	186.43	186.59	186.59	186.65	0.025903	1.03	0.73	6.82	1.01
WC44	10	25-yr	1.02	186.43	186.62	186.62	186.68	0.024048	1.10	0.92	7.39	1.00
WC44	10	50-yr	1.23	186.43	186.64	186.64	186.71	0.023254	1.15	1.07	7.78	1.00
WC44	10	100-yr	1.47	186.43	186.66	186.66	186.73	0.022624	1.21	1.22	8.18	1.00
WC44	10	Check Flow	1.92	186.43	186.69	186.69	186.78	0.021773	1.28	1.49	8.85	1.00
WC44	10	Regional	7.22	186.43	186.93	186.93	187.08	0.017938	1.73	4.18	13.68	1.00

HEC-RAS HEC-RAS 5.0.1 April 2016
U.S. Army Corps of Engineers
Hydrologic Engineering Center
609 Second Street
Davis, California

```
X     X  XXXXXX    XXXX        XXXX       XX      XXXX
X     X  X        X    X       X   X     X  X    X
X     X  X        X            X   X    X    X   X
XXXXXXX  XXXX     X       XXX  XXXX     XXXXXX    XXXX
X     X  X        X            X  X     X    X        X
X     X  X        X    X       X   X    X    X        X
X     X  XXXXXX    XXXX        X    X   X    X   XXXXX
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PROJECT DATA
Project Title: 407TWY-DUFFINS
Project File : 407TWY-DUFFINS.prj
Run Date and Time: 9/21/2016 2:04:25 PM

Project in SI units

Project Description:
HEC-RAS Model created for 407 TWY project from Kennedy Rd. to Brock Rd. -
Duffins Creek Watershed

PLAN DATA

Plan Title: Plan 30
Plan File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.p30

Geometry Title: WC44-PROP (407 ETR)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.g16

Flow Title   : WC44-4hr CH
Flow File   : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.f15

Plan Summary Information:
Number of: Cross Sections = 5   Multiple Openings = 0
            Culverts   = 0   Inline Structures = 0
            Bridges   = 2   Lateral Structures = 0

Computational Information
    Water surface calculation tolerance = 0.01
    Critical depth calculation tolerance = 0.01
    Maximum number of iterations   = 20
    Maximum difference tolerance   = 0.3
    Flow tolerance factor   = 0.001

Computation Options
    Critical depth computed only where necessary
    Conveyance Calculation Method: At breaks in n values only
    Friction Slope Method: Average Conveyance
    Computational Flow Regime: Subcritical Flow

FLOW DATA

Flow Title: WC44-4hr CH
Flow File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.f15

Flow Data (m3/s)

River	Reach	RS	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	Check Flow	Regional
DUFFINS	WC44	400	.3	.55	.75	1.02	1.23	1.47	1.92	7.22

Boundary Conditions

River	Reach	Profile	Upstream	Downstream
DUFFINS	WC44	2-yr		Critical
DUFFINS	WC44	5-yr		Critical
DUFFINS	WC44	10-yr		Critical
DUFFINS	WC44	25-yr		Critical
DUFFINS	WC44	50-yr		Critical
DUFFINS	WC44	100-yr		Critical
DUFFINS	WC44	Check Flow		Critical
DUFFINS	WC44	Regional		Critical

GEOMETRY DATA

Geometry Title: WC44-PROP (407 ETR)
Geometry File : j:\Division\Water\Projects\MARKHAM\TT4022 - 407TWY Phase 2\DESIGN\HEC-RAS\DUFFINS\407TWY-DUFFINS\407TWY-DUFFINS.g16

CROSS SECTION

RIVER: DUFFINS
REACH: WC44 RS: 400

INPUT
Description: ST 400 (Updated Sep 2016)
Station Elevation Data num= 165

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	199.37	.95	199.34	9.29	199	20.31	198.57	22.48	198.5
28.57	198.39	29.9	198.38	30.37	198.37	32.21	198.35	35.01	198.32
36.42	198.3	37.15	198.28	55.78	198	55.88	198	57.7	197.92
58.56	197.89	59.31	197.87	64.76	197.69	69.7	197.53	70.72	197.5
71.64	197.46	71.95	197.45	74.54	197.36	75.83	197.31	82.38	197.12
82.87	197.1	83.74	197.06	85.14	197.01	85.69	197	88.19	196.87
89.16	196.85	89.6	196.83	90.69	196.77	91.86	196.7	93.02	196.68
94.06	196.69	96.43	196.5	97.98	196.44	98.95	196.36	99.07	196.35
100.58	196.18	101.43	196.1	101.82	196.08	101.86	196.08	102.24	196
103.29	195.97	104.56	195.97	105.98	195.87	106.13	195.85	107.21	195.84
107.86	195.6	108.11	195.57	108.82	195.5	110.62	195.34	110.81	195.32
112.38	195	113.35	194.79	114.37	194.5	114.9	194.34	116.39	194
117.92	193.65	118.96	193.5	119.9	193.36	120.39	193.29	120.42	193.29
121.34	193.14	121.84	193.06	122.27	193	123.18	192.86	123.4	192.83
123.63	192.79	124.2	192.7	124.61	192.65	125.96	192.5	126.56	192.45
126.93	192.42	129.04	192.11	129.58	192.03	129.68	192.02	129.82	192
129.99	192	130.12	192	130.92	191.99	132.61	191.94	133.96	191.92
135.33	191.9	137.44	191.9	138.38	191.91	140.78	191.91	140.93	191.91
141.44	191.87	144.3	191.5	144.44	191.5	146.55	191.5	147.13	191.5
147.65	191.5	148.57	191.5	149.64	191.49	150.33	191.49	151.78	191.5
152.44	191.5	154.3	191.5	154.7	191.58	155.03	191.66	156.39	192
156.68	192.12	158.08	192.5	158.56	192.77	158.85	193	159.01	193.13
159.33	193.3	159.72	193.5	159.94	193.62	160.66	194	160.68	194.01
160.73	194.03	160.81	194.09	161.42	194.45	161.54	194.5	161.83	194.63
162.66	195	162.86	195.1	163.44	195.26	164.34	195.5	164.88	195.68
165.8	195.98	165.97	196	166.64	196.07	166.72	196.09	167.52	196.27
167.81	196.31	169.14	196.47	169.26	196.5	169.46	196.56	170.3	196.74
170.92	196.88	171.27	196.91	171.32	196.93	171.53	197	172.66	197.41
172.83	197.5	173.12	197.64	173.84	198	174.14	198.12	174.78	198.3
174.92	198.34	175.01	198.37	175.4	198.5	176	198.7	176.93	199
181.59	199.17	183.3	199.24	184.14	199.27	185.87	199.33	186.91	199.37
187.5	199.4	187.63	199.4	187.71	199.4	187.91	199.41	191.48	199.5
198.17	199.72	200.32	199.76	204.87	199.88	210.1	200	215.65	200.04

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	130.12	.035	156.39	.07

