961 St. David Street North

Functional Servicing and Stormwater Management Report

Project Location:
961 St. David Street North, Fergus, ON

Prepared for:
2687734 Ontario Inc.
766 Hespeler Road
Cambridge, ON N3H 5L8

Prepared by:
MTE Consultants Inc.
520 Bingemans Centre Drive
Kitchener, ON N2B 3X9

July 15, 2022

MTE File No.: 48650-100

Engineers, Scientists, Surveyors.

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1.0 Introduction

MTE Consultants Inc. was retained by 2687734 Ontario Inc. to complete a Functional Servicing and Stormwater Management (FSSWM) Report for the in support of the Zoning By-Law Amendment and Vacant Lot Condominium applications for the proposed residential development to be constructed at 961 St. David Street North / King's Highway 6 (herein referred to as 'the Site') in the Township of Centre Wellington.

The purpose of this study is to support the Zoning By-Law Amendment and Vacant Land Condominium applications. This will be accomplished by reviewing the opportunities and constraints for the subject property with respect to servicing, grading, and stormwater management; reviewing the requirements of the reviewing agencies; describing the development concept; and demonstrating the functional serviceability of the property. Pending approval of the applications, detailed design of the Site will commence and be submitted to the Township of Centre Wellington and other governing agencies in support of the applications and Site Plan Approval.

1.1 Site Description

The Site encompasses an area of 1.402ha, and is currently comprised of a single detached dwelling, several accessory buildings, and an asphalt driveway off of 961 St. David Street North / King's Highway 6. The property is bounded to the west, south, and east by existing residential development, and to the northeast by St. David Street North / King's Highway 6. For the exact location of the Site refer to Figure 1.0.

The current zoning of the Site is Residential R1a Zone. A Zoning By-Law Amendment will be required to re-zone the Site to Residential R3 Zone to permit the proposed vacant land condominium development.

1.2 Proposed Development

The proposed development for the Site is a vacant land condominium, consisting of 13 single-detached houses, and 37 townhouse units, complete with a common element roadway and driveway entrance off of St. David Street North / King's Highway 6.

FIGURE1.0 Date: MAR.16/22 Scale: 1:1500

961 ST. DAVID ST. NORTH
LOCATION PLAN
FERGUS, ONTARIO

MTE
Engineers, Scientists, Surveyors

Project No.: 48650-100

March 16, 2022 — 10:33 a.m. — Plotted By: RChen

P:\P\48650\100\48650-100-F1.dwg

2.0 Existing Conditions

2.1 Topography

Existing topographic information for the Site was obtained from a detailed survey completed by MTE in February 2021. The Site's frontage along St. David Street North / King's Highway 6 has an approximately slope of 2% from west to east. There is an existing ditch along the south side of the highway along the Site's frontage, with an approximate slope of 1% from west to east. The road elevation is approximately 0.8m to 1.0m above the property line elevation along the Site's frontage. The northeast end of the Site is sloped towards St. David Street North / King's Highway 6, with high point elevations of 424.5mASL around the existing buildings, and a low point elevation of approximately 422.4mASL at the northeast corner of the Site. A portion of the middle of the property has an approximate slope of 1.5% towards the southeast property line, with a highpoint elevation of 424.5mASL near the center of the property, and a low point elevation of approximately 423.6mASL along the southeast property line. The majority of the southwest end of the Site is sloped towards the southwest property line, with a high point elevation of 424.5mASL near the approximate center of the property, and a low point elevation of 422.6mASL along the southwest property line.

2.2 Existing Servicing

The Site currently does not have any existing municipal water, storm, or sanitary services to the site. Existing servicing information within the surrounding right-of-ways was obtained from the topographic survey, and from plan and profile information provided by the Township of Centre Wellington.

2.2.1 Water

There is currently an existing 300mm diameter watermain on the far (north) side of St. David Street North / King's Highway 6. There are two existing municipal fire hydrants located on the north side of St. David Street North / King's Highway 6 near the Site. One is located approximately 94m to the north of the existing driveway entrance, and one is located approximately 69m to the south of the existing driveway entrance. A flow test was performed at the aforementioned hydrants by Classic Fire and Life Safety on June 21, 2022. Refer to Table 2.1 below for a summary of the flow test results.

Table 2.1 – Results of Flow Tests

Results of Flow Tests Completed June 21, 2022 by Classic Fire & Life Safety					
Test #	**Outlet Inside Diameter (in.)**	**Number of Outlets**	**Pitot Pressure (PSI)**	**Residual Pressure (PSI)**	**Flow @ Residual (gal/min)**
1	n/a	n/a	n/a	46	0
2	2.5	1	20	40	751
3	2.5	2	12 + 14	38	1,209

Refer to Appendix A for further details.

2.2.2 Sanitary

There is an existing 300mm diameter municipal sanitary sewer along the far (north) side of St. David Street North / King's Highway 6 which drains southeast, at a depth of approximately 5.7m to 6.6m below the centreline elevation of the road.

2.2.3 Storm

There is an existing 500mm diameter Corrugated Metal Pipe (CMP) culvert underneath the existing driveway entrance, draining southeast in the ditch along the Site's frontage with St. David Street North / King's Highway 6. The culvert underneath is at a depth of approximately 1m below the existing grade of the driveway.

2.3 Existing Soils Information

A geotechnical investigation was not available for this development at the time this report was published. However, a geotechnical investigation was completed by Golder Associates Ltd. for trenchless servicing crossing work underneath St. David Street North / King's Highway 6 that is proposed for the Site. This servicing work is detailed further in Section 3.2 of this report.

The geotechnical investigation by Golder Associates was completed in April 2021. Two boreholes were advanced to depths between 8.2m and 9.8m below existing grade to determine the underlying soil conditions at the proposed servicing crossing location. Borehole 20-1 was located near the northern corner of the Site, and Borehole 20-2 was located on the north edge of St. David Street North / King's Highway 6. The borehole logs revealed that the subsurface soil conditions are generally comprised of silty sand and sand deposits, underlain with a layer clayey silt.

At the time of borehole advancement, the groundwater level in Borehole 20-1 was measured at approximately 418.3mASL, and Borehole 20-2 was observed to be dry. However, these water levels were not considering to be representative of the stabilized groundwater conditions. Based on a previous geotechnical investigation completed nearby by LVM Inc. (2013), Golder determined that the groundwater level at the proposed servicing crossing location is expected to be approximately 422.5mASL.

2.4 Reviewing Agencies

2.4.1 Township of Centre Wellington

Functional grading, servicing and stormwater management designs as well as this Functional Servicing and Stormwater Management Report will be required for submission to the Township of Centre Wellington in support of the Zoning By-Law Amendment and Vacant Land Condominium applications. The Township will also be responsible for the review and approval of site plans, site grading, servicing, stormwater management, lighting and landscape design and ultimately issuing building permits.

2.4.2 Ministry of Transportation

St. David Street North is a part of Kings Highway 6, a provincially maintained highway. As such, the Ministry of Transportation (MTO) will be circulated on the Zoning By-Law Amendment and Site Plan Applications and will need to approve the site grading, servicing and stormwater management designs. An entrance permit will need to be obtained from the MTO for the new entrance off of St. David Street North / King's Highway 6.

2.4.3 Grand River Conservation Authority

The Site also falls within the area regulated by the Grand River Conservation Authority (GRCA). As such, the site engineering design will also be submitted to the GRCA for review and approval.

3.0 Proposed Grading and Servicing Strategy

Preliminary grading and servicing strategies have been developed based on the topographic survey, plan and profile information, and the Concept Plan provided by MHBC Ltd., dated May 6, 2022. Refer to the enclosed MTE Drawings C2.1 and C2.2 for details. These grading and servicing strategies will be further refined during detailed design during the Site Plan Approval process.

3.1 Proposed Grading

The proposed vacant land condominium development consists of 13 single-detached houses, and 37 townhouse units, complete with a common element roadway and driveway entrance off of St. David Street North / King's Highway 6. The proposed grading strategy will respect the existing grades along St. David Street North / King's Highway 6, and all other property boundaries. The majority of grading internal to the Site will involve directing stormwater runoff to the existing ditch along the south side of St. David Street North / King's Highway 6. Stormwater runoff will be conveyed to the existing ditch via an on-site storm sewer system, and via a rear-yard swale along the southeast property line. For the units along the south end of the Site, runoff from the rear of the units will continue to drain to the southwest property line at existing runoff rates. Refer to MTE Drawing C2.1 for an illustration of the functional grading design.

3.2 Proposed Servicing

The following sections provide details regarding the preliminary proposed water, sanitary and storm servicing for the proposed development. Refer to MTE Drawing C2.2 for an illustration of the functional servicing design.

Connection to the existing 300mm diameter municipal watermain and existing 300mm diameter municipal sanitary sewer along the north side of St. David Street North / King's Highway 6 will require trenchless installation of the services underneath the road. Detailed design and required supporting investigations have already been completed for the trenchless servicing crossing work, which have been accepted by the Township and the MTO. The proposed water service and the proposed sanitary service will both be 150mm diameter. Each will be extended from their respective existing mains to approximately 2m inside of the Site's property line. The proposed trenchless servicing crossing work is anticipated to be constructed in summer 2022.

3.2.1 Water

A 150mm diameter water service connection to the existing 300mm diameter municipal watermain along the north side of St. David Street North / King's Highway 6 will be required in order to service the proposed development. As previously described, this service will be brought underneath of St. David Street North / King's Highway 6 via trenchless installation. The 150mm diameter watermain will then be upsized to 250mm diameter at the property line, and extended in the common element roadway to service each unit. Each lot will be serviced off the proposed watermain with a 25mm diameter domestic water service connection. It is anticipated that two

on-site fire hydrants will also be required for the proposed development, as shown on the enclosed MTE Drawing C2.2.

Water Demand

Various guidelines and references exist for calculating the required water supply for firefighting purposes. In Ontario, there are two standards/guidelines that are most often referenced:

- Ontario Building Code (OBC) – provincial codes and guidelines published by the Ministry of Municipal Affairs and Housing for the Province of Ontario; and
- The Fire Underwriters Survey (FUS) – an insurance industry guideline.

Many municipalities in Ontario use both the OBC and the FUS fire flow requirements for assessing firefighting water supply requirements. Ideally, fire flow demands for new developments are calculated based on the FUS criteria; however, it is not always reasonable to expect that the local existing municipal infrastructure has the operational capacity to supply water at the rates prescribed in the FUS guidelines. As a result, at no time shall the available fire flow be less than that required by the Ontario Building Code.

The pressures and flows at the proposed private hydrant must be sufficient for firefighting conditions as established by the Ontario Building Code (2012). The minimum residual pressure permitted under firefighting conditions is 140.0kPa (20.3psi) per OBC 2012 A-3.2.5.7 3(b).

The buildings are proposed to be of wood frame construction (combustible construction). For the purposes of this analysis, the worst case scenario was determined to be the future townhouse building located on Units 28-32. This building has the largest allowable footprint, and in a firefighting scenario the hydrant furthest from the connection the municipal main will be utilized. The OBC and FUS requirements were calculated for this worst case scenario for reference and are shown in Table 3.1. Refer to Appendix A for detailed calculations.

Table 3.1 – Required Fire Flow

Building	OBC (L/s)	FUS (L/s)
Proposed Building	4,500	17,000

For this design, pressure and flow information for the existing 300mm diameter municipal watermain in the St. David Street North / King's Highway 6 right-of-way was taken from the hydrant flow testing results as detailed in Section 2.2.1.

The minimum water supply flow rate for the proposed development is 283.0L/s (17,000L/min) based on the calculation method specified in the FUS. The residual pressures at the proposed hydrants are less than the minimum allowable pressure of 140kPa based on the FUS calculation method.

The minimum water supply flow rate for the proposed development is 75.0L/s (4,500L/min) based on the calculation method specified by the OBC. The residual pressure at the proposed hydrant was calculated to be 185kPa at a flow rate of 75.0L/s (4,500L/min), which is greater than the minimum allowable pressure of 140kPa per OBC 2012. Therefore, the proposed watermain configuration is expected to be sufficient. Based on a maximum day domestic demand of 0.93L/s and the fire flow demand of 75.0L/s, the total water demand for the Site is expected to be 75.9L/s.

The fire flow demand calculations completed in this report assume that the proposed buildings will have two above grade stories. Should the buildings increase to a height of 3-storeys as design progresses, fire walls may be required in order to meet previously described pressure and flow requirements set forth by the OBC.

3.2.2 Sanitary

A sanitary flow design sheet has been prepared to determine the flows anticipated to be generated by the proposed development. With the 13 units proposed for detached homes and 37 units proposed for townhouses, the resulting peak flow rate from the Site is expected to be 3.11L/s. Refer to Appendix A for the Sanitary Flow Design Sheet.

As previously described, a 150mm diameter sanitary service will be extended from the existing 300mm sanitary main on the north side of St. David Street North / King's Highway 6 to a private manhole just inside the Site property line. A 150mm diameter private sanitary sewer will be extended from this manhole throughout the common element area of the Site, servicing each of the proposed units.

The proposed 150mm diameter sanitary sewer has a minimum design slope of slope of 1.00%, corresponding to a full flow pipe capacity of 15.22/s. Therefore, the proposed 150mm diameter sanitary sewer has sufficient capacity for this development.

3.2.3 Storm

A private storm sewer system is proposed along the common element roadways within the proposed development. The storm sewer system, which will include several catchbasins, manholes, and catchbasin manholes, will convey runoff from the roadways, driveways, and landscaped areas through an OGS before discharging to the existing ditch along the south side of St. David Street North / King's Highway 6. A storm sewer design sheet for the last pipe run from the Site is included in Appendix A. The major overland flow route for the Site will be to the existing ditch along St. David Street North / King's Highway 6.

Specifications and details of these proposed servicing strategies will be further refined during detailed design.

4.0 Preliminary Storm Water Management Design

4.1 SWM Criteria

In the existing condition, stormwater runoff from the eastern end of the Site is directed to the existing ditch along St. David Street North / King's Highway 6. Stormwater runoff from the western end of the Site is directed to the southwest property line, where it subsequently sheet flows across the adjacent property before reaching Municipal Drain No. 4. A central portion of the Site drains to the adjacent property to the south.

The stormwater management design criteria for the Site, as established by the MTO and the Township of Centre Wellington, are as follows:

i) Attenuation of the post-development peak flows for the 2-, 5-, 10-, 25-, 50-, and 100-year storm events to the pre-development (existing) peak flows;

ii) Implementation of Enhanced (Level 1) water quality controls; and

iii) Implementation of Erosion and Sediment Control Measures.

4.2 Water Quantity Control

In order to successfully complete the preliminary stormwater management design for the Site, the following specific tasks were undertaken:

i) Calculate the allowable runoff rates using MIDUSS NET;

ii) Determine the percent impervious of the Site and catchment parameters for inclusion in MIDUSS NET modelling; and

iii) Calculate post-development runoff hydrographs using MIDUSS NET.

The following table summarizes the catchments used in modelling the Site. The pre-development condition was separated into three catchments areas: the western portion of the Site that drains to the southwest property line, the central portion of the Site that drains to an adjacent property to the south, and the eastern portion of the Site that drains to St. David Street North / King's Highway 6. The post-development condition was separated into four catchment areas: the uncontrolled area directed to the southwest property line, the controlled area directed to St. David Street North / King's Highway 6, the uncontrolled area directed to rear-yard amended topsoil and subsequently to St. David Street North / King's Highway 6, and the uncontrolled area directed to St. David Street North / King's Highway 6. Figure 2.0 illustrates the limits of the pre-development catchment areas. Figure 3.0 illustrates the limits of the post-development catchment areas.

Table 4.1 – Catchment Parameters

#	Catchment	Area (ha)	% Impervious	Pervious CN	Impervious CN	Slope (%)	Flow Length (m)
Pre-Development Catchment Areas							
101	Area to Southwest Property Line	0.734	0%	75	98	2.0	100
102	Area to Adjacent Property to the South	0.286	0%	75	98	1.0	40
103	Area to Highway 6	0.382	14%	75	98	5.0	70
Post-Development Catchment Areas							
201	Uncontrolled Area to Southwest Property Line	0.228	55%	75	98	2.0	15
202	Controlled Area to Highway 6	0.773	75%	75	98	2.0	15
203	Uncontrolled Area to Rear Yard Amended Topsoil, and Subsequently to Highway 6	0.352	25%	75	98	2.0	120
204	Uncontrolled Area to Highway 6	0.049	0%	75	98	2.0	20

As previously described, a geotechnical investigation was completed for the nearby proposed trenchless servicing work development by Golder. Based on the observed subsurface soil conditions, a conservative value of 75 was used for the pervious CN.

