

D.G. Biddle & Associates Limited

consulting engineers and planners

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October 17, 2018 REV January 29, 2020, August 27, 2021 REV November 22, 2023

Township of Cavan Monaghan 988 County Road 10 Millbrook ON LOA 1G0

Attention: Ms. Karen Ellis, Director of Planning

Re: Preliminary Functional Servicing & Stormwater Management Report

Veltri West Lands Turner Street

Millbrook (Township of Cavan-Monaghan) ON

Our File: 115040

Dear Ms. Ellis:

In support of the application for Draft Plan of Subdivision on the above referenced property, we respectfully submit the following Preliminary Functional Servicing and Stormwater Management Report.

This report is intended to be reviewed by the Township of Cavan Monaghan and the Otanabee Regional Conservation Authority to confirm that the necessary infrastructure is available to service the subject lands. It will also discuss how stormwater runoff for the development will be treated prior to its discharge to a tributary of Little Creek. Upon review of the report, we believe the approval agencies will be in a position to issue positive comments and conditions of draft approval for the Plan of Subdivision.

Please contact our office at your convenience, should you have any questions or require additional information on the enclosed report.

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Yours truly,

D.G. BIDDLE & ASSOCIATES LIMITED

P. Noull

D.D. McNaull, P. Eng Civil Design Engineer

MBC/DDM/ddm

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PRELIMINARY STORMWATER DRAINAGE AND FUNCTIONAL SERVICING REPORT

FOR THE VELTRI GROUP

DRAFT PLAN OF SUBDIVISION VELTRI WEST LANDS

VILLAGE OF MILLBROOK TOWNSHIP OF CAVAN-MONAGHAN

> DATE: OCT 2018 REV: JANUARY 2020 REV: AUGUST 2021

REV: NOVEMBER 2023

PROJECT NO. 115040

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115040-SG-1	-	Conceptual Site Grading Plan

FIGURE 1

1.0 INTRODUCTION

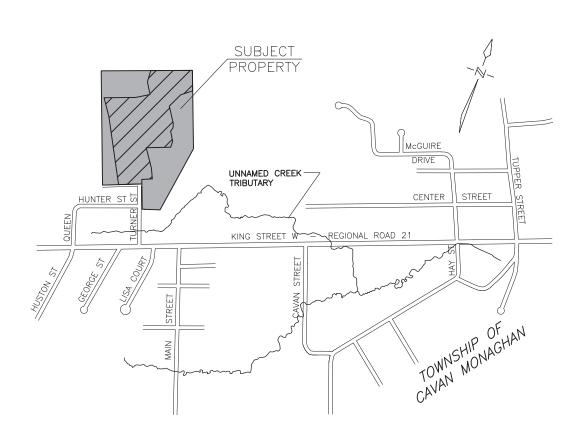
1.1 Purpose

This Preliminary Functional Servicing and Stormwater Management Report has been prepared to review the infrastructure requirements to provide services for the proposed Draft Plan of Subdivision. It will address sanitary sewer services, watermain services, and storm water drainage works required to proceed with the development. This report will also discuss the storm water quality and quantity control objectives for a tributary of Little Creek in accordance with the requirements of the Otanabee Regional Conservation Authority.

1.2 Site Location and Description

The study area forms part of Lot 13, Concession 5, in the former Geographic Township of Cavan, now the Township of Cavan-Monaghan, and County of Peterborough. The development is bound on the north by vegetated/forest lands, on the west by the demolished correctional facility, on the east by vegetated/forest lands and abandoned rail corridor and on the south by existing residential lands. A Site Location Plan, Figure 1, illustrates the site in relation to the surrounding areas. A copy of the Draft Plan of Subdivision is attached at the end of this report as drawing 115040 DP-1.

The current site consists primarily of a sloped open field with a total relief of approximately 28m. The majority of the site drains primarily in an easterly direction to a tributary of Little Creek. Locally, a small portion of land drains to the existing ditch on Turner Street before discharging to the Little Creek tributary.



VELTRI WEST LANDS - TURNER STREET

SITE LOCATION PLAN



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consulting engineers and planners 96 KING STREET EAST • OSHAWA,ON • L1H 1B6 PHONE (905)576-8500 • FAX (905)576-9730 info@dgbiddle.com SCALE N.T.S.
DRAWN G.M.C.
DESIGN G.M.C.
CHECKED M.B.C.
DATE MAR 2018

PROJECT 115040

FIG 1

2.0 <u>SITE SERVICING</u>

2.1 Water Distribution System

The existing water distribution infrastructure consists of a 150mm watermain located at the existing limit of Turner Street road allowance. The Municipality recently upgraded the watermain on King Street to 250mm. The proposal is to connect to the new 250mm main on King Street and extend a 200mm watermain to the subdivision, replacing the existing 150mm main on Turner Street. The proposed 200mm watermain connection is illustrated on the Conceptual Site Servicing Plan, drawing 115040 SS-1, attached at the end of this report.

2.2 Sanitary Sewers

Currently, there is an existing 200mm sanitary sewer located at the southern limit of the development on Turner Street. This existing system will be utilized to service the proposed development. A 200mm sanitary sewer system is proposed to convey the sanitary drainage south and connect to the existing sanitary sewer on Turner Street.

The internal sanitary sewer will be sized in accordance with the Township of Cavan Monaghan design criteria, with consideration on minimum and maximum grades, depths and velocity. The minimum sewer diameter will be 200mm, with all terminal legs having a minimum grade of 1.00%. All service laterals will be 100mm diameter at 2.00% minimum grade. The proposed internal sanitary sewer network is illustrated on the Conceptual Site Servicing Plan, drawing 115040 SS-1, attached at the end of this report.

2.3 Storm Sewers and Major Overland Flow

A proposed storm sewer system will be designed as per Township of Cavan-Monaghan standards, based on a 5-year return frequency event. Foundation drains from the proposed basements will be connected to the proposed storm sewer system through sump pumps. The drainage system will accommodate minor flows in the storm sewers and major overland flows will be accommodated within the streets during storm events in excess of the 5-year flow.

Storm flows for the minor events will be split and be conveyed to two Stormwater Management Dry Ponds. A majority of the minor and major flows will discharge northeasterly to Little Creek via a Stormwater Management Dry Pond. The remainder of the minor and major flows will drain south which discharges to an Unnamed Creek also through a Stormwater Management Dry Pond. Both ponds will be equipped with quality control oil/grit separators (Stormceptor) for treatment of the runoff.

The quality control Stormceptors will provide Enhanced Protection quality control through the treatment train process. The dry ponds will be the primary means of providing post-development to pre-development quantity control. Conceptual details of the facilities are described in Section 3.0 below. The storm sewer drainage network is illustrated on the Conceptual Site Servicing Plan, drawing 115040 SS-1. The Conceptual Site Grading Plan illustrates the proposed road grades for the major system and is attached as drawing 115040 SG-1.

3.0 STORMWATER QUANTITY CONTROLS

As noted above, most of the site drains in a north easterly direction, while a small portion of the site drains to the south towards the existing Turner Street roadway. The Pre-Development Storm Drainage Scheme is attached, drawing 115040 Figure 2. In post-development conditions, most of the flow will drain to a proposed Quantity Control Dry Pond before discharging to Little Creek located in the north-east corner of the subject site. It is proposed that storm drainage be conveyed by a dual drainage system. The minor storm sewer system will be designed to accommodate, minimum, minor flows (1 in 5 years), while major storm flows will be conveyed by a surface system of swales and roadways to convey overland flows to the proposed dry pond. Similarly, the drainage area flowing south, a small portion of the site in post development conditions will flow to an unnamed creek via another pond.

3.1 Stormwater Quantity Controls – Little Creek

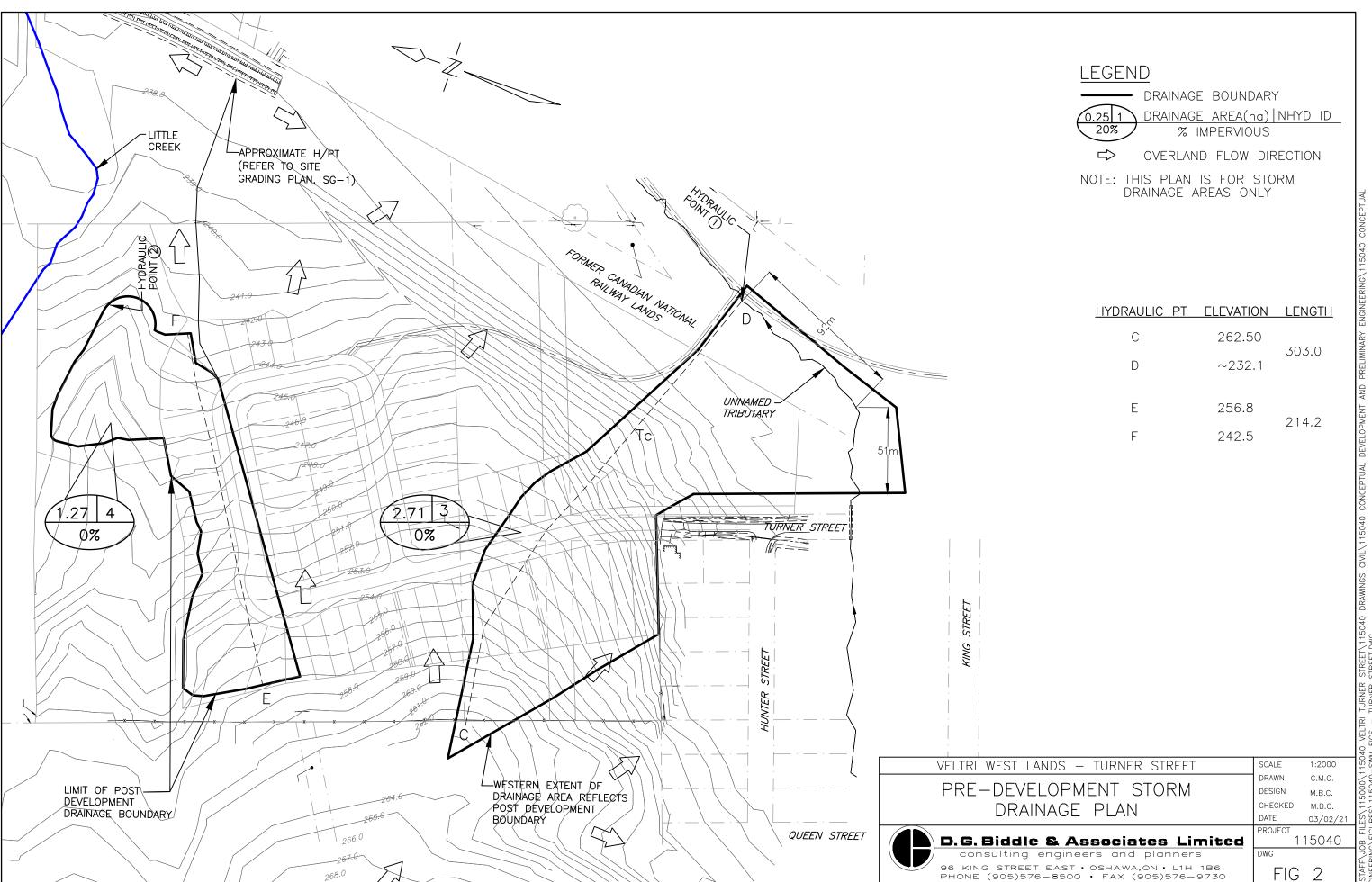
We have reviewed the post-development watershed using the DESIGN STANDHYD Sub-Routine of the computer model Visual Otthymo 3.0. For a direct comparison, the pre-development and post-development watersheds for the subject site have been modelled using a 6-hour AES, 6-hour SCS, 12-hour SCS and 12-hour Chicago distribution rainfall event for the 2, 5, 10, 25, 50 and 100-year events. The 6-hour SCS storm event generated the greatest runoff peak flows and volumes for both pre-development and post-development conditions, therefore this design storm was used to simulate rainfall events for the site. The rainfall intensity-duration values for Peterborough Airport were used to compute the peak flows. Input parameters for time to peak values for the computer model were calculated using the MTO Drainage Manual equations. The calculations are attached in Schedule 1. The input parameters for the curve numbers were estimated based on the MTO drainage manual design charts 1.08 and 1.09, which are included in Schedule 1. According to public GIS the area consists of soil type B Otonabee Loam.

The quantity control storage volume of approximately 2,653m³ is achieved through the berming and excavation of the facility from an elevation of 242.70m to 244.65m. This provides greater than 300mm freeboard above the maximum anticipated 100-year water surface elevation in the facility. Through the introduction of a 300mm outlet pipe discharging to a manhole, located within the maintenance access of a pond, with an 75mm orifice control plate, the proposed stormwater dry pond will attenuate post-development peak flows to pre-development levels. The Post-Development Storm Drainage Scheme is illustrated on drawing 115040 Figure 3. The ROUTE RESERVOIR Sub-Routine was used to simulate the performance of the pond. A comparison of the pre-development and routed post-development peak flows are tabulated below. The Visual Otthymo summary files are attached in Schedule 2.

TABLE 1: PEAK FLOWS TO LITTLE CREEK (NORTH)

RETURN FREQUENCY (YEARS)	TOTAL PRE-DEV. PEAK FLOW (L/s)	POND INLET POST-DEV PEAK FLOW (L/s)	ROUTED POND OUTFALL FLOW (L/s)	POND WSE (m)
2	17	295	11	243.40
5	33	439	12	243.40
10	45	535	13	243.70
25	63	664	14	243.95
50	77	778	15	244.10
100	93	922	16	244.35

As is reported above, post-development peak flows are less than pre-development levels; therefore, no adverse impact to the existing storm drainage network is anticipated.



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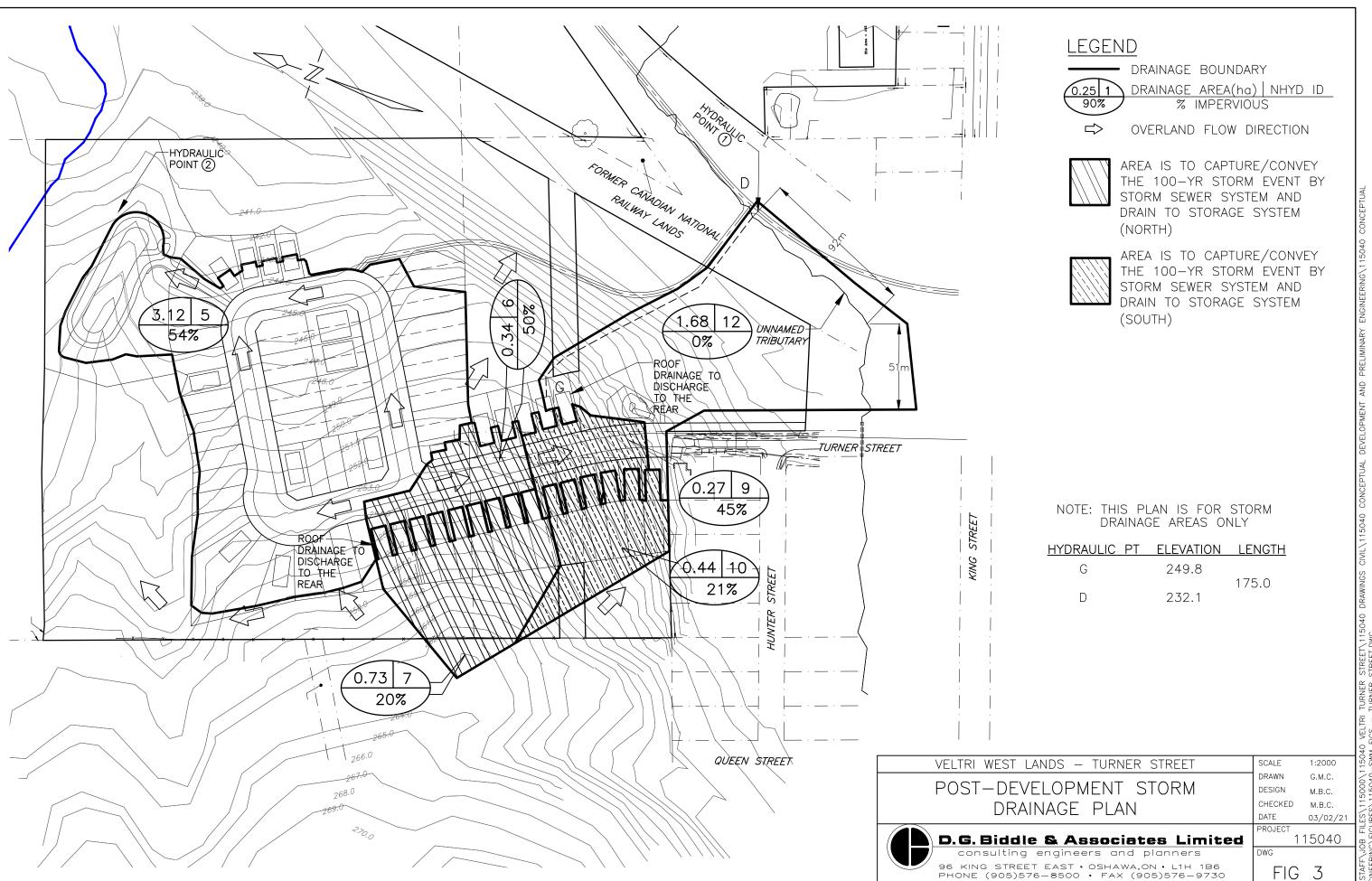


FIG 3

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3.2 Stormwater Quantity Control – Unnamed Creek

Currently, a small portion of land on the south side of the subject site and the surrounding lands drains to the Unnamed Creek. With the proposed development, approximately 0.71ha of the site (Hyd 9 & 10) will drain to a Stormwater Management Pond. It should be noted that all major flows in excess of a 5-year storm from the abovementioned drainage areas will be captured via the storm sewer system and be conveyed to the pond. The inlet capacity of these catch basins will be designed to capture up to the 100-year storm event at detailed design.

The quantity control storage volume of approximately 150.45m³ is achieved through the berming and excavation of the facility from an elevation of 240.55m to 241.95m. This provides greater than 300mm freeboard above the maximum anticipated 100-year water surface elevation in the facility. Through the introduction of a 300mm outlet pipe discharging to a manhole, located within the maintenance access of a pond, with an 70mm orifice control plate and a 220mm overflow orifice plate, the proposed stormwater dry pond will effectively attenuate post-development peak flows to pre-development levels. The Post-Development Storm Drainage Scheme is illustrated on drawing 115040 Figure 3. The ROUTE RESERVOIR Sub-Routine was used to simulate the performance of the pond storage. A comparison of the pre-development and routed post-development peak flows are tabulated below. The Visual Otthymo summary files are attached in Schedule 2.

TABLE 3: PEAK FLOWS TO UNNAMED CREEK (SOUTH)

RETURN FREQUENCY (YEARS)	PRE-DEV. PEAK FLOW (L/s)	POST-DEV. PEAK FLOW (L/s)	CHANGE (%)
2	36	36	0
5	69	61	- 12
10	95	90	- 5
25	132	135	+ 2
50	162	168	+ 2
100	195	204	+ 5

As is reported above, overall post-development peak flows are effectively equal to predevelopment levels. The 100-year storm is 5% above pre-development levels but this is considered a negligible increase. Therefore, no adverse impact to the unnamed creek or the existing storm drainage network is anticipated.

4.0 STORMWATER QUALITY CONTROLS

As noted in above, the subject site is tributary to Little Creek, which is a regulated watercourse as administered by Otanabee Regional Conservation Authority (ORCA). Little Creek provides habitat for cold water fish species, thereby requiring protection from increased erosion, sedimentation and degradation of water quality. Therefore Level 1 Enhanced protection is required.

4.1 Quality Controls – Little Creek

The area tributary to the pond is approximately 3.99ha, and a large portion of this land is essentially clean water. Due to the relatively small size of the development and service area, a wet pond is not recommended as it is unlikely to maintain a permanent pool. The dry pond facility's primary purpose is for the attenuation of post-development peak flows and will not provide the necessary quality controls.

The Storm Water Management Practices Planning and Design Manual (March 2003) also recommends oil/grit separators for areas less than 2ha. Due to grading constraints, other recommended quality controls are not achievable. It is noted that the actual impervious areas tributary to the pond is less than 2ha. Therefore, stormwater quality treatment for the proposed development is proposed to be provided through the implementation of a Stormceptor where it will then discharge to a grassed swale for further treatment. It will be installed downstream of the proposed dry pond, ensuring the volume of stormwater treated is maximized. Sizing calculations are attached at the end of this report.

4.2 Quality Controls – Unnamed Creek

The proposed development area considered to the unnamed creek is approximately 2.39ha (HYD 9, 10, 12). However, only 0.77ha (Hyd 9 & 10) of the 2.39ha will be treated as the remainder of the drainage area is either outside the subject site or is being discharged to the creek via pervious areas. The stormwater quality treatment pertaining to the treatable area (0.77ha), is proposed to be treated in the form of a treatment train through the implementation of a Stormceptor and bio-swale. Sizing calculations are attached at the end of this report.