```
Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        130.12  156.39              77      83      75             .3       .5
Ineffective Flow     num=       2
   Sta L    Sta R    Elev  Permanent
       0   116.6   195.1       T
     159  215.65   195.1       T
```

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	191.64	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	191.63	Reach Len. (m)	25.50	25.50	25.50
Crit W.S. (m)	191.55	Flow Area (m2)		1.46	
E.G. Slope (m/m)	0.000823	Area (m2)		1.46	
Q Total (m3/s)	0.30	Flow (m3/s)		0.30	
Top Width (m)	11.65	Top Width (m)		11.65	
Vel Total (m/s)	0.21	Avg. Vel. (m/s)		0.21	
Max Chl Dpth (m)	0.14	Hydr. Depth (m)		0.13	
Conv. Total (m3/s)	10.5	Conv. (m3/s)		10.5	
Length Wtd. (m)	25.50	Wetted Per. (m)		11.67	
Min Ch El (m)	191.49	Shear (N/m2)		1.01	
Alpha	1.00	Stream Power (N/m s)		0.21	
Frctn Loss (m)	0.06	Cum Volume (1000 m3)		0.21	
C & E Loss (m)	0.01	Cum SA (1000 m2)		2.08	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	191.69	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	191.68	Reach Len. (m)	25.50	25.50	25.50
Crit W.S. (m)	191.56	Flow Area (m2)		2.05	
E.G. Slope (m/m)	0.000956	Area (m2)		2.05	
Q Total (m3/s)	0.55	Flow (m3/s)		0.55	
Top Width (m)	12.23	Top Width (m)		12.23	
Vel Total (m/s)	0.27	Avg. Vel. (m/s)		0.27	
Max Chl Dpth (m)	0.19	Hydr. Depth (m)		0.17	
Conv. Total (m3/s)	17.8	Conv. (m3/s)		17.8	
Length Wtd. (m)	25.50	Wetted Per. (m)		12.26	
Min Ch El (m)	191.49	Shear (N/m2)		1.57	
Alpha	1.00	Stream Power (N/m s)		0.42	
Frctn Loss (m)	0.07	Cum Volume (1000 m3)		0.31	
C & E Loss (m)	0.01	Cum SA (1000 m2)		2.36	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	191.71	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	191.71	Reach Len. (m)	25.50	25.50	25.50
Crit W.S. (m)	191.57	Flow Area (m2)		2.37	
E.G. Slope (m/m)	0.001130	Area (m2)		2.37	
Q Total (m3/s)	0.75	Flow (m3/s)		0.75	
Top Width (m)	12.54	Top Width (m)		12.54	
Vel Total (m/s)	0.32	Avg. Vel. (m/s)		0.32	
Max Chl Dpth (m)	0.22	Hydr. Depth (m)		0.19	
Conv. Total (m3/s)	22.3	Conv. (m3/s)		22.3	
Length Wtd. (m)	25.50	Wetted Per. (m)		12.57	
Min Ch El (m)	191.49	Shear (N/m2)		2.09	
Alpha	1.00	Stream Power (N/m s)		0.66	
Frctn Loss (m)	0.08	Cum Volume (1000 m3)		0.37	
C & E Loss (m)	0.01	Cum SA (1000 m2)		2.54	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	191.75	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	191.74	Reach Len. (m)	25.50	25.50	25.50
Crit W.S. (m)	191.61	Flow Area (m2)		2.78	
E.G. Slope (m/m)	0.001280	Area (m2)		2.78	
Q Total (m3/s)	1.02	Flow (m3/s)		1.02	
Top Width (m)	12.91	Top Width (m)		12.91	
Vel Total (m/s)	0.37	Avg. Vel. (m/s)		0.37	
Max Chl Dpth (m)	0.25	Hydr. Depth (m)		0.22	
Conv. Total (m3/s)	28.5	Conv. (m3/s)		28.5	
Length Wtd. (m)	25.50	Wetted Per. (m)		12.96	
Min Ch El (m)	191.49	Shear (N/m2)		2.70	
Alpha	1.00	Stream Power (N/m s)		0.99	
Frctn Loss (m)	0.09	Cum Volume (1000 m3)		0.46	
C & E Loss (m)	0.01	Cum SA (1000 m2)		2.80	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	191.77	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	191.76	Reach Len. (m)	25.50	25.50	25.50
Crit W.S. (m)	191.61	Flow Area (m2)		3.06	
E.G. Slope (m/m)	0.001392	Area (m2)		3.06	
Q Total (m3/s)	1.23	Flow (m3/s)		1.23	
Top Width (m)	13.16	Top Width (m)		13.16	
Vel Total (m/s)	0.40	Avg. Vel. (m/s)		0.40	
Max Chl Dpth (m)	0.27	Hydr. Depth (m)		0.23	
Conv. Total (m3/s)	33.0	Conv. (m3/s)		33.0	
Length Wtd. (m)	25.50	Wetted Per. (m)		13.21	
Min Ch El (m)	191.49	Shear (N/m2)		3.16	
Alpha	1.00	Stream Power (N/m s)		1.27	
Frctn Loss (m)	0.09	Cum Volume (1000 m3)		0.52	
C & E Loss (m)	0.01	Cum SA (1000 m2)		2.90	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	191.80	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	191.79	Reach Len. (m)	25.50	25.50	25.50
Crit W.S. (m)	191.62	Flow Area (m2)		3.38	
E.G. Slope (m/m)	0.001467	Area (m2)		3.38	
Q Total (m3/s)	1.47	Flow (m3/s)		1.47	
Top Width (m)	13.44	Top Width (m)		13.44	
Vel Total (m/s)	0.43	Avg. Vel. (m/s)		0.43	
Max Chl Dpth (m)	0.30	Hydr. Depth (m)		0.25	
Conv. Total (m3/s)	38.4	Conv. (m3/s)		38.4	
Length Wtd. (m)	25.50	Wetted Per. (m)		13.50	
Min Ch El (m)	191.49	Shear (N/m2)		3.60	
Alpha	1.00	Stream Power (N/m s)		1.57	
Frctn Loss (m)	0.10	Cum Volume (1000 m3)		0.57	
C & E Loss (m)	0.01	Cum SA (1000 m2)		2.98	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	191.84	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	

W.S. Elev (m)	191.83	Reach Len. (m)	25.50	25.50	25.50
Crit W.S. (m)	191.65	Flow Area (m2)		3.91	
E.G. Slope (m/m)	0.001608	Area (m2)		3.91	
Q Total (m3/s)	1.92	Flow (m3/s)		1.92	
Top Width (m)	13.90	Top Width (m)		13.90	
Vel Total (m/s)	0.49	Avg. Vel. (m/s)		0.49	
Max Chl Dpth (m)	0.33	Hydr. Depth (m)		0.28	
Conv. Total (m3/s)	47.9	Conv. (m3/s)		47.9	
Length Wtd. (m)	25.50	Wetted Per. (m)		13.96	
Min Ch El (m)	191.49	Shear (N/m2)		4.42	
Alpha	1.00	Stream Power (N/m s)		2.17	
Frctn Loss (m)	0.10	Cum Volume (1000 m3)		0.68	
C & E Loss (m)	0.02	Cum SA (1000 m2)		3.13	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	192.15	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.	0.070	0.035	0.070
W.S. Elev (m)	192.13	Reach Len. (m)	25.50	25.50	25.50
Crit W.S. (m)	191.85	Flow Area (m2)	0.09	10.63	0.02
E.G. Slope (m/m)	0.001892	Area (m2)	0.09	10.63	0.02
Q Total (m3/s)	7.22	Flow (m3/s)	0.01	7.21	0.00
Top Width (m)	27.77	Top Width (m)	1.19	26.27	0.31
Vel Total (m/s)	0.67	Avg. Vel. (m/s)	0.11	0.68	0.09
Max Chl Dpth (m)	0.64	Hydr. Depth (m)	0.08	0.40	0.06
Conv. Total (m3/s)	166.0	Conv. (m3/s)	0.2	165.7	0.0
Length Wtd. (m)	25.50	Wetted Per. (m)	1.19	26.36	0.33
Min Ch El (m)	191.49	Shear (N/m2)	1.47	7.48	1.06
Alpha	1.02	Stream Power (N/m s)	0.17	5.07	0.10
Frctn Loss (m)	0.11	Cum Volume (1000 m3)	0.00	1.63	0.00
C & E Loss (m)	0.04	Cum SA (1000 m2)	0.02	4.28	0.00

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.

BRIDGE

RIVER: DUFFINS
REACH: WC44 RS: 350

INPUT
Description: EX 407 ETR BRIDGE
Distance from Upstream XS = 25.5
Deck/Roadway Width = 28
Weir Coefficient = 1.4
Upstream Deck/Roadway Coordinates
num= 4

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	195.59		116.6	196.69	194.55	159	197.18	195.04
216	197.65							

Upstream Bridge Cross Section Data
Station Elevation Data num= 165

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	199.37	.95	199.34	9.29	199	20.31	198.57	22.48	198.5
28.57	198.39	29.9	198.38	30.37	198.37	32.21	198.35	35.01	198.32
36.42	198.3	37.15	198.28	55.78	198	55.88	198	57.7	197.92
58.56	197.89	59.31	197.87	64.76	197.69	69.7	197.53	70.72	197.5
71.64	197.46	71.95	197.45	74.54	197.36	75.83	197.31	82.38	197.12
82.87	197.1	83.74	197.06	85.14	197.01	85.69	197	88.19	196.87
89.16	196.85	89.6	196.83	90.69	196.77	91.86	196.7	93.02	196.68
94.06	196.69	96.43	196.5	97.98	196.44	98.95	196.36	99.07	196.35
100.58	196.18	101.43	196.1	101.82	196.08	101.86	196.08	102.24	196
103.29	195.97	104.56	195.97	105.98	195.87	106.13	195.85	107.21	195.84
107.86	195.6	108.11	195.57	108.82	195.5	110.62	195.34	110.81	195.32
112.38	195	113.35	194.79	114.37	194.5	114.9	194.34	116.39	194
117.92	193.65	118.96	193.5	119.9	193.36	120.39	193.29	120.42	193.29
121.34	193.14	121.84	193.06	122.27	193	123.18	192.86	123.4	192.83
123.63	192.79	124.2	192.7	124.61	192.65	125.96	192.5	126.56	192.45
126.93	192.42	129.04	192.11	129.58	192.03	129.68	192.02	129.82	192
129.99	192	130.12	192	130.92	191.99	132.61	191.94	133.96	191.92
135.33	191.9	137.44	191.9	138.38	191.91	140.78	191.91	140.93	191.91
141.44	191.87	144.3	191.5	144.44	191.5	146.55	191.5	147.13	191.5
147.65	191.5	148.57	191.5	149.64	191.49	150.33	191.49	151.78	191.5
152.44	191.5	154.3	191.5	154.7	191.58	155.03	191.66	156.39	192
156.68	192.12	158.08	192.5	158.56	192.77	158.85	193	159.01	193.13
159.33	193.3	159.72	193.5	159.94	193.62	160.66	194	160.68	194.01
160.73	194.03	160.81	194.09	161.42	194.45	161.54	194.5	161.83	194.63
162.66	195	162.86	195.1	163.44	195.26	164.34	195.5	164.88	195.68
165.8	195.98	165.97	196	166.64	196.07	166.72	196.09	167.52	196.27
167.81	196.31	169.14	196.47	169.26	196.5	169.46	196.56	170.3	196.74
170.92	196.88	171.27	196.91	171.32	196.93	171.53	197	172.66	197.41
172.83	197.5	173.12	197.64	173.84	198	174.14	198.12	174.78	198.3
174.92	198.34	175.01	198.37	175.4	198.5	176	198.7	176.93	199
181.59	199.17	183.3	199.24	184.14	199.27	185.87	199.33	186.91	199.37
187.5	199.4	187.63	199.4	187.71	199.4	187.91	199.41	191.48	199.5
198.17	199.72	200.32	199.76	204.87	199.88	210.1	200	215.65	200.04

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	130.12	.035	156.39	.07

Bank Sta: Left Right Coeff Contr. Expan.
130.12 156.39 .3 .5
Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	116.6	195.1	T
159	215.65	195.1	T

Downstream Deck/Roadway Coordinates
num= 4

Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord	Sta	Hi Cord	Lo Cord
0	196.13		57.8	196.69	194.55	100	197.18	195.04
140	197.5							

Downstream Bridge Cross Section Data
Station Elevation Data num= 192

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	195.5	.381	195.546	.726	195.595	1.482	195.651	2.06	195.69
3.411	195.729	3.945	195.75	4.181	195.731	5.362	195.746	6.288	195.764
11.555	195.929	12.771	195.974	13.205	195.875	14.957	195.667	16.129	195.549
16.392	195.546	16.408	195.547	16.505	195.555	16.781	195.5	18.718	195.269
20.234	195	21.312	194.808	23.015	194.5	23.538	194.475	23.874	194.413
25.078	194.218	25.768	194	27.592	193.666	27.822	193.624	28.502	193.5
28.88	193.45	29.432	193.325	31.018	193	31.554	192.89	32.316	192.734
33.405	192.5	34.896	192.194	35.286	192.117	35.873	192	36.93	191.801
38.942	191.5	39.018	191.499	40.393	191.473	42.75	191.339	42.812	191.336
46.482	191.217	47.594	191.182	49.362	191.126	50.214	191.111	53.448	191.056
54.859	191	56.201	190.977	57.024	190.96	58.709	190.994	59.028	190.964
59.231	190.963	60.077	190.796	61.51	190.5	61.659	190.429	62.727	190
63.268	189.702	63.679	189.5	64.008	189.496	65.671	189.46	66.718	189.479
66.879	189.485	67.271	189.5	67.449	189.505	67.635	189.51	67.742	189.511
69.365	189.621	70.036	189.658	70.811	189.711	71.374	189.735	71.83	189.763
72.002	189.772	75.426	189.97	75.669	189.971	75.976	189.971	77.711	189.994
78.221	190	78.626	190.079	80.776	190.5	82.169	190.697	83.366	190.866
83.43	190.873	84.561	191	85.653	191.145	86.553	191.265	87.717	191.429
88.129	191.467	88.484	191.5	89.159	191.571	89.694	191.68	91.253	192
91.258	192.001	91.652	192.055	92.203	192.1	92.822	192.04	93.047	192.018
93.131	192.03	93.219	192.018	93.282	192	94.386	191.775	94.839	191.682
96.566	191.573	97.146	191.5	97.4	191.5	97.44	191.5	97.618	191.5
97.689	191.5	98.82	191.5	99.262	191.5	100.25	191.5	100.727	191.5
100.742	191.5	100.756	191.5	100.981	191.5	103.551	191.5	103.957	191.5
107.138	191.5	107.822	191.5	110.082	191.5	110.321	191.5	110.392	191.5
110.754	191.5	111.036	191.704	111.453	192	111.677	192.208	112.014	192.5
112.23	192.796	112.378	193	112.687	193.423	112.743	193.5	112.849	193.675
112.976	194	113.126	194.377	113.173	194.5	113.24	194.662	113.433	195
113.485	195.076	113.768	195.5	113.878	195.637	114.168	196	114.255	196.108
114.483	196.394	114.573	196.5	114.628	196.547	115.119	197	115.442	197.009

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 116.437 197.137 119.849   197.5 120.982 197.689 121.905 197.794 123.378     198
 123.857 198.326 124.711 198.481 124.861   198.5 125.169   198.5 125.478   198.5
 125.573   198.5 125.575   198.5 125.689   198.5 126.477 198.473 126.818 198.469
 127.028 198.478 127.688   198.5 128.602 198.501 128.644 198.501 128.661 198.501
  128.68 198.501  128.89 198.501   129.1 198.501 129.355   198.5 129.751 198.499
 130.011 198.499 130.324 198.499 130.561 198.499 130.924 198.498 131.483 198.498
 131.647 198.499 131.743 198.478 131.969  198.49 132.743   198.5 133.349   198.5
 133.493 198.504 133.495 198.504  133.77  198.51 137.426 198.509 137.451  198.51
 137.494  198.51 140.165 198.518

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .07  58.709    .035  84.561     .07

Bank Sta: Left   Right    Coeff Contr.   Expan.
        58.709  84.561          .3        .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0    57.8   195.1       T
     100 140.165   195.1       T

Upstream Embankment side slope              =       2 horiz. to 1.0 vertical
Downstream Embankment side slope            =       2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Energy Only

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION


RIVER: DUFFINS
REACH: WC44               RS: 300

INPUT
Description: ST 300 (Updated Sep 2016)
Station Elevation Data     num=     192
     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev     Sta    Elev
       0   195.5    .381 195.546    .726 195.595   1.482 195.651    2.06  195.69
   3.411 195.729   3.945  195.75   4.181 195.731   5.362 195.746   6.288 195.764
  11.555 195.929  12.771 195.974  13.205 195.875  14.957 195.667  16.129 195.549
  16.392 195.546  16.408 195.547  16.505 195.555  16.781   195.5  18.718 195.269
  20.234     195  21.312 194.808  23.015   194.5  23.538 194.475  23.874 194.413
  25.078 194.218  25.768     194  27.592 193.666  27.822 193.624  28.502   193.5
   28.88  193.45  29.432 193.325  31.018     193  31.554  192.89  32.316 192.734
  33.405   192.5  34.896 192.194  35.286 192.117  35.873     192   36.93 191.801
  38.942   191.5  39.018 191.499  40.393 191.473   42.75 191.339  42.812 191.336
  46.482 191.217  47.594 191.182  49.362 191.126  50.214 191.111  53.448 191.056
  54.859     191  56.201 190.977  57.024  190.96  58.709 190.994  59.028 190.964
  59.231 190.963  60.077 190.796   61.51   190.5  61.659 190.429  62.727     190
  63.268 189.702  63.679   189.5  64.008 189.496  65.671  189.46  66.718 189.479
  66.879 189.485  67.271   189.5  67.449 189.505  67.635  189.51  67.742 189.511
  69.365 189.621  70.036 189.658  70.811 189.711  71.374 189.735   71.83 189.763
  72.002 189.772  75.426  189.97  75.669 189.971  75.976 189.971  77.711 189.994
  78.221     190  78.626 190.079  80.776   190.5  82.169 190.697  83.366 190.866
   83.43 190.873  84.561     191  85.653 191.145  86.553 191.265  87.717 191.429
  88.129 191.467  88.484   191.5  89.159 191.571  89.694  191.68  91.253     192
  91.258 192.001  91.652 192.055  92.203   192.1  92.822  192.04  93.047 192.018
  93.131  192.03  93.219 192.018  93.282     192  94.386 191.775  94.839 191.682
  96.566 191.573  97.146   191.5    97.4   191.5   97.44   191.5  97.618   191.5
  97.689   191.5   98.82   191.5  99.262   191.5  100.25   191.5 100.727   191.5
 100.742   191.5 100.756   191.5 100.981   191.5 103.551   191.5 103.957   191.5
 107.138   191.5 107.822   191.5 110.082   191.5 110.321   191.5 110.392   191.5
 110.754   191.5 111.036 191.704 111.453     192 111.677 192.208 112.014   192.5
  112.23 192.796 112.378     193 112.687 193.423 112.743   193.5 112.849 193.675
 112.976     194 113.126 194.377 113.173   194.5  113.24 194.662 113.433     195
 113.485 195.076 113.768   195.5 113.878 195.637 114.168     196 114.255 196.108
 114.483 196.394 114.573   196.5 114.628 196.547 115.119     197 115.442 197.009
 116.437 197.137 119.849   197.5 120.982 197.689 121.905 197.794 123.378     198
 123.857 198.326 124.711 198.481 124.861   198.5 125.169   198.5 125.478   198.5
 125.573   198.5 125.575   198.5 125.689   198.5 126.477 198.473 126.818 198.469
 127.028 198.478 127.688   198.5 128.602 198.501 128.644 198.501 128.661 198.501
  128.68 198.501  128.89 198.501   129.1 198.501 129.355   198.5 129.751 198.499
 130.011 198.499 130.324 198.499 130.561 198.499 130.924 198.498 131.483 198.498
 131.647 198.499 131.743 198.478 131.969  198.49 132.743   198.5 133.349   198.5
 133.493 198.504 133.495 198.504  133.77  198.51 137.426 198.509 137.451  198.51
 137.494  198.51 140.165 198.518

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .07  58.709    .035  84.561     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        58.709  84.561            34       35    33.1             .3        .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0    57.8   195.1       T
     100 140.165   195.1       T

CROSS SECTION OUTPUT  Profile #2-yr

  E.G. Elev (m)           189.60    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.05    Wt. n-Val.                           0.035
  W.S. Elev (m)           189.56    Reach Len. (m)           34.00      35.00      33.10
  Crit W.S. (m)           189.56    Flow Area (m2)                       0.32
  E.G. Slope (m/m)      0.042317    Area (m2)                            0.32
  Q Total (m3/s)            0.30    Flow (m3/s)                          0.30
  Top Width (m)             4.83    Top Width (m)                        4.83
  Vel Total (m/s)           0.95    Avg. Vel. (m/s)                      0.95
  Max Chl Dpth (m)          0.10    Hydr. Depth (m)                      0.07
  Conv. Total (m3/s)         1.5    Conv. (m3/s)                          1.5
  Length Wtd. (m)          35.00    Wetted Per. (m)                      4.85
  Min Ch El (m)           189.46    Shear (N/m2)                        27.00
  Alpha                     1.00    Stream Power (N/m s)                25.67
  Frctn Loss (m)            0.09    Cum Volume (1000 m3)                 0.14
  C & E Loss (m)            0.02    Cum SA (1000 m2)                     1.37


Warning: The energy equation could not be balanced within the specified number of iterations.  The program used critical
         depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
         1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate
         the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated
         water surface came back below critical depth.  This indicates that there is not a valid subcritical answer.  The
         program defaulted to critical depth.

CROSS SECTION OUTPUT  Profile #5-yr

  E.G. Elev (m)           189.65    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.05    Wt. n-Val.                           0.035
  W.S. Elev (m)           189.60    Reach Len. (m)           34.00      35.00      33.10
  Crit W.S. (m)           189.60    Flow Area (m2)                       0.56
  E.G. Slope (m/m)      0.026003    Area (m2)                            0.56
  Q Total (m3/s)            0.55    Flow (m3/s)                          0.55
  Top Width (m)             5.61    Top Width (m)                        5.61
```