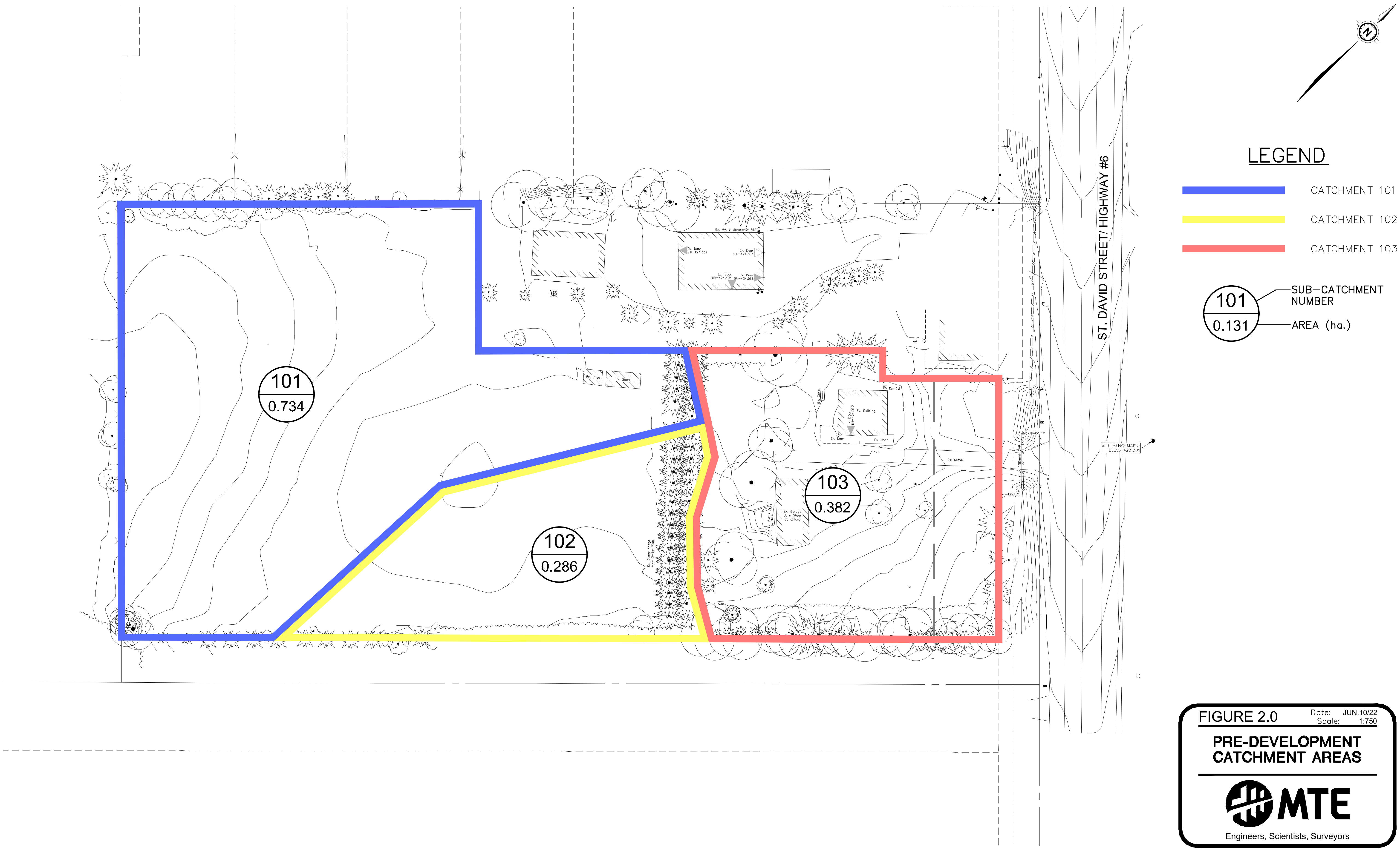


FIGURE 2.0

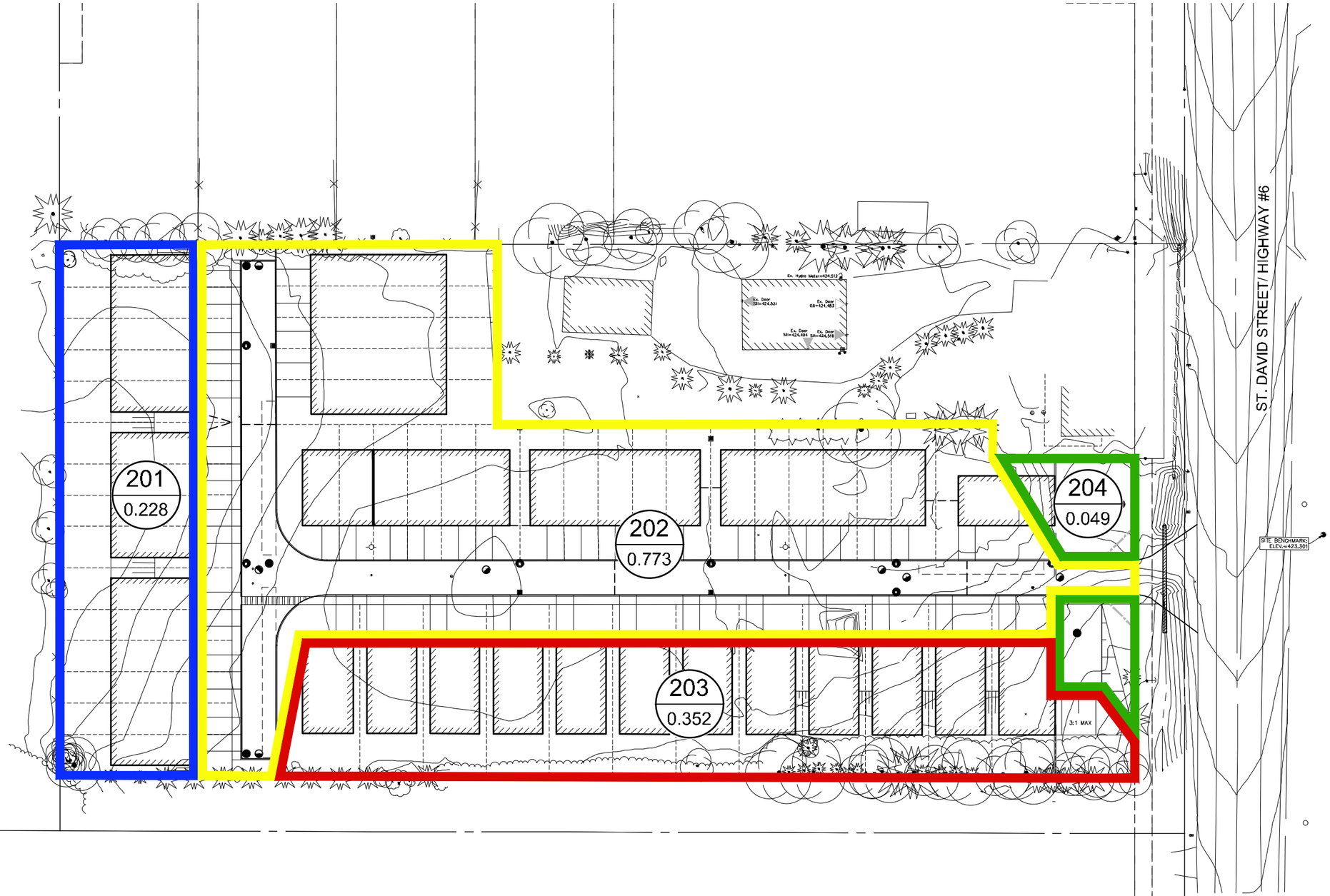
Date: JUN.10/22
Scale: 1:750

PRE-DEVELOPMENT CATCHMENT AREAS

MTE

Engineers, Scientists, Surveyors

Project No.: 48650-100



LEGEND

- CATCHMENT 201
- CATCHMENT 202
- CATCHMENT 203
- CATCHMENT 204

101 / 0.131 — SUB-CATCHMENT NUMBER / AREA (ha.)

FIGURE 3.0

Date: JUN.10/22
Scale: 1:750

POST DEVELOPMENT CATCHMENT AREAS

MTE
Engineers, Scientists, Surveyors

Project No.: 48650-100

In order to achieve the stormwater requirements for the Site, runoff generated within Catchment's 201 and 203 will be directed to a 3.5m wide, 0.5m deep layer of amended topsoil in the rear yards of the units. The amended topsoil will allow for increased infiltration and runoff volume reduction in these areas. Runoff generated in Catchment 202 will be directed controlled with a 75mm orifice tube. Storage volume will be provided by three underground storage tanks, and by surface ponding on the surface of the common element driveway. The following table summarizes the flows generated by the Site for each storm event. The post-development flow rates are subject to change during detailed design.

Table 4.2 – Summary of Flows (MIDUSS Modelling)

Modeling Condition	Pre-Development (m^3/s)			Post-Development (m^3/s)	
	Area to Southwest Property Line	Area to Adjacent Property to the South	Area to Highway 6	Area to Southwest Property Line	Area to Highway 6
2-Year Storm Event	0.004	0.002	0.011	0.000	0.016
5-Year Storm Event	0.011	0.006	0.016	0.000	0.018
10-Year Storm Event	0.018	0.009	0.020	0.000	0.020
25-Year Storm Event	0.029	0.014	0.026	0.004	0.022
50-Year Storm Event	0.038	0.019	0.032	0.009	0.023
100-Year Storm Event	0.052	0.024	0.040	0.019	0.025

With the installation of the orifice tube, the post-development runoff from the controlled portion of the Site for the 2-, 10-, 25-, 50- and 100-year storm events is controlled to $0.016m^3/s$, $0.017m^3/s$, $0.018m^3/s$, $0.019m^3/s$, $0.021m^3/s$, and $0.022m^3/s$, respectively.

The total post-development peak flows to St. David Street North / King's Highway 6 exceed pre-development levels for the 2- and 5-year storm events; however, a 75mm orifice tube is considered to be the minimum acceptable diameter, therefore additional reduction of the post-development peak flows is not considered to be feasible.

The maximum ponding depth in the common element driveway is 0.13m for the 100-year storm event. As above, the ponding values are subject to change at detailed design. Please refer to Appendix B for the MIDUSS outputs.

4.3 Water Quality Control

A Stormceptor Model EFO4 will be installed on the storm sewer system to provide water quality control for the Site. The chosen unit is expected to provide Enhanced (Level 1) water quality control. Refer to Appendix C for the sizing output from the Stormceptor Expert program. The Stormceptor will require regular annual maintenance to ensure it is operating properly. The owner may be required to enter into a maintenance agreement with a suitable contractor to complete this work. In addition, all the storm structures will have a 600mm sump.

4.4 Erosion and Sedimentation Control

Precautions will need to be taken during construction to limit erosion and sedimentation. Typically, the following measures are recommended during construction for erosion and sedimentation control:

i) Erosion and sedimentation facilities are to be installed prior to any area grading operations;

ii) All erosion control measures are to be inspected and monitored by the contractor and repairs are to be completed as required;

iii) All materials and equipment used for the purpose of site preparation and project completion should be operated and stored in a manner that prevents any deleterious substance from leaving the site; and

iv) To minimize the amount of mud being tracked onto the roadway, a mud mat should be installed at the primary construction entrance.

5.0 Conclusions

Based on the foregoing, it is concluded that:

i) Municipal infrastructure for water and sanitary services is available along St. David Street North / King's Highway 6;

ii) A fire flow analysis has been completed and demonstrates that adequate flow and pressure is available from the proposed on-site hydrants;

iii) The water supply needs of the proposed development will not exceed what is available in the existing municipal water distribution system;

iv) The proposed grading design will respect the natural topography of the Site to achieve a reasonable cut/fill balance where possible and match into existing grades along all property boundaries; and

v) The SWM criteria can be satisfied with the implementation of on-site controls for water quantity and water quality.

Detailed grading and servicing designs and a detailed stormwater management design will be provided during detailed design in support of Site Plan Approval and Building Permits.

All of which is respectfully submitted,

MTE Consultants Inc.

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NGK:dlb

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Appendix A

Design Sheets

CLASSIC FIRE + LIFE SAFETY

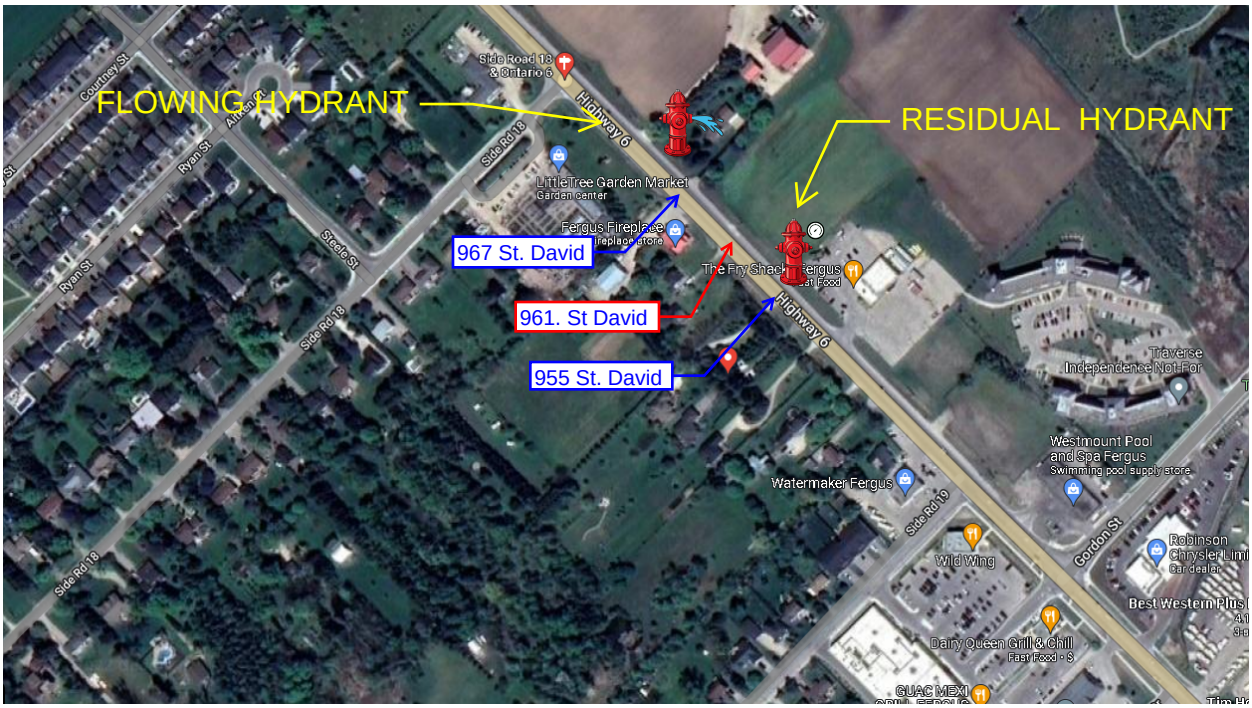
FLOW TEST REPORT

Form SD-003B RevDate: Nov 29, 2021

PROJECT INFORMATION			
Project Name:	Fergus Flow Test	Const. Project #:	22-CAM-690-0568
Site Address:	961 St. David Street/Highway 6 Fergus	Design Project #:	2022-CFLS-359
City Contact:	Mike Mullen	Phone #:	519-501-7252
CFLS Contact:	Dean Wanders	Phone #:	905-514-7417
Technical Contact:	**Andy Coghlin**	Phone #:	**519-476-0761**

SITE INFORMATION

SITE MAP



Note: If the main is a dead end, the flowing hydrant shall be closest to the dead end

ITEMS TO LABEL ON MAP	HYDRANTS USED	MAIN SIZE
☑ Static / Residual & Flow Hydrants	☑ City Hydrant(s)	City: 6"
☐ Flow Direction (if the main is dead end)	☐ Site Hydrant(s)	Site:

SITE NOTES

CLASSIC FIRE + LIFE SAFETY

FLOW TEST REPORT

Form SD-003B RevDate: Nov 29, 2021

TEST INFORMATION			
Minimum Required Flow:	NA	Min Ports:	2
CFLS Personnel Present:	Dean Wanders	Test Date:	2022-06-21
City / External Company:	Infrastructure Services	Test Time:	1:00pm

TEST EQUIPMENT	
☐ Hose Monsters with built in Pitot	Hose length used:
☐ Hand held pitot gauge	☑ Pollard diffuser elbow with built in Pitot
☐ Other:	

TEST RESULTS

Number of Ports	Outlet Size (IN)	Discharge Coefficient	Pitot Reading (PSI)	Total Flow (GPM)	Static / Residual Pressure (PSI)
0 Ports	**STATIC**				46
1 Port	2.5	0.9	20	751	40
2 Ports	2.5	0.9	12 / 14	1,209	38
3 Ports	2.5	0.9		0	
4 Ports	2.5	0.9		0	
0 Ports	**STATIC RE-CHECK**				46

TEST NOTES

HYDRAULIC ADJUSTMENTS (FOR OFFICE USE ONLY)			
ADJUSTMENTS FOR HYDRAULIC GRADE LINE (HGL)			
Reservoir HGL (m):		Site Elevation (m):	
Theoretical Static Head (PSI):	0	PSI to subtract from test pressures:	46
OTHER HYDRAULIC ADJUSTMENTS			
Other adjustment as required by the City / AHJ:			

961 St. David Street
FIRE FLOW DEMANDS
Kitchener, Ontario
Project #: 48650-100
Date: July 14, 2022
Date Printed: 7/14/2022
By: NGK

Development Information[1]								Fire Flow[2]														Domestic Flow[3,4]					
								Ontario Building Code						Fire Underwriters Survey													
Node ID / Area ID / Building #	F.F.E. (m.a.s.l.)	Description	# of Units	Population	Bldg Area (1st Floor)	Total Bldg Area	Building Volume	K	V	S_{tot}	Q	F	F	C	A	F	(2) Occupancy Reduction	(3) Sprinkler Protection	(4) Building Exposure	F	F	Fire Flow (Max OBC/FUS)	MOE Guidelines	Average Day	Max Day	Peak Hour	Minimum Hour	Max Day + Fire Flow
				# of people	m^2	m^2	m^3		m^3		*L*	*L/min*	*L/s*		m^2	*L/min*				*L/min*	*L/s*	*L/s*	*L/s*	*L/s*	*L/s*	*L/s*	*L/s*	*L/s*
Units 1-12, 50		Detached Houses	13	42	135	270	1,316	23	1,316	2.00	60,548	2,700	45	1.50	270	5,422	-15%	0%	75%	8,000	133	133	0.110	0.110	0.303	0.454	0.044	134
Units 13-18		Townhouses	6	15	504	1,008	3,024	23	3,024	2.00	139,104	4,500	75	1.50	1,008	10,477	-15%	0%	75%	16,000	267	267	0.038	0.038	0.105	0.157	0.015	268
Units 19-22		Townhouses	4	10	336	672	2,016	23	2,016	2.00	92,736	2,700	45	1.50	672	8,555	-15%	0%	75%	13,000	217	217	0.025	0.025	0.070	0.105	0.010	218
Units 23-27		Townhouses	5	12	423	846	2,538	23	2,538	2.00	116,748	3,600	60	1.50	846	9,598	-15%	0%	75%	14,000	233	233	0.032	0.032	0.087	0.131	0.013	234
Units 28-32		Townhouses	5	12	580	1,160	3,480	23	3,480	2.00	160,080	4,500	75	1.50	1,160	11,239	-15%	0%	75%	17,000	283	283	0.032	0.032	0.087	0.131	0.013	284
Units 33-38		Townhouses	6	15	486	972	2,916	23	2,916	2.00	134,136	3,600	60	1.50	972	10,288	-15%	0%	75%	15,000	250	250	0.038	0.038	0.105	0.157	0.015	251
Units 39-43		Townhouses	5	12	400	800	2,400	23	2,400	2.00	110,400	3,600	60	1.50	800	9,334	-15%	0%	75%	14,000	233	233	0.032	0.032	0.087	0.131	0.013	234
Units 44-49		Townhouses	6	15	480	960	2,880	23	2,880	2.00	132,480	3,600	60	1.50	960	10,225	-15%	0%	75%	15,000	250	250	0.038	0.038	0.105	0.157	0.015	251
		TOTALS FOR SITE	**50**	**133**							**Max Fire Flow =**		**75**							**Max Fire Flow =**	**283**	**283**	**0.35**	**0.35**	**0.95**	**1.43**	**0.14**	**284**

Sum of Maximum Day Flows + Largest Fire Flow (L/s) = 284

Assumptions:

1 Number of units are based on the Conceptual Plan by MHBC Ltd., dated March 23, 2022

2 Residential population is calculated using a Persons Per Unit (PPU) count taken from "Region of Waterloo Water and Wastewater Monitoring Report" (WWWMR) (Region of Waterloo, June 2021)
- Residential = 3.25 PPU for Single and Semi-Detached houses
- Residential = 2.44 PPU for Townhouses

3 All buildings are classified as occupancy group C (Residential Occupancy)

4 Average Daily Demands for each building are based on "*Tri City Water Distribution Master Plan Final Report" by AECOM, Dated May 2009* :
- Residential = 225 L/cap/day

5 Peaking Factors based on "*Design Guidelines for Drinking-Water Systems* " (MOE, 2008):
- Average Day = 1
- Maximum Day = 2.75
- Peak Hour = 4.13
- Minimum Hour = 0.4

961 St. David Street

FIRE FLOW ANALYSIS

Fergus, Ontario

Project Number: 48650-100
Date: June 3, 2022
Design By: NGK
File: Q:\48650\100\Water\Obsolete\48650-100_Site Fire Flow Analysis with test results.xlsx

CALCULATION OF RESIDUAL PRESSURE AT ON-SITE HYDRANT

1. Boundary Conditions (Based on Fire Flow Test Results):

	Metric		Imperial		
P0 - Starting Pressure	32.35	*m*	46.0	*psi*	
P1 - Pressure at Q1	26.72	*m*	38.0	*psi*	
Q1 - From Fire Flow Test	4577	*L/min*	1209	*U.S. gal/min*	From: Hydrant Flow Test Results
Q2 - Required Flow	4500	*L/min*	1189	*U.S. gal/min*	From: Water Demand calculations by MTE
P-loss 1	5.63	*m*	8	*psi*	
P-loss 2	5.45	*m*	8	*psi*	
P2 - Residual Pressure	**26.90**	***m***	**38**	***psi***	

2. Friction Losses Through Water Service:

Hazen-Williams Equation	Metric		Imperial	
C_{hw} = Pipe Friction Factor	150		150	
k = conversion factor	10.675		4.727	
n = constant	1.852		1.852	
m = constant	4.8704		4.8704	
Q = Flow	4500	L/min		
Q = Flow	0.075	m^3/s	1189	*U.S. gal/min*
d = Pipe Diameter (1)	150	mm	5.91	in
	0.15	m		
d = Pipe Diameter (2)	250	mm	9.84	in
	0.25	m		
p = Loss/Length (1)	0.0846	m/m	0.0367	psi/ft
p = Loss/Length (2)	0.0070	m/m	0.0030	psi/ft
Length (1)	36	m	118	ft
Length (2)	132	m	433	ft
Loss	**3.98**	**m**	**5.7**	**psi**
	39	**kPa**		

3. Friction Losses Through Apurtenances:

Apurtenances	Number	K	Velocity *m/s*	Head Loss *m*	Total Loss *m*	Total Loss *psi*
Site						
Valve - 150mm dia.	3	0.120	4.244	0.110	0.331	0.470
Expander - 150mm to 250mm dia.	1	2.127	4.244	1.953	1.953	2.777
45° Bend - 150mm dia.	1	0.240	1.528	0.029	0.029	0.041
45° Bend - 250mm dia.	1	0.224	1.528	0.027	0.027	0.038
250mm dia. Tee (through)	1	0.280	1.528	0.033	0.033	0.047
150mm dia. Tee (branch)	2	0.900	4.244	0.826	1.653	2.350
Total Minor Losses					**4.024**	**5.722**

4. Elevation - Elevational differences from existing hydrant to proposed hydrant

	Metric		Imperial	
Elevation at Boundary (i.e. Residual Hydrant):	424.00	m	1391	ft
Elevation at Site Hydrant:	424.00	m	1391	ft
Elevation Difference = Loss/Gain	**0**	**m**	**0.0**	**psi**

ANALYSIS SUMMARY

Total Losses	**8.000**	**m**		
	78.48	**kPa**	**11.4**	**psi**
Residual Pressure after Losses	**18.90**	**m**		
	185	**kPa**	**26.9**	**psi** **PASS**
Allowable Residual Pressure	*140*	*kPa*	*20.3*	*psi*