4.3 Low Impact Development Techniques

Low Impact Development Techniques (LIDs) are required to promote infiltration towards maintaining a post development water balance. Figure 4 illustrates locations where opportunities for Low Impact Development Techniques can be provided for the following measures.

To promote water filtering and infiltration on the individual residential building lots, rear roof water leaders will be discharged to grade and lots will be dressed with 300mm of topsoil. Discharging roof water leaders to grade will lengthen the time available for run off to infiltrate into the topsoil before entering the storm sewer system. The sub-grade material below the topsoil should be graded at 2.0% grade minimum prior to placing topsoil. This will assist in preventing surface water being trapped at the interface of the topsoil and less pervious sub-grade material.

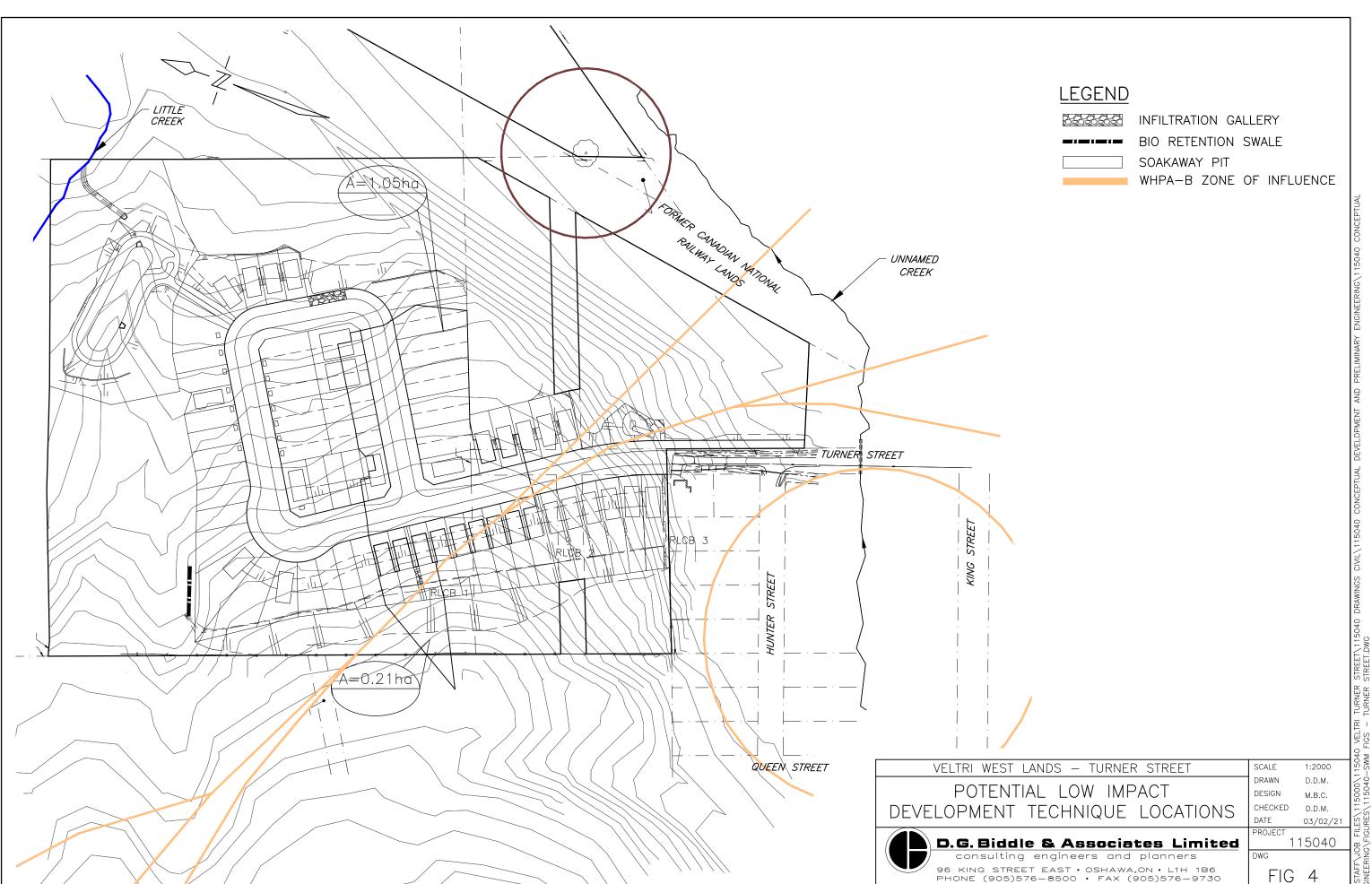
In addition to disconnected downspouts and increased topsoil depth, bio-retention swales, infiltration galleries and soak-away pits are proposed throughout the plan. Bio-retention swales are proposed along the rear yard of the single units in the north west area of the site. Since there are no rear yard catch basins where the bio-retention swales will be located, an underdrain is not proposed as there will not be a connection location available. The bio-retention swale will intercept rear yard drainage, as well as the rear portion of building rooftops. They will be sized to infiltrate up to 15mm of run-off

from the contributing area. Conceptual locations for the bio-retention swales are illustrated in Figure 4, with a detail provided on Figure 5. The suitability of these locations will need to be verified at the detail design stage.

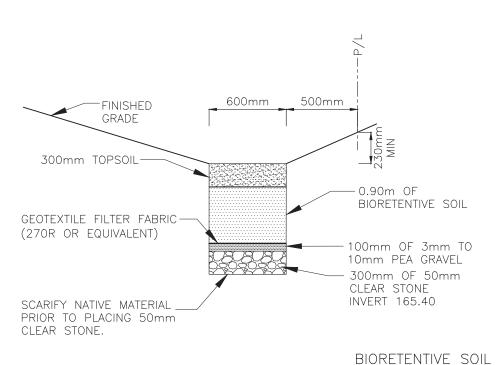
The single lots on the western side of the subject property will have rear yard swale conveying stormwater to rear lot catchbasins. In these locations, we are proposing the implementation of infiltration trenches where feasible. The infiltration trench will be filled with 50mm diameter stone, wrapped in filter cloth with an underdrain. Similar to the bioretention swale, it will also be sized to accommodate 15mm of run-off from the contributing area. Stormwater intercepted by the rear lot catchbasin from offsite areas, will flood the underdrain and stone. An overflow will be provided as a positive outlet to the catchbasin sewer lead, once the infiltration trench volume has been reached. Conceptual locations for the infiltration trenches are illustrated in Figure 4, with a detail provided on Figure 6. The suitability of these locations will need to be verified at the detail design stage.

The single lots and semi detached lots in the interior of the subject property will consist of soak-away pits in the front yard area. The soak-away pit will be filled with 50mm diameter stone, wrapped in filter cloth. Similar to the bio-retention swale and infiltration gallery, the soak-away pits will also be sized to accommodate 15mm of run-off from the roof tops. Stormwater intercepted by the roof tops will flood the underground gallery. An overflow will be provided as a positive outlet at grade which will then flow into the minor storm sewer system, once the infiltration trench volume has been reached. Conceptual locations for the soak-away pits are illustrated in Figure 4, with a detail provided on Figure 7. The suitability of these locations will need to be verified at the detail design stage.

The extent of the LIDs listed above will need to be coordinated with the final Hydrogeological Report to ensure a reasonable water balance is achieved.



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85% SAND 10% FINE SOIL 5% ORGANIC MATERIAL

VELTRI WEST LANDS - TURNER STREET

TYPICAL BIO RETENTION SWALE DETAIL



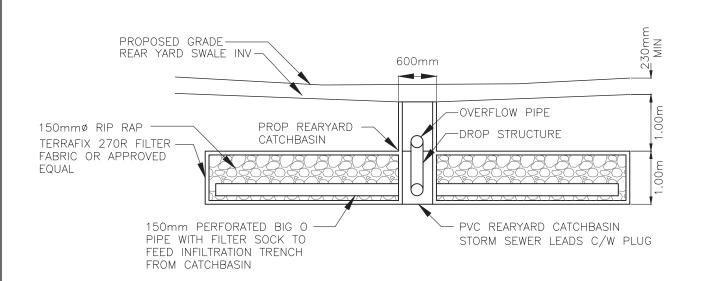
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DATE OCT 2018

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FIG 5



VELTRI WEST LANDS - TURNER STREET

TYPICAL INFILTRATION TRENCH SECTION



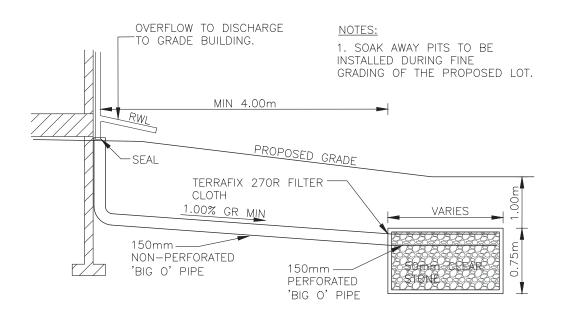
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DATE OCT 2018

115040 DWG FIG 6

PROJECT



VELTRI WEST LANDS - TURNER STREET

TYPICAL SOAK AWAY PIT DETAIL



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DATE MAR 2021

115040 Dwg FIG 7

4.4 Quality Controls During Construction

As set out in the Storm Water Management Practices Planning and Design Manual (March 2003), a new development is required to provide temporary storm water quality controls during construction. In this regard, during the detailed engineering design stage, a Sediment and Erosion Control Plan will be developed to ensure that sediment does not impact the receiving watercourse during the construction stage of the development. The Sediment and Erosion Control Plan will detail control measures such as temporary sediment ponds, enviro fencing, mud mats, and catchbasin filters. These measures are intended to provide protection from sediment impacting Little Creek.

5.0 CONCLUSIONS

The above Preliminary Stormwater Drainage and Functional Servicing Report has been prepared in support of the proposed Draft Plan of Subdivision to identify the servicing requirements to proceed with the development. The following is a summary of the servicing investigation which has been prepared in the preceding text.

- A 200mm watermain will be extended from King Street to service the entire subdivision and replace the existing watermain on Turner Street. It will connect to the existing 250mm watermain on King Street.
- A conventional sanitary system will service the entire subdivision. Sanitary sewage will be conveyed south and connect to the existing sanitary sewer on Turner Street.
- A conventional storm sewer system will service the entire subdivision. Most of
 the stormwater drainage will be conveyed to a proposed stormwater dry pond
 facility at the northeastern corner of the development. The remainder of the
 development will be conveyed south on Turner Street to another stormwater dry
 pond facility.
- Enhanced water quality protection from the development tributary to Little Creek
 to the north and the Unnamed Creek to the south can be provided through the
 implementation of a Stormceptor downstream of their respective outlets.
- Low Impact Development and appropriate areas have been identified in the report. Measures such as roof water leaders discharging to grade, 300mm of topsoil, bio retention swales, soak-away pits and infiltration galleries will be proposed on the detailed engineering drawings. The extent of the LIDs will be coordinated with the final Hydrogeological Report to ensure a reasonable water balance is achieved.

- Overall post-development flows to the Unnamed Creek to the south and Little Creek to the north will be attenuated to pre-development levels for all storm events, up to and including the 100-year event.
- Sediment control measures for construction will need to be provided during the detailed engineering design for the Plan of Subdivision.

SCHEDULE 1

-STORM SEWER DESIGN SHEETS -MTO IDF CURVE LOOKUP OUTPUTS

STORM SEWER DESIGN SHEET **D.G.BIDDLE & ASSOCIATES LTD.**

PAGE 1 OF 1

consulting engineers CRITERIA **RUN OFF CO-EFFICIENTS**

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May 2023 COMMEDIAL

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LOCAT	ION		DRA	INAGI	E DATA	R/	ATIONAL E	ESIGN			PIF	PE DATA					NOTES
FROM	TO	AREA	ı	AxI	ACCUM	T.C	R	FLOW	SIZE	GRADE	CAPACITY	VELOCITY	LENGTH	TIME	TOTAL	%	
МН	MH	(ha)			AxI	min	mm/hr	L/sec	mm	%	L/sec	m/s	m	min	TIME	LOAD	
RLCB-2	ST-11	0.520			0.182	10.00	98.67	49.92	300	2.00	142.66	1.96	50.82	0.43	10.43	34.99	
ST-11	ST-6	0.340			0.369	10.43	95.79	98.26	450	0.50	210.30	1.28	72.28	0.94	11.37	46.72	
ST-6	ST-5	0.270	0.650	0.176		11.37	90.18	136.63	450	0.85	274.20	1.67	55.88	0.56	11.93	49.83	
ST-5	ST-4	0.440			0.831	11.93	87.21	201.47	525	0.85	413.61	1.85	55.84	0.50	12.43	48.71	
ST-4	ST-3		0.000		0.831	12.43	84.73	195.74	525	0.80	401.26	1.80	22.06	0.20	12.64	48.78	
ST-3	ST-2		0.000		0.831	12.64	83.77	193.52	525	0.80	401.26	1.80	53.24	0.49	13.13	48.23	
ST-2	ST-1	0.000	0.000	0.000	0.831	13.13	81.55	188.40	525	0.75	388.52	1.74	9.79	0.09	13.23	48.49	
ST-6	ST-10	0.000	0.000	0.000	0.000	10.00	98.67	0.00	300	1.00	100.87	1.38	7.42	0.09	10.09	0.00	
RLCB-1	ST-10	0.210	0.350	0.074	0.074	10.00	98.67	20.30	300	3.25	181.85	2.49	44.27	0.30	10.30	11.16	
ST-10	ST-9	0.240			0.230	10.30	96.68	61.81	300	1.50	123.54	1.69	76.67	0.75	11.05	50.03	
ST-9	ST-8		0.650		0.724	11.05	92.01	185.20	375	4.50	387.98	3.40	59.55	0.29	11.34	47.73	
ST-8	ST-7	0.000			0.724	11.34	90.35	181.85	450	1.50	364.25	2.22	59.50	0.45	11.79	49.92	
ST-7	ST-1	0.000	0.650	0.000	0.724	11.79	87.94	177.01	450	1.50	364.25	2.22	11.42	0.09	11.88	48.59	
ST-1	ST-1A	0.890				13.23	81.15	481.41	750	0.70	971.65	2.13	59.55	0.47	13.69	49.55	
ST-1A	ST-1B	0.000			2.134	13.69	79.21	469.91	750	0.65	936.31	2.05	29.77	0.24	13.93	50.19	
ST-1B	OUTLET	0.000	0.000	0.000	2.134	13.93	78.25	464.20	750	0.65	936.31	2.05	4.82	0.04	13.97	49.58	
OT 44	OT 10	0.400	0.550	0.055	0.055	40.00	00.07	45.00	000	5.00	005.50	0.00	00.00	0.40	40.40	0.00	
ST-11	ST-12		0.550		0.055	10.00	98.67	15.09	300	5.00	225.56	3.09	33.06	0.18	10.18	6.69	
ST-12	ST-13	0.000	0.000	0.000	0.055	10.18	97.46	14.90	450	1.10	311.93	1.90	36.65	0.32	10.50	4.78	
DI CD 2	CT 14	0.440	0.250	0.454	0.454	10.00	00.67	40.04	450	0.50	240.20	4.00	44.26	0.54	10.54	20.00	
RLCB-3	ST-14	0.440			0.154	10.00	98.67	42.24	450 450	0.50 0.50	210.30	1.28	41.36	0.54	10.54	20.09	
ST-14	ST-13	0.000	0.000	0.000	0.154	10.54	95.12	40.72	450	0.50	210.30	1.28	10.77	0.14	10.68	19.36	
ST-13	ST-15	0.170	0.550	0.004	0.303	10.68	94.24	79.39	450	0.50	210.30	1.28	7.40	0.10	10.77	37.75	
ST-15	EF-4		0.000			10.00	93.65	78.89	450	0.50	210.30	1.28	9.91	0.10	10.77	37.75	
EF-4	OUTLET	0.000				10.77	92.88	100.00	450	0.50	210.30	1.28	11.77	0.15	11.06	47.55	
⊑ Г -4	OUILEI	0.000	0.000	0.000	0.303	10.90	₹2.00	100.00	430	0.30	210.30	1.20	11.77	0.10	11.00	41.00	
	* Refer to IDF Curve Lookup sheet attached. This was taked from the Minstry's website to esta			heite to estab	lich Intensity value	s at subject site	1										
Refer to IDF Curve Lownly sheet attached. This was taked from the winistry's			misuy s we	paire to estar	mon microlly value:	at subject site.	1										
			ь	<u> </u>	<u> </u>	<u>. </u>		 		<u> </u>			1		l		

STORM SEWER DESIGN SHEET D.G.BIDDLE & ASSOCIATES LTD.

PAGE 1 OF 1

consulting engineers CRITERIA

RUN OFF CO-EFFICIENTS

0.013 PARK I=0.20 MUNICPALITY CAVAN-MONAGHAN **DESIGN BY** D.D.M. STORM 100 YEAR SINGLE, SEMI I=0.50 PROJECT Millbrook Turner Street CHK'D BY D.D.M. Α 46.9 TOWNHOUSES,SCHOOL I=0.70PROJECT # 115040 DATE May 2021 -0.699 APARTMENTS I=0.65

May 2023 COMMERCIAL I=0.

	REV May 2023					COMMERCIAL I=0.90											
LOCAT	ION		DRA	INAGE	E DATA	R/	ATIONAL E	ESIGN			PIF	PE DATA					NOTES
FROM	ТО	AREA	ı	AxI	ACCUM	T.C	R	FLOW	SIZE	GRADE	CAPACITY	VELOCITY	LENGTH	TIME	TOTAL	%	
MH	MH	(ha)			AxI	min	mm/hr	L/sec	mm	%	L/sec	m/s	m	min	TIME	LOAD	
RLCB-2	ST-11	0.520	0.350	0.182	0.182	10.00	164.10	103.78	300	2.00	142.66	1.96	50.82	0.43	10.43	72.75	
ST-11	ST-6		0.550		0.369	10.43	159.30	204.27	450	0.50	210.30	1.28	72.28	0.94	11.37	97.13	
ST-6	ST-5	0.270				11.37	149.98	284.04	450	0.85	274.20	1.67	55.88	0.56	11.93	103.59	
ST-5	ST-4	0.440				11.93	145.04	418.84	525	0.85	413.61	1.85	55.84	0.50	12.43	101.26	
ST-4	ST-3	0.000				12.43	140.92	406.93	525	0.80	401.26	1.80	22.06	0.20	12.64	101.41	
ST-3	ST-2	0.000	0.000	0.000	0.831	12.64	139.32	402.31	525	0.80	401.26	1.80	53.24	0.49	13.13	100.26	
ST-2	ST-1	0.000	0.000	0.000	0.831	13.13	135.63	391.67	525	0.75	388.52	1.74	9.79	0.09	13.23	100.81	
ST-6	ST-10	0.000	0.000	0.000	0.000	10.00	164.10	0.00	300	1.00	100.87	1.38	7.42	0.09	10.09	0.00	
RLCB-1	ST-10	0.210	0.350	0.074	0.074	10.00	164.10	42.20	300	3.25	181.85	2.49	44.27	0.30	10.30	23.20	
ST-10	ST-9	0.240				10.30	160.78	128.51	300	1.50	123.54	1.69	76.67	0.75	11.05	104.02	
ST-9	ST-8	0.760			0.724	11.05	153.03	385.00	375	4.50	387.98	3.40	59.55	0.29	11.34	99.23	
ST-8	ST-7		0.650		0.724	11.34	150.27	378.06	450	1.50	364.25	2.22	59.50	0.45	11.79	103.79	
ST-7	ST-1	0.000	0.650	0.000	0.724	11.79	146.26	367.98	450	1.50	364.25	2.22	11.42	0.09	11.88	101.02	
ST-1	ST-1A	0.890				13.23	134.96	1000.81	750	0.70	971.65	2.13	59.55	0.47	13.69	103.00	
ST-1A	ST-1B		0.000		2.134	13.69	131.73	976.89	750	0.65	936.31	2.05	29.77	0.24	13.93	104.33	
ST-1B	OUTLET	0.000	0.000	0.000	2.134	13.93	130.13	965.02	750	0.65	936.31	2.05	4.82	0.04	13.97	103.07	
ST-11	ST-12	0.100				10.00	164.10	31.36	300	5.00	225.56	3.09	33.06	0.18	10.18	13.90	
ST-12	ST-13	0.000	0.000	0.000	0.055	10.18	162.08	30.98	450	1.10	311.93	1.90	36.65	0.32	10.50	9.93	
RLCB-3	ST-14	0.440			0.154	10.00	164.10	87.82	450	0.50	210.30	1.28	41.36	0.54	10.54	41.76	
ST-14	ST-13	0.000	0.000	0.000	0.154	10.54	158.19	84.66	450	0.50	210.30	1.28	10.77	0.14	10.68	40.26	
ST-13	ST-15	0.170			0.303	10.50	158.60	166.99	450	0.50	210.30	1.28	7.40	0.10	10.60	79.41	
ST-15	EF-4		0.000			10.60	157.59	165.93	450	0.50	210.30	1.28	9.91	0.13	10.72	78.90	
EF-4	Outlet	0.000	0.000	0.000	0.303	10.72	156.26	164.53	450	0.50	210.30	1.28	11.77	0.15	10.88	78.24	

Ontario V IDF CURVE LOOKUP

Active coordinate

44° 8' 45" N, 78° 27' 45" W (44.145833,-78.462500)

Retrieved: Mon, 26 Jul 2021 17:22:06 GMT



Location summary

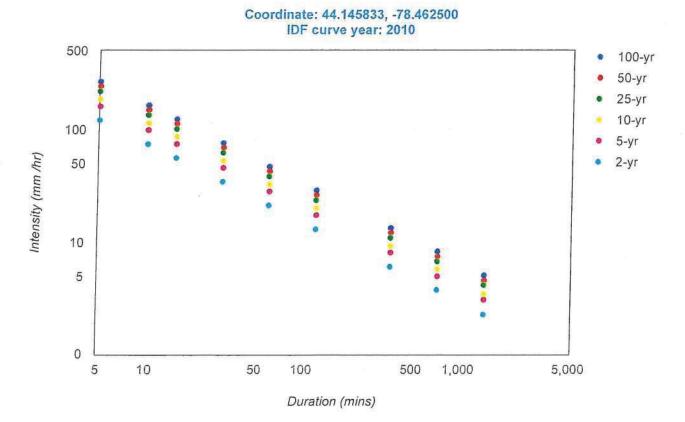
Google

These are the locations in the selection.