Vel Total (m/s)	0.99	Avg. Vel. (m/s)	0.99
Max Chl Dpth (m)	0.14	Hydr. Depth (m)	0.10
Conv. Total (m3/s)	3.4	Conv. (m3/s)	3.4
Length Wtd. (m)	35.00	Wetted Per. (m)	5.64
Min Ch El (m)	189.46	Shear (N/m2)	25.23
Alpha	1.00	Stream Power (N/m s)	24.86
Frctn Loss (m)	0.09	Cum Volume (1000 m3)	0.21
C & E Loss (m)	0.02	Cum SA (1000 m2)	1.59

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	189.68	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.035	
W.S. Elev (m)	189.63	Reach Len. (m)	34.00	35.00	33.10
Crit W.S. (m)	189.63	Flow Area (m2)		0.70	
E.G. Slope (m/m)	0.024694	Area (m2)		0.70	
Q Total (m3/s)	0.75	Flow (m3/s)		0.75	
Top Width (m)	6.05	Top Width (m)		6.05	
Vel Total (m/s)	1.07	Avg. Vel. (m/s)		1.07	
Max Chl Dpth (m)	0.17	Hydr. Depth (m)		0.12	
Conv. Total (m3/s)	4.8	Conv. (m3/s)		4.8	
Length Wtd. (m)	35.00	Wetted Per. (m)		6.09	
Min Ch El (m)	189.46	Shear (N/m2)		28.00	
Alpha	1.00	Stream Power (N/m s)		29.83	
Frctn Loss (m)	0.10	Cum Volume (1000 m3)		0.25	
C & E Loss (m)	0.03	Cum SA (1000 m2)		1.73	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	189.72	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.035	
W.S. Elev (m)	189.66	Reach Len. (m)	34.00	35.00	33.10
Crit W.S. (m)	189.66	Flow Area (m2)		0.89	
E.G. Slope (m/m)	0.023532	Area (m2)		0.89	
Q Total (m3/s)	1.02	Flow (m3/s)		1.02	
Top Width (m)	6.65	Top Width (m)		6.65	
Vel Total (m/s)	1.14	Avg. Vel. (m/s)		1.14	
Max Chl Dpth (m)	0.20	Hydr. Depth (m)		0.13	
Conv. Total (m3/s)	6.6	Conv. (m3/s)		6.6	
Length Wtd. (m)	35.00	Wetted Per. (m)		6.69	
Min Ch El (m)	189.46	Shear (N/m2)		30.76	
Alpha	1.00	Stream Power (N/m s)		35.18	
Frctn Loss (m)	0.11	Cum Volume (1000 m3)		0.31	
C & E Loss (m)	0.03	Cum SA (1000 m2)		1.94	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	189.75	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.035	
W.S. Elev (m)	189.68	Reach Len. (m)	34.00	35.00	33.10
Crit W.S. (m)	189.68	Flow Area (m2)		1.03	
E.G. Slope (m/m)	0.022796	Area (m2)		1.03	
Q Total (m3/s)	1.23	Flow (m3/s)		1.23	
Top Width (m)	6.99	Top Width (m)		6.99	
Vel Total (m/s)	1.20	Avg. Vel. (m/s)		1.20	
Max Chl Dpth (m)	0.22	Hydr. Depth (m)		0.15	
Conv. Total (m3/s)	8.1	Conv. (m3/s)		8.1	
Length Wtd. (m)	35.00	Wetted Per. (m)		7.03	
Min Ch El (m)	189.46	Shear (N/m2)		32.66	
Alpha	1.00	Stream Power (N/m s)		39.09	
Frctn Loss (m)	0.11	Cum Volume (1000 m3)		0.35	
C & E Loss (m)	0.03	Cum SA (1000 m2)		2.01	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	189.78	Element	Left OB	Channel	Right OB
Vel Head (m)	0.08	Wt. n-Val.		0.035	
W.S. Elev (m)	189.70	Reach Len. (m)	34.00	35.00	33.10
Crit W.S. (m)	189.70	Flow Area (m2)		1.17	
E.G. Slope (m/m)	0.022316	Area (m2)		1.17	
Q Total (m3/s)	1.47	Flow (m3/s)		1.47	
Top Width (m)	7.33	Top Width (m)		7.33	
Vel Total (m/s)	1.25	Avg. Vel. (m/s)		1.25	
Max Chl Dpth (m)	0.24	Hydr. Depth (m)		0.16	
Conv. Total (m3/s)	9.8	Conv. (m3/s)		9.8	
Length Wtd. (m)	35.00	Wetted Per. (m)		7.38	
Min Ch El (m)	189.46	Shear (N/m2)		34.80	
Alpha	1.00	Stream Power (N/m s)		43.59	
Frctn Loss (m)	0.12	Cum Volume (1000 m3)		0.39	
C & E Loss (m)	0.04	Cum SA (1000 m2)		2.07	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	189.82	Element	Left OB	Channel	Right OB
Vel Head (m)	0.09	Wt. n-Val.		0.035	
W.S. Elev (m)	189.73	Reach Len. (m)	34.00	35.00	33.10
Crit W.S. (m)	189.73	Flow Area (m2)		1.45	
E.G. Slope (m/m)	0.021707	Area (m2)		1.45	
Q Total (m3/s)	1.92	Flow (m3/s)		1.92	