961 St. David Street
Fergus, Ontario
(TOWNSHIP OF CENTRE WELLINGTON)

Project Number: 48650-100
Date: May 12, 2022
Design By: NGK
Checked By: JPL
File: L:\CORPORATE\Administration\Staff Phone List.xlsx

SANITARY SEWER DESIGN SHEET

ENGINEERING AND PUBLIC WORKS

Drainage Area Plan No: n/a

Design Parameters

Average Daily Flow

Residential[1]	0.00521	L/s/c
Commercial	0.95	L/s/ha
Industrial	0.40	L/s/ha
Inst. / School	0.25	L/s/ha

Mannings "*n*"	0.013	
Min. Velocity	0.6	m/sec
Max. Velocity	3.0	m/sec

Residential Harmon Peaking Factor (F) $F = 1 + 14/(4 + P^{0.5})$
Commercial Peaking Factor = 2.5
Residential Areas Infiltration[1] 0.15 L/s/ha

LOCATION				RESIDENTIAL AREAS AND POPULATION							SCHOOL, INSTITUTIONAL			COMMERCIAL			INDUSTRIAL				INFILTRATION			DESIGN						
											HECTARES AND FLOW OF EACH ZONING																			
											0.25 *L/s/ha*			0.95 *L/s/ha*			0.40 *L/s/ha*												
STREET	AREA NO.	MANHOLE LOCATION FROM MH	MANHOLE LOCATION TO MH	AREA	No. UNITS @ 3.25 PPU	No. UNITS @ 2.44 PPU	POPUL.	CUMUL POPUL.	PEAK FACTOR "F"	PEAK RES. FLOW	AREA	CUMUL AREA	PEAK FLOW	AREA	CUMUL AREA	PEAK FLOW	AREA	CUMUL AREA	PEAK FLOW	TOTALS-C-I FLOW	AREA	CUMUL AREA	INFIL FLOW	TOTAL VOLUME FLOW	LENGTH	SLOPE	PIPE SIZE	CAPACITY	FULL FLOW VELOCITY
				ha			*1000s*	*1000s*		*L/sec*	*ha*	*ha*	*L/sec*	*ha*	*ha*	*L/sec*	*ha*	*ha*	*L/sec*	*L/sec*	*ha*	*ha*	*L/sec*	*L/sec*	*m*	*%*	*mm*	*L/sec.*	*m/s*
Proposed development				1.402	13.00	37.00	0.133	0.133	4.208032	2.9046											1.402	1.402	0.2103	3.1149	50.0	0.90	150	14.4406	0.818

NOTES

1. Residential domestic flow of 450L/capita/day (equal to 0.00521 L/s/capita), and infiltration rate of 0.15L/ha taken from the Township of Centre Wellington's Municipal Servicing Standards, 2004

961 St. David Street
Fergus, Ontario
Township of Centre Wellington

STORM SEWER DESIGN SHEET

ENGINEERING AND PUBLIC WORKS

Project Number: 48650-100
Date: May 10, 2022
Design By: NGK
Checked By: JPL
File: Q:\48650\100\Storm\Storm Sewer Design Sheet Kitchener_Rev10.xlsx

Drainage Area Plan No:

Design Parameters

5 YEAR STORM

Q=kAIC, k=0.00278
Intensity (I) = a/(tc+b)^{c}
a = 500
b = 0.24
c = 0.6877

Manning's "n" 0.013
Min. Velocity 0.800 m/s
Max. Velocity 6.000 m/s

LOCATION				STORMWATER FLOW								DESIGN					
STREET	AREA NUMBER	MANHOLE LOCATION FROM MH	MANHOLE LOCATION TO MH	AREA (A)	RUNOFF COEFF. (C)	A x C	CUMUL. A x C	CONCENTRATION TIME TOTAL	CONCENTRATION TIME IN PIPE	RAIN INTENSITY (I)	FLOW (Q)	PIPE SIZE	LENGTH	SLOPE	CAPACITY	FULL FLOW VELOCITY	PIPE FULL
				ha		*ha*	*ha*	*min*	*min*	*mm/hr*	*L/s*	*mm*	*m*	*%*	*L/s*	*m/s*	*%*
Controlled Area				0.773				5-year flow taken from MIDUSS model			17.00000	250	10.0	0.50	42.04989	0.8566	40.43

Appendix B

MIDUSS Output

2yr Pre

```
"               MIDUSS Output ------------------------------------------------>"
"               MIDUSS version                          Version 2.25  rev. 473"
"               MIDUSS created                        Sunday, February 7, 2010"
"          10   Units used:                                        ie METRIC"
"               Job folder:                                 Q:\48650\100\SWM"
"               Output filename:                             2yr pre TCW.Out"
"               Licensee name:                                             A"
"               Company                                                    "
"               Date & Time last used:                 5/4/2022 at 4:24:28 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"           1   Chicago storm"
"      375.000   Coefficient A"
"        0.240   Constant B"
"        0.689   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"               Maximum intensity          119.788    mm/hr"
"               Total depth                 31.396    mm"
"             6   002hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         101   Area Draining to the West"
"        0.000   % Impervious"
"        0.734   Total Area"
"      100.000   Flow length"
"        2.000   Overland Slope"
"        0.734   Pervious Area"
"      100.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"      100.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.156   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.004     0.000     0.000     0.000 c.m/sec"
"               Catchment 101          Pervious   Impervious Total Area "
"               Surface Area           0.734      0.000      0.734      hectare"
"               Time of concentration  56.110     4.409      56.110     minutes"
"               Time to Centroid       181.077    97.331     181.077    minutes"
"               Rainfall depth         31.396     31.396     31.396     mm"
"               Rainfall volume        230.44     0.00       230.44     c.m"
"               Rainfall losses        26.511     5.151      26.511     mm"
"               Runoff depth           4.885      26.245     4.885      mm"
"               Runoff volume          35.86      0.00       35.86      c.m"
"               Runoff coefficient     0.156      0.000      0.156      "
"               Maximum flow           0.004      0.000      0.004      c.m/sec"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.004     0.000     0.000     0.000"
" 33          CATCHMENT 102"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         102   Area Draining to South"
"        0.000   % Impervious"
"        0.286   Total Area"
"       40.000   Flow length"
"        1.000   Overland Slope"
"        0.286   Pervious Area"
"       40.000   Pervious length"
"        1.000   Pervious slope"
"        0.000   Impervious Area"
"       40.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.156   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.002     0.000     0.000     0.000 c.m/sec"
"               Catchment 102          Pervious   Impervious Total Area "
"               Surface Area           0.286      0.000      0.286      hectare"
"               Time of concentration  39.864     3.132      39.864     minutes"
"               Time to Centroid       160.020    95.246     160.020    minutes"
"               Rainfall depth         31.396     31.396     31.396     mm"
"               Rainfall volume        89.79      0.00       89.79      c.m"
"               Rainfall losses        26.511     5.390      26.511     mm"
"               Runoff depth           4.885      26.006     4.885      mm"
"               Runoff volume          13.97      0.00       13.97      c.m"
"               Runoff coefficient     0.156      0.000      0.156      "
"               Maximum flow           0.002      0.000      0.002      c.m/sec"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.002     0.000     0.000     0.000"
" 33          CATCHMENT 103"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         103   Area Draining to Highway 6"
"       14.000   % Impervious"
"        0.382   Total Area"
"       70.000   Flow length"
"        5.000   Overland Slope"
"        0.329   Pervious Area"
"       70.000   Pervious length"
"        5.000   Pervious slope"
"        0.053   Impervious Area"
"       70.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.156   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
```

```
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.834   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.011     0.000     0.000     0.000 c.m/sec"
"             Catchment 103          Pervious   Impervious Total Area "
"             Surface Area           0.329      0.053      0.382      hectare"
"             Time of concentration  34.413     2.704      19.636     minutes"
"             Time to Centroid       152.959    94.431     125.684    minutes"
"             Rainfall depth         31.396     31.396     31.396     mm"
"             Rainfall volume        103.14     16.79      119.93     c.m"
"             Rainfall losses        26.512     5.214      23.530     mm"
"             Runoff depth           4.884      26.182     7.866      mm"
"             Runoff volume          16.05      14.00      30.05      c.m"
"             Runoff coefficient     0.156      0.834      0.251      "
"             Maximum flow           0.003      0.011      0.011      c.m/sec"
```

5yr Pre

```
"               MIDUSS Output ------------------------------------------------>"
"               MIDUSS version                          Version 2.25  rev. 473"
"               MIDUSS created                       Sunday, February 7, 2010"
"          10   Units used:                                        ie METRIC"
"               Job folder:                     Q:\48650\100\SWM\TCW versions"
"               Output filename:                                 5yr pre.Out"
"               Licensee name:                                             A"
"               Company                                                    "
"               Date & Time last used:                 5/4/2022 at 4:11:08 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"           1   Chicago storm"
"      500.000   Coefficient A"
"        0.240   Constant B"
"        0.688   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity          160.061    mm/hr"
"             Total depth                 42.145    mm"
"           6   005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         101   Area Draining to the West"
"        0.000   % Impervious"
"        0.734   Total Area"
"      100.000   Flow length"
"        2.000   Overland Slope"
"        0.734   Pervious Area"
"      100.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"      100.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.227   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.011     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           0.734      0.000      0.734      hectare"
"             Time of concentration  39.662     3.873      39.662     minutes"
"             Time to Centroid       160.316    95.565     160.316    minutes"
"             Rainfall depth         42.145     42.145     42.145     mm"
"             Rainfall volume        309.34     0.00       309.34     c.m"
"             Rainfall losses        32.561     5.881      32.561     mm"
"             Runoff depth           9.583      36.263     9.583      mm"
"             Runoff volume          70.34      0.00       70.34      c.m"
"             Runoff coefficient     0.227      0.000      0.227      "
"             Maximum flow           0.011      0.000      0.011      c.m/sec"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.011     0.000     0.000     0.000"
" 33          CATCHMENT 102"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         102   Area Draining to South"
"        0.000   % Impervious"
"        0.286   Total Area"
"       40.000   Flow length"
"        1.000   Overland Slope"
"        0.286   Pervious Area"
"       40.000   Pervious length"
"        1.000   Pervious slope"
"        0.000   Impervious Area"
"       40.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.227   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.006     0.000     0.000     0.000 c.m/sec"
"             Catchment 102          Pervious   Impervious Total Area "
"             Surface Area           0.286      0.000      0.286      hectare"
"             Time of concentration  28.179     2.752      28.178     minutes"
"             Time to Centroid       144.328    93.539     144.328    minutes"
"             Rainfall depth         42.145     42.145     42.145     mm"
"             Rainfall volume        120.53     0.00       120.53     c.m"
"             Rainfall losses        32.569     5.505      32.569     mm"
"             Runoff depth           9.576      36.640     9.576      mm"
"             Runoff volume          27.39      0.00       27.39      c.m"
"             Runoff coefficient     0.227      0.000      0.227      "
"             Maximum flow           0.006      0.000      0.006      c.m/sec"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.006     0.000     0.000     0.000"
" 33          CATCHMENT 103"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         103   Area Draining to Highway 6"
"       14.000   % Impervious"
"        0.382   Total Area"
"       70.000   Flow length"
"        5.000   Overland Slope"
"        0.329   Pervious Area"
"       70.000   Pervious length"
"        5.000   Pervious slope"
"        0.053   Impervious Area"
"       70.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.227   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
```

```
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.871   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.016     0.000     0.000     0.000 c.m/sec"
"             Catchment 103          Pervious   Impervious Total Area "
"             Surface Area           0.329      0.053      0.382      hectare"
"             Time of concentration  24.325     2.376      15.892     minutes"
"             Time to Centroid       138.963    92.887     121.261    minutes"
"             Rainfall depth         42.145     42.145     42.145     mm"
"             Rainfall volume        138.45     22.54      160.99     c.m"
"             Rainfall losses        32.564     5.426      28.765     mm"
"             Runoff depth           9.581      36.719     13.380     mm"
"             Runoff volume          31.47      19.64      51.11      c.m"
"             Runoff coefficient     0.227      0.871      0.317      "
"             Maximum flow           0.007      0.015      0.016      c.m/sec"
" 38          START/RE-START TOTALS "
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      0.000    hectare"
"             Total Impervious area                     0.000    hectare"
"             Total % impervious                        0.000"
" 19          EXIT"
```

10yr Pre

```
"               MIDUSS Output ----------------------------------------------->"
"               MIDUSS version                          Version 2.25  rev. 473"
"               MIDUSS created                        Sunday, February 7, 2010"
"          10   Units used:                                        ie METRIC"
"               Job folder:                                 Q:\48650\100\SWM"
"               Output filename:                            10yr pre TCW.Out"
"               Licensee name:                                              A"
"               Company                                                     "
"               Date & Time last used:                  5/4/2022 at 4:26:04 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"           1   Chicago storm"
"      595.000   Coefficient A"
"        0.360   Constant B"
"        0.691   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity          186.431    mm/hr"
"             Total depth                 49.226    mm"
"            6   010hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         101   Area Draining to the West"
"        0.000   % Impervious"
"        0.734   Total Area"
"      100.000   Flow length"
"        2.000   Overland Slope"
"        0.734   Pervious Area"
"      100.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"      100.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.269   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.018     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           0.734      0.000      0.734      hectare"
"             Time of concentration  34.073     3.625      34.073     minutes"
"             Time to Centroid       151.986    94.644     151.986    minutes"
"             Rainfall depth         49.226     49.226     49.226     mm"
"             Rainfall volume        361.32     0.00       361.32     c.m"
"             Rainfall losses        35.986     6.385      35.986     mm"
"             Runoff depth           13.240     42.841     13.240     mm"
"             Runoff volume          97.18      0.00       97.18      c.m"
"             Runoff coefficient     0.269      0.000      0.269      "
"             Maximum flow           0.018      0.000      0.018      c.m/sec"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.018     0.000     0.000     0.000"
" 33          CATCHMENT 102"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         102   Area Draining to South"
"        0.000   % Impervious"
"        0.286   Total Area"
"       40.000   Flow length"
"        1.000   Overland Slope"
"        0.286   Pervious Area"
"       40.000   Pervious length"
"        1.000   Pervious slope"
"        0.000   Impervious Area"
"       40.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.269   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.009     0.000     0.000     0.000 c.m/sec"
"             Catchment 102          Pervious   Impervious Total Area "
"             Surface Area           0.286      0.000      0.286      hectare"
"             Time of concentration  24.208     2.576      24.208     minutes"
"             Time to Centroid       137.952    92.639     137.952    minutes"
"             Rainfall depth         49.226     49.226     49.226     mm"
"             Rainfall volume        140.79     0.00       140.79     c.m"
"             Rainfall losses        35.984     5.590      35.984     mm"
"             Runoff depth           13.242     43.636     13.242     mm"
"             Runoff volume          37.87      0.00       37.87      c.m"
"             Runoff coefficient     0.269      0.000      0.269      "
"             Maximum flow           0.009      0.000      0.009      c.m/sec"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.009     0.000     0.000     0.000"
" 33          CATCHMENT 103"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         103   Area Draining to Highway 6"
"        14.000   % Impervious"
"        0.382   Total Area"
"       70.000   Flow length"
"        5.000   Overland Slope"
"        0.329   Pervious Area"
"       70.000   Pervious length"
"        5.000   Pervious slope"
"        0.053   Impervious Area"
"       70.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.269   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.886   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                    0.020     0.000     0.000     0.000 c.m/sec"
"             Catchment 103          Pervious   Impervious Total Area "
"             Surface Area           0.329      0.053      0.382      hectare"
"             Time of concentration  20.897     2.224      14.379     minutes"
"             Time to Centroid       133.227    92.111     118.875    minutes"
"             Rainfall depth         49.226     49.226     49.226     mm"
"             Rainfall volume        161.72     26.33      188.04     c.m"
"             Rainfall losses        35.985     5.608      31.733     mm"
"             Runoff depth           13.241     43.618     17.493     mm"
"             Runoff volume          43.50      23.33      66.82      c.m"
"             Runoff coefficient     0.269      0.886      0.355      "
"             Maximum flow           0.011      0.019      0.020      c.m/sec"
```

25yr Pre

```
"               MIDUSS Output ------------------------------------------------>"
"               MIDUSS version                          Version 2.25  rev. 473"
"               MIDUSS created                        Sunday, February 7, 2010"
"          10   Units used:                                        ie METRIC"
"               Job folder:                                 Q:\48650\100\SWM"
"               Output filename:                            25yr pre TCW.Out"
"               Licensee name:                                              A"
"               Company                                                     "
"               Date & Time last used:                   5/4/2022 at 4:27:35 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      702.000   Coefficient A"
"        0.350   Constant B"
"        0.690   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"               Maximum intensity          220.574    mm/hr"
"               Total depth                 58.353    mm"
"            6   025hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   Area Draining to the West"
"        0.000   % Impervious"
"        0.734   Total Area"
"      100.000   Flow length"
"        2.000   Overland Slope"
"        0.734   Pervious Area"
"      100.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"      100.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.317   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.029     0.000     0.000     0.000 c.m/sec"
"               Catchment 101          Pervious   Impervious Total Area "
"               Surface Area           0.734      0.000      0.734      hectare"
"               Time of concentration  29.275     3.375      29.275     minutes"
"               Time to Centroid       144.683    93.660     144.683    minutes"
"               Rainfall depth         58.353     58.353     58.353     mm"
"               Rainfall volume        428.31     0.00       428.31     c.m"
"               Rainfall losses        39.869     6.386      39.869     mm"
"               Runoff depth           18.484     51.966     18.484     mm"
"               Runoff volume          135.67     0.00       135.67     c.m"
"               Runoff coefficient     0.317      0.000      0.317      "
"               Maximum flow           0.029      0.000      0.029      c.m/sec"
" 40          HYDROGRAPH Start - New Tributary"
"             2   Start - New Tributary"
"                     0.029     0.000     0.000     0.000"
" 33          CATCHMENT 102"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           102   Area Draining to South"
"         0.000   % Impervious"
"         0.286   Total Area"
"        40.000   Flow length"
"         1.000   Overland Slope"
"         0.286   Pervious Area"
"        40.000   Pervious length"
"         1.000   Pervious slope"
"         0.000   Impervious Area"
"        40.000   Impervious length"
"         1.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        75.000   Pervious SCS Curve No."
"         0.317   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.467   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.000   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                    0.014     0.000     0.000     0.000 c.m/sec"
"               Catchment 102          Pervious   Impervious Total Area "
"               Surface Area           0.286      0.000      0.286      hectare"
"               Time of concentration  20.799     2.398      20.799     minutes"
"               Time to Centroid       132.350    91.879     132.350    minutes"
"               Rainfall depth         58.353     58.353     58.353     mm"
"               Rainfall volume        166.89     0.00       166.89     c.m"
"               Rainfall losses        39.869     5.724      39.869     mm"
"               Runoff depth           18.483     52.629     18.483     mm"
"               Runoff volume          52.86      0.00       52.86      c.m"
"               Runoff coefficient     0.317      0.000      0.317      "
"               Maximum flow           0.014      0.000      0.014      c.m/sec"
" 40          HYDROGRAPH Start - New Tributary"
"             2   Start - New Tributary"
"                     0.014     0.000     0.000     0.000"
" 33          CATCHMENT 103"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           103   Area Draining to Highway 6"
"        14.000   % Impervious"
"         0.382   Total Area"
"        70.000   Flow length"
"         5.000   Overland Slope"
"         0.329   Pervious Area"
"        70.000   Pervious length"
"         5.000   Pervious slope"
"         0.053   Impervious Area"
"        70.000   Impervious length"
"         5.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
```

```
"       75.000   Pervious SCS Curve No."
"        0.317   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.898   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.026     0.000     0.000     0.000 c.m/sec"
"             Catchment 103          Pervious   Impervious Total Area "
"             Surface Area           0.329      0.053      0.382      hectare"
"             Time of concentration  17.954     2.070      12.938     minutes"
"             Time to Centroid       128.213    91.378     116.580    minutes"
"             Rainfall depth         58.353     58.353     58.353     mm"
"             Rainfall volume        191.70     31.21      222.91     c.m"
"             Rainfall losses        39.864     5.931      35.114     mm"
"             Runoff depth           18.488     52.422     23.239     mm"
"             Runoff volume          60.74      28.04      88.77      c.m"
"             Runoff coefficient     0.317      0.898      0.398      "
"             Maximum flow           0.018      0.023      0.026      c.m/sec"
```