IDF Curve: 44° 8' 45" N, 78° 27' 45" W (44.145833,-78.462500)

Results

An IDF curve was found.



Coefficient summary

IDF Curve: 44° 8' 45" N, 78° 27' 45" W (44.145833,-78.462500)

Retrieved: Mon, 26 Jul 2021 17:22:06 GMT

Data year: 2010 IDF curve year: 2010

Return period	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Α	21.3	28.2	32.7	38.5	42.7	46.9
В	-0.699	-0.699	-0.699	-0.699	-0.699	-0.699

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	121.0	74.5	56.1	34.6	21.3	13.1	6.1	3.8	2.3
5-yr	160.2	98.7	74.3	45.8	28.2	17.4	8.1	5.0	3.1
10-yr	185.7	114.4	86.2	53.1	32.7	20.1	9.3	5.8	3.5
25-yr	218.7	134.7	101.5	62.5	38.5	23.7	11.0	6.8	4.2
50-yr	242.5	149.4	112.5	69.3	42.7	26.3	12.2	7.5	4.6
100-yr	266.4	164.1	123.6	76.1	46.9	28.9	13.4	8.3	5.1
Rainfall depth (mm	1)								

Rainfall depth (mm)

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	10.1	12.4	14.0	17.3	21.3	26.2	36.5	45.0	55.4
5-yr	13.3	16.4	18.6	22.9	28.2	34.7	48.4	59.6	73.4
10-yr	15.5	19.1	21.5	26.5	32.7	40.3	56.1	69.1	85.1
25-yr	18.2	22.5	25.4	31.3	38.5	47.4	66.0	81.3	100.2
50-yr	20.2	24.9	28.1	34.7	42.7	52.6	73.2	90.2	111.1
100-yr	22.2	27.3	30.9	38.1	46.9	57.8	80.4	99.1	122.1

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Last Modified: September 2016

Ontario V IDF CURVE LOOKUP

About

Identification

MTO IDF Curves Finder Dr. R. Soulis, P. Eng.

Web Page: Release Date: Version 3.0 September 2016

Features

IDF Station Data Set

Source: Environment Canada (MSC)

Environment Canada station data for Ontario, Manitoba, and

Data set: Quebec up to 2013. The Manitoba and Quebec stations used

are within 150 km of Ontario.

Version:

IDF v2.3

Date of publication:

January 28, 2015

Number of stations:

181

Number of station years:

4562

Source: National Oceanic and Atmospheric Administration (NOAA)

Precipitation-Frequency Atlas of the United States, NOAA Atlas

14. The NOAA stations used are within 150 km of Ontario.

Data set: Vol. 2 - Ohio River Basin

Vol. 8 - Midwestern States

Vol. 10 - Northeastern States

Date of publication:

2006 (Vol. 2); 2013 (Vol. 8); 2015 (Vol. 10)

Number of stations:

171

Number of station years:

6061

IDF Curve Construction

Extreme value PDF:

Gumbel

Parameter estimation:

Method of Moments 2 parameter (A, B)

Interpolation Curve: Parameter estimation:

Least squares fit to quantiles

Return periods modelled:

2, 5, 10, 25, 50, 100 year

Rainfall durations used: 5, 10, 15, 30 min; 1, 2, 6, 12, 24 hr

Spatial Interpolation Procedure

Square Grid

Transformations applied:

Independent variables:

None

Dependent variables:

Digital Elevation Model (DEM):

USGS GTOPO-30

User Interface

Method:

- · Extracts current IDF project values
- · Estimates end of service life IDF values
- · Locates and displays Environment Canada IDF station in the vicinity of a highway project
- Displays 95% confidence limits for project and station values

Contact Information

Ministry of Transportation Ontario Design and Contracts Standards Office Drainage and Hydrology Group Tel.: (905) 704-2293

Purpose

Intensity-Duration-Frequency (IDF) curves are used in the design of flood protection infrastructure on small watersheds. They summarise the annual probability of exceedance, $P(R, \tau)$, of a volume of rainfall, R (mm), in a single event of duration, τ (hr). P is also known as the probability function, (R, τ) , by return period, T (yrs), where:

$$T = \frac{1}{P(R,\tau)}$$

In this tool, rainfall intensity, RR (mm/hr), is expressed by:

$$RR = A\tau^B$$

where:

$$RR = \frac{R}{\tau}$$

A and B vary with location and return period. A is the value of the IDF curve at the 1 hr storm duration. Since IDF curves are portrayed as log-log plots, the curves are always straight lines. B is the slope for each line.

Environment Canada (MSC) publishes *A* and *B* parameters at selected meteorological locations in Ontario and elsewhere in Canada. The two-parameter form that Environment Canada uses is simpler and generally more conservative than other forms.

The purpose of this project is to provide a convenient method to interpolate IDF curve parameters between MSC stations for MTO projects.

Methodology

The method of analysis used is referred to as the Square Grid Technique because it uses UTM grid squares as elementary sub-catchments. The original Digital Elevation Model (DEM) is a set of gridded elevations and drainage fractions coded manually for each 10 km square of the Natural Resources Canada 1:250,000 topographic map series. The current version uses the 30 arcsecond GTOPO-30 dataset from USGS.

The premise is that local climate is strongly influenced by local and regional topography. Thus, topographic parameters are useful interpolators of surface fields of interest, such as temperature, runoff and, in this case, IDF curve parameters A and B.

The digital elevation model is used to derive physiographic characteristics that become independent variables in a regression analysis with station statistics. The regression analysis produces a set of generating equations for the parameters used to produce IDF curves. The technique also weighs station data by their length of record, which ensures that data that are more reliable have greater influence on the interpolation. The database consists of statistics from 352 MSC and NOAA stations with an average record length of 30 years.

The result is a gradually varying regional IDF curve. Because the regional curve and station curves both have uncertainty, the regional estimates are different from the station records. However, the 95% confidence intervals overlap and the upper limit is generally higher than the mean station value. Values from both the regional curve and station curves are accessible by this tool.

Application

The minimum recommended design intensities for storms are the values at the 95% upper confidence limit of the appropriate extreme rainfall IDF curve.

The design IDF curve values are the upper 95% confidence limit for the regional prediction, which is generally higher than the station values.

Time-trend Analysis

The time trend analysis was done using observations from 1960 to 2014. A linear trend was observed and extrapolated from this period to 2060. Significantly less sources were available for data after 2010, so 2010 is the reference year used in this tool. IDF curve projections are extrapolated from the 2010 base year.

With the exception of the 5, 10, and 15 min storm durations, all t-stats exceed the 95% confidence threshold of 1.96. The lack of significance in these storms is not surprising, as data are more difficult to capture for these events, and the events themselves are less reliable. The t-stats for longer duration events, which range from 2.421 for the 30 min event to 6.979 for the 24 hr event, have a stronger statistical significance.

This project does not address the spatial variability of time trends for extreme precipitation in Ontario. The analysis combines the datasets from all stations and determines their collective historical trend. The projections are extrapolations based on past trends and assume that the rate of change, m, will stay constant. This serves two purposes. For now, the extrapolations provide a better projection of future precipitation extremes than a stationary model. In the future, the extrapolation will serve as a baseline for forecasts that incorporate both climatological factors and local variability.

To estimate population parameters of the probability density function, the analysis used the method-of-moments. For the validation, this was compared with an analysis of L-moments. Comparable parameters were generated by both methods.

Rainfall intensities from the 2010 base year are within the safety margin of previous calculations. Future intensities, however, are projected to exceed current design standards. The formula for future IDF curve intensities, $R_{t'}$, for year t' > 2010 uses the following equation:

$$R_{t'} = A_{2010} \cdot \tau^{E} + m \cdot (t' - 2010)$$

Prediction Bounds

With the introduction of time trends, it is necessary to incorporate a new margin of safety. With the seven independent variables, multiple linear regressions can be performed as shown in the equation below.

$$\vec{Y} = X\vec{\beta} + \vec{\varepsilon}$$

in which, \vec{Y} is the natural log of A parameters generated from the regression analysis, X is the matrix of the independent physiographic characteristics, $\vec{\beta}$ is the partial regression coefficient vector, and lastly $\vec{\varepsilon}$ is the error vector from the analysis.

With least squares fit, $\vec{\beta}$ is found with:

$$\vec{\beta} = (X^T X)^{-1} X^T \vec{Y}$$

The mean square error is found with:

$$MS_{RES} = \frac{\vec{\varepsilon}^T \vec{\varepsilon}}{n - p}$$

in which, n is the number of observations in the sample and p is one plus the number of regression coefficients.

The normalized error, ε , for the mean response is derived with the following formulas:

$$\begin{split} \varepsilon_1 &= SE_1 \cdot \tau^B \sqrt{1 + \frac{1}{n_1}} \\ \varepsilon_2 &= SE_2 \cdot \sqrt{\frac{1}{n_2} \left(1 + \frac{(2010 - \tilde{t})^2}{\sigma^2_t}\right)} \\ \varepsilon &= \sqrt{\varepsilon_1^2 + \varepsilon_2^2} \end{split}$$

in which, SE_1 is the root-mean-square deviation of the residuals from the regression of A parameters against physiographic characteristics, SE_2 is the rate of change of the rainfall rate per year, and \bar{t} is the mean calendar year in the dataset for each storm duration.

The formula for the minimum and maximum intensities to form the confidence interval for the curve uses the following equation:

$$R_* = R_* \pm 1.96\varepsilon$$

Acknowledgements

Dr. Ric Soulis, P. Eng. Project Science Manager

The approach used in developing the interpolation technique for this tool for Ontario was conceived by the late Dr. S.I. Solomon, a pioneer of distributed hydrologic modelling in Canada, of the University of Waterloo, Department of Civil and Environmental Engineering.

IDF curves from Environment Canada constitute the base data for the interpolation process. These were prepared by Dr. William Hogg and his staff, including Robert Norris and Joan Klaassen, of the Meteorological Service of Canada, who continued the work after Dr. Hogg's retirement.

Project Team

Ministry of Transportation (MTO)

Project Manager - Dr. Hani Farghaly, P. Eng., Design and Contract Standards, St. Catharines Project Engineer - Muhammad Naeem, P. Eng., Design and Contract Standards, St. Catharines

University of Waterloo

Project Science Manager - Dr. Ric Soulis, P. Eng.
Web Interface Design and Construction - Daniel G. Princz, Graduate Student
Database Construction - Dr. Frank Seglenieks, Environment Canada, Burlington
Graduate Student - John (Chon In) Wong
Co-op Students - Jenn Hale, Kaitlyn McIntyre, Setareh Memarian, Daniel Oh, Benjamin Postma,
Megh Suthar, Mateusz Tinel, Milos Vojvodic, and Claire Park

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Last Modified: September 2016

SCHEDULE 2

-STAGE – STORAGE – DISCHARGE
CALCULATIONS, NORTH AND SOUTH POND
-STORMCEPTOR SIZING OUTPUTS
-TIME OF CONCENTRATION CALCULATIONS
-GRASSED SWALE CAPACITY CALCULATIONS
-FM200 – TRM SPECIFICATION SHEET
-HYDROLOGIC SOILS GROUP DESIGN CHARTS
-IMPERVIOUSNESS CALCULATIONS
-DIRECTLY CONNECTED CALCULATIONS
-INPUT PARAMTERS

Job Number: 115040

Dry Pond and Infiltration Storage - North

Elevation	End Area	Avg. Area	Depth	Volume	Cum. Volume
(m)	(m2)	(m2)	(m)	(m3)	(m3)
242.70	870.00	000.00	0.50	404.00	0.00
243.20	1106.00	988.00	0.50	494.00	494.00
240.20	1100.00	1230.00	0.50	615.00	454.00
243.70	1354.00				1109.00
		1540.00	0.65	1001.00	
244.35	1726.00				2110.00
044.05	1001.00	1810.00	0.30	543.00	
244.65	1894.00				2653.00

ORIFICE DISCHARGE

ORIFICE - North Pond

>	COEFF	0.61	Elevation	Head	Discharge	Discharge
>	DIA	75 mm	(m)	(m)	(m^3/s)	(L/s)
	AREA	0.00441786 m^2	242.54	0.00	0.00000	0.00
	GRAV	9.81 m/s^2	243.20	0.66	0.00972	9.72
	CL ELEV	242.538 m	243.70	1.16	0.01287	12.87
	INV.	242.500	244.35	1.81	0.01607	16.07
	EQN	0.01193691 SQRT(H)				

COEFF

0.61 FOR PLATE

0.8 FOR SHORT TUBE (FOR MTO)

Job Number: 115040

TOTAL STAGE-STORAGE-DISCHARGE

North Pond

CL ORIFICE = 242.538 m DIAMETER = 75 mm

			ORIFICE	TOTAL		
	ELEVATION	HEAD	STORAGE	DISCHARGE	DISCHARGE	
	(m)	(m)	(m3)	(m3/s)	(L/s)	
	242.54	0.00	0.00	0.00000	0.00	
	243.20	0.66	494.00	0.00972	9.72	
	243.70	1.16	1109.00	0.01287	12.87	
	244.35	1.81	2110.00	0.01607	16.07	

Job Number: 115040 Date: 3-May-21

Dry Pond Storage - South

Elevation	End Area	Avg. Area	Depth	Volume	Cum. Volume		
(m)	(m2)	(m2)	(m)	(m3)	(m3)		
240.55	6.00				0.00		
		16.50	0.25	4.13			
240.80	27.00	44.00		44.00	4.13		
044.05	64.00	44.00	0.25	11.00	45.40		
241.05	61.00	82.50	0.25	20.63	15.13		
241.30	104.00	02.50	0.23	20.03	35.75	6.3	*
211.00	101.00	152.00	0.35	53.20	00.10	0.0	
241.65	200.00				88.95	6.3	* (100-yr WSE)
		205.00	0.30	61.50			
241.95	210.00				150.45	300mm	Freeboard

^{*39.85}m of 450mm pipe (pond inv up to ST-14) provides $6.3 \mathrm{m}^3$ of storage

ORIFICE DISCHARGE

>	COEFF	0.61	Elevation	Head	Discharge	Discharge
>	DIA	70 mm	(m)	(m)	(m^3/s)	(L/s)
	AREA	0.00384845 m^2	240.55	0.08	0.00285	2.85
	GRAV	9.81 m/s^2	240.80	0.33	0.00593	5.93
	CL ELEV	240.475 m	241.05	0.58	0.00788	7.88
	INV	240.440 (ST-16)	241.30	0.83	0.00944	9.44
			241.65	1.18	0.01127	11.27
	EQN	0.01039837 SQRT(H)				
	ORIFICE 2					
>	COEFF	0.61	Elevation	Head	Discharge	Discharge
>	DIA	220 mm	(m)	(m)	(m^3/s)	(L/s)
	AREA	0.03801327 m^2	240.55	0.00	0.00000	0.00
	GRAV	9.81 m/s^2	240.80	0.00	0.00000	0.00
	CL ELEV	241.410 m	241.05	0.00	0.00000	0.00
	INV	241.300	241.30	0.00	0.00000	0.00
			241.65	0.24	0.05032	50.32
	EQN	0.10271044 SQRT(H)				

COEFF

0.61 FOR PLATE
0.8 FOR SHORT TUBE (FOR MTO)

Job Number: 115040

TOTAL STAGE-STORAGE-DISCHARGE

South Pond

 Orifice 1
 Orifice 2

 CL Orifice =
 240.48 m
 CL Orifice =
 241.41 m

 Diameter =
 70 mm
 Diameter =
 220 mm

		ORIFICE	ORIFICE	TOTAL	
ELEVATION	HEAD	DISCHARGE 1	DISCHARGE 2	DISCHARGE	STORAGE
(m)	(m)	(m ³ /s)	(m ³ /s)	(L/s)	(m³)
240.55	0.08	0.00285	0.00000	0.00	0.00
240.80	0.33	0.00593	0.00000	5.93	4.13
241.05	0.58	0.00788	0.00000	7.88	15.13
241.30	0.83	0.00944	0.00000	9.44	42.05
241.65	1.18	0.01127	0.05032	61.59	88.95





STORMCEPTOR® ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

06/01/2023

Province:	Ontario
City:	Millbrook
Nearest Rainfall Station:	PETERBOROUGH
Climate Station Id:	6166456
Years of Rainfall Data:	15
	•

Site Name: Turner Street - North

4.19 Drainage Area (ha): 50.00

% Imperviousness:

Runoff Coefficient 'c': 0.60

Particle Size Distribution: Fine 79.0 Target TSS Removal (%):

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	90.73
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Site Sediment Transport Rate (kg/ha/yr):	

Project Name:	Turner Street - North
Project Number:	61706
Designer Name:	David McNaull
Designer Company:	DG Biddle
Designer Email:	david.mcnaull@dgbiddle.com
Designer Phone:	905-576-8500
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction **Sizing Summary**

Stormceptor	TSS Removal
Model	Provided (%)
EFO4	53
EFO6	68
EFO8	79
EFO10	85
EFO12	89

Recommended Stormceptor EFO Model: EFO8

Estimated Net Annual Sediment (TSS) Load Reduction (%): 79

Water Quality Runoff Volume Capture (%):

> 90





THIRD-PARTY TESTING AND VERIFICATION

► Stormceptor® EF and Stormceptor® EFO are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV Procedure for Laboratory Testing of Oil-Grit Separators and performance has been third-party verified in accordance with the ISO 14034 Environmental Technology Verification (ETV) protocol.

PERFORMANCE

▶ Stormceptor® EF and EFO remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterways.