Top Width (m)	8.10	Top Width (m)	8.10
Vel Total (m/s)	1.33	Avg. Vel. (m/s)	1.33
Max Chl Dpth (m)	0.27	Hydr. Depth (m)	0.18
Conv. Total (m3/s)	13.0	Conv. (m3/s)	13.0
Length Wtd. (m)	35.00	Wetted Per. (m)	8.16
Min Ch El (m)	189.46	Shear (N/m2)	37.71
Alpha	1.00	Stream Power (N/m s)	50.06
Frctn Loss (m)	0.12	Cum Volume (1000 m3)	0.46
C & E Loss (m)	0.04	Cum SA (1000 m2)	2.16

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	190.14	Element	Left OB	Channel	Right OB
Vel Head (m)	0.14	Wt. n-Val.		0.035	
W.S. Elev (m)	190.00	Reach Len. (m)	34.00	35.00	33.10
Crit W.S. (m)	190.00	Flow Area (m2)		4.33	
E.G. Slope (m/m)	0.018779	Area (m2)		4.33	
Q Total (m3/s)	7.22	Flow (m3/s)		7.22	
Top Width (m)	15.42	Top Width (m)		15.42	
Vel Total (m/s)	1.67	Avg. Vel. (m/s)		1.67	
Max Chl Dpth (m)	0.54	Hydr. Depth (m)		0.28	
Conv. Total (m3/s)	52.7	Conv. (m3/s)		52.7	
Length Wtd. (m)	35.00	Wetted Per. (m)		15.56	
Min Ch El (m)	189.46	Shear (N/m2)		51.22	
Alpha	1.00	Stream Power (N/m s)		85.45	
Frctn Loss (m)	0.16	Cum Volume (1000 m3)		1.06	
C & E Loss (m)	0.06	Cum SA (1000 m2)		2.84	

Warning: The energy equation could not be balanced within the specified number of iterations. The program used critical depth for the water surface and continued on with the calculations.
Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Warning: During the standard step iterations, when the assumed water surface was set equal to critical depth, the calculated water surface came back below critical depth. This indicates that there is not a valid subcritical answer. The program defaulted to critical depth.

CROSS SECTION

RIVER: DUFFINS
REACH: WC44 RS: 200

INPUT
Description: ST 200 (Updated Sep 2016)
Station Elevation Data num= 142

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	196.722	.634	196.747	1.614	196.737	2.133	196.756	2.813	196.811
2.859	196.813	3.025	196.785	3.053	196.782	3.065	196.785	3.192	196.747
3.358	196.703	3.604	196.622	3.806	196.5	4.42	196.376	4.625	196.339
6.247	196	9.752	195.54	10.098	195.5	11.987	195.028	12.1	195
12.106	194.998	12.131	194.989	13.368	194.5	13.552	194.422	14.546	194
16.068	193.861	20.221	193.5	21.965	193.279	23.426	193.109	24.192	193.012
24.556	193	26.861	192.75	27.645	192.706	29.316	192.518	29.416	192.5
29.506	192.485	32.396	192	32.949	191.722	33.937	191.5	34.197	191.32
34.658	191	34.854	190.864	35.379	190.5	35.415	190.475	35.463	190.442
35.98	190	36.241	189.898	37.009	189.5	37.636	189.334	38.695	189.108
38.835	189.07	39.166	189	40.372	188.984	40.798	188.979	41.887	188.964
41.956	188.964	42.068	188.963	42.255	188.947	44.294	188.825	46.18	188.86
47.674	188.861	48.559	188.839	51.526	188.758	54.03	188.747	54.304	188.749
54.501	188.752	55.281	188.753	56	188.749	59.249	188.824	65.431	188.999
65.605	188.999	65.822	189	65.983	189.021	66.138	189.039	66.807	189.112
70.208	189.492	70.367	189.5	71.725	189.738	73.149	190	73.303	190.08
74.107	190.5	74.61	190.758	75.077	191	75.634	191.285	76.049	191.5
76.655	191.811	77.021	192	77.673	192.334	77.995	192.5	78.828	192.868
79.083	193	79.697	193.399	79.862	193.5	80.534	193.943	80.621	194
81.212	194.39	81.371	194.488	81.391	194.5	82.128	194.953	82.204	195
82.254	195.035	83.09	195.5	83.394	195.714	83.864	196	84.188	196.229
84.631	196.5	85.001	196.761	85.389	197	90.074	197.463	90.438	197.5
91.198	197.561	91.232	197.564	92.376	197.635	95	197.808	97.558	198
99.883	198.288	101.594	198.5	102.63	198.622	107.092	199	107.108	199.001
107.716	199.007	108.213	199.041	108.495	199.051	111.873	199.082	111.934	199.082
111.952	199.083	112.153	199.089	112.202	199.092	112.421	199.104	113.183	199.133
114.574	199.23	115.423	199.276	117.684	199.319	119.08	199.403	120.003	199.38
120.865	199.39	120.978	199.391	121.295	199.383	121.385	199.379	122.064	199.385
122.186	199.384	124.11	199.394						

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.07	35.379	.035	74.107	.07

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
35.379	74.107	20	94	63.5	.3	.5

Ineffective Flow num= 2

Sta L	Sta R	Elev	Permanent
0	35.5	196	F
77.5	124.11	196	F

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	188.91	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	188.91	Reach Len. (m)	23.00	23.00	23.00
Crit W.S. (m)	188.82	Flow Area (m2)		1.81	
E.G. Slope (m/m)	0.000787	Area (m2)		1.81	
Q Total (m3/s)	0.30	Flow (m3/s)		0.30	
Top Width (m)	19.21	Top Width (m)		19.21	
Vel Total (m/s)	0.17	Avg. Vel. (m/s)		0.17	
Max Chl Dpth (m)	0.16	Hydr. Depth (m)		0.09	
Conv. Total (m3/s)	10.7	Conv. (m3/s)		10.7	
Length Wtd. (m)	23.00	Wetted Per. (m)		19.22	
Min Ch El (m)	188.75	Shear (N/m2)		0.73	
Alpha	1.00	Stream Power (N/m s)		0.12	
Frctn Loss (m)	0.05	Cum Volume (1000 m3)		0.10	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.95	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #5-yr

E.G. Elev (m)	188.95	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	188.94	Reach Len. (m)	23.00	23.00	23.00
Crit W.S. (m)	188.84	Flow Area (m2)		2.57	
E.G. Slope (m/m)	0.000930	Area (m2)		2.57	
Q Total (m3/s)	0.55	Flow (m3/s)		0.55	
Top Width (m)	21.18	Top Width (m)		21.18	
Vel Total (m/s)	0.21	Avg. Vel. (m/s)		0.21	
Max Chl Dpth (m)	0.20	Hydr. Depth (m)		0.12	
Conv. Total (m3/s)	18.0	Conv. (m3/s)		18.0	
Length Wtd. (m)	23.00	Wetted Per. (m)		21.19	
Min Ch El (m)	188.75	Shear (N/m2)		1.11	
Alpha	1.00	Stream Power (N/m s)		0.24	
Frctn Loss (m)	0.06	Cum Volume (1000 m3)		0.15	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.12	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than

1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #10-yr

E.G. Elev (m)	188.97	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	188.97	Reach Len. (m)	23.00	23.00	23.00
Crit W.S. (m)	188.86	Flow Area (m2)		3.09	
E.G. Slope (m/m)	0.001030	Area (m2)		3.09	
Q Total (m3/s)	0.75	Flow (m3/s)		0.75	
Top Width (m)	22.70	Top Width (m)		22.70	
Vel Total (m/s)	0.24	Avg. Vel. (m/s)		0.24	
Max Chl Dpth (m)	0.22	Hydr. Depth (m)		0.14	
Conv. Total (m3/s)	23.4	Conv. (m3/s)		23.4	
Length Wtd. (m)	23.00	Wetted Per. (m)		22.71	
Min Ch El (m)	188.75	Shear (N/m2)		1.37	
Alpha	1.00	Stream Power (N/m s)		0.33	
Frctn Loss (m)	0.07	Cum Volume (1000 m3)		0.18	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.23	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #25-yr

E.G. Elev (m)	189.00	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	189.00	Reach Len. (m)	23.00	23.00	23.00
Crit W.S. (m)	188.87	Flow Area (m2)		3.83	
E.G. Slope (m/m)	0.001123	Area (m2)		3.83	
Q Total (m3/s)	1.02	Flow (m3/s)		1.02	
Top Width (m)	26.07	Top Width (m)		26.07	
Vel Total (m/s)	0.27	Avg. Vel. (m/s)		0.27	
Max Chl Dpth (m)	0.25	Hydr. Depth (m)		0.15	
Conv. Total (m3/s)	30.4	Conv. (m3/s)		30.4	
Length Wtd. (m)	23.00	Wetted Per. (m)		26.08	
Min Ch El (m)	188.75	Shear (N/m2)		1.62	
Alpha	1.00	Stream Power (N/m s)		0.43	
Frctn Loss (m)	0.07	Cum Volume (1000 m3)		0.23	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.37	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #50-yr