50yr Pre

```
"               MIDUSS Output ----------------------------------------------->"
"               MIDUSS version                          Version 2.25  rev. 473"
"               MIDUSS created                        Sunday, February 7, 2010"
"          10   Units used:                                        ie METRIC"
"               Job folder:                                 Q:\48650\100\SWM"
"               Output filename:                            50yr pre TCW.Out"
"               Licensee name:                                              A"
"               Company                                                     "
"               Date & Time last used:                   5/4/2022 at 4:29:40 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      780.000   Coefficient A"
"        0.360   Constant B"
"        0.690   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"               Maximum intensity          244.972    mm/hr"
"               Total depth                 65.003    mm"
"            6   050hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   Area Draining to the West"
"        0.000   % Impervious"
"        0.734   Total Area"
"      100.000   Flow length"
"        2.000   Overland Slope"
"        0.734   Pervious Area"
"      100.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"      100.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.348   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.038     0.000     0.000     0.000 c.m/sec"
"               Catchment 101          Pervious   Impervious Total Area "
"               Surface Area           0.734      0.000      0.734      hectare"
"               Time of concentration  26.777     3.229      26.777     minutes"
"               Time to Centroid       140.702    93.078     140.702    minutes"
"               Rainfall depth         65.003     65.003     65.003     mm"
"               Rainfall volume        477.12     0.00       477.12     c.m"
"               Rainfall losses        42.373     6.372      42.373     mm"
"               Runoff depth           22.629     58.631     22.629     mm"
"               Runoff volume          166.10     0.00       166.10     c.m"
"               Runoff coefficient     0.348      0.000      0.348      "
"               Maximum flow           0.038      0.000      0.038      c.m/sec"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.038     0.000     0.000     0.000"
" 33          CATCHMENT 102"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          102   Area Draining to South"
"        0.000   % Impervious"
"        0.286   Total Area"
"       40.000   Flow length"
"        1.000   Overland Slope"
"        0.286   Pervious Area"
"       40.000   Pervious length"
"        1.000   Pervious slope"
"        0.000   Impervious Area"
"       40.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.348   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.019     0.000     0.000     0.000 c.m/sec"
"               Catchment 102          Pervious   Impervious Total Area "
"               Surface Area           0.286      0.000      0.286      hectare"
"               Time of concentration  19.024     2.294      19.024     minutes"
"               Time to Centroid       129.314    91.460     129.314    minutes"
"               Rainfall depth         65.003     65.003     65.003     mm"
"               Rainfall volume        185.91     0.00       185.91     c.m"
"               Rainfall losses        42.413     5.828      42.413     mm"
"               Runoff depth           22.589     59.174     22.589     mm"
"               Runoff volume          64.61      0.00       64.61      c.m"
"               Runoff coefficient     0.348      0.000      0.348      "
"               Maximum flow           0.019      0.000      0.019      c.m/sec"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.019     0.000     0.000     0.000"
" 33          CATCHMENT 103"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          103   Area Draining to Highway 6"
"       14.000   % Impervious"
"        0.382   Total Area"
"       70.000   Flow length"
"        5.000   Overland Slope"
"        0.329   Pervious Area"
"       70.000   Pervious length"
"        5.000   Pervious slope"
"        0.053   Impervious Area"
"       70.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
```

```
"       75.000   Pervious SCS Curve No."
"        0.347   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.906   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.032     0.000     0.000     0.000 c.m/sec"
"             Catchment 103          Pervious   Impervious Total Area "
"             Surface Area           0.329      0.053      0.382      hectare"
"             Time of concentration  16.422     1.980      12.119     minutes"
"             Time to Centroid       125.533    90.934     115.222    minutes"
"             Rainfall depth         65.003     65.003     65.003     mm"
"             Rainfall volume        213.55     34.76      248.31     c.m"
"             Rainfall losses        42.423     6.120      37.340     mm"
"             Runoff depth           22.580     58.883     27.662     mm"
"             Runoff volume          74.18      31.49      105.67     c.m"
"             Runoff coefficient     0.347      0.906      0.426      "
"             Maximum flow           0.026      0.026      0.032      c.m/sec"
```

100yr Pre

```
"               MIDUSS Output ----------------------------------------------->"
"               MIDUSS version                          Version 2.25  rev. 473"
"               MIDUSS created                       Sunday, February 7, 2010"
"          10   Units used:                                        ie METRIC"
"               Job folder:                    Q:\48650\100\SWM\TCW versions"
"               Output filename:                                 100yr pre.Out"
"               Licensee name:                                               A"
"               Company                                                      "
"               Date & Time last used:                 5/4/2022 at 4:19:11 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      851.000   Coefficient A"
"        0.290   Constant B"
"        0.687   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"              Maximum intensity          270.786    mm/hr"
"              Total depth                 71.828    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   Area Draining to the West"
"        0.000   % Impervious"
"        0.734   Total Area"
"      100.000   Flow length"
"        2.000   Overland Slope"
"        0.734   Pervious Area"
"      100.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"      100.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.377   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.052     0.000     0.000     0.000 c.m/sec"
"              Catchment 101          Pervious   Impervious Total Area "
"              Surface Area           0.734      0.000      0.734      hectare"
"              Time of concentration  24.716     3.096      24.715     minutes"
"              Time to Centroid       137.449    92.639     137.449    minutes"
"              Rainfall depth         71.828     71.828     71.828     mm"
"              Rainfall volume        527.22     0.00       527.22     c.m"
"              Rainfall losses        44.722     6.351      44.722     mm"
"              Runoff depth           27.106     65.478     27.106     mm"
"              Runoff volume          198.96     0.00       198.96     c.m"
"              Runoff coefficient     0.377      0.000      0.377      "
"              Maximum flow           0.052      0.000      0.052      c.m/sec"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.052     0.000     0.000     0.000"
" 33          CATCHMENT 102"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          102   Area Draining to South"
"        0.000   % Impervious"
"        0.286   Total Area"
"       40.000   Flow length"
"        1.000   Overland Slope"
"        0.286   Pervious Area"
"       40.000   Pervious length"
"        1.000   Pervious slope"
"        0.000   Impervious Area"
"       40.000   Impervious length"
"        1.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.377   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.024     0.000     0.000     0.000 c.m/sec"
"              Catchment 102          Pervious   Impervious Total Area "
"              Surface Area           0.286      0.000      0.286      hectare"
"              Time of concentration  17.560     2.200      17.560     minutes"
"              Time to Centroid       126.777    91.112     126.777    minutes"
"              Rainfall depth         71.828     71.828     71.828     mm"
"              Rainfall volume        205.43     0.00       205.43     c.m"
"              Rainfall losses        44.716     5.983      44.716     mm"
"              Runoff depth           27.112     65.845     27.112     mm"
"              Runoff volume          77.54      0.00       77.54      c.m"
"              Runoff coefficient     0.377      0.000      0.377      "
"              Maximum flow           0.024      0.000      0.024      c.m/sec"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.024     0.000     0.000     0.000"
" 33          CATCHMENT 103"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          103   Area Draining to Highway 6"
"       14.000   % Impervious"
"        0.382   Total Area"
"       70.000   Flow length"
"        5.000   Overland Slope"
"        0.329   Pervious Area"
"       70.000   Pervious length"
"        5.000   Pervious slope"
"        0.053   Impervious Area"
"       70.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
```

```
"       75.000   Pervious SCS Curve No."
"        0.377   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.912   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.040     0.000     0.000     0.000 c.m/sec"
"             Catchment 103          Pervious   Impervious Total Area "
"             Surface Area           0.329      0.053      0.382      hectare"
"             Time of concentration  15.158     1.899      11.413     minutes"
"             Time to Centroid       123.231    90.553     114.001    minutes"
"             Rainfall depth         71.828     71.828     71.828     mm"
"             Rainfall volume        235.97     38.41      274.38     c.m"
"             Rainfall losses        44.733     6.312      39.354     mm"
"             Runoff depth           27.095     65.517     32.474     mm"
"             Runoff volume          89.01      35.04      124.05     c.m"
"             Runoff coefficient     0.377      0.912      0.452      "
"             Maximum flow           0.033      0.029      0.040      c.m/sec"
```

2yr Post

```
"               MIDUSS Output ------------------------------------------------>"
"               MIDUSS version                          Version 2.25  rev. 473"
"               MIDUSS created                        Sunday, February 7, 2010"
"          10   Units used:                                        ie METRIC"
"               Job folder:                                 Q:\48650\100\SWM"
"               Output filename:                                2yr post.Out"
"               Licensee name:                                             A"
"               Company                                                    "
"               Date & Time last used:                5/10/2022 at 10:36:02 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"           1   Chicago storm"
"      375.000   Coefficient A"
"        0.240   Constant B"
"        0.689   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity          119.788    mm/hr"
"             Total depth                 31.396    mm"
"           6   002hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         201   Uncontrolled to Southwest Property Line"
"       55.000   % Impervious"
"        0.228   Total Area"
"       15.000   Flow length"
"        2.000   Overland Slope"
"        0.103   Pervious Area"
"       15.000   Pervious length"
"        2.000   Pervious slope"
"        0.125   Impervious Area"
"       15.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.156   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.825   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.030     0.000     0.000     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.103      0.125      0.228      hectare"
"             Time of concentration  17.976     1.412      3.627      minutes"
"             Time to Centroid       131.637    92.372     97.622     minutes"
"             Rainfall depth         31.396     31.396     31.396     mm"
"             Rainfall volume        32.21      39.37      71.58      c.m"
"             Rainfall losses        26.512     5.505      14.958     mm"
"             Runoff depth           4.883      25.891     16.437     mm"
"             Runoff volume          5.01       32.47      37.48      c.m"
"             Runoff coefficient     0.156      0.825      0.524      "
"             Maximum flow           0.001      0.030      0.030      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.030     0.030     0.000     0.000"
" 57          TRENCH Design d/s of 201"
"        0.030   Peak inflow"
"       37.477   Hydrograph volume"
"      424.500   Ground elevation"
"      423.500   Downstream trench invert"
"        0.500   Trench height"
"      422.500   Water table elevation"
"        3.500   Trench top width"
"        3.500   Trench bottom width"
"       40.000   Voids ratio (%)"
"       20.000   Hydraulic conductivity"
"        0.000   Trench gradient (%)"
"       85.000   Trench length"
"        1.000   Include base width"
"          21.   Number of stages"
"                  Level Discharge    Volume"
"                423.500     0.000       0.0"
"                423.550     0.000       5.9"
"                423.600     0.000      11.9"
"                423.650     0.000      17.8"
"                423.700     0.000      23.8"
"                423.750     0.000      29.8"
"                423.800     0.000      35.7"
"                423.850     0.000      41.7"
"                423.900     0.000      47.6"
"                423.950     0.000      53.6"
"                424.000     1.458      59.5"
"                424.050     4.123      59.6"
"                424.100     7.577      59.6"
"                424.150    11.664      59.7"
"                424.200    16.303      59.7"
"                424.250    21.430      59.8"
"                424.300    27.003      59.8"
"                424.350    32.994      59.9"
"                424.400    39.369      60.0"
"                424.450    46.112      60.0"
"                424.500    53.197      60.1"
"           1.   WEIRS"
"                  Crest      Weir      Crest      Left      Right"
"              elevation coefficie   breadth sideslope sideslope"
"                423.950     0.900    85.000     0.000     0.000"
"           1.   MANHOLE"
"                Access"
"               diameter"
"                  1.200"
"              Peak outflow                  0.000    c.m/sec"
"              Outflow volume                0.002    c.m"
"              Peak exfiltration             0.002    c.m/sec"
"              Exfiltration volume          37.465    c.m"
"              Maximum level               423.693    metre"
"              Maximum storage              22.941    c.m"
"              Centroidal lag                3.895   hours"
"              Infiltration area 2 sides    32.773   sq.metre"
"              Infiltration Base area      297.500    sq.metre"
"                   0.030     0.030     0.000     0.002 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"           6   Combine "
"           1   Node #"
"               Total Site"
"              Maximum flow                  0.000    c.m/sec"
"              Hydrograph volume             0.002    c.m"
"                     0.030     0.030     0.000     0.000"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
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"                    0.030     0.000     0.000     0.000"
" 33          CATCHMENT 202"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         202   Controlled Area to Highway 6"
"      75.000   % Impervious"
"       0.773   Total Area"
"      15.000   Flow length"
"       2.000   Overland Slope"
"       0.193   Pervious Area"
"      15.000   Pervious length"
"       2.000   Pervious slope"
"       0.580   Impervious Area"
"      15.000   Impervious length"
"       2.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      75.000   Pervious SCS Curve No."
"       0.156   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.467   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.825   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                    0.137     0.000     0.000     0.000 c.m/sec"
"            Catchment 202          Pervious   Impervious Total Area "
"            Surface Area           0.193      0.580      0.773      hectare"
"            Time of concentration  17.976     1.412      2.392      minutes"
"            Time to Centroid       131.637    92.372     94.695     minutes"
"            Rainfall depth         31.396     31.396     31.396     mm"
"            Rainfall volume        60.67      182.02     242.69     c.m"
"            Rainfall losses        26.512     5.505      10.757     mm"
"            Runoff depth           4.883      25.891     20.639     mm"
"            Runoff volume          9.44       150.10     159.54     c.m"
"            Runoff coefficient     0.156      0.825      0.657      "
"            Maximum flow           0.002      0.137      0.137      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.137     0.137     0.000     0.000"
" 54          POND DESIGN"
"       0.137   Current peak flow    c.m/sec"
"       0.180   Target outflow    c.m/sec"
"       159.5   Hydrograph volume    c.m"
"         13.   Number of stages"
"     422.046   Minimum water level    metre"
"     424.050   Maximum water level    metre"
"     422.046   Starting water level    metre"
"           0   Keep Design Data: 1 = True; 0 = False"
"                 Level Discharge    Volume"
"               422.046     0.000     0.000"
"               422.350   0.00809  1.01E-05"
"               422.600   0.01139    12.800"
"               422.800   0.01346    23.000"
"               423.000   0.01526    61.200"
"               423.260   0.01731   110.900"
"               423.500   0.01901   187.100"
"               423.660   0.02007   216.500"
"               423.830   0.02113   226.000"
"               423.880   0.02143   228.700"
"               423.930   0.02173   241.000"
"               423.980   0.02203   264.900"
"               424.050   0.05083   264.900"
"          1.   WEIRS"
"                 Crest      Weir     Crest      Left     Right"
"            elevation coefficie   breadth sideslope sideslope"
"              423.980     0.900     1.000     0.000     0.000"
"          1.   ORIFICES"
"               Orifice   Orifice   Orifice Number of"
"                invert coefficie  diameter  orifices"
"               422.046     0.820    0.0750     1.000"
"            Peak outflow                  0.016    c.m/sec"
"            Maximum level               423.053    metre"
"            Maximum storage              71.277    c.m"
"            Centroidal lag                2.375   hours"
"                 0.137     0.137     0.016     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"           6   Combine "
"           2   Node #"
"               Total to Highway 6"
"            Maximum flow                  0.016    c.m/sec"
"            Hydrograph volume           159.111    c.m"
"                    0.137     0.137     0.016     0.016"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.137     0.000     0.016     0.016"
" 33          CATCHMENT 203"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         203   Uncontrolled to Rear Yard Amended Topsoil then to Hwy 6"
"      25.000   % Impervious"
"       0.352   Total Area"
"     120.000   Flow length"
"       2.000   Overland Slope"
"       0.264   Pervious Area"
"     120.000   Pervious length"
"       2.000   Pervious slope"
"       0.088   Impervious Area"
"     120.000   Impervious length"
"       2.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      75.000   Pervious SCS Curve No."
"       0.156   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.467   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.839   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                    0.018     0.000     0.016     0.016 c.m/sec"
"            Catchment 203          Pervious   Impervious Total Area "
"            Surface Area           0.264      0.088      0.352      hectare"
"            Time of concentration  62.596     4.918      25.535     minutes"
"            Time to Centroid       189.486    98.108     130.770    minutes"
"            Rainfall depth         31.396     31.396     31.396     mm"
"            Rainfall volume        82.88      27.63      110.51     c.m"
"            Rainfall losses        26.510     5.049      21.145     mm"
"            Runoff depth           4.885      26.347     10.251     mm"
"            Runoff volume          12.90      23.19      36.08      c.m"
"            Runoff coefficient     0.156      0.839      0.326      "
"            Maximum flow           0.001      0.018      0.018      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.018     0.018     0.016     0.016"
" 57          TRENCH Design d/s of 203"
```

```
"        0.018   Peak inflow"
"       36.082   Hydrograph volume"
"      424.500   Ground elevation"
"      423.500   Downstream trench invert"
"        0.500   Trench height"
"      422.500   Water table elevation"
"        3.500   Trench top width"
"        3.500   Trench bottom width"
"       40.000   Voids ratio (%)"
"       20.000   Hydraulic conductivity"
"        0.000   Trench gradient (%)"
"      130.000   Trench length"
"        1.000   Include base width"
"          21.   Number of stages"
"                  Level Discharge    Volume"
"                423.500     0.000       0.0"
"                423.550     0.000       9.1"
"                423.600     0.000      18.2"
"                423.650     0.000      27.3"
"                423.700     0.000      36.4"
"                423.750     0.000      45.5"
"                423.800     0.000      54.6"
"                423.850     0.000      63.7"
"                423.900     0.000      72.8"
"                423.950     0.000      81.9"
"                424.000     0.017      91.0"
"                424.050     0.049      91.1"
"                424.100     0.089      91.1"
"                424.150     0.137      91.2"
"                424.200     0.192      91.2"
"                424.250     0.252      91.3"
"                424.300     0.318      91.3"
"                424.350     0.388      91.4"
"                424.400     0.463      91.5"
"                424.450     0.543      91.5"
"                424.500     0.626      91.6"
"           1.   WEIRS"
"                  Crest      Weir     Crest      Left     Right"
"              elevation coefficie   breadth sideslope sideslope"
"                423.950     0.900     1.000     0.000     0.000"
"           1.   MANHOLE"
"                 Access"
"              diameter"
"                1.200"
"             Peak outflow                  0.000    c.m/sec"
"             Outflow volume                0.001    c.m"
"             Peak exfiltration             0.003    c.m/sec"
"             Exfiltration volume          36.070    c.m"
"             Maximum level               423.571    metre"
"             Maximum storage              12.943    c.m"
"             Centroidal lag                3.302   hours"
"             Infiltration area 2 sides    18.488   sq.metre"
"             Infiltration Base area      455.000   sq.metre"
"                  0.018     0.018     0.000     0.003 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"           6   Combine "
"           2   Node #"
"               Total to Highway 6"
"             Maximum flow                  0.016    c.m/sec"
"             Hydrograph volume           159.112    c.m"
"                    0.018     0.018     0.000     0.016"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.018     0.000     0.000     0.016"
" 33           CATCHMENT 204"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           204   Uncontrolled to Highway 6"
"         0.000   % Impervious"
"         0.049   Total Area"
"        20.000   Flow length"
"         2.000   Overland Slope"
"         0.049   Pervious Area"
"        20.000   Pervious length"
"         2.000   Pervious slope"
"         0.000   Impervious Area"
"        20.000   Impervious length"
"         2.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        75.000   Pervious SCS Curve No."
"         0.156   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.467   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.000   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                    0.001     0.000     0.000     0.016 c.m/sec"
"              Catchment 204          Pervious   Impervious Total Area "
"              Surface Area           0.049      0.000      0.049      hectare"
"              Time of concentration  21.363     1.678      21.363     minutes"
"              Time to Centroid       136.032    92.661     136.032    minutes"
"              Rainfall depth         31.396     31.396     31.396     mm"
"              Rainfall volume        15.38      0.00       15.38      c.m"
"              Rainfall losses        26.513     5.389      26.513     mm"
"              Runoff depth           4.883      26.006     4.883      mm"
"              Runoff volume          2.39       0.00       2.39       c.m"
"              Runoff coefficient     0.156      0.000      0.156      "
"              Maximum flow           0.001      0.000      0.001      c.m/sec"
" 40           HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                    0.001     0.001     0.000     0.016"
" 40           HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
"                    0.001     0.001     0.001     0.016"
" 40           HYDROGRAPH   Combine    2"
"             6   Combine "
"             2   Node #"
"                 Total to Highway 6"
"              Maximum flow                  0.016    c.m/sec"
"              Hydrograph volume           161.505    c.m"
"                    0.001     0.001     0.001     0.016"
" 40           HYDROGRAPH   Confluence    2"
"             7   Confluence "
"             2   Node #"
"                 Total to Highway 6"
"              Maximum flow                  0.016    c.m/sec"
"              Hydrograph volume           161.505    c.m"
"                    0.001     0.016     0.001     0.000"
" 40           HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
"                    0.001     0.016     0.016     0.000"
" 40           HYDROGRAPH   Combine    1"
"             6   Combine "
"             1   Node #"
"                 Total Site"
```

```
"             Maximum flow                  0.016    c.m/sec"
"             Hydrograph volume           161.507    c.m"
"                    0.001     0.016     0.016     0.016"
" 40          HYDROGRAPH   Confluence    1"
"            7   Confluence "
"            1   Node #"
"                Total Site"
"             Maximum flow                  0.016    c.m/sec"
"             Hydrograph volume           161.507    c.m"
"                    0.001     0.016     0.016     0.000"
" 38          START/RE-START TOTALS 1"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      1.402    hectare"
"             Total Impervious area                     0.793    hectare"
"             Total % impervious                       56.573"
" 19          EXIT"
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5yr Post

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"               MIDUSS Output ------------------------------------------------>"
"               MIDUSS version                          Version 2.25  rev. 473"
"               MIDUSS created                        Sunday, February 7, 2010"
"          10   Units used:                                        ie METRIC"
"               Job folder:                                 Q:\48650\100\SWM"
"               Output filename:                               5yr post.Out"
"               Licensee name:                                              A"
"               Company                                                     "
"               Date & Time last used:                5/10/2022 at 10:34:16 AM"
" 31          TIME PARAMETERS"
"       5.000   Time Step"
"     180.000   Max. Storm length"
"    1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"           1   Chicago storm"
"     500.000   Coefficient A"
"       0.240   Constant B"
"       0.688   Exponent C"
"       0.400   Fraction R"
"     180.000   Duration"
"       1.000   Time step multiplier"
"            Maximum intensity          160.061    mm/hr"
"            Total depth                 42.145    mm"
"           6   005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         201   Uncontrolled to Southwest Property Line"
"      55.000   % Impervious"
"       0.228   Total Area"
"      15.000   Flow length"
"       2.000   Overland Slope"
"       0.103   Pervious Area"
"      15.000   Pervious length"
"       2.000   Pervious slope"
"       0.125   Impervious Area"
"      15.000   Impervious length"
"       2.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      75.000   Pervious SCS Curve No."
"       0.227   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.467   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.855   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                   0.043     0.000     0.000     0.000 c.m/sec"
"            Catchment 201          Pervious   Impervious Total Area "
"            Surface Area           0.103      0.125      0.228      hectare"
"            Time of concentration  12.707     1.241      3.285      minutes"
"            Time to Centroid       122.816    91.016     96.684     minutes"
"            Rainfall depth         42.145     42.145     42.145     mm"
"            Rainfall volume        43.24      52.85      96.09      c.m"
"            Rainfall losses        32.593     6.117      18.031     mm"
"            Runoff depth           9.552      36.027     24.113     mm"
"            Runoff volume          9.80       45.18      54.98      c.m"
"            Runoff coefficient     0.227      0.855      0.572      "
"            Maximum flow           0.003      0.042      0.043      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.043     0.043     0.000     0.000"
" 57          TRENCH Design d/s of 201"
"        0.043   Peak inflow"
"       54.978   Hydrograph volume"
"      424.500   Ground elevation"
"      423.500   Downstream trench invert"
"        0.500   Trench height"
"      422.500   Water table elevation"
"        3.500   Trench top width"
"        3.500   Trench bottom width"
"       40.000   Voids ratio (%)"
"       20.000   Hydraulic conductivity"
"        0.000   Trench gradient (%)"
"       85.000   Trench length"
"        1.000   Include base width"
"          21.   Number of stages"
"                  Level Discharge    Volume"
"                423.500     0.000       0.0"
"                423.550     0.000       5.9"
"                423.600     0.000      11.9"
"                423.650     0.000      17.8"
"                423.700     0.000      23.8"
"                423.750     0.000      29.8"
"                423.800     0.000      35.7"
"                423.850     0.000      41.7"
"                423.900     0.000      47.6"
"                423.950     0.000      53.6"
"                424.000     1.458      59.5"
"                424.050     4.123      59.6"
"                424.100     7.577      59.6"
"                424.150    11.664      59.7"
"                424.200    16.303      59.7"
"                424.250    21.430      59.8"
"                424.300    27.003      59.8"
"                424.350    32.994      59.9"
"                424.400    39.369      60.0"
"                424.450    46.112      60.0"
"                424.500    53.197      60.1"
"           1.   WEIRS"
"                  Crest      Weir      Crest      Left      Right"
"              elevation coefficie   breadth sideslope sideslope"
"                423.950     0.900    85.000     0.000     0.000"
"           1.   MANHOLE"
"                 Access"
"               diameter"
"                  1.200"
"              Peak outflow                  0.000    c.m/sec"
"              Outflow volume                0.003    c.m"
"              Peak exfiltration             0.002    c.m/sec"
"              Exfiltration volume          54.965    c.m"
"              Maximum level               423.815    metre"
"              Maximum storage              37.466    c.m"
"              Centroidal lag                4.819   hours"
"              Infiltration area 2 sides    53.519   sq.metre"
"              Infiltration Base area      297.500   sq.metre"
"                   0.043     0.043     0.000     0.002 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"           6   Combine "
"           1   Node #"
"               Total Site"
"              Maximum flow                  0.000    c.m/sec"
"              Hydrograph volume             0.003    c.m"
"                     0.043     0.043     0.000     0.000"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
```

```
"                   0.043     0.000     0.000     0.000"
" 33          CATCHMENT 202"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         202   Controlled Area to Highway 6"
"      75.000   % Impervious"
"       0.773   Total Area"
"      15.000   Flow length"
"       2.000   Overland Slope"
"       0.193   Pervious Area"
"      15.000   Pervious length"
"       2.000   Pervious slope"
"       0.580   Impervious Area"
"      15.000   Impervious length"
"       2.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      75.000   Pervious SCS Curve No."
"       0.227   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.467   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.855   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                   0.196     0.000     0.000     0.000 c.m/sec"
"            Catchment 202          Pervious   Impervious Total Area "
"            Surface Area           0.193      0.580      0.773      hectare"
"            Time of concentration  12.707     1.241      2.172      minutes"
"            Time to Centroid       122.816    91.016     93.598     minutes"
"            Rainfall depth         42.145     42.145     42.145     mm"
"            Rainfall volume        81.44      244.33     325.78     c.m"
"            Rainfall losses        32.593     6.117      12.736     mm"
"            Runoff depth           9.552      36.027     29.408     mm"
"            Runoff volume          18.46      208.87     227.33     c.m"
"            Runoff coefficient     0.227      0.855      0.698      "
"            Maximum flow           0.006      0.194      0.196      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.196     0.196     0.000     0.000"
" 54          POND DESIGN"
"       0.196   Current peak flow    c.m/sec"
"       0.180   Target outflow    c.m/sec"
"       227.3   Hydrograph volume    c.m"
"         13.   Number of stages"
"     422.046   Minimum water level    metre"
"     424.050   Maximum water level    metre"
"     422.046   Starting water level    metre"
"           0   Keep Design Data: 1 = True; 0 = False"
"                 Level Discharge    Volume"
"               422.046     0.000     0.000"
"               422.350   0.00809  1.01E-05"
"               422.600   0.01139    12.800"
"               422.800   0.01346    23.000"
"               423.000   0.01526    61.200"
"               423.260   0.01731   110.900"
"               423.500   0.01901   187.100"
"               423.660   0.02007   216.500"
"               423.830   0.02113   226.000"
"               423.880   0.02143   228.700"
"               423.930   0.02173   241.000"
"               423.980   0.02203   264.900"
"               424.050   0.05083   264.900"
"          1.   WEIRS"
"                 Crest      Weir     Crest      Left     Right"
"            elevation coefficie   breadth sideslope sideslope"
"              423.980     0.900     1.000     0.000     0.000"
"          1.   ORIFICES"
"               Orifice   Orifice   Orifice Number of"
"                invert coefficie  diameter  orifices"
"               422.046     0.820    0.0750     1.000"
"            Peak outflow                  0.017    c.m/sec"
"            Maximum level               423.271    metre"
"            Maximum storage             114.407    c.m"
"            Centroidal lag                2.749   hours"
"                 0.196     0.196     0.017     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"           6   Combine "
"           2   Node #"
"               Total to Highway 6"
"            Maximum flow                  0.017    c.m/sec"
"            Hydrograph volume           227.364    c.m"
"                   0.196     0.196     0.017     0.017"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.196     0.000     0.017     0.017"
" 33          CATCHMENT 203"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         203   Uncontrolled to Rear Yard Amended Topsoil then to Hwy 6"
"      25.000   % Impervious"
"       0.352   Total Area"
"     120.000   Flow length"
"       2.000   Overland Slope"
"       0.264   Pervious Area"
"     120.000   Pervious length"
"       2.000   Pervious slope"
"       0.088   Impervious Area"
"     120.000   Impervious length"
"       2.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      75.000   Pervious SCS Curve No."
"       0.227   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.467   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.871   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                   0.025     0.000     0.017     0.017 c.m/sec"
"            Catchment 203          Pervious   Impervious Total Area "
"            Surface Area           0.264      0.088      0.352      hectare"
"            Time of concentration  44.247     4.321      21.854     minutes"
"            Time to Centroid       166.702    96.216     127.170    minutes"
"            Rainfall depth         42.145     42.145     42.145     mm"
"            Rainfall volume        111.26     37.09      148.35     c.m"
"            Rainfall losses        32.566     5.443      25.785     mm"
"            Runoff depth           9.579      36.702     16.360     mm"
"            Runoff volume          25.29      32.30      57.59      c.m"
"            Runoff coefficient     0.227      0.871      0.388      "
"            Maximum flow           0.004      0.024      0.025      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.025     0.025     0.017     0.017"
" 57          TRENCH Design d/s of 203"
```