PARTICLE SIZE DISTRIBUTION (PSD)

► The Canadian ETV PSD shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV Procedure for Laboratory Testing of Oil-Grit Separators for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

Particle	Percent Less	Particle Size	Dawaant
Size (µm)	Than	Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5





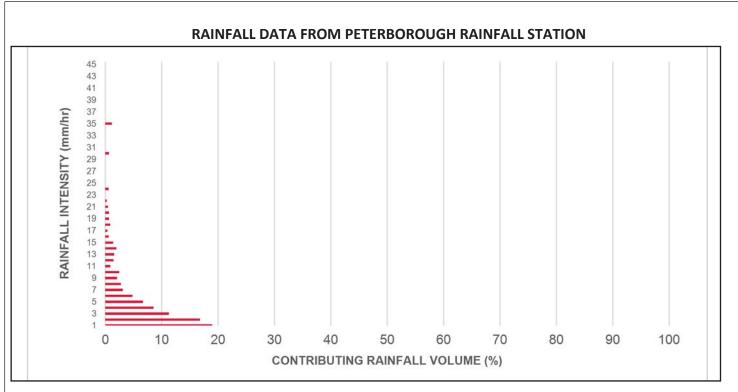
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.5	8.5	8.5	3.49	210.0	45.0	100	8.5	8.5
1	19.0	27.5	6.99	419.0	89.0	97	18.5	27.0
2	16.8	44.3	13.98	839.0	178.0	87	14.6	41.6
3	11.3	55.6	20.97	1258.0	268.0	80	9.1	50.7
4	8.6	64.2	27.96	1677.0	357.0	76	6.5	57.2
5	6.7	70.9	34.94	2097.0	446.0	72	4.8	62.0
6	4.8	75.6	41.93	2516.0	535.0	68	3.2	65.2
7	3.1	78.7	48.92	2935.0	625.0	64	2.0	67.2
8	2.8	81.5	55.91	3355.0	714.0	64	1.8	69.0
9	2.1	83.6	62.90	3774.0	803.0	63	1.3	70.3
10	2.5	86.1	69.89	4193.0	892.0	62	1.6	71.9
11	0.9	87.0	76.88	4613.0	981.0	62	0.6	72.4
12	1.5	88.5	83.87	5032.0	1071.0	60	0.9	73.3
13	1.6	90.0	90.86	5451.0	1160.0	58	0.9	74.2
14	2.0	92.0	97.84	5871.0	1249.0	56	1.1	75.3
15	1.4	93.5	104.83	6290.0	1338.0	54	0.8	76.1
16	0.6	94.1	111.82	6709.0	1428.0	52	0.3	76.4
17	0.4	94.5	118.81	7129.0	1517.0	48	0.2	76.6
18	0.9	95.3	125.80	7548.0	1606.0	46	0.4	77.0
19	0.7	96.0	132.79	7967.0	1695.0	43	0.3	77.3
20	0.7	96.7	139.78	8387.0	1784.0	41	0.3	77.6
21	0.5	97.2	146.77	8806.0	1874.0	39	0.2	77.8
22	0.3	97.5	153.76	9225.0	1963.0	37	0.1	77.9
23	0.0	97.5	160.75	9645.0	2052.0	36	0.0	77.9
24	0.6	98.1	167.73	10064.0	2141.0	34	0.2	78.1
25	0.0	98.1	174.72	10483.0	2231.0	33	0.0	78.1
30	0.7	98.8	209.67	12580.0	2677.0	28	0.2	78.3
35	1.2	100.0	244.61	14677.0	3123.0	24	0.3	78.6
40	0.0	100.0	279.56	16773.0	3569.0	21	0.0	78.6
45	0.0	100.0	314.50	18870.0	4015.0	18	0.0	78.6
	Estimated Net Annual Sediment (TSS) Load Reduction =							

Climate Station ID: 6166456 Years of Rainfall Data: 15

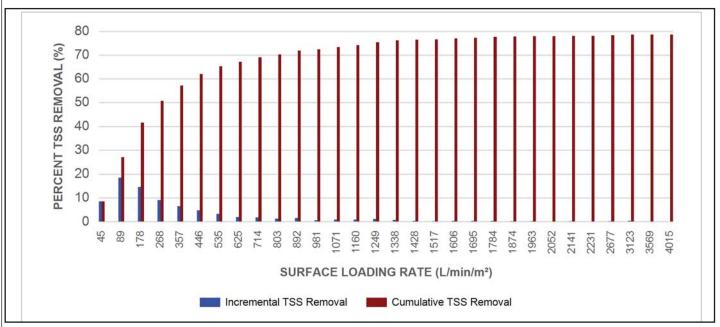








INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL







Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes		Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)	
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15	
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35	
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60	
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100	
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100	

SCOUR PREVENTION AND ONLINE CONFIGURATION

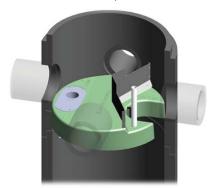
► Stormceptor® EF and EFO feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV Procedure for Laboratory Testing of Oil-Grit Separators, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

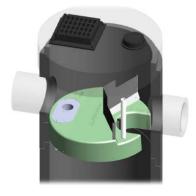
DESIGN FLEXIBILITY

► Stormceptor® EF and EFO offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

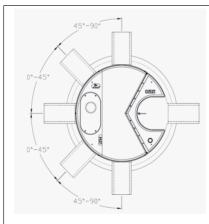
OIL CAPTURE AND RETENTION

▶ While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid reentrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.









INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.

 0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.

45° - 90°: The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Mod Diam		Depth Pipe In Sump		Oil Vo							mum Volume *	Maxim Sediment	-
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft³)	(kg)	(lb)		
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250		
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375		
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750		
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500		
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875		

^{*}Increased sump depth may be added to increase sediment storage capacity

** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft³)

Feature	Benefit	Feature Appeals To		
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer		
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner		
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer		
Minimal drop between inlet and outlet	Site installation ease	Contractor		
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner		

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef







STANDARD PERFORMANCE SPECIFICATION FOR "OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREATMENT DEVICE

PART 1 - GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators**

1.3 SUBMITTALS

- 1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.
- 1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.
- 1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 - PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1 4 ft (1219 mm) Diameter OGS Units: 1.19 m³ sediment / 265 L oil
6 ft (1829 mm) Diameter OGS Units: 3.48 m³ sediment / 609 L oil
8 ft (2438 mm) Diameter OGS Units: 8.78 m³ sediment / 1,071 L oil
10 ft (3048 mm) Diameter OGS Units: 17.78 m³ sediment / 1,673 L oil
12 ft (3657 mm) Diameter OGS Units: 31.23 m³ sediment / 2,476 L oil

PART 3 - PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall







remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

- 3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m² to 1400 L/min/m², and as stated in the ISO 14034 ETV Verification Statement for the OGS device.
- 3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m² and 1400 L/min/m² shall be based on linear interpolation of data between consecutive tested surface loading rates.
- 3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m² shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m². No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m².
- 3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m² shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m², and shall be calculated using a simple proportioning formula, with 1400 L/min/m² in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m².

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators**.

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m².

3.4 <u>LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING</u>

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This reentrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to







assess whether light liquids captured after a spill are effectively retained at high flow rates. For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m² to 2600 L/min/m²) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's Procedure for Laboratory Testing of Oil-Grit Separators. However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.





STORMCEPTOR® ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

06/01/2023

Province:	Ontario			
City:	Millbrook			
Nearest Rainfall Station:	PETERBOROUGH			
Climate Station Id:	6166456			
Years of Rainfall Data:	15			
	6 6			

Site Name: Turner Street - South

Drainage Area (ha): 0.71
% Imperviousness: 45.00

Runoff Coefficient 'c': 0.57

Particle Size Distribution: Fine

Target TSS Removal (%): 80.0

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	14.61
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Site Sediment Transport Rate (kg/ha/yr):	

Project Name:	Turner Street - South
Project Number:	61706
Designer Name:	David McNaull
Designer Company:	DG Biddle
Designer Email:	david.mcnaull@dgbiddle.com
Designer Phone:	905-576-8500
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)				
EFO4	85				
EFO6	93				
EFO8	97				
EFO10	98				
EFO12	99				

Recommended Stormceptor EFO Model: EFO4

Estimated Net Annual Sediment (TSS) Load Reduction (%): 85

Water Quality Runoff Volume Capture (%):

> 90





THIRD-PARTY TESTING AND VERIFICATION

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Particle	Percent Less	Particle Size	Dawaant
Size (µm)	Than	Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5





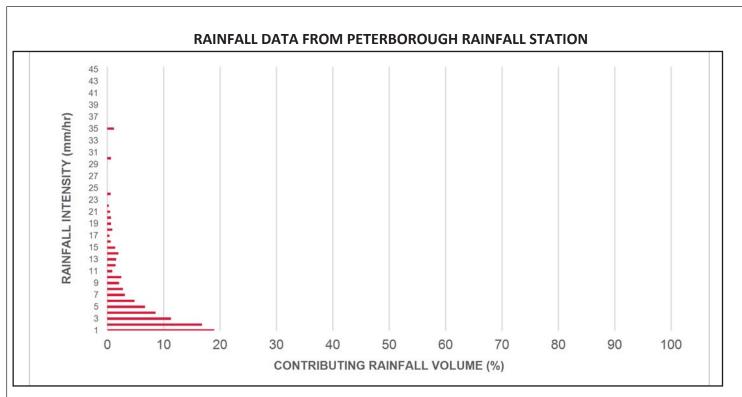
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.5	8.5	8.5	0.56	34.0	28.0	100	8.5	8.5
1	19.0	27.5	1.13	68.0	56.0	100	19.0	27.5
2	16.8	44.3	2.25	135.0	113.0	95	15.9	43.4
3	11.3	55.6	3.38	203.0	169.0	88	10.0	53.4
4	8.6	64.2	4.50	270.0	225.0	82	7.0	60.4
5	6.7	70.9	5.63	338.0	281.0	79	5.3	65.7
6	4.8	75.6	6.75	405.0	338.0	77	3.7	69.4
7	3.1	78.7	7.88	473.0	394.0	74	2.3	71.7
8	2.8	81.5	9.00	540.0	450.0	72	2.0	73.7
9	2.1	83.6	10.13	608.0	506.0	69	1.4	75.1
10	2.5	86.1	11.25	675.0	563.0	66	1.7	76.8
11	0.9	87.0	12.38	743.0	619.0	65	0.6	77.4
12	1.5	88.5	13.50	810.0	675.0	64	0.9	78.3
13	1.6	90.0	14.63	878.0	731.0	64	1.0	79.3
14	2.0	92.0	15.75	945.0	788.0	63	1.3	80.6
15	1.4	93.5	16.88	1013.0	844.0	63	0.9	81.5
16	0.6	94.1	18.00	1080.0	900.0	62	0.4	81.9
17	0.4	94.5	19.13	1148.0	956.0	62	0.3	82.1
18	0.9	95.3	20.25	1215.0	1013.0	61	0.5	82.6
19	0.7	96.0	21.38	1283.0	1069.0	60	0.4	83.0
20	0.7	96.7	22.50	1350.0	1125.0	59	0.4	83.5
21	0.5	97.2	23.63	1418.0	1181.0	57	0.3	83.8
22	0.3	97.5	24.75	1485.0	1238.0	56	0.1	83.9
23	0.0	97.5	25.88	1553.0	1294.0	55	0.0	83.9
24	0.6	98.1	27.00	1620.0	1350.0	53	0.3	84.2
25	0.0	98.1	28.13	1688.0	1406.0	52	0.0	84.2
30	0.7	98.8	33.75	2025.0	1688.0	44	0.3	84.5
35	1.2	100.0	39.38	2363.0	1969.0	37	0.5	85.0
40	0.0	100.0	45.00	2700.0	2250.0	33	0.0	85.0
45	0.0	100.0	50.63	3038.0	2531.0	29	0.0	85.0
			Es	timated Ne	t Annual Sedim	ent (TSS) Loa	d Reduction =	85 %

Climate Station ID: 6166456 Years of Rainfall Data: 15

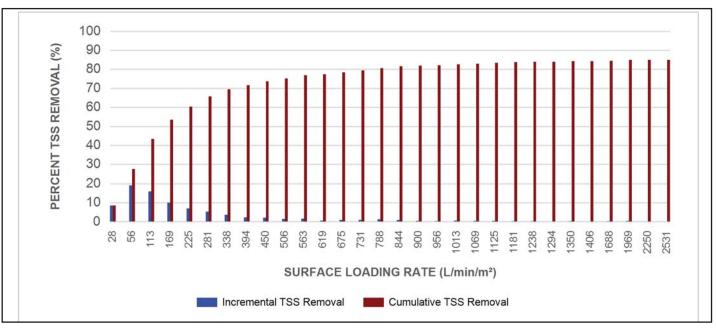








INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL







Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Model Diameter Min Angle Inlet / Outlet Pipes Diameter		Max Outl	•	Peak Conveyance Flow Rate		
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

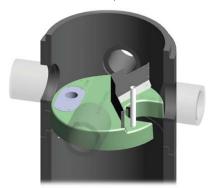
► Stormceptor® EF and EFO feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV Procedure for Laboratory Testing of Oil-Grit Separators, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

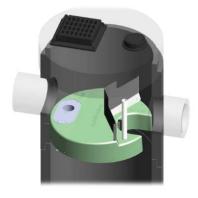
DESIGN FLEXIBILITY

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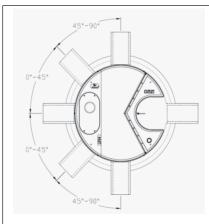
OIL CAPTURE AND RETENTION

► While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid reentrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.









INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.

 0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.

45° - 90°: The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Mod Diam		Depth Pipe In Sump		Oil Vo							mum Volume *	Maxim Sediment	-
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft³)	(kg)	(lb)		
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250		
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375		
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750		
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500		
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875		

^{*}Increased sump depth may be added to increase sediment storage capacity

^{**} Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft³)

Feature	Benefit	Feature Appeals To		
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer		
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner		
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer		
Minimal drop between inlet and outlet	Site installation ease	Contractor		
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner		

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef







STANDARD PERFORMANCE SPECIFICATION FOR "OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREATMENT DEVICE

PART 1 - GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators**

1.3 SUBMITTALS

- 1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.
- 1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.
- 1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 - PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1 4 ft (1219 mm) Diameter OGS Units: 1.19 m³ sediment / 265 L oil
6 ft (1829 mm) Diameter OGS Units: 3.48 m³ sediment / 609 L oil
8 ft (2438 mm) Diameter OGS Units: 8.78 m³ sediment / 1,071 L oil
10 ft (3048 mm) Diameter OGS Units: 17.78 m³ sediment / 1,673 L oil
12 ft (3657 mm) Diameter OGS Units: 31.23 m³ sediment / 2,476 L oil

PART 3 - PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall







remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

- 3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m² to 1400 L/min/m², and as stated in the ISO 14034 ETV Verification Statement for the OGS device.
- 3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m² and 1400 L/min/m² shall be based on linear interpolation of data between consecutive tested surface loading rates.
- 3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m² shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m². No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m².
- 3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m² shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m², and shall be calculated using a simple proportioning formula, with 1400 L/min/m² in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m².

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators**.

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m².

3.4 <u>LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING</u>

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This reentrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to







assess whether light liquids captured after a spill are effectively retained at high flow rates. For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m² to 2600 L/min/m²) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's Procedure for Laboratory Testing of Oil-Grit Separators. However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

Time of Concentration Calculations

Refer to Figures 2 and 3 for drainage areas

Pre-Development

tc= 23.86 min tp=
$$0.67*$$
tc tp= 0.265 hr

tc= 22.95 min tp=
$$0.67*$$
tc tp= 0.256 hr

Post-Development

tc= 18.09 min tp=
$$0.67*$$
tc tp= 0.202 hr

Grassed Swale Capacity Calculations

Maximum controlled discharge from pond for a 100-year storm event 16L/sec Refer to VH output - Route Reservoir Node 22

The initial leg of the outfall channel will follow the existing grade which coincides with an approximate slope of 9.5%

9.5% slope

Q=	1	$AxR^{2/3}S^{1/2}$	Channel Base	e Width=	0.5 m
	n	-	Side Slope =		3 :1
			Depth=		0.03 m
Q=_	1	0.018 0.026 2/3 0.0	95 ^{1/2} Manning's Co	pefficient	0.03
	0.030		Channel Slop	<u>e</u>	<u>0.095</u> m/m
Q=	0.016	m3/s = VH Output (100-	r) A=Area		0.018 m^2
		•	P=Wetted Pe	erimeter	0.690 m
V=	Q		R=Hydraulic	Radius=A/P	0.026 m
	А	-			
V=	0.894	m/s	•		

Note: Check dams will be in place to mitigate flow velocity
The specified FM200 TRM can withstand up to 3.8m/sec (unvegetated)

1% slope

1/0 310	Jpc					
Q=_	1	AxR ^{2/3} S ^{1/3}	/2		Channel Base Width=	0.5 m
	n				Side Slope =	3 :1
					Depth=	0.057 m
Q=	1	0.038	$0.044^{-2/3}$	0.010 1/2	Manning's Coefficient	0.03
	0.030				Channel Slope	<u>0.010</u> m/m
Q=	0.01	<mark>.6</mark> m3/s			A=Area	0.038 m^2
					P=Wetted Perimeter	0.860 m
V=	Q				R=Hydraulic Radius=A/P	0.044 m
	Α					
V=	0.41	<mark>8</mark> m/s	Exiting Veloci	ty		

The channel velocity should be limited to 0.50m/sec before merging with the existing creek. Therefore, the slope of the last leg of the outfall channel will be reduced to 1% to limit channel exit velocity to below 0.50m/sec.



FM200 - TRM

Specification Sheet

The FM200 is a turf reinforcement mat made of 100% polypropylene fiber (green) designed for critical slope and channel applications requiring permanent erosion control and turf reinforcement. The matting is sewn together on 1.5 inch (38.1 mm) centers. The FM200 meets all requirements established in the FHWA FP-03 as a Type 5 A, B, and C turf reinforcement matting for use on slopes with gradients up to 0.5:1 (h:v), channels, and shorelines. The FM200 has been tested by the National Transportation Product Evaluation Program (NTPEP). The FM200 comes packaged in clear shrink-wrap with a blue band and includes installation instructions.

Product Nomenclature & Properties

FM = 100% polypropylene fiber matrix (tan or green in color) applied at a rate of 0.75 lbs/yd² (400 g/m²)

= top permanent UV stabilized black net with a mesh size of 0.53 x 0.5 in (1.34 x 1.27 cm)

= bottom permanent UV stabilized black net with a mesh size of 0.626 x 0.626 in (1.59 x 1.59 cm)

= permanent UV stabilized black thread

Index & Bench Scale Testing

Test Description	Test Method	Test Results
Mass per Unit Area	ASTM D6475	12.7 oz/yd ²
UV Stability at 500 hours	ASTM D 4355	96%
Tensile Strength	ASTM D6818	31.4 lb/in @ 27.6% MD 17.7 lb/in @ 33.4% TD
Thickness	ASTM D6525	0.446 in
Light Penetration / Ground Cover	ASTM D6567	20% / 80%
Unvegetated Bench-Scale Rain Splash and Runoff (not to be used as a design value)	ASTM D7101	Soil Loss Ratio* = 6.29 Soil Loss Ratio*= 6.05 Soil Loss Ratio*= 5.81
Unvegetated Bench-Scale Shear Stress (not to be used as design value)	ASTM D7207	3.07 lbs/ft ² @ ½ in. soil loss
Seed Germination and Plant Growth Under Bench-Scale Conditions	ASTM D7322	508% Improvement (increased biomass)
*Soil Loss Ratio = Soil Loss Bare Soil / Soil Loss with RECP = 1 / C-Factor (No	te: Soil loss is based on regres	ssion analysis)

Design Values

- "C" factor = 0.001
- Unvegetated Maximum Permissible Shear Stress = 3.30 lbs/ft² (158.4 Pa)
- Vegetated Maximum Permissible Shear Stress = 14.0 lbs/ft² (665 Pa)
- Maximum Flow Velocity Unvegetated = 12 ft/s (3.8 m/s)
- Maximum Flow Velocity Vegetated = 21 ft/s (6.65 m/s)
- Unvegetated Manning's "n" = 0.03 (The hydraulic roughness coefficient will vary for vegetated conditions based on vegetation stand height and density)

Standard Roll Details

 Width
 2.44m (8ft)

 Standard Length
 25.7m (84.3ft)

 Area
 62.7m² (75yd²)

 Weight ±10%
 28kg (61lb)

Also available in:

Width 2.44m (8ft) 4.88m (16ft) 4.88m (16ft) Standard Length 102.8m (337.5ft) 102.8m (337.5ft) 25.7m (84.3ft) 250.8m² (300yd²) 500m² (600yd²) 125.4m² (150yd²) Area 224kg (488 lb) Weight ±10% 112kg (244 lb) 56kg (122lb)

Design Chart 1.08: Hydrologic Soil Groups (Continued)

- Based on Soil Texture

Sand	s, Sandy Loams and Gravels	
-	overlying sand, gravel or limestone bedrock, very well drained	A
-	ditto, imperfectly drained	AB
-	shallow, overlying Precambrian bedrock or clay subsoil	В
Medi	um to Coarse Loams	
-	overlying sand, gravel or limestone, well drained	AB
-	shallow, overlying Precambrian bedrock or clay subsoil	В
Medi	um Textured Loams	
-	shallow, overlying limestone bedrock	В
-	overlying medium textured subsoil	BC
Silt L	oams, Some Loams	
-	with good internal drainage	ВС
-	with slow internal drainage and good external drainage	С
Clays.	Clay Loams, Silty Clay Loams	
-	with good internal drainage	С
-	with imperfect or poor external drainage	С
-	with slow internal drainage and good external drainage	D

Source: U.S. Department of Agriculture (1972)

Design Chart 1.09: Soil/Land Use Curve Numbers

Land Use	Treatment or Practice	Hydrologic Condition ⁴	Hydrologic Soil Group			
		, ,	Α	В	С	D
Fallow	Straight row		77	86	91	94
Row crops	ıı ı	Poor	72	81	88	91
		Good	67	78	85	89
	Contoured	Poor	70	79	84	88
		Good	65	75	82	86
	" and terraced	Poor	66	74	8	82
		Good	62	71	78	81
Small grain	Straight row	Poor	65	76	84	88
		Good	63	75	83	87
	Contoured	Poor	63	74	82	85
		Good	61	73	81	84
	" and terraced	Poor	61	72	79	82
		Good	59	70	78	81
Close-seeded	Straight row	Poor	66	77	85	89
legumes ²	11 11	Good	58	72	81	85
or	Contoured	Poor	64	75	83	85
rotation	Company and the company of the compa	Good	55	69	78	83
meadow	" and terraced	Poor	63	73	80	83
	" and terraced	Good	51	67	76	80
Pasture		Poor	68	79	86	89
or range		Fair	49	69	79	84
	Contoured	Good	39	61	74	80
	P	Poor	47	67	81	88
		Fair	25	59	75	83
		Good	6	35	70	79
Meadow		Good	30	(58)	71	78
Woods		Poor	45	66	77	83
		Fair	36	60 (55)	73	79
		Good	25	(55)	70	77
Farmsteads			59	74	82	86
			72	82	87	89
			74	84	90	92

For average anticedent soil moisture condition (AMC II) ² Close-drilled or broadcast.

Source: U.S. Department of Agriculture (1972)

⁴ The hydrologic condition of cropland is good if a good crop rotation practice is used; it is poor if one crop is grown continuously.