E.G. Elev (m)	189.02	Element	Left OB	Channel	Right OB
Vel Head (m)	0.00	Wt. n-Val.		0.035	
W.S. Elev (m)	189.01	Reach Len. (m)	23.00	23.00	23.00
Crit W.S. (m)	188.88	Flow Area (m2)		4.24	
E.G. Slope (m/m)	0.001203	Area (m2)		4.24	
Q Total (m3/s)	1.23	Flow (m3/s)		1.23	
Top Width (m)	26.82	Top Width (m)		26.82	
Vel Total (m/s)	0.29	Avg. Vel. (m/s)		0.29	
Max Chl Dpth (m)	0.27	Hydr. Depth (m)		0.16	
Conv. Total (m3/s)	35.5	Conv. (m3/s)		35.5	
Length Wtd. (m)	23.00	Wetted Per. (m)		26.83	
Min Ch El (m)	188.75	Shear (N/m2)		1.87	
Alpha	1.00	Stream Power (N/m s)		0.54	
Frctn Loss (m)	0.08	Cum Volume (1000 m3)		0.26	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.42	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	189.03	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	189.03	Reach Len. (m)	23.00	23.00	23.00
Crit W.S. (m)	188.90	Flow Area (m2)		4.61	
E.G. Slope (m/m)	0.001316	Area (m2)		4.61	
Q Total (m3/s)	1.47	Flow (m3/s)		1.47	
Top Width (m)	27.00	Top Width (m)		27.00	
Vel Total (m/s)	0.32	Avg. Vel. (m/s)		0.32	
Max Chl Dpth (m)	0.28	Hydr. Depth (m)		0.17	
Conv. Total (m3/s)	40.5	Conv. (m3/s)		40.5	
Length Wtd. (m)	23.00	Wetted Per. (m)		27.01	
Min Ch El (m)	188.75	Shear (N/m2)		2.20	
Alpha	1.00	Stream Power (N/m s)		0.70	
Frctn Loss (m)	0.08	Cum Volume (1000 m3)		0.29	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.47	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	189.06	Element	Left OB	Channel	Right OB
Vel Head (m)	0.01	Wt. n-Val.		0.035	
W.S. Elev (m)	189.06	Reach Len. (m)	23.00	23.00	23.00
Crit W.S. (m)	188.91	Flow Area (m2)		5.40	
E.G. Slope (m/m)	0.001354	Area (m2)		5.40	
Q Total (m3/s)	1.92	Flow (m3/s)		1.92	
Top Width (m)	27.39	Top Width (m)		27.39	
Vel Total (m/s)	0.36	Avg. Vel. (m/s)		0.36	
Max Chl Dpth (m)	0.31	Hydr. Depth (m)		0.20	
Conv. Total (m3/s)	52.2	Conv. (m3/s)		52.2	
Length Wtd. (m)	23.00	Wetted Per. (m)		27.41	
Min Ch El (m)	188.75	Shear (N/m2)		2.61	
Alpha	1.00	Stream Power (N/m s)		0.93	
Frctn Loss (m)	0.08	Cum Volume (1000 m3)		0.34	
C & E Loss (m)	0.01	Cum SA (1000 m2)		1.54	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	189.28	Element	Left OB	Channel	Right OB
Vel Head (m)	0.02	Wt. n-Val.		0.035	
W.S. Elev (m)	189.25	Reach Len. (m)	23.00	23.00	23.00
Crit W.S. (m)	189.05	Flow Area (m2)		11.10	
E.G. Slope (m/m)	0.001960	Area (m2)		11.10	
Q Total (m3/s)	7.22	Flow (m3/s)		7.22	
Top Width (m)	30.08	Top Width (m)		30.08	
Vel Total (m/s)	0.65	Avg. Vel. (m/s)		0.65	
Max Chl Dpth (m)	0.51	Hydr. Depth (m)		0.37	
Conv. Total (m3/s)	163.1	Conv. (m3/s)		163.1	
Length Wtd. (m)	23.00	Wetted Per. (m)		30.13	
Min Ch El (m)	188.75	Shear (N/m2)		7.08	
Alpha	1.00	Stream Power (N/m s)		4.61	
Frctn Loss (m)	0.11	Cum Volume (1000 m3)		0.79	
C & E Loss (m)	0.02	Cum SA (1000 m2)		2.04	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
1.4. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

BRIDGE

```
RIVER: DUFFINS
REACH: WC44               RS: 150

INPUT
Description: Proposed bridge - 407 TWY
Distance from Upstream XS =      23
Deck/Roadway Width        =   19.95
Weir Coefficient          =     1.4
Upstream  Deck/Roadway Coordinates
    num=       4
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0   195.8            35.5   195.9  193.76    77.5   196.2  194.06
     124   196.8

Upstream Bridge Cross Section Data
Station Elevation Data    num=     142
     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev
       0 196.722    .634 196.747   1.614 196.737   2.133 196.756   2.813 196.811
   2.859 196.813   3.025 196.785   3.053 196.782   3.065 196.785   3.192 196.747
   3.358 196.703   3.604 196.622   3.806    196.5    4.42 196.376   4.625 196.339
   6.247     196   9.752  195.54  10.098     195.5  11.987 195.028    12.1     195
  12.106 194.998  12.131 194.989  13.368     194.5  13.552 194.422  14.546     194
  16.068 193.861  20.221    193.5  21.965 193.279  23.426 193.109  24.192 193.012
  24.556     193  26.861   192.75  27.645 192.706  29.316 192.518  29.416    192.5
  29.506 192.485  32.396      192  32.949 191.722  33.937    191.5  34.197  191.32
  34.658     191  34.854 190.864  35.379     190.5  35.415 190.475  35.463 190.442
   35.98     190  36.241 189.898  37.009     189.5  37.636 189.334  38.695 189.108
  38.835   189.07  39.166     189  40.372 188.984  40.798 188.979  41.887 188.964
  41.956 188.964  42.068 188.963  42.255 188.947  44.294 188.825   46.18  188.86
  47.674 188.861  48.559 188.839  51.526 188.758   54.03 188.747  54.304 188.749
  54.501 188.752  55.281 188.753      56 188.749  59.249 188.824  65.431 188.999
  65.605 188.999  65.822     189  65.983 189.021  66.138 189.039  66.807 189.112
  70.208 189.492  70.367   189.5  71.725 189.738  73.149     190  73.303  190.08
  74.107    190.5   74.61 190.758  75.077     191  75.634 191.285  76.049    191.5
  76.655 191.811  77.021     192  77.673 192.334  77.995    192.5  78.828 192.868
  79.083     193  79.697 193.399  79.862    193.5  80.534 193.943  80.621     194
  81.212  194.39  81.371 194.488  81.391    194.5  82.128 194.953  82.204     195
  82.254 195.035   83.09    195.5  83.394 195.714  83.864     196  84.188 196.229
  84.631    196.5  85.001 196.761  85.389     197  90.074 197.463  90.438    197.5
  91.198 197.561  91.232 197.564  92.376 197.635      95 197.808  97.558      198
  99.883 198.288 101.594   198.5  102.63 198.622 107.092     199 107.108 199.001
 107.716 199.007 108.213 199.041 108.495 199.051 111.873 199.082 111.934 199.082
 111.952 199.083 112.153 199.089 112.202 199.092 112.421 199.104 113.183 199.133
 114.574  199.23 115.423 199.276 117.684 199.319  119.08 199.403 120.003  199.38
 120.865  199.39 120.978 199.391 121.295 199.383 121.385 199.379 122.064 199.385
 122.186 199.384  124.11 199.394

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .07  35.379    .035  74.107     .07

Bank Sta: Left   Right    Coeff Contr.   Expan.
       35.379  74.107          .3         .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0    35.5     196       F
    77.5  124.11     196       F

Downstream  Deck/Roadway Coordinates
    num=       4
     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord     Sta Hi Cord Lo Cord
       0   195.5              36   195.9  193.76      78   196.2  194.06
     188   196.9

Downstream Bridge Cross Section Data
Station Elevation Data    num=     130
     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev
       0 194.799    3.44    194.5   4.903 194.408   6.217 194.316   7.707   194.2
   9.176 194.103  10.383      194  12.789 193.801  13.806  193.74  14.778 193.669
  15.452 193.648  17.918    193.5  19.083 193.385  19.979  193.27  21.221 193.145
  22.332     193  24.445 192.829  24.895 192.781  27.729   192.5  29.406  192.34
  29.653 192.325  30.913 192.205  31.525  192.14  32.447 192.063  33.003     192
   34.04 191.719  34.847   191.5  34.983 191.463  35.018 191.454  36.469     191
  37.888 190.654   38.61   190.5  40.507 190.102  40.708 190.065  40.807 190.051
  41.308 190.001  41.313     190  42.097 189.884  43.298   189.5  44.052 189.255
  44.852     189  45.407  188.82  45.624 188.787   46.79 188.612  47.154 188.543
  47.384    188.5  47.875  188.47  48.423 188.441   50.09 188.405  50.208 188.408
  50.309  188.41  51.035 188.393  52.174 188.358  53.761 188.307  55.621 188.259
  55.963 188.244  56.151 188.262  56.514 188.249  56.892 188.265   57.15 188.249
  57.295 188.296  58.248     188  58.828 187.732  59.487 187.575  59.559 187.557
  59.695    187.5  59.822 187.487  61.272 187.288  63.144     187  63.463 186.999
  64.866      187  65.727 187.094  66.343 187.319  66.732   187.5  66.855 187.569
  67.736      188  68.538 188.396  68.727    188.5  69.674 188.961  69.745     189
  69.802 189.031  70.952    189.5  71.378 189.613  72.821 189.991  72.862     190
  72.881 190.004  75.273     190.5  75.784 190.684  76.621     191  76.934 191.273
  77.242    191.5  77.565 191.782  77.852     192  78.174 192.282  78.461    192.5
  78.784 192.782  79.071     193  79.393 193.282   79.68    193.5  80.003 193.782
  80.289     194  80.903 194.277  81.423    194.5   82.23 194.765  82.874     195
  83.639 195.252  84.318   195.5  87.862 195.901  88.297     196  94.914 196.375
  97.122    196.5  97.375 196.532 100.958     197 106.417 197.292 106.808    197.3
 109.078 197.375 111.339 197.437 112.754   197.5  118.63  197.72 126.008     198
 134.602 198.381 136.434 198.462 137.219   198.5 137.478 198.512 145.292     199
 146.883 199.106 152.396   199.5  154.11 199.589 163.351     200 169.315 200.014

Manning's n Values        num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .07  57.295    .035  68.538     .07

Bank Sta: Left   Right    Coeff Contr.   Expan.
       57.295  68.538          .3         .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0      36     196       F
      78 169.315     196       F

Upstream Embankment side slope              =       2 horiz. to 1.0 vertical
Downstream Embankment side slope            =       2 horiz. to 1.0 vertical
Maximum allowable submergence for weir flow =     .98
Elevation at which weir flow begins         =   194.5
Energy head used in spillway design         =
Spillway height used in design              =
Weir crest shape                            = Broad Crested

Number of Bridge Coefficient Sets =  1

Low Flow Methods and Data
       Energy
Selected Low Flow Methods = Highest Energy Answer

High Flow Method
       Energy Only

Additional Bridge Parameters
       Add Friction component to Momentum
       Do not add Weight component to Momentum
       Class B flow critical depth computations use critical depth
           inside the bridge at the upstream end
       Criteria to check for pressure flow = Upstream energy grade line

CROSS SECTION


RIVER: DUFFINS
REACH: WC44               RS: 100

INPUT
Description: ST 100 (Updated Sep 2016)
Station Elevation Data    num=     130
     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev     Sta     Elev
       0 194.799    3.44    194.5   4.903 194.408   6.217 194.316   7.707   194.2
   9.176 194.103  10.383      194  12.789 193.801  13.806  193.74  14.778 193.669
  15.452 193.648  17.918    193.5  19.083 193.385  19.979  193.27  21.221 193.145
  22.332     193  24.445 192.829  24.895 192.781  27.729   192.5  29.406  192.34
  29.653 192.325  30.913 192.205  31.525  192.14  32.447 192.063  33.003     192
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  34.04 191.719  34.847   191.5  34.983 191.463  35.018 191.454  36.469     191
 37.888 190.654   38.61   190.5  40.507 190.102  40.708 190.065  40.807 190.051
 41.308 190.001  41.313     190  42.097 189.884  43.298   189.5  44.052 189.255
 44.852     189  45.407  188.82  45.624 188.787   46.79 188.612  47.154 188.543
 47.384   188.5  47.875  188.47  48.423 188.441   50.09 188.405  50.208 188.408
 50.309  188.41  51.035 188.393  52.174 188.358  53.761 188.307  55.621 188.259
 55.963 188.244  56.151 188.262  56.514 188.249  56.892 188.265   57.15 188.249
 57.295 188.296  58.248     188  58.828 187.732  59.487 187.575  59.559 187.557
 59.695   187.5  59.822 187.487  61.272 187.288  63.144     187  63.463 186.999
 64.866     187  65.727 187.094  66.343 187.319  66.732   187.5  66.855 187.569
 67.736     188  68.538 188.396  68.727   188.5  69.674 188.961  69.745     189
 69.802 189.031  70.952   189.5  71.378 189.613  72.821 189.991  72.862     190
 72.881 190.004  75.273   190.5  75.784 190.684  76.621     191  76.934 191.273
 77.242   191.5  77.565 191.782  77.852     192  78.174 192.282  78.461   192.5
 78.784 192.782  79.071     193  79.393 193.282   79.68   193.5  80.003 193.782
 80.289     194  80.903 194.277  81.423   194.5   82.23 194.765  82.874     195
 83.639 195.252  84.318   195.5  87.862 195.901  88.297     196  94.914 196.375
 97.122   196.5  97.375 196.532 100.958     197 106.417 197.292 106.808   197.3
109.078 197.375 111.339 197.437 112.754   197.5  118.63  197.72 126.008     198
134.602 198.381 136.434 198.462 137.219   198.5 137.478 198.512 145.292     199
146.883 199.106 152.396   199.5  154.11 199.589 163.351     200 169.315 200.014

Manning's n Values         num=       3
     Sta   n Val     Sta   n Val     Sta   n Val
       0     .07  57.295    .035  68.538     .07

Bank Sta: Left   Right    Lengths: Left Channel   Right     Coeff Contr.   Expan.
        57.295  68.538             40.5    50.5    64.5             .3      .5
Ineffective Flow     num=       2
   Sta L   Sta R    Elev  Permanent
       0      36     196       F
      78 169.315     196       F

CROSS SECTION OUTPUT  Profile #2-yr

  E.G. Elev (m)           187.19    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.02    Wt. n-Val.                         0.035
  W.S. Elev (m)           187.17    Reach Len. (m)           40.50      50.50      64.50
  Crit W.S. (m)           187.12    Flow Area (m2)                      0.51
  E.G. Slope (m/m)      0.006444    Area (m2)                           0.51
  Q Total (m3/s)            0.30    Flow (m3/s)                         0.30
  Top Width (m)             3.92    Top Width (m)                       3.92
  Vel Total (m/s)           0.59    Avg. Vel. (m/s)                     0.59
  Max Chl Dpth (m)          0.17    Hydr. Depth (m)                     0.13
  Conv. Total (m3/s)         3.7    Conv. (m3/s)                         3.7
  Length Wtd. (m)          50.50    Wetted Per. (m)                     3.95
  Min Ch El (m)           187.00    Shear (N/m2)                        8.18
  Alpha                     1.00    Stream Power (N/m s)                4.80
  Frctn Loss (m)            0.61    Cum Volume (1000 m3)                0.02
  C & E Loss (m)            0.00    Cum SA (1000 m2)                    0.24


Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
         1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate
         the need for additional cross sections.
Note:    Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT  Profile #5-yr

  E.G. Elev (m)           187.26    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.03    Wt. n-Val.                         0.035
  W.S. Elev (m)           187.23    Reach Len. (m)           40.50      50.50      64.50
  Crit W.S. (m)           187.17    Flow Area (m2)                      0.76
  E.G. Slope (m/m)      0.006897    Area (m2)                           0.76
  Q Total (m3/s)            0.55    Flow (m3/s)                         0.55
  Top Width (m)             4.47    Top Width (m)                       4.47
  Vel Total (m/s)           0.72    Avg. Vel. (m/s)                     0.72
  Max Chl Dpth (m)          0.23    Hydr. Depth (m)                     0.17
  Conv. Total (m3/s)         6.6    Conv. (m3/s)                         6.6
  Length Wtd. (m)          50.50    Wetted Per. (m)                     4.51
  Min Ch El (m)           187.00    Shear (N/m2)                       11.39
  Alpha                     1.00    Stream Power (N/m s)                8.24
  Frctn Loss (m)            0.63    Cum Volume (1000 m3)                0.03
  C & E Loss (m)            0.01    Cum SA (1000 m2)                    0.27


Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
         1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate
         the need for additional cross sections.
Note:    Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT  Profile #10-yr

  E.G. Elev (m)           187.30    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.03    Wt. n-Val.                         0.035
  W.S. Elev (m)           187.27    Reach Len. (m)           40.50      50.50      64.50
  Crit W.S. (m)           187.20    Flow Area (m2)                      0.92
  E.G. Slope (m/m)      0.007563    Area (m2)                           0.92
  Q Total (m3/s)            0.75    Flow (m3/s)                         0.75
  Top Width (m)             4.78    Top Width (m)                       4.78
  Vel Total (m/s)           0.82    Avg. Vel. (m/s)                     0.82
  Max Chl Dpth (m)          0.27    Hydr. Depth (m)                     0.19
  Conv. Total (m3/s)         8.6    Conv. (m3/s)                         8.6
  Length Wtd. (m)          50.50    Wetted Per. (m)                     4.83
  Min Ch El (m)           187.00    Shear (N/m2)                       14.04
  Alpha                     1.00    Stream Power (N/m s)               11.51
  Frctn Loss (m)            0.64    Cum Volume (1000 m3)                0.04
  C & E Loss (m)            0.01    Cum SA (1000 m2)                    0.29


Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
         1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate
         the need for additional cross sections.
Note:    Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT  Profile #25-yr

  E.G. Elev (m)           187.35    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.04    Wt. n-Val.                         0.035
  W.S. Elev (m)           187.31    Reach Len. (m)           40.50      50.50      64.50
  Crit W.S. (m)           187.24    Flow Area (m2)                      1.12
  E.G. Slope (m/m)      0.007993    Area (m2)                           1.12
  Q Total (m3/s)            1.02    Flow (m3/s)                         1.02
  Top Width (m)             5.17    Top Width (m)                       5.17
  Vel Total (m/s)           0.91    Avg. Vel. (m/s)                     0.91
  Max Chl Dpth (m)          0.31    Hydr. Depth (m)                     0.22
  Conv. Total (m3/s)        11.4    Conv. (m3/s)                        11.4
  Length Wtd. (m)          50.50    Wetted Per. (m)                     5.23
  Min Ch El (m)           187.00    Shear (N/m2)                       16.74
  Alpha                     1.00    Stream Power (N/m s)               15.28
  Frctn Loss (m)            0.65    Cum Volume (1000 m3)                0.05
  C & E Loss (m)            0.01    Cum SA (1000 m2)                    0.32


Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than
         1.4.  This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section.  This may indicate
         the need for additional cross sections.
Note:    Multiple critical depths were found at this location.  The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT  Profile #50-yr

  E.G. Elev (m)           187.38    Element                 Left OB    Channel   Right OB
  Vel Head (m)              0.05    Wt. n-Val.                         0.035
  W.S. Elev (m)           187.33    Reach Len. (m)           40.50      50.50      64.50
  Crit W.S. (m)           187.26    Flow Area (m2)                      1.26
  E.G. Slope (m/m)      0.008346    Area (m2)                           1.26
  Q Total (m3/s)            1.23    Flow (m3/s)                         1.23
  Top Width (m)             5.43    Top Width (m)                       5.43
  Vel Total (m/s)           0.98    Avg. Vel. (m/s)                     0.98
  Max Chl Dpth (m)          0.33    Hydr. Depth (m)                     0.23
```