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"        0.025   Peak inflow"
"       57.586   Hydrograph volume"
"      424.500   Ground elevation"
"      423.500   Downstream trench invert"
"        0.500   Trench height"
"      422.500   Water table elevation"
"        3.500   Trench top width"
"        3.500   Trench bottom width"
"       40.000   Voids ratio (%)"
"       20.000   Hydraulic conductivity"
"        0.000   Trench gradient (%)"
"      130.000   Trench length"
"        1.000   Include base width"
"          21.   Number of stages"
"                  Level Discharge    Volume"
"                423.500     0.000       0.0"
"                423.550     0.000       9.1"
"                423.600     0.000      18.2"
"                423.650     0.000      27.3"
"                423.700     0.000      36.4"
"                423.750     0.000      45.5"
"                423.800     0.000      54.6"
"                423.850     0.000      63.7"
"                423.900     0.000      72.8"
"                423.950     0.000      81.9"
"                424.000     0.017      91.0"
"                424.050     0.049      91.1"
"                424.100     0.089      91.1"
"                424.150     0.137      91.2"
"                424.200     0.192      91.2"
"                424.250     0.252      91.3"
"                424.300     0.318      91.3"
"                424.350     0.388      91.4"
"                424.400     0.463      91.5"
"                424.450     0.543      91.5"
"                424.500     0.626      91.6"
"            1.  WEIRS"
"                  Crest      Weir     Crest      Left     Right"
"               elevation coefficie   breadth sideslope sideslope"
"                423.950     0.900     1.000     0.000     0.000"
"            1.  MANHOLE"
"                 Access"
"               diameter"
"                  1.200"
"              Peak outflow                  0.000    c.m/sec"
"              Outflow volume                0.002    c.m"
"              Peak exfiltration             0.003    c.m/sec"
"              Exfiltration volume          57.564    c.m"
"              Maximum level               423.655    metre"
"              Maximum storage              28.168    c.m"
"              Centroidal lag                4.072   hours"
"              Infiltration area 2 sides    40.236   sq.metre"
"              Infiltration Base area      455.000   sq.metre"
"                   0.025     0.025     0.000     0.003 c.m/sec"
" 40           HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Total to Highway 6"
"              Maximum flow                  0.017    c.m/sec"
"              Hydrograph volume           227.366    c.m"
"                   0.025     0.025     0.000     0.017"
" 40           HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                   0.025     0.000     0.000     0.017"
" 33            CATCHMENT 204"
"              1   Triangular SCS"
"              1   Equal length"
"              1   SCS method"
"            204   Uncontrolled to Highway 6"
"          0.000   % Impervious"
"          0.049   Total Area"
"         20.000   Flow length"
"          2.000   Overland Slope"
"          0.049   Pervious Area"
"         20.000   Pervious length"
"          2.000   Pervious slope"
"          0.000   Impervious Area"
"         20.000   Impervious length"
"          2.000   Impervious slope"
"          0.250   Pervious Manning 'n'"
"         75.000   Pervious SCS Curve No."
"          0.227   Pervious Runoff coefficient"
"          0.100   Pervious Ia/S coefficient"
"          8.467   Pervious Initial abstraction"
"          0.015   Impervious Manning 'n'"
"         98.000   Impervious SCS Curve No."
"          0.000   Impervious Runoff coefficient"
"          0.100   Impervious Ia/S coefficient"
"          0.518   Impervious Initial abstraction"
"                    0.002     0.000     0.000     0.017 c.m/sec"
"               Catchment 204          Pervious   Impervious Total Area "
"               Surface Area           0.049      0.000      0.049      hectare"
"               Time of concentration  15.101     1.475      15.100     minutes"
"               Time to Centroid       126.125    91.467     126.125    minutes"
"               Rainfall depth         42.145     42.145     42.145     mm"
"               Rainfall volume        20.65      0.00       20.65      c.m"
"               Rainfall losses        32.574     5.830      32.574     mm"
"               Runoff depth           9.571      36.315     9.571      mm"
"               Runoff volume          4.69       0.00       4.69       c.m"
"               Runoff coefficient     0.227      0.000      0.227      "
"               Maximum flow           0.002      0.000      0.002      c.m/sec"
" 40            HYDROGRAPH Add Runoff "
"              4   Add Runoff "
"                    0.002     0.002     0.000     0.017"
" 40            HYDROGRAPH Copy to Outflow"
"              8   Copy to Outflow"
"                    0.002     0.002     0.002     0.017"
" 40            HYDROGRAPH   Combine    2"
"              6   Combine "
"              2   Node #"
"                  Total to Highway 6"
"               Maximum flow                  0.018    c.m/sec"
"               Hydrograph volume           232.056    c.m"
"                    0.002     0.002     0.002     0.018"
" 40            HYDROGRAPH   Confluence    2"
"              7   Confluence "
"              2   Node #"
"                  Total to Highway 6"
"               Maximum flow                  0.018    c.m/sec"
"               Hydrograph volume           232.056    c.m"
"                    0.002     0.018     0.002     0.000"
" 40            HYDROGRAPH Copy to Outflow"
"              8   Copy to Outflow"
"                    0.002     0.018     0.018     0.000"
" 40            HYDROGRAPH   Combine    1"
"              6   Combine "
"              1   Node #"
"                  Total Site"
```

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"             Maximum flow                  0.018    c.m/sec"
"             Hydrograph volume           232.059    c.m"
"                    0.002     0.018     0.018     0.018"
" 40          HYDROGRAPH   Confluence    1"
"            7   Confluence "
"            1   Node #"
"                Total Site"
"             Maximum flow                  0.018    c.m/sec"
"             Hydrograph volume           232.059    c.m"
"                    0.002     0.018     0.018     0.000"
" 38          START/RE-START TOTALS 1"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      1.402    hectare"
"             Total Impervious area                     0.793    hectare"
"             Total % impervious                       56.573"
" 19          EXIT"
```