Imperviousness Calculations

HYD 5 - Post Development to the North

<u>ltem</u>	Area (m²)	<u>% lmp</u>	Total Area of Tributary = 31,200 m2
Lot Fabric	18,619	* 50%	Max. lot coverage permitted under proposed zoning by-law
Driveways (R.O.W.)	2,016	100%	-6m x 6m driveway within R.O.W. footprint, 56 driveways
			-28 Single houses and 14 semi det. (28+(14x2) driveways)
8m Road Width	3,455	100%	
**Sidewalk	291	100%	-330m of SW (1.5m wide) subtract driveways for 34 lots.
Dry Pond	2,500	70%	-Area bounded by top of berm
Landscape	4,319	0%	-Landscape area is the total area subtract the aforementioned
	31200		items. This is mainly the boulevard to be sodded and the area
			between the pond and the lot fabric.

^{*}Includes driveway area and house footprint within lot fabric

HYD 6 - Post Development to the North (Major Flows to Existing Turner Street Ditch)

<u>ltem</u>	Area (m²)	<u>% lmp</u>	Total Area of Tributary = 3,354 m2
House Footprint	116	100%	Drainage from roof's will discharge to the rear yard (0.75 of 1 house)
Driveways (R.O.W.)	396	100%	-6m x 6m driveway within R.O.W. footprint, 11 driveways
Driveways (Lot)	396	100%	-6m x 6m driveway within lot fabric, 11 driveways
8m Road Width	680	100%	
Sidewalk	70	100%	-100m of SW (1.5m wide) subtract driveways for 9 lots, south side.
Landscape	1,812	0%	
	3,354		
<u>% Imp. =</u>	<u>1,658</u> _X	100%	+ 1,812 x 0%
	3,354		3,354
<u>% Imp. =</u>	49.43%		

Therefore, use 50% in VH Model

^{**}Not on both side of Blvd.

Imperviousness Calculations

HYD 9 - Part of Post Development Drainage Area to Existing Turner Street Ditch

<u>Item</u>	Area (m²)	% Imp	Total Area of Tributary = 2,735 m2
House Footprint	0	-	Drainage from roof's will discharge to the rear lot
Driveways (R.O.W.)	288	100%	-6m x 6m driveway within R.O.W. footprint, 8 driveways
Driveways (Lot)	288	100%	-6m x 6m driveway within lot fabric, 12 driveways
8m Road Width	480	100%	
Sidewalk	45	100%	-60m of SW (1.5m wide) subtract driveways for 5 lots.
Landscape	1,634	0%	
	2,735		
<u>% Imp. =</u>	1,101	- x 100%	+ 1,634 0%
	2,735	_ ^	2,735
<u>% Imp. =</u>	40.26%	Therefore,	use 45% in VH Model

HYD 7 - Post Development to the North

<u>ltem</u>	Area (m²)	<u>% lmp</u>	Total Area of Tributary = 7,300	m2
House Footprint	1,377	100%	9 lots with 8.5 x 18m House footprint	
Landscape	5,923	0%		
	7,300			
<u>% lmp. =</u>	1,377	- x ^{100%}	+ 5,923 _X 0%	
	7,300	^	7,300	
% Imp. =	18.86%	Use 20% in	VH Model	

HYD 10 - Post Development to the South

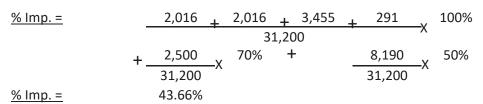
<u>Item</u>	Area (m²)	% Imp	Total Area of Tributary =	4,400	m2
House Footprint	918	100%	6 lots with 8.5 x 18m House f	ootprint	
Landscape	3,536	0%			
	4,400				

<u>% Imp. =</u> 20.86% Therefore, use 21% in VH Model

Directly Connected Drainage

HYD 5 - Post Development to the North

Area (m²)	<u>% lmp</u>	Total Area of Tributary =	31,200	m2
8,190	50%	28 Houses at 155m2 and 14 Semi's	at 275m2	
2,016	100%	-6m x 6m driveways for 56 drivewa	ys (28 + (1	4x2))
2,016	100%			
3,455	100%			
291	100%			
2,500	70%			
	8,190 2,016 2,016 3,455 291	8,190 50% 2,016 100% 2,016 100% 3,455 100% 291 100%	8,190 50% 28 Houses at 155m2 and 14 Semi's 2,016 100% -6m x 6m driveways for 56 drivewa 2,016 100% 3,455 100% 291 100%	8,190 50% 28 Houses at 155m2 and 14 Semi's at 275m2 2,016 100% -6m x 6m driveways for 56 driveways (28 + (1 2,016 100% 3,455 100% 291 100%



Therefore, use 45% in VH Model

PROJECT Millbrook - Veltri

PROJECT # 115040 **DATE** 3-May

INPUT PARAMETERS

Pre development

NASH HYD 3

Area (ha)	2.71	Area (ha)	1.27
Time Step (min)	5	Time Step (min)	5
DWF (m3/s)	0	DWF (m3/s)	0
CN	57	CN	57
IA (mm)	5	IA (mm)	5
N	3	N	3
Tp (hr)	0.265	Tp (hr)	0.256

NASH HYD 4

Post development

STAND HYD 5			STAND HYD 6			STAND HYD 7		
Area (ha)	3.12		Area (ha)	0.34		Area (ha)	0.73	
Time Step (min)	5		Time Step (min)	5		Time Step (min)	5	
TIMP	0.54		TIMP	0.50		TIMP	0.20	
XIMP	0.47		XIMP	0.50		XIMP	0.01	
DWF (m3/s)	0		DWF (m3/s)	0		DWF (m3/s)	0	
LOSS	SCS Curve Me	thod	LOSS	CS Curve Method		LOSS	CS Curve Method	
	CN	57		CN	57		CN	57
	IA (mm)	1.5		IA (mm)	1.5		IA (mm)	1.5
SLPP (%)	2		SLPP (%)	2		SLPP (%)	2	
LGP (m)	40		LGP (m)	40		LGP (m)	40	
MNP	0.25		MNP	0.25		MNP	0.25	
SCP (hr)	0		SCP (hr)	0		SCP (hr)	0	
DPSI (mm)	1		DPSI (mm)	1		DPSI (mm)	1	
SLPI (%)	5		SLPI (%)	5		SLPI (%)	5	
LGI (m)	144.22		LGI (m)	47.61		LGI (m)	69.76	
MNI	0.013		MNI	0.013		MNI	0.013	
SCI (hr)	0		SCI (hr)	0		SCI (hr)	0	

PROJECT Millbrook - Veltri

PROJECT # 115040 **DATE** 3-May

INPUT PARAMETERS

Post development

STAND HYD 9

STAND HYD 10

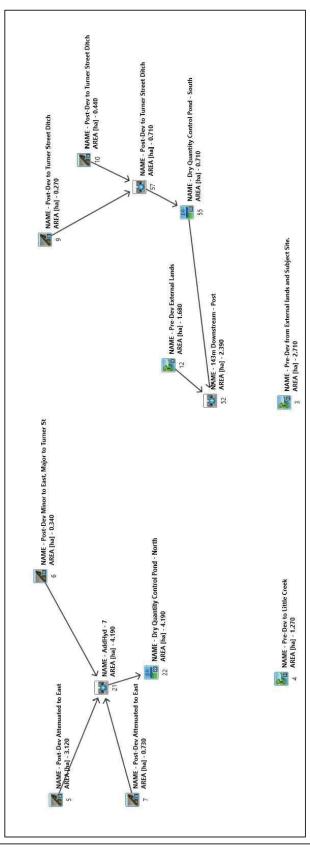
Area (ha)	0.27		Area (ha)	0.44	
Time Step (min)	5		Time Step (min)	5	
TIMP	0.45		TIMP	0.21	
XIMP	0.45		XIMP	0.01	
DWF (m3/s)	0		DWF (m3/s)	0	
LOSS	SCS Curve Method		LOSS	Mod SCS Curve Metho	
	CN	57		CN	57
	IA (mm)	1.5		IA (mm)	1.5
SLPP (%)	2		SLPP (%)	2	
LGP (m)	40		LGP (m)	40	
MNP	0.25		MNP	0.25	
SCP (hr)	0		SCP (hr)	0	
DPSI (mm)	1		DPSI (mm)	1	
SLPI (%)	5		SLPI (%)	5	
LGI (m)	42.43		LGI (m)	54.16	
MNI	0.013		MNI	0.013	
SCI (hr)	0		SCI (hr)	0	

NASH HYD 12

Area (ha)	1.68		
Time Step (min)	5		
DWF (m3/s)	0		
CN	57		
IA (mm)	5		
N	3		
Tp (hr)	0.202		

SCHEDULE 3

-VISUAL OTTHYMO 3.0 OUTPUT FILES



VELTRI WEST LANDS - TURNER STREET

VISUAL OTTHYMO SCHEME



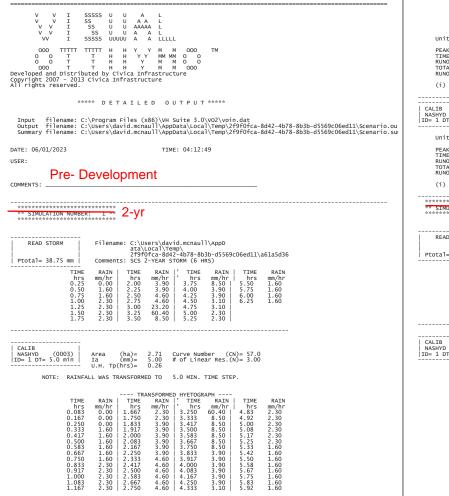
D.G. Biddle & Associates Limited

consulting engineers and planners 96 KING STREET EAST • OSHAWA,ON • L1H 1B6 PHONE (905)576—8500 • FAX (905)576—9730 info@dgbiddle.com SCALE N.T.S.
DRAWN G.M.C.
DESIGN G.M.C.
CHECKED M.B.C.
DATE MAR 2018

PROJECT 115040

WG _

FIG 8



```
Unit Hyd Qpeak (cms)= 0.391
          PEAK FLOW (cms)= 0.036 (i)
TIME TO PEAK (hrs)= 3.417
RUNOFF VOLUME (mm)= 5.051
TOTAL RAINFALL (mm)= 38.750
RUNOFF COEFFICIENT = 0.130
          (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
Unit Hyd Qpeak (cms)= 0.189
          PEAK FLOW (cms)= 0.017 (i)
TIME TO PEAK (hrs)= 3.417
RUNOFF VOLUME (mm)= 5.050
TOTAL RAINFALL (mm)= 38.750
RUNOFF COEFFICIENT = 0.130
          (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
    READ STORM
                                                      Filename: C:\Users\david.mcnaull\AppD
ata\Locall\Temp\
2F9f0fca=8d42-4078-8b3b-d5569c06ed11\ab61d37e
Comments: SCS 5-YEAR STORM (6 HRS)
    Ptota1= 52.44 mm
                                                       RAIN | TIME
mm/hr | hrs
0.00 | 2.00
2.10 | 2.50
3.20 | 2.75
3.20 | 3.00
3.20 | 3.00
3.20 | 3.50
                                                                                           RAIN | TIME mm/hr | hrs 5.20 | 3.75 | 5.20 | 4.00 | 6.30 | 4.25 | 6.30 | 4.50 | 31.40 | 4.75 | 81.78 | 5.00 | 11.50 | 5.25
                                                                                                                               RAIN
mm/hr
11.50 |
5.20 |
5.20 |
4.20 |
4.20 |
3.20 |
3.20 |
                                      TIME
hrs
0.25
0.50
0.75
1.00
1.25
1.50
1.75
                                                                                                                                                      TIME
hrs
5.50
5.75
6.00
6.25
NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.
                                                                                    TRANSFORMED HYETOGRAPH ----
HE RAIN | TIME RAIN | TIME
57 3.20 3.250 81.78 4.83
10 3.20 3.253 81.78 4.83
10 3.20 3.233 11.50 4.92
10 5.20 3.4317 11.50 5.00
10 5.20 3.4317 11.50 5.00
10 5.20 3.683 11.50 5.00
10 5.20 3.683 11.50 5.00
10 5.20 3.683 11.50 5.25
17 5.20 3.667 11.50 5.35
10 5.20 3.833 5.20 5.25
10 5.20 3.833 5.20 5.25
10 5.20 3.833 5.20 5.25
10 5.20 3.833 5.20 5.57
10 6.30 4.020 5.20 5.50
17 6.63 14.020 5.20 5.50
18 6.30 4.020 5.20 5.50
19 6.30 4.033 4.020 5.20 5.83
10 6.30 4.333 4.20 5.20 5.83
10 6.30 4.333 4.20 5.20 5.83
10 6.30 4.333 4.20 5.20 5.83
                                                                                                                                                                         TIME hrs 0.083 0.167 0.250 0.333 0.417 0.500 0.583 0.667 0.750 0.833 1.000 1.083 1.167 1.250
                                                                        TIME
hrs
1.667
1.750
1.833
1.917
2.000
2.083
2.167
2.250
2.333
2.417
2.583
2.667
2.7583
```

```
Unit Hyd Qpeak (cms)= 0.391
                                Unit Hyd Qpeak (cms)= 0.391
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              PEAK FLOW (cms)= 0.095 (i)
TIME TO PEAK (hrs)= 3.417
RUNOFF VOLUME (mm)= 12.898
TOTAL RAINFALL (mm)= 61.600
RUNOFF COEFFICIENT = 0.209
                              PEAK FLOW (cms)= 0.069 (i)
TIME TO PEAK (hrs)= 3.417
RUNOFF VOLUME (mm)= 9.410
TOTAL RAINFALL (mm)= 52.445
RUNOFF COEFFICIENT = 0.179
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
                                (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | CALIB
| NASHYD (0004) | Area (ha)= 1.27 Curve Number (CN)= 57.0
| ID= 1 DT= 5.0 min | Ia (mm)= 5.00 # of Linear Res.(N)= 3.00
| U.H. Tp(hrs)= 0.26
Unit Hyd Qpeak (cms)= 0.189
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              PEAK FLOW (cms)= 0.045 (i)
TIME TO PEAK (hrs)= 3.417
RUNOFF VOLUME (mm)= 12.897
TOTAL RAINFALL (mm)= 61.600
RUNOFF COEFFICIENT = 0.209
                              PEAK FLOW (CmS)= 0.033 (i)
TIME TO PEAK (hrs)= 3.417
RUNOFF VOLUME (mm)= 9.409
TOTAL RAINFALL (mm)= 52.445
RUNOFF COEFFICIENT = 0.179
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW TE ANY.
                              (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        ******
            ********
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          ** SIMULATION NUMBER: 4 ** 25-yr
            *** SIMULATION NUMBER: 3 ** 10-yr
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        READ STORM
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                Filename: C:\Users\david.mcnaull\AppD
ata\uoca\\remp\
2f9f0fca.8dd2-4b78-8b3b-d5569c06ed11\77c033ec
Comments: SCS 25-YEAR STORM (6 HRS)
                  READ STORM
                                                                                                                                                      Filename: C:\Users\david.mcnaull\AppD
ata\Local\Temp\
2F9f0fca=842-4b78-8b3b-d5569c06ed11\dc938a67
Comments: SCS 10-YEAR STORM (6 HRS)
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      Ptotal= 72.90 mm
  Ptotal= 61.60 mm
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                RAIN | TIME RAIN | TIME mm/hr hrs mm/hr hrs mm/hr hrs close | 10.00 | 2.00 | 7.30 | 3.75 | 2.90 | 2.25 | 7.30 | 4.00 | 2.50 | 8.80 | 4.25 | 4.40 | 2.75 | 8.80 | 4.25 | 4.40 | 3.00 | 43.70 | 4.75 | 4.40 | 3.25 | 113.70 | 5.00 | 4.40 | 3.50 | 16.00 | 5.25 |
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            RAIN
mm/hr
16.00 |
7.30 |
5.80 |
5.80 |
4.40 |
4.40 |
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  TIME
hrs
0.25
0.50
0.75
1.00
1.25
1.50
                                                                                                                                                            RAIN | TIME RAIN | TIME mm/hr hrs
0.00 | 2.00 | 6.20 | 3.75
2.50 | 2.25 | 6.20 | 4.00
2.50 | 2.50 | 7.40 | 4.25
3.70 | 2.75 | 7.40 | 4.25
3.70 | 3.00 | 36.90 | 4.75
3.70 | 3.25 | 95.90 | 5.00
3.70 | 3.35 | 35.00 | 5.25
                                                                                                                  TIME
hrs
0.25
0.50
0.75
1.00
1.25
1.50
                                                                                                                                                                                                                                                                                                                                                                                                    RAIN | TIME
mm/hr | hrs
13.50 | 5.50
6.20 | 5.50
6.20 | 6.00
4.90 | 6.25
4.90 | 3.70 |
3.70 |
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | CALIB
| NASHYD (0003)
|ID= 1 DT= 5.0 min
| CALTB | CALT
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    Area (ha)= 2.71 Curve Number (CN)= 57.0 Ia (mm)= 5.00 # of Linear Res.(N)= 3.00 U.H. Tp(hrs)= 0.26
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.
                                                            NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          TRANSFORMED HYETOGRAPH
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      RAIN | TIME | mm/hr | hrs | 1.7 | hrs | 1.
                                                                                                                                                                                                                                                                                                                                                                                    RAIN 95.90 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 1
                                                                                                                                                                                                                                                              TRANSFORMED HYETOGRAPH
                                                                                                                                                                                                                                                                      RANSFORMED | RAIN | MAIN | MAI
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        TIME
hrs
1.667
1.750
1.833
1.917
2.000
2.083
2.167
2.250
2.333
2.417
2.500
2.583
2.670
2.833
2.913
3.913
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            RAIN
                                                                                                                                                                                                                                                                                                                                  TIME hrs
3.250
3.333
3.417
3.500
3.583
3.667
3.750
3.883
3.917
4.000
4.083
4.4167
4.250
4.333
4.417
4.500
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            TIME hrs
4.83
4.92
5.00
5.08
5.17
5.25
5.33
5.42
5.50
5.58
5.67
5.75
5.83
5.90
6.00
6.08
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    mm/hr
4.40
4.40
7.30
7.30
7.30
7.30
7.30
8.80
8.80
8.80
8.80
8.80
43.70
43.70
                                                                                                              TIME
hrs
0.083
0.167
0.250
0.333
0.417
0.500
0.583
0.667
0.750
0.833
0.917
1.000
1.083
1.167
1.250
                                                                                                                                                                                                                        TIME hhrs 1.667 1.750 1.833 1.917 2.000 2.083 2.167 2.250 2.333 2.417 2.500 2.583 2.667 2.750 2.833 2.917
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          hrs
0.083
0.167
0.250
0.333
0.417
0.500
0.583
0.667
0.750
0.833
0.917
1.008
1.167
1.250
1.333
1.417
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    mm/hr
0.00
0.00
2.90
2.90
2.90
2.90
2.90
4.40
4.40
4.40
4.40
4.40
4.40
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            mm/hr
4.40
4.40
4.40
4.40
4.40
2.90
2.90
2.90
2.90
```

```
1.583 4.90 | 3.167 127.00 | 4.750 6.50 |
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 Unit Hyd Qpeak (cms)= 0.391
                              Unit Hyd Qpeak (cms)= 0.391
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   PEAK FLOW (CMS)= 0.162 (i)
TIME TO PEAK (hrs)= 3.417
RUNOFF VOLUME (mm)= 21.801
TOTAL RAINFALL (mm)= 81.475
RUNOFF COEFFICIENT = 0.268
                                PEAK FLOW (cms)= 0.132 (i)
TIME TO PEAK (hrs)= 3.417
RUNOFF VOLUME (mm)= 17.754
TOTAL RAINFALL (mm)= 72.900
RUNOFF COEFFICIENT = 0.244
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
                                (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Unit Hyd Qpeak (cms)= 0.189
                                Unit Hyd Qpeak (cms)= 0.189
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 PEAK FLOW (cms)= 0.077 (i)
TIME TO PEAK (hrs)= 3.417
RUNOFF VOLUME (mm)= 21.799
TOTAL RAINFALL (mm)= 81.475
RUNOFF COEFFICIENT = 0.268
                                PEAK FLOW (cms)= 0.063 (i)
TIME TO PEAK (hrs)= 3.417
RUNOFF VOLUME (mm)= 17.752
TOTAL RAINFALL (mm)= 72.900
RUNOFF COEFFICIENT = 0.244
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
                                (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     ** SIMULATION NUMBER: 6 *** 100-yr
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           READ STORM
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       Filename: C:\Users\david.mcnaull\AppD
ata\\Local\Temp\
299f0fca-8d42-4b78-8b3b-d5569c06ed11\fb7a95c4
Comments: SCS 100-YEAR STORM (6 HRS)
                                                                                                                                                             Filename: C:\Users\david.mcnaull\AppD
ata\Local\Temp\
2f9f0fca=8d42-4b78-8b3b-d5569c06ed11\0df70418
Comments: SCS 50-YEAR STORM (6 HRS)
                            READ STORM
        Ptotal= 81.47 mm
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         RAIN | TIME
mm/hr | hrs
0.00 | 2.00
3.60 | 2.50
3.60 | 2.55
5.40 | 2.75
5.40 | 3.00
5.40 | 3.25
5.40 | 3.50
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 RAIN
mm/hr
19.80 |
9.00 |
9.00 |
7.20 |
7.20 |
5.40 |
                                                                                                                                                                    RAIN | TIME RAIN | TIME mm/hr | hrs mm/hr | hrs mm/hr | hrs 3 | 10.00 | 2.00 | 8.10 | 3.75 | 3.30 | 2.25 | 8.10 | 4.00 | 3.30 | 2.25 | 8.10 | 4.00 | 3.30 | 2.25 | 9.80 | 4.25 | 4.90 | 2.75 | 9.80 | 4.25 | 4.90 | 3.00 | 48.90 | 4.75 | 4.90 | 3.25 | 227.00 | 5.00 | 4.90 | 3.50 | 127.00 | 5.25 |
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         TIME
hrs
0.25
0.50
0.75
1.00
1.25
1.50
1.75
                                                                                                                                                                                                                                                                                                                                                                                                   RAIN | 17.90 | 8.10 | 8.10 | 6.50 | 4.90 |
                                                                                                                    TIME
hrs
0.25
0.50
0.75
1.00
1.25
1.50
1.75
                                                                                                                                                                                                                                                                                                                                                                                                                                                               TIME
hrs
5.50
5.75
6.00
6.25
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           mm/hr
3.30
3.30
3.30
3.30
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | CALIB
| NASHYD (0003) |
|ID= 1 DT= 5.0 min |
Area (ha)= 2.71 Curve Number (CN)= 57.0 Ia (mm)= 5.00 # of Linear Res.(N)= 3.00 U.H. Tp(hrs)= 0.26
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.
                                                             NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP.
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        RAPH ----
E RAIN | 140, 20 | 10, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 19, 80 | 1
                                                                                                                                                                                                                                     --- TRANSFORMET
TIME RAIN
1. 167 mm/lm
1. 163 mm/lm
1. 164 mm/lm
1. 16
                                                                                                                                                                                                                                                                                                                                            ) HYETOGRAPH ----

1 TIME RAIN | TIME RAIN
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             TIME hrs 3.250 3.333 3.417 3.500 3.583 3.667 3.750 13.833 14.167 4.083 4.167 4.250 4.333 4.417 4.500 4.583 4.4667 4.750
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   TIME hrs 0.083 0.167 0.250 0.333 0.417 0.500 0.583 0.917 1.000 1.083 1.167 1.250 1.333 1.417 1.503 1.583
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 RAIN
mm/hr
0.00
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3.60
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                TIME
hrss
1.667
1.750
1.833
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2.1667
2.250
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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         RAIN mm/hr 5.40 5.40 9.00 9.00 9.00 9.00 10.80 10.80 10.80 10.80 53.90 53.90 140.20 140.20
                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  TIME hrs
4.83
4.92
5.00
5.17
5.25
5.33
5.42
5.50
5.58
5.67
5.75
5.83
6.00
6.08
6.08
6.17
6.25
                                                                                                                                                                        mm/hr
0.00
0.00
3.30
3.30
3.30
3.30
3.30
4.90
4.90
4.90
4.90
4.90
4.90
                                                                                                              hrs
0.083
0.167
0.250
0.333
0.417
0.500
0.583
0.667
0.750
0.833
0.917
1.000
1.083
1.167
1.250
1.333
1.417
                                                                                                                                                                                                                             hrs
1.667
1.750
1.833
1.917
2.000
2.083
2.167
2.333
2.417
2.583
2.667
2.758
2.667
2.733
2.917
3.000
3.083
```