Conv. Total (m3/s)	13.5	Conv. (m3/s)	13.5
Length Wtd. (m)	50.50	Wetted Per. (m)	5.50
Min Ch El (m)	187.00	Shear (N/m2)	18.74
Alpha	1.00	Stream Power (N/m s)	18.30
Frctn Loss (m)	0.66	Cum Volume (1000 m3)	0.06
C & E Loss (m)	0.01	Cum SA (1000 m2)	0.33

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #100-yr

E.G. Elev (m)	187.42	Element	Left OB	Channel	Right OB
Vel Head (m)	0.06	Wt. n-Val.		0.035	
W.S. Elev (m)	187.36	Reach Len. (m)	40.50	50.50	64.50
Crit W.S. (m)	187.29	Flow Area (m2)		1.41	
E.G. Slope (m/m)	0.008744	Area (m2)		1.41	
Q Total (m3/s)	1.47	Flow (m3/s)		1.47	
Top Width (m)	5.68	Top Width (m)		5.68	
Vel Total (m/s)	1.04	Avg. Vel. (m/s)		1.04	
Max Chl Dpth (m)	0.36	Hydr. Depth (m)		0.25	
Conv. Total (m3/s)	15.7	Conv. (m3/s)		15.7	
Length Wtd. (m)	50.50	Wetted Per. (m)		5.76	
Min Ch El (m)	187.00	Shear (N/m2)		20.95	
Alpha	1.00	Stream Power (N/m s)		21.88	
Frctn Loss (m)	0.67	Cum Volume (1000 m3)		0.07	
C & E Loss (m)	0.01	Cum SA (1000 m2)		0.35	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #Check Flow

E.G. Elev (m)	187.47	Element	Left OB	Channel	Right OB
Vel Head (m)	0.07	Wt. n-Val.		0.035	
W.S. Elev (m)	187.40	Reach Len. (m)	40.50	50.50	64.50
Crit W.S. (m)	187.33	Flow Area (m2)		1.67	
E.G. Slope (m/m)	0.009353	Area (m2)		1.67	
Q Total (m3/s)	1.92	Flow (m3/s)		1.92	
Top Width (m)	6.09	Top Width (m)		6.09	
Vel Total (m/s)	1.15	Avg. Vel. (m/s)		1.15	
Max Chl Dpth (m)	0.40	Hydr. Depth (m)		0.27	
Conv. Total (m3/s)	19.9	Conv. (m3/s)		19.9	
Length Wtd. (m)	50.50	Wetted Per. (m)		6.19	
Min Ch El (m)	187.00	Shear (N/m2)		24.70	
Alpha	1.00	Stream Power (N/m s)		28.46	
Frctn Loss (m)	0.69	Cum Volume (1000 m3)		0.08	
C & E Loss (m)	0.00	Cum SA (1000 m2)		0.38	

Warning: The conveyance ratio (upstream conveyance divided by downstream conveyance) is less than 0.7 or greater than 1.4. This may indicate the need for additional cross sections.
Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION OUTPUT Profile #Regional

E.G. Elev (m)	187.88	Element	Left OB	Channel	Right OB
Vel Head (m)	0.19	Wt. n-Val.		0.035	
W.S. Elev (m)	187.69	Reach Len. (m)	40.50	50.50	64.50
Crit W.S. (m)	187.65	Flow Area (m2)		3.72	
E.G. Slope (m/m)	0.013385	Area (m2)		3.72	
Q Total (m3/s)	7.22	Flow (m3/s)		7.22	
Top Width (m)	8.09	Top Width (m)		8.09	
Vel Total (m/s)	1.94	Avg. Vel. (m/s)		1.94	
Max Chl Dpth (m)	0.69	Hydr. Depth (m)		0.46	
Conv. Total (m3/s)	62.4	Conv. (m3/s)		62.4	
Length Wtd. (m)	50.50	Wetted Per. (m)		8.29	
Min Ch El (m)	187.00	Shear (N/m2)		58.97	
Alpha	1.00	Stream Power (N/m s)		114.34	
Frctn Loss (m)	0.78	Cum Volume (1000 m3)		0.20	
C & E Loss (m)	0.02	Cum SA (1000 m2)		0.55	

Warning: The energy loss was greater than 1.0 ft (0.3 m). between the current and previous cross section. This may indicate the need for additional cross sections.
Note: Multiple critical depths were found at this location. The critical depth with the lowest, valid, water surface was used.