10yr Post

```
"               MIDUSS Output ----------------------------------------------->"
"               MIDUSS version                          Version 2.25  rev. 473"
"               MIDUSS created                        Sunday, February 7, 2010"
"          10   Units used:                                        ie METRIC"
"               Job folder:                                 Q:\48650\100\SWM"
"               Output filename:                               10yr post.Out"
"               Licensee name:                                             A"
"               Company                                                    "
"               Date & Time last used:                5/10/2022 at 10:31:38 AM"
" 31          TIME PARAMETERS"
"       5.000   Time Step"
"     180.000   Max. Storm length"
"    1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"           1   Chicago storm"
"     595.000   Coefficient A"
"       0.360   Constant B"
"       0.691   Exponent C"
"       0.400   Fraction R"
"     180.000   Duration"
"       1.000   Time step multiplier"
"            Maximum intensity          186.431    mm/hr"
"            Total depth                 49.226    mm"
"           6   010hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         201   Uncontrolled to Southwest Property Line"
"      55.000   % Impervious"
"       0.228   Total Area"
"      15.000   Flow length"
"       2.000   Overland Slope"
"       0.103   Pervious Area"
"      15.000   Pervious length"
"       2.000   Pervious slope"
"       0.125   Impervious Area"
"      15.000   Impervious length"
"       2.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      75.000   Pervious SCS Curve No."
"       0.268   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.467   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.867   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                   0.052     0.000     0.000     0.000 c.m/sec"
"            Catchment 201          Pervious   Impervious Total Area "
"            Surface Area           0.103      0.125      0.228      hectare"
"            Time of concentration  10.916     1.162      3.132      minutes"
"            Time to Centroid       119.039    90.250     96.065     minutes"
"            Rainfall depth         49.226     49.226     49.226     mm"
"            Rainfall volume        50.51      61.73      112.24     c.m"
"            Rainfall losses        36.015     6.525      19.795     mm"
"            Runoff depth           13.211     42.701     29.430     mm"
"            Runoff volume          13.55      53.55      67.10      c.m"
"            Runoff coefficient     0.268      0.867      0.598      "
"            Maximum flow           0.005      0.050      0.052      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.052     0.052     0.000     0.000"
" 57          TRENCH Design d/s of 201"
"       0.052   Peak inflow"
"      67.101   Hydrograph volume"
"     424.500   Ground elevation"
"     423.500   Downstream trench invert"
"       0.500   Trench height"
"     422.500   Water table elevation"
"       3.500   Trench top width"
"       3.500   Trench bottom width"
"      40.000   Voids ratio (%)"
"      20.000   Hydraulic conductivity"
"       0.000   Trench gradient (%)"
"      85.000   Trench length"
"       1.000   Include base width"
"         21.   Number of stages"
"                 Level Discharge    Volume"
"               423.500     0.000       0.0"
"               423.550     0.000       5.9"
"               423.600     0.000      11.9"
"               423.650     0.000      17.8"
"               423.700     0.000      23.8"
"               423.750     0.000      29.8"
"               423.800     0.000      35.7"
"               423.850     0.000      41.7"
"               423.900     0.000      47.6"
"               423.950     0.000      53.6"
"               424.000     1.458      59.5"
"               424.050     4.123      59.6"
"               424.100     7.577      59.6"
"               424.150    11.664      59.7"
"               424.200    16.303      59.7"
"               424.250    21.430      59.8"
"               424.300    27.003      59.8"
"               424.350    32.994      59.9"
"               424.400    39.369      60.0"
"               424.450    46.112      60.0"
"               424.500    53.197      60.1"
"          1.   WEIRS"
"                 Crest      Weir      Crest      Left      Right"
"              elevation coefficie   breadth sideslope sideslope"
"               423.950     0.900    85.000     0.000     0.000"
"          1.   MANHOLE"
"                Access"
"              diameter"
"                 1.200"
"            Peak outflow                  0.000    c.m/sec"
"            Outflow volume                0.003    c.m"
"            Peak exfiltration             0.002    c.m/sec"
"            Exfiltration volume          67.096    c.m"
"            Maximum level               423.903    metre"
"            Maximum storage              47.942    c.m"
"            Centroidal lag                5.404   hours"
"            Infiltration area 2 sides    68.487   sq.metre"
"            Infiltration Base area      297.500    sq.metre"
"                 0.052     0.052     0.000     0.002 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"           6   Combine "
"           1   Node #"
"               Total Site"
"            Maximum flow                  0.000    c.m/sec"
"            Hydrograph volume             0.003    c.m"
"                   0.052     0.052     0.000     0.000"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
```

```
"                   0.052     0.000     0.000     0.000"
" 33          CATCHMENT 202"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         202   Controlled Area to Highway 6"
"      75.000   % Impervious"
"       0.773   Total Area"
"      15.000   Flow length"
"       2.000   Overland Slope"
"       0.193   Pervious Area"
"      15.000   Pervious length"
"       2.000   Pervious slope"
"       0.580   Impervious Area"
"      15.000   Impervious length"
"       2.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      75.000   Pervious SCS Curve No."
"       0.268   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.467   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.867   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                   0.235     0.000     0.000     0.000 c.m/sec"
"            Catchment 202          Pervious   Impervious Total Area "
"            Surface Area           0.193      0.580      0.773      hectare"
"            Time of concentration  10.916     1.162      2.073      minutes"
"            Time to Centroid       119.039    90.250     92.941     minutes"
"            Rainfall depth         49.226     49.226     49.226     mm"
"            Rainfall volume        95.13      285.39     380.52     c.m"
"            Rainfall losses        36.015     6.525      13.898     mm"
"            Runoff depth           13.211     42.701     35.328     mm"
"            Runoff volume          25.53      247.56     273.09     c.m"
"            Runoff coefficient     0.268      0.867      0.718      "
"            Maximum flow           0.010      0.232      0.235      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.235     0.235     0.000     0.000"
" 54          POND DESIGN"
"       0.235   Current peak flow    c.m/sec"
"       0.180   Target outflow    c.m/sec"
"       273.1   Hydrograph volume    c.m"
"         13.   Number of stages"
"     422.046   Minimum water level    metre"
"     424.050   Maximum water level    metre"
"     422.046   Starting water level    metre"
"           0   Keep Design Data: 1 = True; 0 = False"
"                 Level Discharge    Volume"
"               422.046     0.000     0.000"
"               422.350   0.00809  1.01E-05"
"               422.600   0.01139    12.800"
"               422.800   0.01346    23.000"
"               423.000   0.01526    61.200"
"               423.260   0.01731   110.900"
"               423.500   0.01901   187.100"
"               423.660   0.02007   216.500"
"               423.830   0.02113   226.000"
"               423.880   0.02143   228.700"
"               423.930   0.02173   241.000"
"               423.980   0.02203   264.900"
"               424.050   0.05083   264.900"
"         1.   WEIRS"
"                Crest      Weir     Crest      Left     Right"
"            elevation coefficie   breadth sideslope sideslope"
"              423.980     0.900     1.000     0.000     0.000"
"         1.   ORIFICES"
"              Orifice   Orifice   Orifice Number of"
"               invert coefficie  diameter  orifices"
"              422.046     0.820    0.0750     1.000"
"            Peak outflow                  0.018    c.m/sec"
"            Maximum level               423.374    metre"
"            Maximum storage             146.966    c.m"
"            Centroidal lag                2.998   hours"
"                 0.235     0.235     0.018     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"           6   Combine "
"           2   Node #"
"               Total to Highway 6"
"            Maximum flow                  0.018    c.m/sec"
"            Hydrograph volume           272.718    c.m"
"                   0.235     0.235     0.018     0.018"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.235     0.000     0.018     0.018"
" 33          CATCHMENT 203"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         203   Uncontrolled to Rear Yard Amended Topsoil then to Hwy 6"
"      25.000   % Impervious"
"       0.352   Total Area"
"      120.000   Flow length"
"       2.000   Overland Slope"
"       0.264   Pervious Area"
"      120.000   Pervious length"
"       2.000   Pervious slope"
"       0.088   Impervious Area"
"      120.000   Impervious length"
"       2.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      75.000   Pervious SCS Curve No."
"       0.269   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.467   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.881   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                   0.029     0.000     0.018     0.018 c.m/sec"
"            Catchment 203          Pervious   Impervious Total Area "
"            Surface Area           0.264      0.088      0.352      hectare"
"            Time of concentration  38.012     4.045      20.284     minutes"
"            Time to Centroid       157.603    95.239     125.054    minutes"
"            Rainfall depth         49.226     49.226     49.226     mm"
"            Rainfall volume        129.96     43.32      173.28     c.m"
"            Rainfall losses        35.991     5.881      28.463     mm"
"            Runoff depth           13.235     43.345     20.763     mm"
"            Runoff volume          34.94      38.14      73.08      c.m"
"            Runoff coefficient     0.269      0.881      0.422      "
"            Maximum flow           0.006      0.028      0.029      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.029     0.029     0.018     0.018"
" 57          TRENCH Design d/s of 203"
```

```
"        0.029   Peak inflow"
"       73.085   Hydrograph volume"
"      424.500   Ground elevation"
"      423.500   Downstream trench invert"
"        0.500   Trench height"
"      422.500   Water table elevation"
"        3.500   Trench top width"
"        3.500   Trench bottom width"
"       40.000   Voids ratio (%)"
"       20.000   Hydraulic conductivity"
"        0.000   Trench gradient (%)"
"      130.000   Trench length"
"        1.000   Include base width"
"          21.   Number of stages"
"                  Level Discharge    Volume"
"                423.500     0.000       0.0"
"                423.550     0.000       9.1"
"                423.600     0.000      18.2"
"                423.650     0.000      27.3"
"                423.700     0.000      36.4"
"                423.750     0.000      45.5"
"                423.800     0.000      54.6"
"                423.850     0.000      63.7"
"                423.900     0.000      72.8"
"                423.950     0.000      81.9"
"                424.000     0.017      91.0"
"                424.050     0.049      91.1"
"                424.100     0.089      91.1"
"                424.150     0.137      91.2"
"                424.200     0.192      91.2"
"                424.250     0.252      91.3"
"                424.300     0.318      91.3"
"                424.350     0.388      91.4"
"                424.400     0.463      91.5"
"                424.450     0.543      91.5"
"                424.500     0.626      91.6"
"           1.   WEIRS"
"                  Crest      Weir     Crest      Left     Right"
"              elevation coefficie   breadth sideslope sideslope"
"                423.950     0.900     1.000     0.000     0.000"
"           1.   MANHOLE"
"                 Access"
"              diameter"
"                  1.200"
"             Peak outflow                  0.000    c.m/sec"
"             Outflow volume                0.002    c.m"
"             Peak exfiltration             0.003    c.m/sec"
"             Exfiltration volume          73.075    c.m"
"             Maximum level               423.724    metre"
"             Maximum storage              40.831    c.m"
"             Centroidal lag                4.646   hours"
"             Infiltration area 2 sides    58.327   sq.metre"
"             Infiltration Base area      455.000   sq.metre"
"                  0.029     0.029     0.000     0.003 c.m/sec"
" 40         HYDROGRAPH   Combine    2"
"           6   Combine "
"           2   Node #"
"               Total to Highway 6"
"             Maximum flow                  0.018    c.m/sec"
"             Hydrograph volume           272.721    c.m"
"                    0.029     0.029     0.000     0.018"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.029     0.000     0.000     0.018"
" 33          CATCHMENT 204"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           204   Uncontrolled to Highway 6"
"         0.000   % Impervious"
"         0.049   Total Area"
"        20.000   Flow length"
"         2.000   Overland Slope"
"         0.049   Pervious Area"
"        20.000   Pervious length"
"         2.000   Pervious slope"
"         0.000   Impervious Area"
"        20.000   Impervious length"
"         2.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        75.000   Pervious SCS Curve No."
"         0.268   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.467   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.000   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                    0.002     0.000     0.000     0.018 c.m/sec"
"              Catchment 204          Pervious   Impervious Total Area "
"              Surface Area           0.049      0.000      0.049      hectare"
"              Time of concentration  12.973     1.380      12.973     minutes"
"              Time to Centroid       122.023    90.744     122.023    minutes"
"              Rainfall depth         49.226     49.226     49.226     mm"
"              Rainfall volume        24.12      0.00       24.12      c.m"
"              Rainfall losses        36.046     6.135      36.046     mm"
"              Runoff depth           13.180     43.091     13.180     mm"
"              Runoff volume          6.46       0.00       6.46       c.m"
"              Runoff coefficient     0.268      0.000      0.268      "
"              Maximum flow           0.002      0.000      0.002      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.002     0.002     0.000     0.018"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                    0.002     0.002     0.002     0.018"
" 40          HYDROGRAPH   Combine    2"
"           6   Combine "
"           2   Node #"
"               Total to Highway 6"
"             Maximum flow                  0.020    c.m/sec"
"             Hydrograph volume           279.179    c.m"
"                    0.002     0.002     0.002     0.020"
" 40          HYDROGRAPH   Confluence    2"
"           7   Confluence "
"           2   Node #"
"               Total to Highway 6"
"             Maximum flow                  0.020    c.m/sec"
"             Hydrograph volume           279.179    c.m"
"                    0.002     0.020     0.002     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                    0.002     0.020     0.020     0.000"
" 40          HYDROGRAPH   Combine    1"
"           6   Combine "
"           1   Node #"
"               Total Site"
```

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"             Maximum flow                  0.020    c.m/sec"
"             Hydrograph volume           279.182    c.m"
"                    0.002     0.020     0.020     0.020"
" 40          HYDROGRAPH   Confluence    1"
"            7   Confluence "
"            1   Node #"
"                Total Site"
"             Maximum flow                  0.020    c.m/sec"
"             Hydrograph volume           279.182    c.m"
"                    0.002     0.020     0.020     0.000"
" 38          START/RE-START TOTALS 1"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      1.402    hectare"
"             Total Impervious area                     0.793    hectare"
"             Total % impervious                       56.573"
" 19          EXIT"
```

25yr Post

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"               MIDUSS Output ------------------------------------------------>"
"               MIDUSS version                          Version 2.25  rev. 473"
"               MIDUSS created                        Sunday, February 7, 2010"
"          10   Units used:                                        ie METRIC"
"               Job folder:                                 Q:\48650\100\SWM"
"               Output filename:                               25yr post.Out"
"               Licensee name:                                             A"
"               Company                                                    "
"               Date & Time last used:                5/10/2022 at 10:28:05 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"           1   Chicago storm"
"      702.000   Coefficient A"
"        0.350   Constant B"
"        0.690   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity          220.574    mm/hr"
"             Total depth                 58.353    mm"
"           6   025hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         201   Uncontrolled to Southwest Property Line"
"        55.000   % Impervious"
"        0.228   Total Area"
"       15.000   Flow length"
"        2.000   Overland Slope"
"        0.103   Pervious Area"
"       15.000   Pervious length"
"        2.000   Pervious slope"
"        0.125   Impervious Area"
"       15.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious SCS Curve No."
"        0.316   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.467   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.879   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.064     0.000     0.000     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           0.103      0.125      0.228      hectare"
"             Time of concentration  9.379      1.081      2.966      minutes"
"             Time to Centroid       115.782    89.548     95.508     minutes"
"             Rainfall depth         58.353     58.353     58.353     mm"
"             Rainfall volume        59.87      73.17      133.04     c.m"
"             Rainfall losses        39.929     7.077      21.861     mm"
"             Runoff depth           18.424     51.276     36.492     mm"
"             Runoff volume          18.90      64.30      83.20      c.m"
"             Runoff coefficient     0.316      0.879      0.625      "
"             Maximum flow           0.008      0.061      0.064      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.064     0.064     0.000     0.000"
" 57          TRENCH Design d/s of 201"
"        0.064   Peak inflow"
"       83.202   Hydrograph volume"
"      424.500   Ground elevation"
"      423.500   Downstream trench invert"
"        0.500   Trench height"
"      422.500   Water table elevation"
"        3.500   Trench top width"
"        3.500   Trench bottom width"
"       40.000   Voids ratio (%)"
"       20.000   Hydraulic conductivity"
"        0.000   Trench gradient (%)"
"       85.000   Trench length"
"        1.000   Include base width"
"          21.   Number of stages"
"                  Level Discharge    Volume"
"                423.500     0.000       0.0"
"                423.550     0.000       5.9"
"                423.600     0.000      11.9"
"                423.650     0.000      17.8"
"                423.700     0.000      23.8"
"                423.750     0.000      29.8"
"                423.800     0.000      35.7"
"                423.850     0.000      41.7"
"                423.900     0.000      47.6"
"                423.950     0.000      53.6"
"                424.000     1.458      59.5"
"                424.050     4.123      59.6"
"                424.100     7.577      59.6"
"                424.150    11.664      59.7"
"                424.200    16.303      59.7"
"                424.250    21.430      59.8"
"                424.300    27.003      59.8"
"                424.350    32.994      59.9"
"                424.400    39.369      60.0"
"                424.450    46.112      60.0"
"                424.500    53.197      60.1"
"           1.   WEIRS"
"                  Crest      Weir      Crest      Left      Right"
"              elevation coefficie   breadth sideslope sideslope"
"                423.950     0.900    85.000     0.000     0.000"
"           1.   MANHOLE"
"                Access"
"               diameter"
"                  1.200"
"              Peak outflow                  0.004    c.m/sec"
"              Outflow volume                8.290    c.m"
"              Peak exfiltration             0.003    c.m/sec"
"              Exfiltration volume          74.391    c.m"
"              Maximum level               423.950    metre"
"              Maximum storage              53.585    c.m"
"              Centroidal lag                2.262   hours"
"              Infiltration area 2 sides    76.549   sq.metre"
"              Infiltration Base area      297.500   sq.metre"
"                   0.064     0.064     0.004     0.003 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"           6   Combine "
"           1   Node #"
"               Total Site"
"              Maximum flow                  0.004    c.m/sec"
"              Hydrograph volume             8.290    c.m"
"                    0.064     0.064     0.004     0.004"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
```

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"                  0.064     0.000     0.004     0.004"
" 33          CATCHMENT 202"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         202   Controlled Area to Highway 6"
"      75.000   % Impervious"
"       0.773   Total Area"
"      15.000   Flow length"
"       2.000   Overland Slope"
"       0.193   Pervious Area"
"      15.000   Pervious length"
"       2.000   Pervious slope"
"       0.580   Impervious Area"
"      15.000   Impervious length"
"       2.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      75.000   Pervious SCS Curve No."
"       0.316   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.467   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.879   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                  0.286     0.000     0.004     0.004 c.m/sec"
"            Catchment 202          Pervious   Impervious Total Area "
"            Surface Area           0.193      0.580      0.773      hectare"
"            Time of concentration  9.379      1.081      1.969      minutes"
"            Time to Centroid       115.782    89.548     92.354     minutes"
"            Rainfall depth         58.353     58.353     58.353     mm"
"            Rainfall volume        112.77     338.30     451.07     c.m"
"            Rainfall losses        39.929     7.077      15.290     mm"
"            Runoff depth           18.424     51.276     43.063     mm"
"            Runoff volume          35.60      297.27     332.87     c.m"
"            Runoff coefficient     0.316      0.879      0.738      "
"            Maximum flow           0.015      0.281      0.286      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.286     0.286     0.004     0.004"
" 54          POND DESIGN"
"       0.286   Current peak flow    c.m/sec"
"       0.180   Target outflow    c.m/sec"
"       332.9   Hydrograph volume    c.m"
"         13.   Number of stages"
"     422.046   Minimum water level    metre"
"     424.050   Maximum water level    metre"
"     422.046   Starting water level    metre"
"           0   Keep Design Data: 1 = True; 0 = False"
"                 Level Discharge    Volume"
"               422.046     0.000     0.000"
"               422.350   0.00809  1.01E-05"
"               422.600   0.01139    12.800"
"               422.800   0.01346    23.000"
"               423.000   0.01526    61.200"
"               423.260   0.01731   110.900"
"               423.500   0.01901   187.100"
"               423.660   0.02007   216.500"
"               423.830   0.02113   226.000"
"               423.880   0.02143   228.700"
"               423.930   0.02173   241.000"
"               423.980   0.02203   264.900"
"               424.050   0.05083   264.900"
"          1.   WEIRS"
"                 Crest      Weir     Crest      Left     Right"
"            elevation coefficie   breadth sideslope sideslope"
"              423.980     0.900     1.000     0.000     0.000"
"          1.   ORIFICES"
"               Orifice   Orifice   Orifice Number of"
"                invert coefficie  diameter  orifices"
"               422.046     0.820    0.0750     1.000"
"            Peak outflow                  0.019    c.m/sec"
"            Maximum level               423.521    metre"
"            Maximum storage             190.964    c.m"
"            Centroidal lag                3.315   hours"
"                 0.286     0.286     0.019     0.004 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"           6   Combine "
"           2   Node #"
"               Total to Highway 6"
"            Maximum flow                  0.019    c.m/sec"
"            Hydrograph volume           332.443    c.m"
"                   0.286     0.286     0.019     0.019"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                  0.286     0.000     0.019     0.019"
" 33          CATCHMENT 203"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         203   Uncontrolled to Rear Yard Amended Topsoil then to Hwy 6"
"      25.000   % Impervious"
"       0.352   Total Area"
"     120.000   Flow length"
"       2.000   Overland Slope"
"       0.264   Pervious Area"
"     120.000   Pervious length"
"       2.000   Pervious slope"
"       0.088   Impervious Area"
"     120.000   Impervious length"
"       2.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      75.000   Pervious SCS Curve No."
"       0.317   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.467   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.888   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                  0.036     0.000     0.019     0.019 c.m/sec"
"            Catchment 203          Pervious   Impervious Total Area "
"            Surface Area           0.264      0.088      0.352      hectare"
"            Time of concentration  32.659     3.765      18.703     minutes"
"            Time to Centroid       149.614    94.370     122.931    minutes"
"            Rainfall depth         58.353     58.353     58.353     mm"
"            Rainfall volume        154.05     51.35      205.40     c.m"
"            Rainfall losses        39.863     6.529      31.529     mm"
"            Runoff depth           18.490     51.824     26.824     mm"
"            Runoff volume          48.81      45.61      94.42      c.m"
"            Runoff coefficient     0.317      0.888      0.460      "
"            Maximum flow           0.010      0.033      0.036      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.036     0.036     0.019     0.019"
" 57          TRENCH Design d/s of 203"
```

```
"        0.036   Peak inflow"
"       94.419   Hydrograph volume"
"      424.500   Ground elevation"
"      423.500   Downstream trench invert"
"        0.500   Trench height"
"      422.500   Water table elevation"
"        3.500   Trench top width"
"        3.500   Trench bottom width"
"       40.000   Voids ratio (%)"
"       20.000   Hydraulic conductivity"
"        0.000   Trench gradient (%)"
"      130.000   Trench length"
"        1.000   Include base width"
"          21.   Number of stages"
"                  Level Discharge    Volume"
"                423.500     0.000       0.0"
"                423.550     0.000       9.1"
"                423.600     0.000      18.2"
"                423.650     0.000      27.3"
"                423.700     0.000      36.4"
"                423.750     0.000      45.5"
"                423.800     0.000      54.6"
"                423.850     0.000      63.7"
"                423.900     0.000      72.8"
"                423.950     0.000      81.9"
"                424.000     0.017      91.0"
"                424.050     0.049      91.1"
"                424.100     0.089      91.1"
"                424.150     0.137      91.2"
"                424.200     0.192      91.2"
"                424.250     0.252      91.3"
"                424.300     0.318      91.3"
"                424.350     0.388      91.4"
"                424.400     0.463      91.5"
"                424.450     0.543      91.5"
"                424.500     0.626      91.6"
"            1.  WEIRS"
"                  Crest      Weir     Crest      Left     Right"
"               elevation coefficie   breadth sideslope sideslope"
"                423.950     0.900     1.000     0.000     0.000"
"            1.  MANHOLE"
"                 Access"
"               diameter"
"                  1.200"
"              Peak outflow                  0.000    c.m/sec"
"              Outflow volume                0.003    c.m"
"              Peak exfiltration             0.003    c.m/sec"
"              Exfiltration volume          94.460    c.m"
"              Maximum level               423.822    metre"
"              Maximum storage              58.668    c.m"
"              Centroidal lag                5.373   hours"
"              Infiltration area 2 sides    83.813   sq.metre"
"              Infiltration Base area      455.000   sq.metre"
"                   0.036     0.036     0.000     0.003 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Total to Highway 6"
"              Maximum flow                  0.019    c.m/sec"
"              Hydrograph volume           332.446    c.m"
"                     0.036     0.036     0.000     0.019"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                      0.036     0.000     0.000     0.019"
" 33           CATCHMENT 204"
"              1   Triangular SCS"
"              1   Equal length"
"              1   SCS method"
"            204   Uncontrolled to Highway 6"
"          0.000   % Impervious"
"          0.049   Total Area"
"         20.000   Flow length"
"          2.000   Overland Slope"
"          0.049   Pervious Area"
"         20.000   Pervious length"
"          2.000   Pervious slope"
"          0.000   Impervious Area"
"         20.000   Impervious length"
"          2.000   Impervious slope"
"          0.250   Pervious Manning 'n'"
"         75.000   Pervious SCS Curve No."
"          0.317   Pervious Runoff coefficient"
"          0.100   Pervious Ia/S coefficient"
"          8.467   Pervious Initial abstraction"
"          0.015   Impervious Manning 'n'"
"         98.000   Impervious SCS Curve No."
"          0.000   Impervious Runoff coefficient"
"          0.100   Impervious Ia/S coefficient"
"          0.518   Impervious Initial abstraction"
"                      0.004     0.000     0.000     0.019 c.m/sec"
"               Catchment 204          Pervious   Impervious Total Area "
"               Surface Area           0.049      0.000      0.049      hectare"
"               Time of concentration  11.146     1.285      11.146     minutes"
"               Time to Centroid       118.302    90.077     118.302    minutes"
"               Rainfall depth         58.353     58.353     58.353     mm"
"               Rainfall volume        28.59      0.00       28.59      c.m"
"               Rainfall losses        39.879     6.582      39.879     mm"
"               Runoff depth           18.473     51.771     18.473     mm"
"               Runoff volume          9.05       0.00       9.05       c.m"
"               Runoff coefficient     0.317      0.000      0.317      "
"               Maximum flow           0.004      0.000      0.004      c.m/sec"
" 40            HYDROGRAPH Add Runoff "
"              4   Add Runoff "
"                      0.004     0.004     0.000     0.019"
" 40            HYDROGRAPH Copy to Outflow"
"              8   Copy to Outflow"
"                      0.004     0.004     0.004     0.019"
" 40            HYDROGRAPH   Combine    2"
"              6   Combine "
"              2   Node #"
"                  Total to Highway 6"
"               Maximum flow                  0.022    c.m/sec"
"               Hydrograph volume           341.498    c.m"
"                      0.004     0.004     0.004     0.022"
" 40            HYDROGRAPH   Confluence    2"
"              7   Confluence "
"              2   Node #"
"                  Total to Highway 6"
"               Maximum flow                  0.022    c.m/sec"
"               Hydrograph volume           341.498    c.m"
"                      0.004     0.022     0.004     0.000"
" 40            HYDROGRAPH Copy to Outflow"
"              8   Copy to Outflow"
"                      0.004     0.022     0.022     0.000"
" 40            HYDROGRAPH   Combine    1"
"              6   Combine "
"              1   Node #"
"                  Total Site"
```