RAIN mm/hr 5 5 .40 5 5 .40 5 5 .40 5 5 .40 3 .60 3 .60 3 .60 3 .60 3 .60 3 .60 3 .60 3 .60 3 .60 3 .60 3 .60 3 .60 3 .60 3 .60 3 .60 3 .60

```
Unit Hyd Qpeak (cms)= 0.391

PEAK FLOW (cms)= 0.195 (i)
TIME TO PEAK (hrs)= 3.417
RUNGFF COEFFICIENT = 0.290

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB (0004) Area (ha)= 1.27 Curve Number (CN)= 57.0

Whith Hyd Qpeak (cms)= 0.189

PEAK FLOW (cms)= 0.189

PEAK FLOW (cms)= 0.189

PEAK FLOW (cms)= 0.093 (i)
TIME TO PEAK (hrs)= 3.417
RUNGFF VOLUME (mm)= 25.021

RUNGFF COEFFICIENT = 0.290

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

0.7: 0.8: 0.9: 1.0: 1.0: 1.1: 1.2: 1.3: 1.4: 1.5:	50 1.60 1.60 1.60 1.70	2.333 2.417 2.500 2.583 2.667 2.750 2.833 2.917 3.000 3.083 3.167	4.60 3.917 4.60 4.083 4.60 4.167 4.60 4.167 4.60 4.250 323.20 4.417 23.20 4.583 60.40 4.563 60.40 4.653	3.90 5.50 3.90 5.58 3.90 5.67 3.90 5.83 3.10 5.92 3.10 6.08 3.10 6.17 3.10 6.25	1.60 1.60 1.60 1.60 1.60 1.60 1.60 1.60
Max.Eff.Inten. ove Storage Coeff. Unit Hyd. Tpeal Unit Hyd. peak	(mm/hr)= (min)= (min)= ((min)= (cms)=	60.40 5.00 1.55 5.00 0.33	15.67 20.00 ii) 16.37 (i 20.00 0.06	ii) *TOTALS*	
PEAK FLOW TIME TO PEAK RUNOFF VOLUME TOTAL RAINFALL RUNOFF COEFFIC	(cms)= (hrs)= (mm)= (mm)= EENT =	0.00 3.25 37.75 38.75 0.97	0.01 3.42 7.32 38.75 0.19	0.014 (iii 3.42 7.61 38.75 0.20)
(i) CN PROCEI CN* = (ii) TIME STEI	REAS WITH IN HOULD CONSID DURE SELECTE 57.0 Ia P (DT) SHOUL STORAGE COE	D FOR PER' D FOR PER' D DEP. Store D BE SMAL FFICIENT.	RATIOS BELOW 2 ING THE AREA. VIOUS LOSSES: orage (Above) LER OR EQUAL	0	
CALIB STANDHYD (0005) ID= 1 DT= 5.0 min	Area Total Im	(ha)= 3 p(%)= 54	.12 .00 Dir. Cor	nn.(%)= 45.00	
Surface Area Dep. Storage Average Slope Length Mannings n	(ha)= (mm)= (%)= (m)= =	MPERVIOUS 1.68 1.00 5.00 144.22 0.013	1.44 1.50 2.00 40.00 0.250	(1)	
Max.Eff.Inten. over Storage Coeff. Unit Hyd. Tpeal Unit Hyd. peak	(mm/hr) = (min) = (min) = (min) = (cms) =	60.40 5.00 2.40 5.00 0.30	11.87 20.00 18.96 (1 20.00 0.06		
PEAK FLOW TIME TO PEAK RUNOFF VOLUME TOTAL RAINFALL RUNOFF COEFFIC	(CMS)= (hrs)= (mm)= (mm)= (ENT =	0.24 3.25 37.75 38.75 0.97	0.03 3.50 7.11 38.75 0.18	0.254 (iii 3.25 20.89 38.75 0.54)
CN* = (ii) TIME STEI THAN THE (iii) PEAK FLOW	OURE SELECTE 57.0 Ia P (DT) SHOUL STORAGE COE	D FOR PER' = Dep. St D BE SMAL FFICIENT.	VIOUS LOSSES: orage (Above) LER OR EQUAL	1	
CALIB STANDHYD (0006) ID= 1 DT= 5.0 min Surface Area Dep. Storage Average Slope Length Mannings n	Area Total Im (ha)= (mm)= (%)= (m)=	(ha)= 0 p(%)= 50 MPERVIOUS 0.17 1.00 5.00 47.61	.34 .00 Dir. Cor PERVIOUS (0.17 1.50 2.00 40.00	nn.(%)= 50.00 (i)	
Mannings n	=	0.013	0.250		

60.40 8.42 5.00 25.00 1.24 (ii) 20.22 (ii) 5.00 25.00

Max.Eff.Inten.(mm/hr)= over (min) Storage Coeff. (min)= Unit Hyd. Tpeak (min)=

```
*TOTALS*
0.030 (iii)
3.25
21.87
38.75
0.56
        PEAK FLOW (CMS)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =
                                                         0.03
3.25
37.75
38.75
0.97
                                                                               0.00
3.50
6.06
38.75
0.16
 ***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES: CN^{\circ}=57.0 Ia = bep. Storage (Above) (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT. IT HAY LOW DOES NOT INCLUDE BASEFLOW IF ANY.
| ADD HYD (0021) | 1 + 2 = 3 |
   ADD HYD (0021) | AREA QPEAK | 1 + 2 = 3 | AREA (ha) (cms) | 101= 1 (0005): 3.12 0.254 | 102= 2 (0006): 0.34 0.030
                                                                               TPEAK R.V. (hrs) (mm) 3.25 20.89 3.25 21.87
            ID = 3 (0021): 3.46 0.284
                                                                          3.25
                                                                                              20.99
        NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
| ADD HYD (0021) |
| 3 + 2 = 1 |
| ID1= 3 (0021):
+ ID2= 2 (0007):
                                                  AREA QPEAK
(ha) (cms)
3.46 0.284
0.73 0.014
            ID = 1 (0021): 4.19
                                                                                3.25
                                                            0.295
                                                                                              18.66
       NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
  RESERVOIR (0022) |
IN= 2---> OUT= 1 |
DT= 5.0 min |

        OUTFLOW
        STORAGE
        OUTFLOW
        STORAGE

        (cms)
        (ha.m.)
        (cms)
        (ha.m.)

        0.0000
        0.00129
        0.1109

        0.0097
        0.0494
        0.0161
        0.2110

        PEAK FLOW REDUCTION [Qout/Qin](%)= 3.57
TIME SHIFT OF PEAK FLOW (min)=180.00
MAXIMUM STORAGE USED (ha.m.)= 0.0652
Unit Hyd Qpeak (cms)= 0.318
        PEAK FLOW (cms)= 0.027 (i)
TIME TO PEAK (hrs)= 3.333
RUNOFF VOLUME (mm)= 5.045
TOTAL RAINFALL (mm)= 38.750
RUNOFF COEFFICIENT = 0.130
```

0.33

0.05

Unit Hyd. peak (cms)=

Surface Area (h Dep. Storage (m Average Slope (Length (i Mannings n	a) = 0.12 m) = 1.00 b) = 5.00 m) = 42.43 = 0.013	0.15 1.50 2.00 40.00 0.250	
Max.Eff.Inten.(mm/h over (mi Storage Coeff. (mi Unit Hyd. Tpeak (mi Unit Hyd. peak (cm	r)= 60.40 n) 5.00 n)= 1.15 (ii) n)= 5.00 s)= 0.34	8.42 25.00 20.14 (ii) 25.00 0.05	FOTALS*
PEAK FLOW (cm TIME TO PEAK (hr. RUNOFF VOLUME (m TOTAL RAINFALL (m RUNOFF COEFFICIENT	s)= 0.02 s)= 3.25 m)= 37.75 m)= 38.75 = 0.97		0.021 (iii) 3.25 20.28 38.75 0.52
***** WARNING: STORAGE C	OEFF. IS SMALLER THAN	TIME STEP!	
CN* = 57.0 (ii) TIME STEP (DT THAN THE STOR	SELECTED FOR PERVIOUS IA = Dep. Storage) SHOULD BE SMALLER OF AGE COEFFICIENT. S NOT INCLUDE BASEFLOR	(Above) R EQUAL V IF ANY.	
CALIB STANDHYD (0010) A ID= 1 DT= 5.0 min To			1.00
	IMPERVIOUS PI a)= 0.09 m)= 1.00 %)= 5.00 m)= 54.16		
	r)= 60.40 n) 5.00 n)= 1.33 (ii) n)= 5.00 s)= 0.33		FOTALS*
PEAK FLOW (cm TIME TO PEAK (hr. RUNOFF VOLUME (m TOTAL RAINFALL (m RUNOFF COEFFICIENT	s)= 0.00 s)= 3.25 m)= 37.75 m)= 38.75 = 0.97	0.01 3.42 7.40 38.75 0.19	0.009 (iii) 3.42 7.69 38.75 0.20
***** WARNING: STORAGE CO ***** WARNING:FOR AREAS N YOU SHOULD	DEFF. IS SMALLER THAN WITH IMPERVIOUS RATIO: CONSIDER SPLITTING TO	TIME STEP! S BELOW 20% HE AREA.	
CN* = 57.0 (ii) TIME STEP (DT THAN THE STOR	SELECTED FOR PERVIOUS IA = Dep. Storage) SHOULD BE SMALLER OF AGE COEFFICIENT. S NOT INCLUDE BASEFLOR	(Above) R EQUAL	
ADD HYD (0057) 1 + 2 = 3 ID1= 1 (0010): + TD2= 2 (0009):	AREA QPEAK (ha) (cms) 0.44 0.009 0.27 0.021	TPEAK R.V. (hrs) (mm) 3.42 7.69 3.25 20.28	
	0.71 0.028		
	0.71 0.028 D NOT INCLUDE BASEFLO		
RESERVOIR (0055) IN= 2> OUT= 1 DT= 5.0 min	OUTFLOW STORAGE (cms) (ha.m.) 0.0000 0.0000 0.0059 0.0004 0.0079 0.0015	OUTFLOW (cms) 0.0094 0.0616	STORAGE (ha.m.) 0.0042 0.0095
	0.0079 0.0015	0.0000	0.0000

TPEAK (hrs) 3.25 3.75 INFLOW: ID= 2 (0057) OUTFLOW: ID= 1 (0055) PEAK FLOW REDUCTION [Qout/Qin] (%)= 30.91 TIME SHIFT OF PEAK FLOW (min)= 30.00 MAXIMUM STORAGE USED (ha.m.)= 0.0028| ADD HYD (0052) | | 1 + 2 = 3 | AREA QPEAK (ha) (cms) 1.68 0.027 0.71 0.009 ID1= 1 (0012): + ID2= 2 (0055): ID = 3 (0052): 2.39 0.036 3.33 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY. ****** ** SIMULATION NUMBER: 2 ** 5-yr Filename: C:\Users\david.mcnaull\AppD ata\\Local\Temp\ 3298d697-8c39-4942-9f06-32b9fda43240\ab61d37e Comments: SCS 5-YEAR STORM (6 HRS) READ STORM Ptotal= 52.44 mm | RAIN | TIME | RAIN | TIME | RAIN | TIME | RMM/hr | hrs | mm/hr | hrs | hrs | 1.50 | 5.20 | 5.75 | 2.10 | 2.25 | 5.20 | 4.00 | 5.20 | 5.75 | 3.20 | 2.75 | 6.30 | 4.25 | 5.20 | 6.05 | 3.20 | 2.75 | 6.30 | 4.25 | 4.20 | 6.25 | 3.20 | 3.20 | 3.25 | 81.78 | 5.20 | 3.20 | 3.20 | 3.20 | 3.20 | 3.20 | 3.20 | 3.20 | 3.20 | 3.20 | 3.20 | 3.20 | 3.20 | 3.20 | 3.20 | 3.20 | 3.20 | Area (ha)= 0.73 Total Imp(%)= 20.00 Dir. Conn.(%)= 1.00 IMPER/JOUS PERVIOUS (i)
0.15 0.58
1.00 1.50
5.00 2.00
69.76 40.00
0.013 0.250 Surface Area Dep. Storage Average Slope Length Mannings n (ha)= (mm)= (%)= (m)= NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP. TRANSFORMED HYETOGRAPH
ME RAIN ' TIMES
1.52 mm/hr ' S.25 TIME hrs 0.083 0.167 0.250 0.333 0.417 0.500 0.583 0.917 1.000 1.083 1.167 1.250 1.333 1.417 1.503 1.583 TIME hrs 1.667 1.750 1.833 1.917 2.000 2.083 2.167 2.250 2.333 2.417 2.500 2.583 2.667 2.750 2.833 2.917 3.000 3.083 3.167 mm/hr 81.78 11.50 11.50 11.50 11.50 11.50 5.20 5.20 5.20 5.20 4.20 4.20 4.20 4.20 4.20 hrs 4.83 4.92 5.00 5.08 5.17 5.25 5.33 5.42 5.50 6.67 5.75 5.83 5.92 6.00 6.17 6.25

```
Max.Eff.Inten.(mm/hr)=
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=
                                                                                                                                                                       *TOTALS*
0.028 (iii)
3.33
13.11
52.45
0.25
             PEAK FLOW (CMS)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mM)=
TOTAL RAINFALL (mM)=
RUNOFF COEFFICIENT =
***** 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^{\circ}=57.0 Ia = bep. Storage (Above) (i) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT. (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
| CALIB | STANDHYD (0005) | ID= 1 DT= 5.0 min |
                                                                Area (ha)= 3.12
Total Imp(%)= 54.00 Dir. Conn.(%)= 45.00
                                                                                   IMPERVIOUS
1.68
1.00
5.00
144.22
0.013
                                                                                                                          PERVIOUS (i)
1.44
1.50
2.00
40.00
0.250
            Surface Area
Dep. Storage
Average Slope
Length
Mannings n
                                                              (ha)=
(mm)=
(%)=
(m)=
=
            Max.Eff.Inten.(mm/hr)=
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=
                                                                                                                                                                       *TOTALS*
0.371 (iii)
3.25
29.96
52.45
0.57
            PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =
                                                                                           0.32
3.25
51.44
52.45
0.98
                                                                                                                                 0.06
3.33
12.39
52.45
0.24
***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
            (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES: \text{CN}^\circ = 57.0. Ia = bep. Storage (Above) (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)
ID= 1 DT= 5.0 min
                                                                Area (ha) = 0.34
Total Imp(\%) = 50.00 Dir. Conn.(\%) = 50.00
                                                                                   IMPERVIOUS PERVIOUS (i) 0.17 0.17 1.00 1.50 5.00 2.00 47.61 40.00 0.013 0.250
             Surface Area
Dep. Storage
Average Slope
Length
Mannings n
                                                              (ha)=
(mm)=
(%)=
(m)=
=
            Max.Eff.Inten.(mm/hr)=
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=
                                                                                           81.78
5.00
1.09 (ii)
5.00
0.34
                                                                                                                                18.57
15.00
14.94 (ii)
15.00
0.08
                                                                                                                                                                       *TOTALS*
0.043 (iii)
3.25
31.05
52.45
0.59
            PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =
                                                                                           0.04
3.25
51.45
52.45
0.98
                                                                                                                                 0.01
3.42
10.70
52.45
0.20
***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
                 (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES: CN^* = 57.0 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.
TPEAK
(hrs)
3.25
3.25
                                                                                       R.V.
(mm)
29.96
31.05
                                                                           3.25
                                                                                        30.07
        NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
  RESERVOIR (0022) |
IN= 2---> OUT= 1 |
DT= 5.0 min |

        OUTFLOW
        STORAGE
        OUTFLOW
        STORAGE

        (cms)
        (ha.m.)
        (cms)
        (ha.m.)