CROSS SECTION

RIVER: DUFFINS
REACH: WC44 RS: 10

INPUT
Description: ST 10 (Updated Sep 2016)
Station Elevation Data num= 128

Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev	Sta	Elev
0	195.19	1.225	195.162	2.114	195.141	7.369	195	11.233	194.881
15.526	194.78	21.821	194.612	24.115	194.548	25.048	194.526	25.198	194.526
25.378	194.524	25.541	194.523	26.156	194.5	28.719	194.274	32.116	194
33.592	193.835	36.867	193.5	38.665	193.351	41.709	193.107	43.189	193
50.658	192.79	58.667	192.568	58.901	192.563	59.947	192.535	60.14	192.529
60.413	192.522	60.559	192.519	61.503	192.5	62.033	192.482	63.419	192.346
66.306	192.061	66.621	192.03	66.896	192	67.171	191.951	69.696	191.5
71.183	191.285	72.307	191	73.681	190.627	73.989	190.5	74.481	190.173
74.764	190	74.959	189.88	75.579	189.5	76.001	189.241	76.394	189
76.758	188.777	77.21	188.5	78.901	188.092	79.366	188	79.823	187.91
82.507	187.5	85.498	187.238	85.942	187.205	88.888	187	90.956	186.849
92.037	186.799	95.881	186.586	97.299	186.5	99.7	186.434	99.827	186.431
100.691	186.455	102.331	186.5	103.031	186.771	103.528	186.921	103.797	187
104.172	187.176	104.59	187.4	104.788	187.5	105.671	187.946	105.779	188
106.688	188.459	106.77	188.5	107.662	188.953	107.753	189	108.554	189.416
108.717	189.5	109.45	189.88	109.681	190	110.356	190.35	110.646	190.5
111.27	190.824	111.607	191	112.17	191.305	112.523	191.5	112.97	191.746
113.43	192	113.7	192.149	114.193	192.421	114.328	192.5	114.57	192.642
115.182	193	115.684	193.274	115.768	193.313	116.122	193.467	116.236	193.5
117.671	193.914	117.984	194	119.123	194.326	119.766	194.5	120.949	194.653
121.292	194.666	122.441	194.71	124.241	195	126.762	195.304	127.504	195.383
128.179	195.5	128.987	195.614	131.8	196	135.937	196.24	136.636	196.279
141.073	196.494	142.368	196.497	142.478	196.5	148.473	196.971	148.85	197
149.089	197.02	156.363	197.5	156.404	197.503	157.635	197.586	163.671	197.986
163.892	198	166.622	198.157	172.797	198.5	176.687	198.681	183.273	199
193.477	199.359	197.24	199.5	199.799	199.553				

Manning's n Values num= 3

Sta	n Val	Sta	n Val	Sta	n Val
0	.08	82.507	.035	104.788	.08

Bank Sta: Left	Right	Lengths: Left Channel	Right	Coeff Contr.	Expan.
82.507	104.788	0	0	.3	.5

CROSS SECTION OUTPUT Profile #2-yr

E.G. Elev (m)	186.57	Element	Left OB	Channel	Right OB
Vel Head (m)	0.03	Wt. n-Val.		0.035	
W.S. Elev (m)	186.54	Reach Len. (m)			
Crit W.S. (m)	186.54	Flow Area (m2)		0.37	
E.G. Slope (m/m)	0.030213	Area (m2)		0.37	
Q Total (m3/s)	0.30	Flow (m3/s)		0.30	
Top Width (m)	5.74	Top Width (m)		5.74	
Vel Total (m/s)	0.80	Avg. Vel. (m/s)		0.80	
Max Chl Dpth (m)	0.11	Hydr. Depth (m)		0.07	
Conv. Total (m3/s)	1.7	Conv. (m3/s)		1.7	
Length Wtd. (m)		Wetted Per. (m)		5.75	

Min Ch El (m)	186.43	Shear (N/m2)	19.26
Alpha	1.00	Stream Power (N/m s)	15.46
Frctn Loss (m)		Cum Volume (1000 m3)	
C & E Loss (m)		Cum SA (1000 m2)	

CROSS SECTION OUTPUT Profile #5-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	186.62	Element			
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	186.57	Reach Len. (m)			
Crit W.S. (m)	186.57	Flow Area (m2)		0.57	
E.G. Slope (m/m)	0.028703	Area (m2)		0.57	
Q Total (m3/s)	0.55	Flow (m3/s)		0.55	
Top Width (m)	6.35	Top Width (m)		6.35	
Vel Total (m/s)	0.97	Avg. Vel. (m/s)		0.97	
Max Chl Dpth (m)	0.14	Hydr. Depth (m)		0.09	
Conv. Total (m3/s)	3.2	Conv. (m3/s)		3.2	
Length Wtd. (m)		Wetted Per. (m)		6.37	
Min Ch El (m)	186.43	Shear (N/m2)		25.13	
Alpha	1.00	Stream Power (N/m s)		24.30	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #10-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	186.65	Element			
Vel Head (m)	0.05	Wt. n-Val.		0.035	
W.S. Elev (m)	186.59	Reach Len. (m)			
Crit W.S. (m)	186.59	Flow Area (m2)		0.73	
E.G. Slope (m/m)	0.025903	Area (m2)		0.73	
Q Total (m3/s)	0.75	Flow (m3/s)		0.75	
Top Width (m)	6.82	Top Width (m)		6.82	
Vel Total (m/s)	1.03	Avg. Vel. (m/s)		1.03	
Max Chl Dpth (m)	0.16	Hydr. Depth (m)		0.11	
Conv. Total (m3/s)	4.7	Conv. (m3/s)		4.7	
Length Wtd. (m)		Wetted Per. (m)		6.85	
Min Ch El (m)	186.43	Shear (N/m2)		26.98	
Alpha	1.00	Stream Power (N/m s)		27.83	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #25-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	186.68	Element			
Vel Head (m)	0.06	Wt. n-Val.		0.035	
W.S. Elev (m)	186.62	Reach Len. (m)			
Crit W.S. (m)	186.62	Flow Area (m2)		0.92	
E.G. Slope (m/m)	0.024048	Area (m2)		0.92	
Q Total (m3/s)	1.02	Flow (m3/s)		1.02	
Top Width (m)	7.39	Top Width (m)		7.39	
Vel Total (m/s)	1.10	Avg. Vel. (m/s)		1.10	
Max Chl Dpth (m)	0.19	Hydr. Depth (m)		0.12	
Conv. Total (m3/s)	6.6	Conv. (m3/s)		6.6	
Length Wtd. (m)		Wetted Per. (m)		7.42	
Min Ch El (m)	186.43	Shear (N/m2)		29.35	
Alpha	1.00	Stream Power (N/m s)		32.41	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #50-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	186.71	Element			
Vel Head (m)	0.07	Wt. n-Val.		0.035	
W.S. Elev (m)	186.64	Reach Len. (m)			
Crit W.S. (m)	186.64	Flow Area (m2)		1.07	
E.G. Slope (m/m)	0.023254	Area (m2)		1.07	
Q Total (m3/s)	1.23	Flow (m3/s)		1.23	
Top Width (m)	7.78	Top Width (m)		7.78	
Vel Total (m/s)	1.15	Avg. Vel. (m/s)		1.15	
Max Chl Dpth (m)	0.21	Hydr. Depth (m)		0.14	
Conv. Total (m3/s)	8.1	Conv. (m3/s)		8.1	
Length Wtd. (m)		Wetted Per. (m)		7.81	
Min Ch El (m)	186.43	Shear (N/m2)		31.10	
Alpha	1.00	Stream Power (N/m s)		35.90	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #100-yr

			Left OB	Channel	Right OB
E.G. Elev (m)	186.73	Element			
Vel Head (m)	0.07	Wt. n-Val.		0.035	
W.S. Elev (m)	186.66	Reach Len. (m)			
Crit W.S. (m)	186.66	Flow Area (m2)		1.22	
E.G. Slope (m/m)	0.022624	Area (m2)		1.22	
Q Total (m3/s)	1.47	Flow (m3/s)		1.47	
Top Width (m)	8.18	Top Width (m)		8.18	
Vel Total (m/s)	1.21	Avg. Vel. (m/s)		1.21	
Max Chl Dpth (m)	0.23	Hydr. Depth (m)		0.15	
Conv. Total (m3/s)	9.8	Conv. (m3/s)		9.8	
Length Wtd. (m)		Wetted Per. (m)		8.22	
Min Ch El (m)	186.43	Shear (N/m2)		32.94	
Alpha	1.00	Stream Power (N/m s)		39.70	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Check Flow

			Left OB	Channel	Right OB
E.G. Elev (m)	186.78	Element			
Vel Head (m)	0.08	Wt. n-Val.		0.035	
W.S. Elev (m)	186.69	Reach Len. (m)			
Crit W.S. (m)	186.69	Flow Area (m2)		1.49	
E.G. Slope (m/m)	0.021773	Area (m2)		1.49	
Q Total (m3/s)	1.92	Flow (m3/s)		1.92	
Top Width (m)	8.85	Top Width (m)		8.85	
Vel Total (m/s)	1.28	Avg. Vel. (m/s)		1.28	
Max Chl Dpth (m)	0.26	Hydr. Depth (m)		0.17	
Conv. Total (m3/s)	13.0	Conv. (m3/s)		13.0	
Length Wtd. (m)		Wetted Per. (m)		8.89	
Min Ch El (m)	186.43	Shear (N/m2)		35.91	
Alpha	1.00	Stream Power (N/m s)		46.12	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

CROSS SECTION OUTPUT Profile #Regional

			Left OB	Channel	Right OB
E.G. Elev (m)	187.08	Element			
Vel Head (m)	0.15	Wt. n-Val.		0.035	
W.S. Elev (m)	186.93	Reach Len. (m)			
Crit W.S. (m)	186.93	Flow Area (m2)		4.18	
E.G. Slope (m/m)	0.017938	Area (m2)		4.18	
Q Total (m3/s)	7.22	Flow (m3/s)		7.22	
Top Width (m)	13.68	Top Width (m)		13.68	
Vel Total (m/s)	1.73	Avg. Vel. (m/s)		1.73	
Max Chl Dpth (m)	0.50	Hydr. Depth (m)		0.31	
Conv. Total (m3/s)	53.9	Conv. (m3/s)		53.9	
Length Wtd. (m)		Wetted Per. (m)		13.76	
Min Ch El (m)	186.43	Shear (N/m2)		53.39	
Alpha	1.00	Stream Power (N/m s)		92.27	
Frctn Loss (m)		Cum Volume (1000 m3)			
C & E Loss (m)		Cum SA (1000 m2)			