```
"             Maximum flow                  0.025    c.m/sec"
"             Hydrograph volume           349.789    c.m"
"                    0.004     0.022     0.022     0.025"
" 40          HYDROGRAPH   Confluence    1"
"            7   Confluence "
"            1   Node #"
"                Total Site"
"             Maximum flow                  0.025    c.m/sec"
"             Hydrograph volume           349.789    c.m"
"                    0.004     0.025     0.022     0.000"
" 38          START/RE-START TOTALS 1"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      1.402    hectare"
"             Total Impervious area                     0.793    hectare"
"             Total % impervious                       56.573"
" 19          EXIT"
```

50yr Post

```
"               MIDUSS Output ------------------------------------------------>"
"               MIDUSS version                          Version 2.25  rev. 473"
"               MIDUSS created                        Sunday, February 7, 2010"
"          10   Units used:                                        ie METRIC"
"               Job folder:                                 Q:\48650\100\SWM"
"               Output filename:                               50yr post.Out"
"               Licensee name:                                             A"
"               Company                                                    "
"               Date & Time last used:                5/10/2022 at 10:24:48 AM"
" 31          TIME PARAMETERS"
"       5.000   Time Step"
"     180.000   Max. Storm length"
"    1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"           1   Chicago storm"
"     780.000   Coefficient A"
"       0.360   Constant B"
"       0.690   Exponent C"
"       0.400   Fraction R"
"     180.000   Duration"
"       1.000   Time step multiplier"
"            Maximum intensity          244.972    mm/hr"
"            Total depth                 65.003    mm"
"           6   050hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         201   Uncontrolled to Southwest Property Line"
"      55.000   % Impervious"
"       0.228   Total Area"
"      15.000   Flow length"
"       2.000   Overland Slope"
"       0.103   Pervious Area"
"      15.000   Pervious length"
"       2.000   Pervious slope"
"       0.125   Impervious Area"
"      15.000   Impervious length"
"       2.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      75.000   Pervious SCS Curve No."
"       0.347   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.467   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.885   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                   0.072     0.000     0.000     0.000 c.m/sec"
"            Catchment 201          Pervious   Impervious Total Area "
"            Surface Area           0.103      0.125      0.228      hectare"
"            Time of concentration  8.579      1.034      2.868      minutes"
"            Time to Centroid       113.921    89.143     95.166     minutes"
"            Rainfall depth         65.003     65.003     65.003     mm"
"            Rainfall volume        66.69      81.51      148.21     c.m"
"            Rainfall losses        42.421     7.474      23.200     mm"
"            Runoff depth           22.581     57.528     41.802     mm"
"            Runoff volume          23.17      72.14      95.31      c.m"
"            Runoff coefficient     0.347      0.885      0.643      "
"            Maximum flow           0.011      0.068      0.072      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.072     0.072     0.000     0.000"
" 57          TRENCH Design d/s of 201"
"       0.072   Peak inflow"
"      95.309   Hydrograph volume"
"     424.500   Ground elevation"
"     423.500   Downstream trench invert"
"       0.500   Trench height"
"     422.500   Water table elevation"
"       3.500   Trench top width"
"       3.500   Trench bottom width"
"      40.000   Voids ratio (%)"
"      20.000   Hydraulic conductivity"
"       0.000   Trench gradient (%)"
"      85.000   Trench length"
"       1.000   Include base width"
"         21.   Number of stages"
"                 Level Discharge    Volume"
"               423.500     0.000       0.0"
"               423.550     0.000       5.9"
"               423.600     0.000      11.9"
"               423.650     0.000      17.8"
"               423.700     0.000      23.8"
"               423.750     0.000      29.8"
"               423.800     0.000      35.7"
"               423.850     0.000      41.7"
"               423.900     0.000      47.6"
"               423.950     0.000      53.6"
"               424.000     1.458      59.5"
"               424.050     4.123      59.6"
"               424.100     7.577      59.6"
"               424.150    11.664      59.7"
"               424.200    16.303      59.7"
"               424.250    21.430      59.8"
"               424.300    27.003      59.8"
"               424.350    32.994      59.9"
"               424.400    39.369      60.0"
"               424.450    46.112      60.0"
"               424.500    53.197      60.1"
"          1.   WEIRS"
"                 Crest      Weir      Crest      Left      Right"
"              elevation coefficie   breadth sideslope sideslope"
"               423.950     0.900    85.000     0.000     0.000"
"          1.   MANHOLE"
"                Access"
"              diameter"
"                 1.200"
"              Peak outflow                  0.009    c.m/sec"
"              Outflow volume               18.482    c.m"
"              Peak exfiltration             0.003    c.m/sec"
"              Exfiltration volume          74.997    c.m"
"              Maximum level               423.951    metre"
"              Maximum storage              53.630    c.m"
"              Centroidal lag                2.042   hours"
"              Infiltration area 2 sides    76.616   sq.metre"
"              Infiltration Base area      297.500    sq.metre"
"                   0.072     0.072     0.009     0.003 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"           6   Combine "
"           1   Node #"
"               Total Site"
"              Maximum flow                  0.009    c.m/sec"
"              Hydrograph volume            18.482    c.m"
"                     0.072     0.072     0.009     0.009"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
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"                  0.072     0.000     0.009     0.009"
" 33          CATCHMENT 202"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         202   Controlled Area to Highway 6"
"      75.000   % Impervious"
"       0.773   Total Area"
"      15.000   Flow length"
"       2.000   Overland Slope"
"       0.193   Pervious Area"
"      15.000   Pervious length"
"       2.000   Pervious slope"
"       0.580   Impervious Area"
"      15.000   Impervious length"
"       2.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      75.000   Pervious SCS Curve No."
"       0.347   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.467   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.885   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                  0.323     0.000     0.009     0.009 c.m/sec"
"           Catchment 202          Pervious   Impervious Total Area "
"           Surface Area           0.193      0.580      0.773      hectare"
"           Time of concentration  8.579      1.034      1.907      minutes"
"           Time to Centroid       113.921    89.143     92.010     minutes"
"           Rainfall depth         65.003     65.003     65.003     mm"
"           Rainfall volume        125.62     376.85     502.47     c.m"
"           Rainfall losses        42.421     7.474      16.211     mm"
"           Runoff depth           22.581     57.528     48.791     mm"
"           Runoff volume          43.64      333.52     377.16     c.m"
"           Runoff coefficient     0.347      0.885      0.751      "
"           Maximum flow           0.021      0.315      0.323      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.323     0.323     0.009     0.009"
" 54          POND DESIGN"
"       0.323   Current peak flow    c.m/sec"
"       0.180   Target outflow    c.m/sec"
"       377.2   Hydrograph volume    c.m"
"         13.   Number of stages"
"     422.046   Minimum water level    metre"
"     424.050   Maximum water level    metre"
"     422.046   Starting water level    metre"
"           0   Keep Design Data: 1 = True; 0 = False"
"                 Level Discharge    Volume"
"               422.046     0.000     0.000"
"               422.350   0.00809  1.01E-05"
"               422.600   0.01139    12.800"
"               422.800   0.01346    23.000"
"               423.000   0.01526    61.200"
"               423.260   0.01731   110.900"
"               423.500   0.01901   187.100"
"               423.660   0.02007   216.500"
"               423.830   0.02113   226.000"
"               423.880   0.02143   228.700"
"               423.930   0.02173   241.000"
"               423.980   0.02203   264.900"
"               424.050   0.05083   264.900"
"          1.   WEIRS"
"                 Crest      Weir     Crest      Left     Right"
"            elevation coefficie   breadth sideslope sideslope"
"              423.980     0.900     1.000     0.000     0.000"
"          1.   ORIFICES"
"               Orifice   Orifice   Orifice Number of"
"                invert coefficie  diameter  orifices"
"               422.046     0.820    0.0750     1.000"
"            Peak outflow                  0.021    c.m/sec"
"            Maximum level               423.783    metre"
"            Maximum storage             223.395    c.m"
"            Centroidal lag                3.511   hours"
"                 0.323     0.323     0.021     0.009 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"           6   Combine "
"           2   Node #"
"               Total to Highway 6"
"            Maximum flow                  0.021    c.m/sec"
"            Hydrograph volume           377.033    c.m"
"                   0.323     0.323     0.021     0.021"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.323     0.000     0.021     0.021"
" 33          CATCHMENT 203"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         203   Uncontrolled to Rear Yard Amended Topsoil then to Hwy 6"
"      25.000   % Impervious"
"       0.352   Total Area"
"     120.000   Flow length"
"       2.000   Overland Slope"
"       0.264   Pervious Area"
"     120.000   Pervious length"
"       2.000   Pervious slope"
"       0.088   Impervious Area"
"     120.000   Impervious length"
"       2.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      75.000   Pervious SCS Curve No."
"       0.348   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.467   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.894   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                  0.041     0.000     0.021     0.021 c.m/sec"
"           Catchment 203          Pervious   Impervious Total Area "
"           Surface Area           0.264      0.088      0.352      hectare"
"           Time of concentration  29.872     3.602      17.758     minutes"
"           Time to Centroid       145.259    93.828     121.542    minutes"
"           Rainfall depth         65.003     65.003     65.003     mm"
"           Rainfall volume        171.61     57.20      228.81     c.m"
"           Rainfall losses        42.369     6.895      33.500     mm"
"           Runoff depth           22.633     58.108     31.502     mm"
"           Runoff volume          59.75      51.13      110.89     c.m"
"           Runoff coefficient     0.348      0.894      0.485      "
"           Maximum flow           0.013      0.037      0.041      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.041     0.041     0.021     0.021"
" 57          TRENCH Design d/s of 203"
```

```
"        0.041   Peak inflow"
"      110.887   Hydrograph volume"
"      424.500   Ground elevation"
"      423.500   Downstream trench invert"
"        0.500   Trench height"
"      422.500   Water table elevation"
"        3.500   Trench top width"
"        3.500   Trench bottom width"
"       40.000   Voids ratio (%)"
"       20.000   Hydraulic conductivity"
"        0.000   Trench gradient (%)"
"      130.000   Trench length"
"        1.000   Include base width"
"          21.   Number of stages"
"                  Level Discharge    Volume"
"                423.500     0.000       0.0"
"                423.550     0.000       9.1"
"                423.600     0.000      18.2"
"                423.650     0.000      27.3"
"                423.700     0.000      36.4"
"                423.750     0.000      45.5"
"                423.800     0.000      54.6"
"                423.850     0.000      63.7"
"                423.900     0.000      72.8"
"                423.950     0.000      81.9"
"                424.000     0.017      91.0"
"                424.050     0.049      91.1"
"                424.100     0.089      91.1"
"                424.150     0.137      91.2"
"                424.200     0.192      91.2"
"                424.250     0.252      91.3"
"                424.300     0.318      91.3"
"                424.350     0.388      91.4"
"                424.400     0.463      91.5"
"                424.450     0.543      91.5"
"                424.500     0.626      91.6"
"           1.   WEIRS"
"                  Crest      Weir     Crest      Left     Right"
"              elevation coefficie   breadth sideslope sideslope"
"                423.950     0.900     1.000     0.000     0.000"
"           1.   MANHOLE"
"                 Access"
"              diameter"
"                  1.200"
"            Peak outflow                  0.000    c.m/sec"
"            Outflow volume                0.003    c.m"
"            Peak exfiltration             0.004    c.m/sec"
"            Exfiltration volume         110.885    c.m"
"            Maximum level               423.899    metre"
"            Maximum storage              72.605    c.m"
"            Centroidal lag                5.894   hours"
"            Infiltration area 2 sides   103.721   sq.metre"
"            Infiltration Base area      455.000   sq.metre"
"                 0.041     0.041     0.000     0.004 c.m/sec"
" 40         HYDROGRAPH   Combine    2"
"           6   Combine "
"           2   Node #"
"               Total to Highway 6"
"            Maximum flow                  0.021    c.m/sec"
"            Hydrograph volume           377.036    c.m"
"                  0.041     0.041     0.000     0.021"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                  0.041     0.000     0.000     0.021"
" 33          CATCHMENT 204"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           204   Uncontrolled to Highway 6"
"         0.000   % Impervious"
"         0.049   Total Area"
"        20.000   Flow length"
"         2.000   Overland Slope"
"         0.049   Pervious Area"
"        20.000   Pervious length"
"         2.000   Pervious slope"
"         0.000   Impervious Area"
"        20.000   Impervious length"
"         2.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        75.000   Pervious SCS Curve No."
"         0.346   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.467   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.000   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                  0.005     0.000     0.000     0.021 c.m/sec"
"              Catchment 204          Pervious   Impervious Total Area "
"              Surface Area           0.049      0.000      0.049      hectare"
"              Time of concentration  10.195     1.229      10.195     minutes"
"              Time to Centroid       116.372    89.660     116.372    minutes"
"              Rainfall depth         65.003     65.003     65.003     mm"
"              Rainfall volume        31.85      0.00       31.85      c.m"
"              Rainfall losses        42.484     6.915      42.484     mm"
"              Runoff depth           22.519     58.088     22.519     mm"
"              Runoff volume          11.03      0.00       11.03      c.m"
"              Runoff coefficient     0.346      0.000      0.346      "
"              Maximum flow           0.005      0.000      0.005      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                  0.005     0.005     0.000     0.021"
" 40          HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
"                  0.005     0.005     0.005     0.021"
" 40          HYDROGRAPH   Combine    2"
"             6   Combine "
"             2   Node #"
"                 Total to Highway 6"
"              Maximum flow                  0.023    c.m/sec"
"              Hydrograph volume           388.070    c.m"
"                  0.005     0.005     0.005     0.023"
" 40          HYDROGRAPH   Confluence    2"
"             7   Confluence "
"             2   Node #"
"                 Total to Highway 6"
"              Maximum flow                  0.023    c.m/sec"
"              Hydrograph volume           388.070    c.m"
"                  0.005     0.023     0.005     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
"                  0.005     0.023     0.023     0.000"
" 40          HYDROGRAPH   Combine    1"
"             6   Combine "
"             1   Node #"
"                 Total Site"
```

```
"             Maximum flow                  0.031    c.m/sec"
"             Hydrograph volume           406.553    c.m"
"                    0.005     0.023     0.023     0.031"
" 40          HYDROGRAPH   Confluence    1"
"            7   Confluence "
"            1   Node #"
"                Total Site"
"             Maximum flow                  0.031    c.m/sec"
"             Hydrograph volume           406.553    c.m"
"                    0.005     0.031     0.023     0.000"
" 38          START/RE-START TOTALS 1"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      1.402    hectare"
"             Total Impervious area                     0.793    hectare"
"             Total % impervious                       56.573"
" 19          EXIT"
```

100yr Post

```
"               MIDUSS Output ----------------------------------------------->"
"               MIDUSS version                          Version 2.25  rev. 473"
"               MIDUSS created                        Sunday, February 7, 2010"
"          10   Units used:                                        ie METRIC"
"               Job folder:                                 Q:\48650\100\SWM"
"               Output filename:                              100yr post.Out"
"               Licensee name:                                              A"
"               Company                                                     "
"               Date & Time last used:                 5/10/2022 at 10:17:16 AM"
" 31          TIME PARAMETERS"
"       5.000   Time Step"
"     180.000   Max. Storm length"
"    1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"           1   Chicago storm"
"     851.000   Coefficient A"
"       0.290   Constant B"
"       0.687   Exponent C"
"       0.400   Fraction R"
"     180.000   Duration"
"       1.000   Time step multiplier"
"            Maximum intensity          270.966    mm/hr"
"            Total depth                 71.978    mm"
"           6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         201   Uncontrolled to Southwest Property Line"
"      55.000   % Impervious"
"       0.228   Total Area"
"      15.000   Flow length"
"       2.000   Overland Slope"
"       0.103   Pervious Area"
"      15.000   Pervious length"
"       2.000   Pervious slope"
"       0.125   Impervious Area"
"      15.000   Impervious length"
"       2.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      75.000   Pervious SCS Curve No."
"       0.377   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.467   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.890   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                   0.080     0.000     0.000     0.000 c.m/sec"
"            Catchment 201          Pervious   Impervious Total Area "
"            Surface Area           0.103      0.125      0.228      hectare"
"            Time of concentration  7.910      0.992      2.773      minutes"
"            Time to Centroid       112.515    88.822     94.922     minutes"
"            Rainfall depth         71.978     71.978     71.978     mm"
"            Rainfall volume        73.85      90.26      164.11     c.m"
"            Rainfall losses        44.823     7.891      24.511     mm"
"            Runoff depth           27.155     64.087     47.467     mm"
"            Runoff volume          27.86      80.36      108.23     c.m"
"            Runoff coefficient     0.377      0.890      0.659      "
"            Maximum flow           0.016      0.076      0.080      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.080     0.080     0.000     0.000"
" 57          TRENCH Design d/s of 201"
"       0.080   Peak inflow"
"     108.225   Hydrograph volume"
"     424.500   Ground elevation"
"     423.500   Downstream trench invert"
"       0.500   Trench height"
"     422.500   Water table elevation"
"       3.500   Trench top width"
"       3.500   Trench bottom width"
"      40.000   Voids ratio (%)"
"      20.000   Hydraulic conductivity"
"       0.000   Trench gradient (%)"
"      85.000   Trench length"
"       1.000   Include base width"
"         21.   Number of stages"
"                 Level Discharge    Volume"
"               423.500     0.000       0.0"
"               423.550     0.000       5.9"
"               423.600     0.000      11.9"
"               423.650     0.000      17.8"
"               423.700     0.000      23.8"
"               423.750     0.000      29.8"
"               423.800     0.000      35.7"
"               423.850     0.000      41.7"
"               423.900     0.000      47.6"
"               423.950     0.000      53.6"
"               424.000     1.458      59.5"
"               424.050     4.123      59.6"
"               424.100     7.577      59.6"
"               424.150    11.664      59.7"
"               424.200    16.303      59.7"
"               424.250    21.430      59.8"
"               424.300    27.003      59.8"
"               424.350    32.994      59.9"
"               424.400    39.369      60.0"
"               424.450    46.112      60.0"
"               424.500    53.197      60.1"
"          1.   WEIRS"
"                 Crest      Weir      Crest      Left      Right"
"              elevation coefficie   breadth sideslope sideslope"
"               423.950     0.900    85.000     0.000     0.000"
"          1.   MANHOLE"
"                Access"
"              diameter"
"                 1.200"
"            Peak outflow                 0.019    c.m/sec"
"            Outflow volume              33.303    c.m"
"            Peak exfiltration            0.003    c.m/sec"
"            Exfiltration volume         75.532    c.m"
"            Maximum level              423.951    metre"
"            Maximum storage             53.686    c.m"
"            Centroidal lag               1.879    hours"
"            Infiltration area 2 sides   76.694    sq.metre"
"            Infiltration Base area     297.500    sq.metre"
"                 0.080     0.080     0.019     0.003 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"          6   Combine "
"          1   Node #"
"              Total Site"
"            Maximum flow                 0.019    c.m/sec"
"            Hydrograph volume           33.303    c.m"
"                   0.080     0.080     0.019     0.019"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
```