        0.0000
        0.00129
        0.1109

        0.0097
        0.0494
        0.0161
        0.2110

       PEAK FLOW REDUCTION [Qout/Qin] (%)= 2.78 TIME SHIFT OF PEAK FLOW (min)=180.00 MAXIMUM STORAGE USED (ha.m.)= 0.0982
 Unit Hyd Qpeak (cms)= 0.318
       PEAK FLOW (cms)= 0.052 (i)
TIME TO PEAK (hrs)= 3.333
RUNOFF VOLUME (mm)= 9.399
TOTAL RAINFALL (mm)= 52.445
RUNOFF COEFFICIENT = 0.179
        (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
  CALIB
STANDHYD (0009) | Area (ha)= 0.27
DD= 1 DT= 5.0 min | Total Imp(%)= 45.00 Dir. conn.(%)= 45.00
                                              IMPERVIOUS (i) 0.12 0.15 (1.00 1.50 5.00 2.00 42.43 40.00 0.013 0.250
        Surface Area
Dep. Storage (mm)=
Average Slope
Length
Mannings n (ha)=
(mm)=
(mm)=
(m)=
       Max.Eff.Inten.(mm/hr)=
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=
                                                                         18.57
15.00
14.86 (ii)
15.00
0.08
                                                     81.78
5.00
1.02 (ii)
5.00
0.34
```

PEAK FLOW (TIME TO PEAK (I RUNOFF VOLUME TOTAL RAINFALL RUNOFF COEFFICIEN ***** WARNING: STORAGE	cms)= 0. hrs)= 3. (mm)= 51. (mm)= 52. T = 0.	03 25 45 45 98	0.00 3.42 10.70 52.45 0.20	0.031 (iii) 3.25 29.00 52.45 0.55
**** WARNING: STORAGE	COEFF. IS SMA	LLER THAN	TIME STEP!	
(i) CN PROCEDUR CN* = 57 (ii) TIME STEP (INTERPORT (I	.0 Ia = Dep DT) SHOULD BE DRAGE COEFFICI	. Storage SMALLER OF ENT.	(Above) R EQUAL	
CALIB STANDHYD (0010) ID= 1 DT= 5.0 min	Area (ha)= Total Imp(%)=	0.44 21.00	Dir. Conn.(%)=	1.00
Surface Area Dep. Storage Average Slope Length Mannings n	(ha)= IMPERV (mm)= 0. (%)= 5. (m)= 54. = 0.0	09 00 00 16 13	0.35 1.50 2.00 40.00 0.250	
Max.Eff.Inten.(mm over (Storage Coeff. (Unit Hyd. Tpeak (Unit Hyd. peak (/hr)= 81. min) 5. min)= 1.	78 00 18 (ii)	28.11 15.00 12.91 (ii)	
Unit Hyd. peak (cms)= 0.	33	0.08	TOTALS*
PEAK FLOW (TIME TO PEAK (RUNOFF VOLUME TOTAL RAINFALL RUNOFF COEFFICIEN	Cms)= 0. hrs)= 3. (mm)= 51. (mm)= 52. T = 0.	00 25 44 45 98		0.018 (iii) 3.33 13.23 52.45 0.25
**** WARNING: STORAGE **** WARNING: FOR AREA		LLER THAN	TIME STEP! S BELOW 20% HE AREA.	
(i) CN PROCEDUR CN* = 57 (ii) TIME STEP (THAN THE ST (iii) PEAK FLOW DO	.0 Ia = Dep DT) SHOULD BE DRAGE COEFFICI	. Storage SMALLER OF ENT.	(Above) R EQUAL	
ADD HYD (0057) 1 + 2 = 3 ID1= 1 (0010 + ID2= 2 (0009)	AREA (ha)): 0.44	QPEAK (cms) 0.018	TPEAK R.V. (hrs) (mm) 3.33 13.23 3.25 29.00	
ID = 3 (0057			3.25 19.23	
NOTE: PEAK FLOWS				
RESERVOIR (0055) IN= 2> OUT= 1 DT= 5.0 min	OUTFLOW (CMS)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
			0.0000	0.0042 0.0095 0.0000
INFLOW: ID= 2 (0) OUTFLOW: ID= 1 (0)	055) 0.71			
PEA TIM MAX	K FLOW RED E SHIFT OF PEA IMUM STORAGE	UCTION [QC K FLOW USED	out/Qin](%)= 34 (min)= 25 (ha.m.)= 0	.73 .00 .0049

| ADD HYD (0052) | 1 + 2 = 3 | AREA (ha) 1.68 0.71 QPEAK (cms) 0.052 0.016 ID1= 1 (0012): + ID2= 2 (0055): ID = 3 (0052): 2.39 0.061 3.33 12.31 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY. READ STORM Filename: C:\Users\david.mcnaull\AppD ata\Local\Temp\ 3298d697-8c39-4942-9f06-32b9fda43240\dc938a67 Comments: SCS 10-YEAR STORM (6 HRS) Ptotal= 61.60 mm RAIN | mm/hr | 0.00 | 2.50 | 2.50 | 3.70 | 3.70 | 3.70 | TIME hrs mm/hr hrs 2.00 6.20 3.75 6.20 4.00 2.55 7.40 4.25 2.75 7.40 4.50 3.00 36.90 4.75 3.25 95.90 5.00 3.50 13.50 5.25 RAIN mm/hr 13.50 | 6.20 | 4.90 | 4.90 | 3.70 | 3.70 | RAIN mm/hr 2.50 2.50 2.50 2.50 TIME hrs 0.25 0.50 0.75 1.00 1.25 1.50 1.75 CALIB | STANDHYD (0007) | |ID= 1 DT= 5.0 min | Area (ha)= 0.73 Total Imp(%)= 20.00 Dir. Conn.(%)= 1.00 IMPERVIOUS 0.15 1.00 5.00 69.76 0.013 PERVIOUS (i)
0.58
1.50
2.00
40.00
0.250 (ha)= (mm)= (%)= (m)= = Surface Area Dep. Storage Average Slope Length Mannings n NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP. RANSFORMED HYETOGR.
RAIN | TIME
mm/fn | TIME
3 30 3 3 3417
6 20 3 3 4417
6 20 3 3 503
6 20 3 3 503
6 20 3 3 503
6 20 3 3 667
6 20 3 3 667
6 20 3 3 67
7 40 4 4 200
7 7 40 4 4 200
7 7 40 4 4 250
7 7 40 4 4 250
7 7 40 4 4 333
36 90 4 4 417
36 90 4 4 503
36 90 4 4 503
36 90 9 9 9 9 9 9 9 TIME hrs 4.83 4.92 5.008 5.17 5.25 5.33 5.42 5.58 5.67 5.75 5.75 5.83 6.00 6.08 6.17 6.25 RAIN mm/hr 95.90 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 13.50 | 6.20 | 6.20 | 6.20 | 6.20 | 6.20 | 4.90 | 4.90 | 4.90 | 4.90 | TIME hrs 0.083 0.167 0.250 0.333 0.417 0.500 0.583 0.667 0.750 0.833 1.167 1.250 1.333 1.417 1.583 Max.Eff.Inten.(mm/hr)=
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)= 95.90 5.00 1.29 (ii) 5.00 0.33 36.61 15.00 11.84 (ii) 15.00 0.09 *TOTALS* 0.040 (iii) 3.33 17.37 61.60 0.28 PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT = 0.00 3.25 60.60 61.60 0.98 0.04 3.33 16.94 61.60 0.28

***** 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: $CN^{\circ}=57.0$ Ia = Dep. Storage (Above) (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT. IT ANY LOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (0005) ID= 1 DT= 5.0 min	Area Total	(ha)= 3.1 Imp(%)= 54.0		K)= 45.00
Surface Area Dep. Storage Average Slope Length Mannings n	(ha)= (mm)= (%)= (m)= =	IMPERVIOUS 1.68 1.00 5.00 144.22 0.013	PERVIOUS (i) 1.44 1.50 2.00 40.00 0.250	
Max.Eff.Inten.(over Storage Coeff. Unit Hyd. Tpeak Unit Hyd. peak	(min) (min)= (min)=	95.90 5.00 2.00 (ii 5.00 0.31	34.44 15.00 12.81 (ii) 15.00 0.08	
PEAK FLOW TIME TO PEAK RUNOFF VOLUME TOTAL RAINFALL RUNOFF COEFFICI	(cms)= (hrs)= (mm)= (mm)= ENT =	0.37 3.25 60.60 61.60 0.98	0.09 3.33 16.51 61.60 0.27	*TOTALS* 0.448 (iii) 3.25 36.35 61.60 0.59

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES: $CN^{\circ}=57.0$ Ia = Dep. Storage (Above) (i) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT. (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

	rea (ha)= 0.34 otal Imp(%)= 50.00	Dir. Conn.(%)=	50.00
Dep. Storage (mr Average Slope (S	a)=	PERVIOUS (i) 0.17 1.50 2.00 40.00 0.250	
Max.Eff.Inten.(mm/h over (mi Storage Coeff. (mi Unit Hyd. Tpeak (mi Unit Hyd. peak (cm	n) 5.00 n)= 1.03 (ii) n)= 5.00	15.00 0.08	TOTALS*
TIME TO PEAK (hr: RUNOFF VOLUME (mr	s)= 0.05 s)= 3.25 m)= 60.60 m)= 61.60 = 0.98	0.01 3.33 14.35 61.60 0.23	0.051 (iii) 3.25 37.45 61.60 0.61
***** WARNING: STORAGE CO	DEFF. IS SMALLER THA	N TIME STEP!	

- (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES: $\mathbb{C}N^{\circ}=57.0$ Ia = bep. Storage (Above) (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT. (iii) PHAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

| ADD HYD (0021) | 1 + 2 = 3 | AREA QPEAK TPEAK R.V. (ha) (cms) (hrs) (mm) 3.12 0.448 3.25 36.35 0.34 0.051 3.25 37.45 ID1= 1 (0005): + ID2= 2 (0006):

ADD HYD (0021) | 3 + 2 = 1 | AREA QPEAK (ha) (cms) 3.46 0.499 0.73 0.040 TPEAK (hrs) 3.25 3.33 R.V. (mm) 36.46 17.37 ID1= 3 (0021): + ID2= 2 (0007): 4.19 ID = 1 (0021): 0.535 3 25 33 13 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY. RESERVOIR (0022) | IN= 2---> OUT= 1 | DT= 5.0 min |
 OUTFLOW (cms)
 STORAGE (ha.m.)
 OUTFLOW (cms)

 0.0000
 0.0000
 0.0129

 0.0097
 0.0494
 0.0161
 AREA QPEAK TPEAK (ha) (cms) (hrs) (hrs) (1914 (1904 (1 PEAK FLOW REDUCTION [Qout/Qin](%)= 2.47
TIME SHIFT OF PEAK FLOW (min)=185.00
MAXIMUM STORAGE USED (ha.m.)= 0.1218 CALIB (0012) | Area (ha)= 1.68 Curve Number (CN)= 57.0 | TiD= 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)= 0.318 PEAK FLOW (cms)= 0.071 (i)
TIME TO PEAK (hrs)= 3.333
RUNOFF VOLUME (mm)= 12.882
TOTAL RAINFALL (mm)= 61.600
RUNOFF COEFFICIENT = 0.209 (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY. CALIB

STANDHYD (0009) | Area (ha)= 0.27

DE=10T=5.0 min | Total Imp(%)= 45.00 bir. Conn.(%)= 45.00 IMPERVIOUS PERVIOUS (i) Surface Area Dep. Storage Average Slope Length Mannings n 0.12 1.00 5.00 42.43 0.013 0.15 1.50 2.00 40.00 0.250 Max.Eff.Inten.(mm/hr)=
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)= 95.90 5.00 0.96 (ii) 5.00 0.34 24.94 15.00 13.26 (ii) 15.00 0.08 *TOTALS* 0.038 (iii) 3.25 35.14 61.60 0.57 PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT = 0.03 3.25 60.60 61.60 0.98 0.01 3.33 14.35 61.60 0.23 ***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP! (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES: $CN^{\pm}=57.0$ Ta= Dep. Storage (Above) (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT.

ID = 3 (0021): 3.46 0.499 3.25 36.46

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY. CALIB | STANDHYD (0010) | ID= 1 DT= 5.0 min | Area (ha)= 0.44 Total Imp(%)= 21.00 Dir. Conn.(%)= 1.00 IMPERVIOUS PERVIOUS (i) Surface Area Dep. Storage Average Slope Length Mannings n (ha)= (mm)= (%)= (m)= = 0.09 1.00 5.00 54.16 0.013 0.35 1.50 2.00 40.00 0.250 Max.Eff.Inten.(mm/hr)=
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)= 95.90 37.44 5.00 15.00 1.11 (ii) 11.56 (ii) 5.00 0.34 0.09 *TOTALS* 0.024 (iii) 3.33 17.52 61.60 0.28 PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT = 0.00 3.25 60.60 61.60 0.98 0.02 3.33 17.10 61.60 0.28 ***** 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: $CN^{\circ} = 57.0$ Ia = Dep. 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 (0057) | 1 + 2 = 3 | AREA QPEAK (ha) (cms) 0.44 0.024 0.27 0.038 R.V. (mm) 17.52 35.14 ID1= 1 (0010): + ID2= 2 (0009): ID = 3 (0057): 0.71 0.059 3.25 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY. RESERVOIR (0055) IN= 2---> OUT= 1 DT= 5.0 min OUTFLOW STORAGE (cms) (ha.m.) 0.0000 0.0000 0.0059 0.0004 0.0079 0.0015 OUTFLOW (cms) 0.0094 0.0616 0.0000 AREA QPEAK TPEAK (ha) (cms) (hrs) 0.710 0.059 3.25 0.710 0.025 3.50 INFLOW: ID= 2 (0057) OUTFLOW: ID= 1 (0055) PEAK FLOW REDUCTION [Qout/Qin](%)= 42.16
TIME SHIFT OF PEAK FLOW (min)= 15.00
MAXIMUM STORAGE USED (ha.m.)= 0.0058 ADD HYD (0052) | 1 + 2 = 3 TPEAK (hrs) 3.33 3.50 ID1= 1 (0012): + ID2= 2 (0055): 3.33 16.25 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY. ****

25-yr ** SIMULATION NUMBER: 4 ** ****************** READ STORM Filename: C:\Users\david.mcnaull\AppD ata\Locall\Temp\ 3298d697-8c39-4942-9f06-32b9fda43240\77c033ec Comments: SCS 25-YEAR STORM (6 HRS) Ptotal= 72.90 mm TIME hrs 3.75 4.00 4.25 4.50 4.75 5.00 5.25 RAIN | mm/hr | 0.00 | 2.90 | 2.90 | 4.40 | 4.40 | 4.40 | RAIN mm/hr 2.90 2.90 2.90 2.90 RAIN | mm/hr | 7.30 | 7.30 | 8.80 | 8.80 | 43.70 | 113.70 | 16.00 | RAIN mm/hr 16.00 7.30 7.30 5.80 5.80 4.40 4.40 TIME hrs 0.25 0.50 0.75 1.00 1.25 1.50 TIME hrs 2.00 2.25 2.50 2.75 3.00 3.25 3.50 CALIB STANDHYD (0007) ID= 1 DT= 5.0 min Area (ha)= 0.73 Total Imp(%)= 20.00 Dir. Conn.(%)= 1.00 IMPERVIOUS 0.15 1.00 5.00 69.76 0.013 PERVIOUS (i) 0.58 1.50 2.00 40.00 0.250 Surface Area Dep. Storage Average Slope Length Mannings n (ha)= (mm)= (%)= (m)= = NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP. HYETOGR TIME hrss 3.250 3.333 3.417 3.583 3.657 3.750 4.000 4.083 4.167 4.250 4.453 4.417 4.500 4.583 4.467 4.500 4.583 RAIN Mm/hr 4.40 7.30 7.30 7.30 7.30 7.30 8.80 8.80 8.80 8.80 43.70 43.70 43.70 113.70 TIME hrs 1.667 1.750 1.833 1.917 2.000 2.083 2.167 2.250 2.333 2.417 2.500 2.583 2.917 3.000 3.083 3.063 3.163 TIME hrs 4.83 4.92 5.00 5.08 5.17 5.25 5.32 5.50 5.587 5.75 5.83 6.00 6.08 6.17 6.25 TIME hrs 0.083 0.167 0.250 0.333 0.417 0.500 0.583 0.915 0.067 0.750 0.833 1.167 1.250 1.333 1.417 1.503 1.583 Max.Eff.Inten.(mm/hr)= over (min) Storage Coeff. (min)= Unit Hyd. Tpeak (min)= Unit Hyd. peak (cms)= 113.70 5.00 1.21 (ii) 5.00 0.33 53.93 15.00 10.24 (ii) 15.00 0.09 *TOTALS* 0.057 (iii) 3.33 23.17 72.90 0.32 PEAK FLOW (cms)= TIME TO PEAK (hrs)= RUNOFF VOLUME (mm)= TOTAL RAINFALL (mm)= RUNOFF COEFFICIENT = 0.00 3.25 71.90 72.90 0.99 0.06 3.33 22.69 72.90 0.31 ***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP! ***** WARNING: FOR AREAS WITH IMPERVIOUS RATIOS BELOW 20% YOU SHOULD CONSIDER SPLITTING THE AREA. (i) ON PROCEDURE SELECTED FOR PERVIOUS LOSSES: CN° = 57.0 Ia = Dep. Storage (Above) (i) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT. (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

CALIB STANDHYD (0005) Area ID= 1 DT= 5.0 min Tota	(ha)= 3.12 Imp(%)= 54.00		45.00
ID= 1 DT= 5.0 min Tota	l Imp(%)= 54.00	Dir. Conn.(%)=	45.00
Surface Area (ha)= Dep. Storage (mm)= Average Slope (%)= Length (m)= Mannings n =	IMPERVIOUS 1.68 1.00 5.00 144.22 0.013	1.44 1.50 2.00 40.00 0.250	
Max.Eff.Inten.(mm/hr)= over (min) Storage Coeff. (min)= Unit Hyd. Tpeak (min)= Unit Hyd. peak (cms)=	5.00 1.87 (ii) 5.00 0.32		TOTALS*
PEAK FLOW (cms)= TIME TO PEAK (hrs)= RUNOFF VOLUME (mm)= TOTAL RAINFALL (mm)= RUNOFF COEFFICIENT =		0.13 3.33 22.13 72.90 0.30	0.551 (iii) 3.25 44.53 72.90 0.61
**** WARNING: STORAGE COEF	. IS SMALLER THA	N TIME STEP!	
(i) CN PROCEDURE SELF CN* = 57.0 (ii) TIME STEP (DT) SI THAN THE STORAGE (iii) PEAK FLOW DOES NO	ECTED FOR PERVIOU Ia = Dep. Storag HOULD BE SMALLER COEFFICIENT. DT INCLUDE BASEFL	S LOSSES: e (Above) OR EQUAL OW IF ANY.	
CALIB			50.00
Surface Area (ha)= Dep. Storage (mm)= Average Slope (%)= Length (m)= Mannings n =		0.17 1.50 2.00 40.00 0.250	
Max.Eff.Inten.(mm/hr)= over (min) Storage Coeff. (min)= Unit Hyd. Tpeak (min)= Unit Hyd. peak (cms)=		33.89 15.00 11.84 (ii) 15.00 0.09	TOTALS*
PEAK FLOW (cms)= TIME TO PEAK (hrs)= RUNOFF VOLUME (mm)= TOTAL RAINFALL (mm)= RUNOFF COEFFICIENT =	0.05 3.25 71.90 72.90 0.99	0.01 3.33 19.38 72.90 0.27	0.063 (iii) 3.25 45.62 72.90 0.63
**** WARNING: STORAGE COEF	. IS SMALLER THA	N TIME STEP!	
(i) CN PROCEDURE SELF CN* = 57.0 (ii) TIME STEP (DT) SI THAN THE STORAGE (iii) PEAK FLOW DOES NO	ECTED FOR PERVIOU Ia = Dep. Storag HOULD BE SMALLER COEFFICIENT. DT INCLUDE BASEFL	S LOSSES: e (Above) OR EQUAL	
ADD HYD (0021) 1 + 2 = 3 T01= 1 (0005): + ID2= 2 (0006):	AREA QPEAK (ha) (cms) 3.12 0.551 0.34 0.063	TPEAK R.V. (hrs) (mm) 3.25 44.53 3.25 45.62	
ID = 3 (0021):			
NOTE: PEAK FLOWS DO NO			
ADD HYD (0021) 3 + 2 = 1 ID1= 3 (0021):	AREA QPEAK (ha) (cms) 3.46 0.614	TPEAK R.V. (hrs) (mm) 3.25 44.63	

```
+ ID2= 2 (0007): 0.73 0.057 3.33 23.17

ID = 1 (0021): 4.19 0.664 3.25 40.89
        NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
  RESERVOIR (0022) |
IN= 2---> OUT= 1 |
DT= 5.0 min |

        OUTFLOW
(cms)
        STORAGE
(ha.m.)
        OUTFLOW
(cms)

        0.0000
        0.0000
        0.0129

        0.0097
        0.0494
        0.0161

       Unit Hyd Qpeak (cms)= 0.318
       PEAK FLOW (cms)= 0.099 (i)
TIME TO PEAK (hrs)= 3.333
RUNOFF VOLUME (mm)= 17.733
TOTAL RAINFALL (mm)= 72.900
RUNOFF COEFFICIENT = 0.243
        (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
 PERVIOUS (i)
0.15
1.50
2.00
40.00
0.250
                                                  IMPERVIOUS