SUMMARY OF MANNING'S N VALUES

River:DUFFINS

Reach	River Sta.	n1	n2	n3
WC44	400	.07	.035	.07
WC44	350	Bridge		
WC44	300	.07	.035	.07
WC44	200	.07	.035	.07
WC44	150	Bridge		
WC44	100	.07	.035	.07
WC44	10	.08	.035	.08

SUMMARY OF REACH LENGTHS

River: DUFFINS

Reach	River Sta.	Left	Channel	Right
WC44	400	77	83	75
WC44	350	Bridge		
WC44	300	34	35	33.1
WC44	200	20	94	63.5
WC44	150	Bridge		
WC44	100	40.5	50.5	64.5
WC44	10	0	0	0

SUMMARY OF CONTRACTION AND EXPANSION COEFFICIENTS
River: DUFFINS

Reach	River Sta.	Contr.	Expan.
WC44	400	.3	.5
WC44	350	Bridge	
WC44	300	.3	.5
WC44	200	.3	.5
WC44	150	Bridge	
WC44	100	.3	.5
WC44	10	.3	.5

Profile Output Table - Standard Table 1

Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
WC44	400	2-yr	0.30	191.49	191.63	191.55	191.64	0.000823	0.21	1.46	11.65	0.18
WC44	400	5-yr	0.55	191.49	191.68	191.56	191.69	0.000956	0.27	2.05	12.23	0.21
WC44	400	10-yr	0.75	191.49	191.71	191.57	191.71	0.001130	0.32	2.37	12.54	0.23
WC44	400	25-yr	1.02	191.49	191.74	191.61	191.75	0.001280	0.37	2.78	12.91	0.25
WC44	400	50-yr	1.23	191.49	191.76	191.61	191.77	0.001392	0.40	3.06	13.16	0.27
WC44	400	100-yr	1.47	191.49	191.79	191.62	191.80	0.001467	0.43	3.38	13.44	0.28
WC44	400	Check Flow	1.92	191.49	191.83	191.65	191.84	0.001608	0.49	3.91	13.90	0.30
WC44	400	Regional	7.22	191.49	192.13	191.85	192.15	0.001892	0.68	10.74	27.77	0.34
WC44	350		Bridge									
WC44	300	2-yr	0.30	189.46	189.56	189.56	189.60	0.042317	0.95	0.32	4.83	1.19
WC44	300	5-yr	0.55	189.46	189.60	189.60	189.65	0.026003	0.99	0.56	5.61	1.00
WC44	300	10-yr	0.75	189.46	189.63	189.63	189.68	0.024694	1.07	0.70	6.05	1.00
WC44	300	25-yr	1.02	189.46	189.66	189.66	189.72	0.023532	1.14	0.89	6.65	1.00
WC44	300	50-yr	1.23	189.46	189.68	189.68	189.75	0.022796	1.20	1.03	6.99	1.00
WC44	300	100-yr	1.47	189.46	189.70	189.70	189.78	0.022316	1.25	1.17	7.33	1.00
WC44	300	Check Flow	1.92	189.46	189.73	189.73	189.82	0.021707	1.33	1.45	8.10	1.00
WC44	300	Regional	7.22	189.46	190.00	190.00	190.14	0.018779	1.67	4.33	15.42	1.01
WC44	200	2-yr	0.30	188.75	188.91	188.82	188.91	0.000787	0.17	1.81	19.21	0.17
WC44	200	5-yr	0.55	188.75	188.94	188.84	188.95	0.000930	0.21	2.57	21.18	0.20
WC44	200	10-yr	0.75	188.75	188.97	188.86	188.97	0.001030	0.24	3.09	22.70	0.21
WC44	200	25-yr	1.02	188.75	189.00	188.87	189.00	0.001123	0.27	3.83	26.07	0.22
WC44	200	50-yr	1.23	188.75	189.01	188.88	189.02	0.001203	0.29	4.24	26.82	0.23
WC44	200	100-yr	1.47	188.75	189.03	188.90	189.03	0.001316	0.32	4.61	27.00	0.25
WC44	200	Check Flow	1.92	188.75	189.06	188.91	189.06	0.001354	0.36	5.40	27.39	0.26
WC44	200	Regional	7.22	188.75	189.25	189.05	189.28	0.001960	0.65	11.10	30.08	0.34
WC44	150		Bridge									
WC44	100	2-yr	0.30	187.00	187.17	187.12	187.19	0.006444	0.59	0.51	3.92	0.52
WC44	100	5-yr	0.55	187.00	187.23	187.17	187.26	0.006897	0.72	0.76	4.47	0.56
WC44	100	10-yr	0.75	187.00	187.27	187.20	187.30	0.007563	0.82	0.92	4.78	0.60
WC44	100	25-yr	1.02	187.00	187.31	187.24	187.35	0.007993	0.91	1.12	5.17	0.63
WC44	100	50-yr	1.23	187.00	187.33	187.26	187.38	0.008346	0.98	1.26	5.43	0.65
WC44	100	100-yr	1.47	187.00	187.36	187.29	187.42	0.008744	1.04	1.41	5.68	0.67
WC44	100	Check Flow	1.92	187.00	187.40	187.33	187.47	0.009353	1.15	1.67	6.09	0.70
WC44	100	Regional	7.22	187.00	187.69	187.65	187.88	0.013385	1.94	3.72	8.09	0.91
WC44	10	2-yr	0.30	186.43	186.54	186.54	186.57	0.030213	0.80	0.37	5.74	1.00
WC44	10	5-yr	0.55	186.43	186.57	186.57	186.62	0.028703	0.97	0.57	6.35	1.03
WC44	10	10-yr	0.75	186.43	186.59	186.59	186.65	0.025903	1.03	0.73	6.82	1.01
WC44	10	25-yr	1.02	186.43	186.62	186.62	186.68	0.024048	1.10	0.92	7.39	1.00
WC44	10	50-yr	1.23	186.43	186.64	186.64	186.71	0.023254	1.15	1.07	7.78	1.00
WC44	10	100-yr	1.47	186.43	186.66	186.66	186.73	0.022624	1.21	1.22	8.18	1.00
WC44	10	Check Flow	1.92	186.43	186.69	186.69	186.78	0.021773	1.28	1.49	8.85	1.00
WC44	10	Regional	7.22	186.43	186.93	186.93	187.08	0.017938	1.73	4.18	13.68	1.00

Profile Output Table - Standard Table 2

Reach	River Sta	Profile	E.G. Elev (m)	W.S. Elev (m)	Vel Head (m)	Frctn Loss (m)	C & E Loss (m)	Q Left (m3/s)	Q Channel (m3/s)	Q Right (m3/s)	Top Width (m)
WC44	400	2-yr	191.64	191.63	0.00	0.06	0.01		0.30		11.65
WC44	400	5-yr	191.69	191.68	0.00	0.07	0.01		0.55		12.23
WC44	400	10-yr	191.71	191.71	0.01	0.08	0.01		0.75		12.54
WC44	400	25-yr	191.75	191.74	0.01	0.09	0.01		1.02		12.91
WC44	400	50-yr	191.77	191.76	0.01	0.09	0.01		1.23		13.16
WC44	400	100-yr	191.80	191.79	0.01	0.10	0.01		1.47		13.44
WC44	400	Check Flow	191.84	191.83	0.01	0.10	0.02		1.92		13.90
WC44	400	Regional	192.15	192.13	0.02	0.11	0.04	0.01	7.21	0.00	27.77
WC44	350		Bridge								
WC44	300	2-yr	189.60	189.56	0.05	0.09	0.02		0.30		4.83
WC44	300	5-yr	189.65	189.60	0.05	0.09	0.02		0.55		5.61
WC44	300	10-yr	189.68	189.63	0.06	0.10	0.03		0.75		6.05
WC44	300	25-yr	189.72	189.66	0.07	0.11	0.03		1.02		6.65
WC44	300	50-yr	189.75	189.68	0.07	0.11	0.03		1.23		6.99
WC44	300	100-yr	189.78	189.70	0.08	0.12	0.04		1.47		7.33
WC44	300	Check Flow	189.82	189.73	0.09	0.12	0.04		1.92		8.10
WC44	300	Regional	190.14	190.00	0.14	0.16	0.06		7.22		15.42
WC44	200	2-yr	188.91	188.91	0.00	0.05	0.01		0.30		19.21
WC44	200	5-yr	188.95	188.94	0.00	0.06	0.01		0.55		21.18
WC44	200	10-yr	188.97	188.97	0.00	0.07	0.01		0.75		22.70
WC44	200	25-yr	189.00	189.00	0.00	0.07	0.01		1.02		26.07
WC44	200	50-yr	189.02	189.01	0.00	0.08	0.01		1.23		26.82
WC44	200	100-yr	189.03	189.03	0.01	0.08	0.01		1.47		27.00
WC44	200	Check Flow	189.06	189.06	0.01	0.08	0.01		1.92		27.39
WC44	200	Regional	189.28	189.25	0.02	0.11	0.02		7.22		30.08
WC44	150		Bridge								
WC44	100	2-yr	187.19	187.17	0.02	0.61	0.00		0.30		3.92
WC44	100	5-yr	187.26	187.23	0.03	0.63	0.01		0.55		4.47
WC44	100	10-yr	187.30	187.27	0.03	0.64	0.01		0.75		4.78
WC44	100	25-yr	187.35	187.31	0.04	0.65	0.01		1.02		5.17
WC44	100	50-yr	187.38	187.33	0.05	0.66	0.01		1.23		5.43
WC44	100	100-yr	187.42	187.36	0.06	0.67	0.01		1.47		5.68
WC44	100	Check Flow	187.47	187.40	0.07	0.69	0.00		1.92		6.09

WC44	100	Regional	187.88	187.69	0.19	0.78	0.02	7.22	8.09
WC44	10	2-yr	186.57	186.54	0.03			0.30	5.74
WC44	10	5-yr	186.62	186.57	0.05			0.55	6.35
WC44	10	10-yr	186.65	186.59	0.05			0.75	6.82
WC44	10	25-yr	186.68	186.62	0.06			1.02	7.39
WC44	10	50-yr	186.71	186.64	0.07			1.23	7.78
WC44	10	100-yr	186.73	186.66	0.07			1.47	8.18
WC44	10	Check Flow	186.78	186.69	0.08			1.92	8.85
WC44	10	Regional	187.08	186.93	0.15			7.22	13.68

Profile Output Table - Culvert Only

Reach	River Sta	Profile	E.G. US. (m)	W.S. US. (m)	E.G. IC (m)	E.G. OC (m)	Min El Weir Flow (m)	Q Culv Group (m3/s)	Q Weir (m3/s)	Delta WS (m)	Culv Vel US (m/s)	Culv Vel DS (m/s)