```
"                    0.080     0.000     0.019     0.019"
" 33          CATCHMENT 202"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         202   Controlled Area to Highway 6"
"      75.000   % Impervious"
"       0.773   Total Area"
"      15.000   Flow length"
"       2.000   Overland Slope"
"       0.193   Pervious Area"
"      15.000   Pervious length"
"       2.000   Pervious slope"
"       0.580   Impervious Area"
"      15.000   Impervious length"
"       2.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      75.000   Pervious SCS Curve No."
"       0.377   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.467   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.890   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                    0.360     0.000     0.019     0.019 c.m/sec"
"            Catchment 202          Pervious   Impervious Total Area "
"            Surface Area           0.193      0.580      0.773      hectare"
"            Time of concentration  7.910      0.992      1.848      minutes"
"            Time to Centroid       112.515    88.822     91.755     minutes"
"            Rainfall depth         71.978     71.978     71.978     mm"
"            Rainfall volume        139.10     417.29     556.39     c.m"
"            Rainfall losses        44.823     7.891      17.124     mm"
"            Runoff depth           27.154     64.087     54.854     mm"
"            Runoff volume          52.48      371.54     424.02     c.m"
"            Runoff coefficient     0.377      0.890      0.762      "
"            Maximum flow           0.031      0.352      0.360      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.360     0.360     0.019     0.019"
" 54          POND DESIGN"
"       0.360   Current peak flow    c.m/sec"
"       0.180   Target outflow    c.m/sec"
"       424.0   Hydrograph volume    c.m"
"         13.   Number of stages"
"     422.046   Minimum water level    metre"
"     424.050   Maximum water level    metre"
"     422.046   Starting water level    metre"
"           0   Keep Design Data: 1 = True; 0 = False"
"                 Level Discharge    Volume"
"               422.046     0.000     0.000"
"               422.350   0.00809  1.01E-05"
"               422.600   0.01139    12.800"
"               422.800   0.01346    23.000"
"               423.000   0.01526    61.200"
"               423.260   0.01731   110.900"
"               423.500   0.01901   187.100"
"               423.660   0.02007   216.500"
"               423.830   0.02113   226.000"
"               423.880   0.02143   228.700"
"               423.930   0.02173   241.000"
"               423.980   0.02203   264.900"
"               424.050   0.05083   264.900"
"          1.   WEIRS"
"                 Crest      Weir     Crest      Left     Right"
"            elevation coefficie   breadth sideslope sideslope"
"              423.980     0.900     1.000     0.000     0.000"
"          1.   ORIFICES"
"               Orifice   Orifice   Orifice Number of"
"                invert coefficie  diameter  orifices"
"               422.046     0.820    0.0750     1.000"
"            Peak outflow                  0.022    c.m/sec"
"            Maximum level               423.964    metre"
"            Maximum storage             257.311    c.m"
"            Centroidal lag                3.690   hours"
"                 0.360     0.360     0.022     0.019 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"           6   Combine "
"           2   Node #"
"               Total to Highway 6"
"            Maximum flow                  0.022    c.m/sec"
"            Hydrograph volume           425.049    c.m"
"                    0.360     0.360     0.022     0.022"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.360     0.000     0.022     0.022"
" 33          CATCHMENT 203"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         203   Uncontrolled to Rear Yard Amended Topsoil then to Hwy 6"
"      25.000   % Impervious"
"       0.352   Total Area"
"      120.000   Flow length"
"       2.000   Overland Slope"
"       0.264   Pervious Area"
"      120.000   Pervious length"
"       2.000   Pervious slope"
"       0.088   Impervious Area"
"      120.000   Impervious length"
"       2.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      75.000   Pervious SCS Curve No."
"       0.378   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.467   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.905   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                    0.046     0.000     0.022     0.022 c.m/sec"
"            Catchment 203          Pervious   Impervious Total Area "
"            Surface Area           0.264      0.088      0.352      hectare"
"            Time of concentration  27.544     3.453      16.855     minutes"
"            Time to Centroid       141.640    93.308     120.195    minutes"
"            Rainfall depth         71.978     71.978     71.978     mm"
"            Rainfall volume        190.02     63.34      253.36     c.m"
"            Rainfall losses        44.763     6.860      35.288     mm"
"            Runoff depth           27.214     65.118     36.690     mm"
"            Runoff volume          71.85      57.30      129.15     c.m"
"            Runoff coefficient     0.378      0.905      0.510      "
"            Maximum flow           0.016      0.040      0.046      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.046     0.046     0.022     0.022"
" 57          TRENCH Design d/s of 203"
```

```
"        0.046   Peak inflow"
"      129.149   Hydrograph volume"
"      424.500   Ground elevation"
"      423.500   Downstream trench invert"
"        0.500   Trench height"
"      422.500   Water table elevation"
"        3.500   Trench top width"
"        3.500   Trench bottom width"
"       40.000   Voids ratio (%)"
"       20.000   Hydraulic conductivity"
"        0.000   Trench gradient (%)"
"      130.000   Trench length"
"        1.000   Include base width"
"          21.   Number of stages"
"                  Level Discharge    Volume"
"                423.500     0.000       0.0"
"                423.550     0.000       9.1"
"                423.600     0.000      18.2"
"                423.650     0.000      27.3"
"                423.700     0.000      36.4"
"                423.750     0.000      45.5"
"                423.800     0.000      54.6"
"                423.850     0.000      63.7"
"                423.900     0.000      72.8"
"                423.950     0.000      81.9"
"                424.000     0.017      91.0"
"                424.050     0.049      91.1"
"                424.100     0.089      91.1"
"                424.150     0.137      91.2"
"                424.200     0.192      91.2"
"                424.250     0.252      91.3"
"                424.300     0.318      91.3"
"                424.350     0.388      91.4"
"                424.400     0.463      91.5"
"                424.450     0.543      91.5"
"                424.500     0.626      91.6"
"           1.   WEIRS"
"                  Crest      Weir     Crest      Left     Right"
"              elevation coefficie   breadth sideslope sideslope"
"                423.950     0.900     1.000     0.000     0.000"
"           1.   MANHOLE"
"                 Access"
"              diameter"
"                1.200"
"             Peak outflow                  0.003    c.m/sec"
"             Outflow volume                6.189    c.m"
"             Peak exfiltration             0.004    c.m/sec"
"             Exfiltration volume         122.938    c.m"
"             Maximum level               423.958    metre"
"             Maximum storage              83.437    c.m"
"             Centroidal lag                3.049   hours"
"             Infiltration area 2 sides   119.193   sq.metre"
"             Infiltration Base area      455.000   sq.metre"
"                  0.046     0.046     0.003     0.004 c.m/sec"
" 40          HYDROGRAPH   Combine    2"
"           6   Combine "
"           2   Node #"
"               Total to Highway 6"
"             Maximum flow                  0.025    c.m/sec"
"             Hydrograph volume           431.238    c.m"
"                    0.046     0.046     0.003     0.025"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.046     0.000     0.003     0.025"
" 33           CATCHMENT 204"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           204   Uncontrolled to Highway 6"
"         0.000   % Impervious"
"         0.049   Total Area"
"        20.000   Flow length"
"         2.000   Overland Slope"
"         0.049   Pervious Area"
"        20.000   Pervious length"
"         2.000   Pervious slope"
"         0.000   Impervious Area"
"        20.000   Impervious length"
"         2.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        75.000   Pervious SCS Curve No."
"         0.377   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.467   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.000   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                    0.006     0.000     0.003     0.025 c.m/sec"
"              Catchment 204          Pervious   Impervious Total Area "
"              Surface Area           0.049      0.000      0.049      hectare"
"              Time of concentration  9.400      1.178      9.400      minutes"
"              Time to Centroid       114.691    89.317     114.691    minutes"
"              Rainfall depth         71.978     71.978     71.978     mm"
"              Rainfall volume        35.27      0.00       35.27      c.m"
"              Rainfall losses        44.863     7.301      44.863     mm"
"              Runoff depth           27.115     64.677     27.115     mm"
"              Runoff volume          13.29      0.00       13.29      c.m"
"              Runoff coefficient     0.377      0.000      0.377      "
"              Maximum flow           0.006      0.000      0.006      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.006     0.006     0.003     0.025"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                    0.006     0.006     0.006     0.025"
" 40          HYDROGRAPH   Combine    2"
"           6   Combine "
"           2   Node #"
"               Total to Highway 6"
"             Maximum flow                  0.025    c.m/sec"
"             Hydrograph volume           444.525    c.m"
"                    0.006     0.006     0.006     0.025"
" 40          HYDROGRAPH   Confluence    2"
"           7   Confluence "
"           2   Node #"
"               Total to Highway 6"
"             Maximum flow                  0.025    c.m/sec"
"             Hydrograph volume           444.525    c.m"
"                    0.006     0.025     0.006     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                    0.006     0.025     0.025     0.000"
" 40          HYDROGRAPH   Combine    1"
"           6   Combine "
"           1   Node #"
"               Total Site"
```

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"             Maximum flow                  0.044    c.m/sec"
"             Hydrograph volume           477.828    c.m"
"                     0.006     0.025     0.025     0.044"
" 40          HYDROGRAPH   Confluence    1"
"           7   Confluence "
"           1   Node #"
"               Total Site"
"             Maximum flow                  0.044    c.m/sec"
"             Hydrograph volume           477.828    c.m"
"                     0.006     0.044     0.025     0.000"

```

Appendix C

Stormceptor Sizing

Stormceptor®

FORTERRA

Stormceptor® EF Sizing Report

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

05/10/2022

Province:	Ontario
City:	Fergus
Nearest Rainfall Station:	WATERLOO WELLINGTON AP
Climate Station Id:	6149387
Years of Rainfall Data:	34

Site Name:	961 St. David Street North

Drainage Area (ha):	0.77
% Imperviousness:	75.00

Runoff Coefficient 'c': 0.75

Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	21.88
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	Yes
Upstream Orifice Control Flow Rate to Stormceptor (L/s):	22.00
Peak Conveyance (maximum) Flow Rate (L/s):	
Site Sediment Transport Rate (kg/ha/yr):	

Project Name:	961 St. David Street North
Project Number:	48650-100
Designer Name:	Nathan Katerberg
Designer Company:	MTE Consultants Inc
Designer Email:	nkaterberg@mte85.com
Designer Phone:	519-743-6500
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	80
EFO6	89
EFO8	95
EFO10	97
EFO12	99

Recommended Stormceptor EFO Model: EFO4

Estimated Net Annual Sediment (TSS) Load Reduction (%): 80

Water Quality Runoff Volume Capture (%): > 90

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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 waterwavs.

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 Size (µm)	Percent Less Than	Particle Size 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

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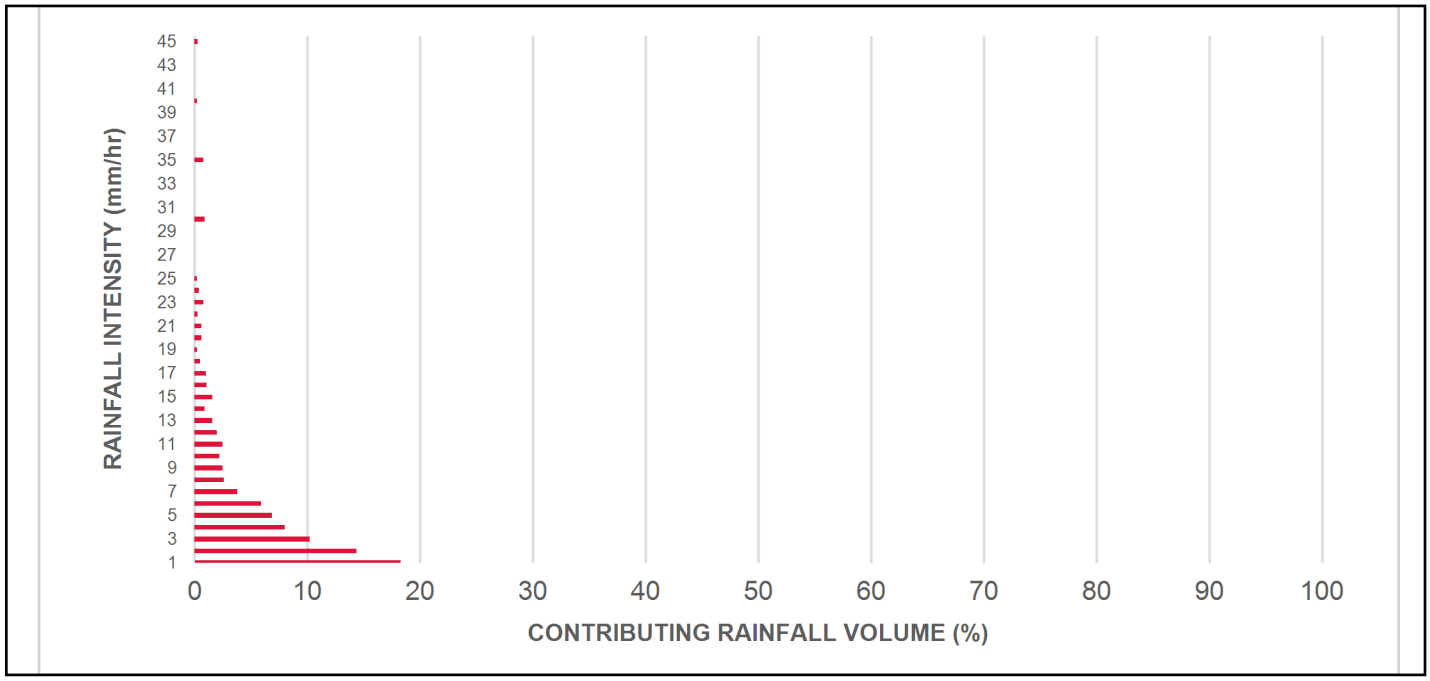
Upstream Flow Controlled Results

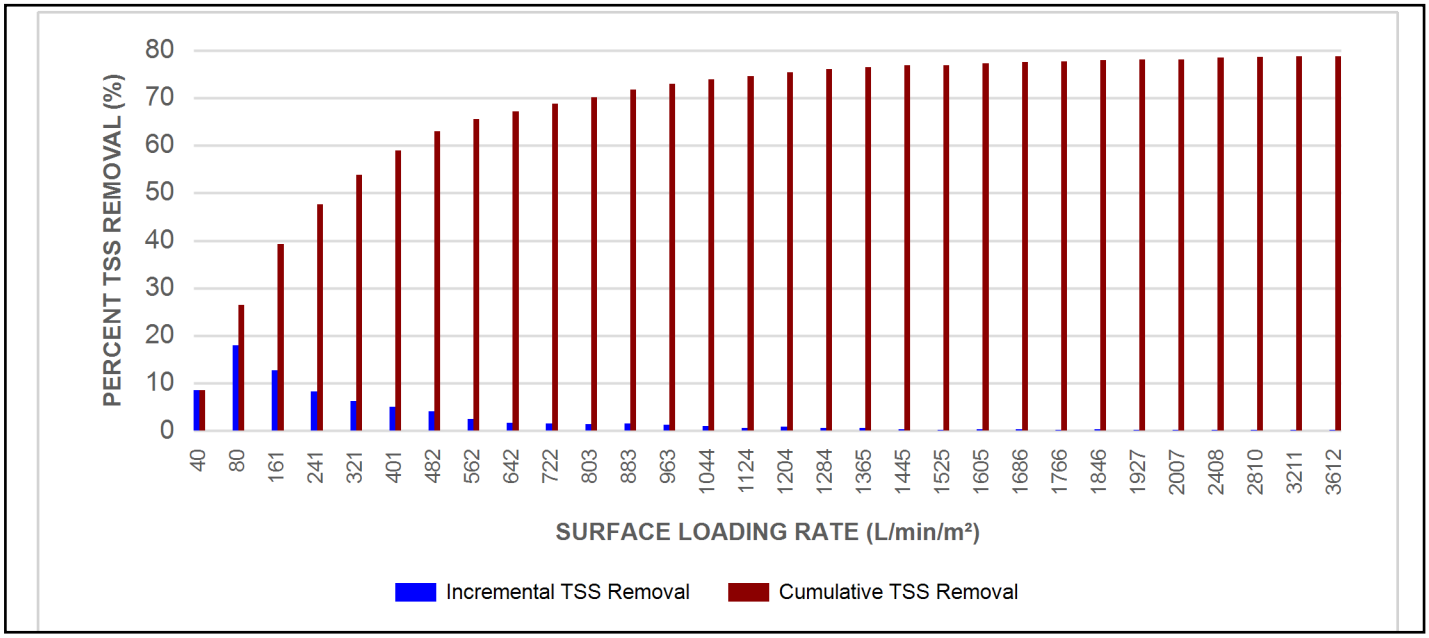
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.5	8.5	8.5	0.80	48.0	40.0	100	8.5	8.5
1	18.3	26.8	1.61	96.0	80.0	98	18.0	26.5
2	14.4	41.3	3.21	193.0	161.0	88	12.7	39.3
3	10.2	51.5	4.82	289.0	241.0	81	8.3	47.6
4	8.0	59.5	6.42	385.0	321.0	78	6.2	53.8
5	6.9	66.4	8.03	482.0	401.0	74	5.1	58.9
6	5.9	72.3	9.63	578.0	482.0	70	4.1	63.0
7	3.8	76.1	11.24	674.0	562.0	66	2.5	65.5
8	2.6	78.7	12.84	771.0	642.0	64	1.7	67.2
9	2.5	81.1	14.45	867.0	722.0	64	1.6	68.8
10	2.2	83.3	16.05	963.0	803.0	63	1.4	70.1
11	2.5	85.8	17.66	1060.0	883.0	62	1.6	71.7
12	2.0	87.8	19.27	1156.0	963.0	62	1.2	72.9
13	12.2	100.0	20.87	1252.0	1044.0	61	7.4	80.3
14	0.0	100.0	22.00	1320.0	1100.0	59	0.0	80.3
15	0.0	100.0	22.00	1320.0	1100.0	59	0.0	80.3
16	0.0	100.0	22.00	1320.0	1100.0	59	0.0	80.3
17	0.0	100.0	22.00	1320.0	1100.0	59	0.0	80.3
18	0.0	100.0	22.00	1320.0	1100.0	59	0.0	80.3
19	0.0	100.0	22.00	1320.0	1100.0	59	0.0	80.3
20	0.0	100.0	22.00	1320.0	1100.0	59	0.0	80.3
21	0.0	100.0	22.00	1320.0	1100.0	59	0.0	80.3
22	0.0	100.0	22.00	1320.0	1100.0	59	0.0	80.3
23	0.0	100.0	22.00	1320.0	1100.0	59	0.0	80.3
24	0.0	100.0	22.00	1320.0	1100.0	59	0.0	80.3
25	0.0	100.0	22.00	1320.0	1100.0	59	0.0	80.3
30	0.0	100.0	22.00	1320.0	1100.0	59	0.0	80.3
35	0.0	100.0	22.00	1320.0	1100.0	59	0.0	80.3
40	0.0	100.0	22.00	1320.0	1100.0	59	0.0	80.3
45	0.0	100.0	22.00	1320.0	1100.0	59	0.0	80.3
						Estimated Net Annual Sediment (TSS) Load Reduction =		**80 %**

Climate Station ID: 6149387 *Years of Rainfall Data*: 34

RAINFALL DATA FROM WATERLOO WELLINGTON AP RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



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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

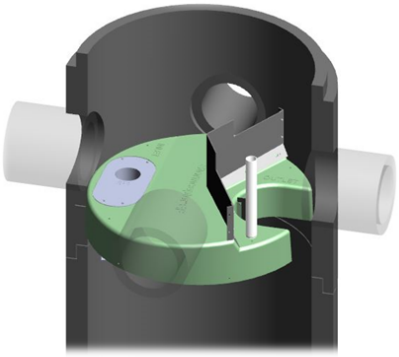
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test 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.

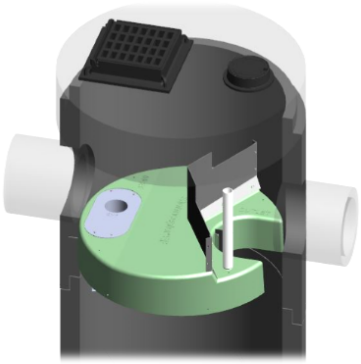
DESIGN FLEXIBILITY

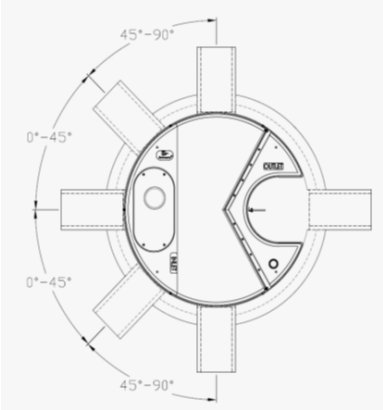
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend 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 re-entrainment 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	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(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/ft^3)

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 m^3 sediment / 265 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 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/m^2 to 1400 L/min/m^2, 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/m^2 and 1400 L/min/m^2 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/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 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/m^2.

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/m^2.

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

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 re-entrainment 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.

3.4.1 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/m^2 to 2600 L/min/m^2) 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.