0.12

1.00

5.00

42.43

0.013
        Surface Area
Dep. Storage (mm)=
Average Slope
Length (%)=
Mannings n =
       Max.Eff.Inten.(mm/hr)=
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=
                                                      113.70
5.00
0.90 (ii)
5.00
0.34
                                                                                 33.89
15.00
11.78 (ii)
15.00
0.09
                                                                                                         *TOTALS*
0.046 (iii)
3.25
42.99
72.90
0.59
        PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =
                                                          0.04
3.25
71.90
72.90
0.99
                                                                                  0.01
3.33
19.38
72.90
0.27
***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!
        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES: CN^* = 57.0 Ia = bep. Storage (Above) if TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT. (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
                                        Area (ha)= 0.44 Total Imp(\%)= 21.00 Dir. Conn.(\%)= 1.00
                                      (ha)= 0.09 0.35 (mm)= 1.00 1.50 (%)= 5.00 2.00
        Surface Area
Dep. Storage
Average Slope
```

Length Mannings n	(m)= =	54.16 0.013	40.00 0.250		
Max.Eff.Inten.(mm	/hr)=	113.70	55.10 10.00		
over (Storage Coeff. (Unit Hyd. Tpeak (Unit Hyd. peak (min)=	113.70 5.00 1.04 (ii) 5.00	9.99 (ii) 10.00)	
Unit Hyd. peak (cms)=	0.34	0.11	*TOTALS*	
PEAK FLOW (cms)=	0.00	0.04 3.33 22.89	0.038 (iii 3.25)
PEAK FLOW (TIME TO PEAK (RUNOFF VOLUME TOTAL RAINFALL	(mm)=	71.90	22.89 72.90	23.37 72.90	
KUNOFF COEFFICIEN	=	0.99	0.31	0.32	
***** WARNING: STORAGE ***** WARNING: FOR AREA YOU SHOU	COEFF. IS S WITH IMP LD CONSIDE	SMALLER THAPERVIOUS RATI R SPLITTING	N TIME STEP OS BELOW 209 THE AREA.	! %	
(i) CN PROCEDUR CN* = 57 (ii) TIME STEP (.0 Ia = DT) SHOULD	BE SMALLER	e (Above) OR EQUAL		
THAN THE ST (iii) PEAK FLOW D	ORAGE COEF OES NOT IN	FICIENT. ICLUDE BASEFL	OW IF ANY.		
ADD HYD (0057)					
ADD HYD (0057) 1 + 2 = 3	ARE (ha	A QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	
1 + 2 = 3): 0.4): 0.2	4 0.038 7 0.046	3.25 2 3.25 4	3.37 2.99	
ID = 3 (0057					
NOTE: PEAK FLOWS	DO NOT IN	ICLUDE BASEFL	OWS IF ANY.		
RESERVOIR (0055)					
IN= 2> OUT= 1 DT= 5.0 min	OUTFLOW	STORAGE	OUTFLO	W STORAGE	
	0.0000	STORAGE (ha.m.) 0.0000 0.0004 0.0015	0.009	(ha.m.) 4 0.0042 6 0.0095	
	0.0079	0.0015			
		AREA QPE (ha) (cm	AK TPEAL	K R.V. (mm)	
INFLOW: ID= 2 (0 OUTFLOW: ID= 1 (0		0.710 0 0.710 0	.084 3 .038 3	R.V. (mm) .25 30.83 .42 30.81	
TIM MAX	E SHIFT OF IMUM STOR	REDUCTION [PEAK FLOW AGE USED	(min (ha.m.)= 10.00)= 0.0072	
ADD HYD (0052) 1 + 2 = 3	ARE	A QPEAK	TPEAK	R.V.	
ID1= 1 (0012 + ID2= 2 (0055	(ha	(A QPEAK (Cms) (B 0.099 (1 0.038	(hrs) 3.33 1	R.V. (mm) 7.73 0.81	
				0.81 ===== 1.62	
ID = 3 (0052 NOTE: PEAK FLOWS				1.02	
************************************	: 5 **	50-	/r		
*********	******		,		
	-12				
READ STORM	Filename	:: C:\Users\d ata\Local\	avid.mcnaul Temp\	I \AppD	0.1570416
Ptotal= 81.47 mm	Comments	32980697-8 SCS 50-YEA	C39-4942-9†1 R STORM (6 1	06-32b9fda43240\ HRS)	Uat/U418
TIME	RAIN	TIME RAI	N TIME	RAIN TIME mm/hr hrs	RAIN mm/hr
III'S	ami/111	1113 111111/11	1 1 11175	/III III'S	/ 111

```
17.90
8.10
8.10
6.50
6.50
4.90
4.90
                                                                              0.00 | 2.00 | 8.10 | 3.75
3.30 | 2.25 | 8.10 | 4.00
3.30 | 2.25 | 8.10 | 4.25
4.90 | 2.75 | 9.80 | 4.55
4.90 | 3.00 | 48.90 | 4.75
4.90 | 3.25 | 27.00 | 5.00
4.90 | 3.50 | 17.90 | 5.25
                                                       0.25
0.50
0.75
1.00
1.25
1.50
 | CALIB
| STANDHYD (0007) |
|ID= 1 DT= 5.0 min |
                                                                           Area (ha)= 0.73  
Total Imp(\%)= 20.00 Dir. Conn.(%)= 1.00
                                                                                                 IMPERVIOUS
                                                                                                                                        PERVIOUS (i)
                Surface Area
Dep. Storage
Average Slope
Length
Mannings n
                                                                                                         0.15
1.00
5.00
69.76
0.013
                                                                                                                                                 0.58
1.50
2.00
40.00
0.250
                                                                                                  TIME hrs 4.83 4.92 5.00 5.08 5.17 5.25 5.32 5.50 5.58 7.75 5.83 6.00 6.08 6.17 6.25
                                                    TIME hrs 0.083 0.167 0.250 0.333 0.417 0.500 0.583 0.667 0.750 0.833 1.167 1.250 1.333 1.417 1.500 1.583
                                                                              65.04
10.00
9.54 (ii)
10.00
0.12
               Max.Eff.Inten.(mm/hr)=
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)=
                                                                                                     127.00
5.00
1.15 (ii)
5.00
0.34
                                                                                                                                                                                               *TOTALS*
0.076 (iiii)
3.25
27.92
81.48
0.34
                 PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT =
                                                                                                           0.00
3.25
80.47
81.48
0.99
                                                                                                                                                     0.07
3.25
27.40
81.48
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:

(ii) TIME STEP (IT) SHE DED STORAGE (ABOVE)

(iii) TIME STEP (IT) SHE DED STORAGE (ABOVE)

(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
  CALIB (0005) |
STANDHYD (0005) |
ID= 1 DT= 5.0 min |
                                                                           Area (ha)= 3.12
Total Imp(%)= 54.00 Dir. Conn.(%)= 45.00
                                                                                                                                             PERVIOUS (i)
1.44
1.50
2.00
40.00
0.250
                                                                                               IMPERVIOUS
1.68
1.00
5.00
144.22
0.013
                Surface Area
Dep. Storage
Average Slope
Length
Mannings n
                                                                        (ha)=
(mm)=
(%)=
(m)=
=
                 Max.Eff.Inten.(mm/hr)=
```

UNIT Hyd. DeaX (Cms)= PEAX FLOW (Cms)= TIME TO PEAX (hrs)= TOTAL RAINFALL (mm)= TOTAL RAINFALL (mm)= ***** WARNING: STORAGE COEFF (i) ON PROCEDURE SELE	0.5 3.2 80.4 81.4 0.9 5. IS SMAL	8 (ii) 0 2 0 5 7 8 9 LER THAN PERVIOUS Storage	0.16 3.33 26.76 81.48 0.33 TIME STI	# EP!	TOTALS* 0.535 (iii) 5.55 (iii) 5.55 (iii) 81.48 0.63
CALIB			Dir. Co	nn. (%)=	50.00
Surface Area (ha)= Dep. Storage (mm)= Average Slope Length (m)= Mannings n =	IMPERVIO 0.1 1.0 5.0 47.6 0.01	OUS PE 7 0 0 1 1 3	0.17 1.50 2.00 40.00 0.250	(i)	
Max.Eff.Inten.(mm/hr)= over (min) Storage Coeff. (min)= Unit Hyd. Tpeak (min)= Unit Hyd. peak (cms)=	127.00 5.00 0.90 5.00 0.30	0 0 2 (ii) 0 4	45.21 15.00 10.61 (* 15.00 0.09	ii)	·TOTALS*
PEAK FLOW (cms)= TIME TO PEAK (hrs)= RUNOFF VOLUME (mm)= TOTAL RAINFALL (mm)= RUNOFF COEFFICIENT =	0.00 3.2 80.4 81.4 0.9	8 8	0.01 3.33 23.55 81.48 0.29		0.072 (iii) 3.25 51.99 81.48 0.64
***** WARNING: STORAGE COEFF (i) CN PROCEDURE SELE CN = 57.0 (ii) TIME STEP (DT) SH THAN THE STORAGE (iii) PEAK FLOW DOES NO	CTED FOR I IA = Dep. IOULD BE SI COEFFICIE	PERVIOUS Storage MALLER OF	LOSSES: (Above) R EQUAL)	
ADD HYD (0021) 1 + 2 = 3 TD1= 1 (0005): + ID2= 2 (0006):	AREA (ha) 3.12 0 0.34 0	QPEAK (cms) .630 .072	TPEAK (hrs) 3.25 3.25	R.V. (mm) 50.93 51.99	
ID = 3 (0021): NOTE: PEAK FLOWS DO NO	3.46 0	.702	3.25	51.03	
ADD HYD (0021) 3 + 2 = 1 ID1= 3 (0021): + ID2= 2 (0007):	AREA (ha) 3.46 0 0.73 0	OPEAK (cms) .702 .076	TPEAK (hrs) 3.25 3.25	R.V. (mm) 51.03 27.92	
ID = 1 (0021):	4.19 0	.778	3.25	47.01	-
NOTE: PEAK FLOWS DO NO	INCLUDE	BASEFLOV	v5 IF AN'	r. 	
RESERVOIR (0022) IN= 2> OUT= 1 DT= 5.0 min OUT	FLOW S	TORAGE ha.m.)	OUTFI Cm:	-OW S)	STORAGE (ha.m.)

Unit Hyd Qpeak (cms)= 0.318 PEAK FLOW (cms)= 0.122 (i)
TIME TO PEAK (hrs)= 3.333
RUNOFF VOLUME (mm)= 21.775
TOTAL RATNFALL (mm)= 81.475
RUNOFF COEFFICIENT = 0.267 (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY. CALIB STANDHYD (0009) | Area (ha)= 0.27 ID= 1 DT= 5.0 min | Total Imp(%)= 45.00 Dir. Conn.(%)= 45.00 PERVIOUS (i) 0.15 1.50 2.00 40.00 0.250 IMPERVIOUS Surface Area
Dep. Storage
Average Slope
Length
Mannings n

(ha)=
(mm)=
(%)=
(m)= 0.12 1.00 5.00 42.43 0.013 Max.Eff.Inten.(mm/hr)=
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)= 127.00 5.00 0.86 (ii) 5.00 0.34 45.21 15.00 10.55 15.00 0.09 *TOTALS* 0.053 (iii) 3.25 49.14 81.48 0.60 PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT = 0.04 3.25 80.47 81.48 0.99 0.01 3.33 23.55 81.48 0.29 (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES: $\text{CN}^\circ = 57.0$ Ia = bep. Storage (Above) if TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT. (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY. Surface Area Dep. Storage Average Slope Length Mannings n 0.09 1.00 5.00 54.16 0.013 0.35 1.50 2.00 40.00 0.250 Max.Eff.Inten.(mm/hr)=
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)= 127.00 5.00 0.99 (ii) 5.00 0.34 66.43 10.00 9.30 (ii) 10.00 0.12 *TOTALS* 0.047 (iii) 3.25 28.15 PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)= 0.00 3.25 80.48 0.05 3.25 27.64

0.0000 0.0000 | 0.0129 0.0097 0.0494 | 0.0161

PEAK FLOW REDUCTION [Qout/Qin](%)= 1.93
TIME SHIFT OF PEAK FLOW (min)=185.00
MAXIMUM STORAGE USED (ha.m.)= 0.1772

AREA QPEAK (hs) (cms) (hrs)
INFLOW: ID= 2 (0021) 4.190 0.778 3.25
OUTFLOW: ID= 1 (0022) 4.190 0.015 6.33

0.1109

R.V. (mm) 47.01 46.70

TOTAL RAINFALL (mm)= 81.48 81.48 RUNOFF COEFFICIENT = 0.99 0.34 81.48 ***** 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* = 57.0 Ia = Dep. Storage (Above).

(i) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL

THAN THE STORAGE COEFFICIENT.

(ii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY. ADD HYD (0057) | 1 + 2 = 3 ID = 3 (0057): 0.71 0.100 3.25 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY. RESERVOIR (0055) | IN= 2---> OUT= 1 | DT= 5.0 min | OUTFLOW STORAGE (cms) (ha.m.) 0.0000 0.0000 0.0059 0.0004 0.0079 0.0015 PEAK FLOW REDUCTION [Qout/Qin](%)= 48.86 TIME SHIFT OF PEAK FLOW (min)= 10.00 MAXIMUM STORAGE USED (ha.m.)= 0.0082ADD HYD (0052) | 1 + 2 = 3 | D HYD (0052) | AREA QPEAK TPEAK R.V. | 101=1 (0012): 1.68 0.122 3.33 21.78 | 102=2 (0055): 0.71 0.049 3.42 36.12 | 10 = 3 (0052): 2.39 0.168 3.33 26.04 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY. READ STORM Filename: C:\Users\david.mcnaull\AppD ata\\Local\Temp\ 3298d697-8c39-4942-9f06-32b9fda43240\fb7a95c4 Comments: SCS 100-YEAR STORM (6 HRS) Ptotal= 89.93 mm

IMPERVIOUS 0.15 1.00 5.00 69.76 0.013 PERVIOUS (i) 0.58 1.50 2.00 40.00 0.250 Surface Area Dep. Storage Average Slope Length Mannings n (ha)= (mm)= (%)= (m)= = NOTE: RAINFALL WAS TRANSFORMED TO 5.0 MIN. TIME STEP. TIME RAIN | TIME R 11ME hrs 3.250 3.333 3.417 3.500 3.583 hrs 0.083 0.167 0.250 0.333 0.417 0.500 0.583 0.667 0.750 0.833 1.000 1.083 1.167 1.250 1.333 1.417 1.500 mm/hr 0.00 0.00 3.60 3.60 3.60 3.60 5.40 5.40 5.40 5.40 5.40 5.40 5.40 hrs 4.83 4.92 5.08 5.17 5.33 5.42 5.50 5.75 5.75 5.83 5.67 5.75 6.00 6.00 6.17 6.25 19.80 19.80 9.00 9.00 9.00 9.00 9.00 7.20 7.20 7.20 7.20 7.20 Max.Eff.Inten.(mm/hr)=
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)= 140.20 5.00 1.11 (ii) 5.00 0.34 76.65 10.00 8.96 (ii) 10.00 0.12 *TOTALS* 0.092 (iii) 3.25 32.87 89.93 0.37 PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT = 0.00 3.25 88.92 89.93 0.99 0.09 3.25 32.31 89.93 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: $\text{CN}^* = 57.0$ Ia = bep. Storage (Above) (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT. (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY. CALIB STANDHYD (0005) ID= 1 DT= 5.0 min Area (ha)= 3.12Total Imp(%)= 54.00 Dir. Conn.(%)= 45.00IMPERVIOUS PERVIOUS (i) Surface Area Dep. Storage Average Slope Length Mannings n (ha)= (mm)= (%)= (m)= = 1.68 1.00 5.00 144.22 0.013 1.44 1.50 2.00 40.00 0.250 Max.Eff.Inten.(mm/hr)=
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)= 140.20 5.00 1.72 (ii) 5.00 0.32 72.40 10.00 9.75 (ii) 10.00 0.11 *TOTALS* 0.747 (iii) 3.25 57.39 89.93 0.64 PEAK FLOW (CMS)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT = 0.55 3.25 88.92 89.93 0.99 0.20 3.25 31.59 89.93 0.35 ***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

Area (ha)= 0.73 Total Imp(%)= 20.00 Dir. Conn.(%)= 1.00

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES: $CN^{\circ}=57.0$ Ia = bep. Storage (Above) (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) ID= 1 DT= 5.0 min Area (ha)= 0.34
Total Imp(%)= 50.00 Dir. Conn.(%)= 50.00 IMPERVIOUS 0.17 1.00 5.00 47.61 0.013 PERVIOUS (i) 0.17 1.50 2.00 40.00 0.250 Surface Area Dep. Storage Average Slope Length Mannings n (ha)= (mm)= (%)= (m)= = Max.Eff.Inten.(mm/hr)= over (min) Storage Coeff. (min)= Unit Hyd. Tpeak (min)= Unit Hyd. peak (cms)= 140.20 53.58 5.00 10.00 0.88 (ii) 9.94 (ii) 5.00 0.34 0.11 *TOTALS* 0.083 (iii) 3.25 58.41 89.93 0.65 PEAK FLOW (cms)= TIME TO PEAK (hrs)= RUNOFF VOLUME (mm)= TOTAL RAINFALL (mm)= RUNOFF COEFFICIENT = 0.07 3.25 88.92 89.93 0.99 0.02 3.33 27.92 89.93 0.31 ***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP! (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES: $CN^{\circ}=57.0$ Ia = Dep. 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 (0021) | 1 + 2 = 3 | AREA (ha) 3.12 0.34 QPEAK (cms) 0.747 0.083 TPEAK (hrs) 3.25 3.25 ID1= 1 (0005): + ID2= 2 (0006): ID = 3 (0021): 3.46 0.830 3.25 57.49 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY. ADD HYD (0021) | 3 + 2 = 1 | ID1= 3 (0021): + ID2= 2 (0007): OPEAK (cms) 0.830 0.092 ID = 1 (0021): 53.20 4.19 0.922 3.25 NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY. RESERVOIR (0022) | IN= 2---> OUT= 1 | DT= 5.0 min | OUTFLOW STORAGE (cms) (ha.m.) 0.0000 0.0000 0.0097 0.0494 STORAGE (ha.m.) 0.1109 0.2110 OUTFLOW OUTFLOW (cms) 0.0129 0.0161 QPEAK TPEAK (cms) (hrs) 0.922 3.25 0.016 6.33 INFLOW: ID= 2 (0021) OUTFLOW: ID= 1 (0022) PEAK FLOW REDUCTION [Qout/Qin](%)= 1.71
TIME SHIFT OF PEAK FLOW (min)=185.00
MAXIMUM STORAGE USED (ha.m.)= 0.2022

| CALIB | NASHYD (0012) |ID= 1 DT= 5.0 min Area (ha)= 1.68 Curve Number (CN)= 57.0 Ia (mm)= 5.00 # of Linear Res.(N)= 3.00 U.H. Tp(hrs)= 0.20Unit Hyd Qpeak (cms)= 0.318 PEAK FLOW (cms)= 0.146 (i)
TIME TO PEAK (hrs)= 3.333
RUNOFF VOLUME (mm)= 26.032
TOTAL RATNFALL (mm)= 89,925
RUNOFF COEFFICIENT = 0.289 (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY. CALIB STANDHYD (0009) ID= 1 DT= 5.0 min Area (ha)= 0.27 Total Imp(%)= 45.00 Dir. Conn.(%)= 45.00 IMPERVIOUS 0.12 1.00 5.00 42.43 0.013 PERVIOUS (i) 0.15 1.50 2.00 40.00 0.250 Surface Area Dep. Storage Average Slope Length Mannings n (ha)= (mm)= (%)= (m)= = Max.Eff.Inten.(mm/hr)=
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)= 140.20 5.00 0.82 (ii) 5.00 0.34 53.58 10.00 9.88 (ii) 10.00 0.11 *TOTALS* 0.062 (iiii) 3.25 55.35 89.93 0.62 PEAK FLOW (cms)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT = 0.05 3.25 88.93 89.93 0.99 0.02 3.33 27.92 89.93 0.31 ***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP! (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES: $\mathbb{C}N^{+} = 57.0$ Ia = Dep. Storage (Above) (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT. (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY. Area (ha)= 0.44 Total Imp(%)= 21.00 Dir. Conn.(%)= 1.00 PERVIOUS (i)
0.35
1.50
2.00
40.00
0.250 IMPERVIOUS 0.09 1.00 5.00 54.16 0.013 Surface Area Dep. Storage Average Slope Length Mannings n (ha)= (mm)= (%)= (m)= = 140.20 78.25 5.00 10.00 0.95 (ii) 8.74 (ii) 5.00 10.00 0.34 0.12 Max.Eff.Inten.(mm/hr)=
over (min)
Storage Coeff. (min)=
Unit Hyd. Tpeak (min)=
Unit Hyd. peak (cms)= *TOTALS* 0.057 (iii) 3.25 33.13 89.93 0.37 0.00 3.25 88.92 89.93 0.99 0.05 3.25 32.58 89.93 0.36 PEAK FLOW (CMS)=
TIME TO PEAK (hrs)=
RUNOFF VOLUME (mm)=
TOTAL RAINFALL (mm)=
RUNOFF COEFFICIENT = ***** 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: $CN^{\circ}=57.0$ ia = Dep. Storage (Above) (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL THAN THE STORAGE COEFFICIENT. (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

DD HYD (0057) 1 + 2 = 3 	1): 0.44	QPEAK (cms) 0.057	3.25	33.13	
+ ID2= 2 (0009	0.27	0.062	3.25	55.35	
	'): 0.71				
NOTE: PEAK FLOWS	DO NOT INCLU	JDE BASEFLO	OWS IF AN	Υ.	
ESERVOIR (0055) N= 2> OUT= 1					
T= 5.0 min	OUTFLOW (cms) 0.0000 0.0059 0.0079	STORAGE	OUTF	LOW ST	ORAGE
	0.0000	0.0000	0.0	094 616	0.0042
	0.0039	0.0004	0.0	000	0.0000
	ΔRI	Δ OPE	AK TP	FΔK	R V
INFLOW: ID= 2 (0 OUTFLOW: ID= 1 (0	(ha (057) (ha	a) (cms 710 0.	s) (h .119	rs) 3.25	(mm) 41.58
OUTFLOW: ID= 1 (0	055) 0.1	710 0.	.060	3.42	41.56
	K FLOW RI				
TIN MAX	ME SHIFT OF PI	AK FLOW USED	(ha.	m.)= 10.0 m.)= 0.0	1095
DD HYD (0052) 1 + 2 = 3	ΔΡΕΔ	OPEAK	TPFAK	R V	
ID1= 1 (0012	(ha)	QPEAK (cms) 0.146	(hrs)	(mm)	
+ ID2= 2 (0055	i): 0.71	0.060	3.42	41.56	
ID = 3 (0052	:): 2.39	0.204	3.33	30.65	
NOTE: PEAK FLOWS					