Functional Servicing and Stormwater Management Design Report – 191 Wellington Road 7 and 290 South Street

Township of Centre Wellington (Elora), Ontario

Submitted by:
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Project No. 2404979

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Certification

PREPARED BY:
GEI Consultants Canada Limited

Patrick Grier, P.Eng.
Senior Project Engineer

1. Introduction

This report has been prepared to document the servicing and stormwater management system design for the proposed development of 191 Wellington Road 7 and 290 South Street in the Township of Centre Wellington (Elora). The Owner is required to have a Professional Engineer design a stormwater management system and have the said Engineer supervise and certify that the stormwater management system was installed in accordance with the approvals given under Section 41 of the Planning Act.

The legal survey was completed by Black, Shoemaker, Robinson & Donaldson Limited (received December 6th, 2016). The topographical survey was completed by GM BluePlan Engineering Limited (dated December 6th, 2016). The existing and proposed site details are provided on the drawings prepared by GEI Consultants Canada Ltd.

The site is bound by South Street to the east, existing residential lands to the south and north, and Wellington Road 7 to the west. At this time, the intent of the Owner is to construct a 25-unit condominium development on the 0.74 ha site, along with the associated driving, parking and landscaped areas.

2. Site Grading

As illustrated by the topographic survey, the site generally slopes from the northeast to the southwest towards the roadside ditch along Wellington Road 7. The centerline road elevation on South Street along the frontage of the property ranges from approximately 395.0m to 392.0m. The edge of pavement elevation on Wellington Road 7 along the frontage of the property ranges from approximately 394.0m to 390.0m.

The grade and elevations of the site are controlled by the elevation of the existing road elevations of Wellington Road 7 and South Street. The site will be graded to match the existing elevations along the property limits.

3. Site Services

3.1. Water Supply

Water supply for majority of the site is proposed to be provided via the extension of a 150mm diameter water service lateral from the existing 150mm watermain on the South Street right-of-way. Water supply for Block 1 will be supplied via the extension of four (4) 25mm diameter water service laterals from the existing 150mm watermain on the South Street right-of-way.

Fire water supply will be provided by the existing municipal fire hydrants at the intersections of Wellington Road 7 and David Street West and David Street West and South Street.

Table 3-1. Anticipated Water Demands from Site

	Anticipated Water Demand
Average Water Demand (25 Units @ 2.4 ppl/unit @ 0.004 L/s/cap)	0.24 L/s
Maximum Day (Peak Factor of 2)	0.48 L/s

We estimate the fire flow demand for the largest townhouse block of the proposed development with noncombustible construction is 133 L/s, per the FUS approach. A copy of the fire flow demands have been included in Appendix A.

3.2. Sanitary Service

Sanitary service for the site will be provided by a 200mm diameter sanitary sewer extended from the existing 200mm diameter sanitary sewer on the South Street right-of-way. Sanitary services for Block 1 will be provided by the extension of four (4) 100mm diameter sanitary service laterals from the existing 200mm diameter sanitary sewer on South Street. The capacity of the existing 200mm diameter sanitary sewer on South Street is approximately 0.077 m^3/s, based on a grade of 4.77%.

The following table summarizes the flows discharging from the site to the municipal sanitary sewer. The sanitary sewer design sheet is provided in Appendix B.

Table 3-2. Anticipated Sanitary Design Flows to South Street

	Anticipated Sanitary Design Flow
Peak Sanitary Sewer Flow (25 Units @ 2.4 ppl/unit @ 345.6 L/cap/d) Peak factor = 4	0.00127 m^3/s
Extraneous Flow (0.75 ha site @ 0.15 L/s/ha)	0.00011 m^3/s
Total Sanitary Flow	0.00139 m^3/s
Existing 200mm Diameter Sanitary Sewer Capacity	0.077 m^3/s

The peak sanitary sewer flow from the development to South Street represents approximately 2% of the existing sanitary sewer capacity. Therefore, in our opinion, the existing 200mm sanitary sewer on South Street has sufficient capacity to convey the anticipated design flows from the proposed development.

3.3. Storm Service

On-site storm sewers have been designed to convey the 100-year design storm event to the proposed detention tank. Storm services for the majority of the site will be provided via 300mm to 525mm diameter storm sewers discharging to the roadside ditch along the Wellington Road 7 right-of-way. A portion of the site will be serviced via a 250mm storm sewer discharging to the existing 250mm storm sewer on South Street. The storm sewer design sheet can be found in Appendix B.

4. Stormwater Management Design

The Fergus Shand Dam rainfall parameters presented in the Stormwater Management Master Plan for Centre Wellington (Elora, Salem and Fergus) (WSP Group, dated April 9, 2024) were used to generate the mass rainfall data for a 4-hour duration rainfall event for the full range of design storms (2 to 100-year). The Chicago storm parameters and the total depth of rainfall for each storm are as follows:

Table 4-1. Fergus Shand Dam – Chicago Storm Parameters

	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
A	414.876	544.711	627.308	746.059	820.361	901.088
B	0.0268	0.0206	0.0136	0.0851	0.0100	0.0426
C	0.682	0.686	0.687	0.692	0.691	0.692
r	0.375	0.375	0.375	0.375	0.375	0.375
Duration (min.)	240	240	240	240	240	240
Total Depth (mm)	39.504	50.743	58.119	67.239	74.358	81.221

The Horton infiltration method was used in the MIDUSS model. The parameters used in MIDUSS are as follows:

Table 4-2. MIDUSS Horton Parameters

	Impervious Areas	Pervious Areas
Maximum Infiltration (mm/hr)	0.0	75.0
Minimum Infiltration (mm/hr)	0.0	12.5
Lag Constant (hr)	0.05	0.25
Depression Storage (mm)	1.5	5.0

The hydrologic model MIDUSS was used to create runoff hydrographs and to route the flows through the storage structures.

4.1. Stormwater Management Criteria

The following are the criteria used to design the stormwater management system for the proposed development:

1. The post-development peak runoff generated from the site is to be attenuated to the existing condition levels plus an additional 20% peak flow reduction, for the full range of design storm events up to and including the 100-year design storm.
2. Enhanced water quality treatment (80% TSS total suspended solids removal) is to be provided prior to the discharge of runoff from the site.
3. Major storm flows are to be routed overland to an appropriate outlet.

4.2. Existing Condition Drainage Areas

For the existing condition analysis, an analysis of two (2) drainage catchments was completed. The existing condition drainage areas are shown in Figure No. 1.

Catchment 10 (0.74-hectares, 2% impervious) represents the existing site, consisting of existing concrete foundations and landscaped areas. Under existing conditions, runoff generated from Catchment 10 sheetflows overland, uncontrolled, to the roadside ditch within the Wellington Road 7 right-of-way.

Catchment 20 (1.32-hectares, 20% impervious) represents the external drainage area northwest of the site, consisting of residential land use area with rooftops, driveways, and landscaped areas. Under existing conditions, runoff generated from Catchment 20 sheetflows overland, uncontrolled to Catchment 10 and eventually drains to the roadside ditch along Wellington Road 7 right-of-way.

The following table summarizes the existing condition flow rates.

Table 4-3. Existing Condition Peak Flow Rates

	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Catchment 10 (uncontrolled)	0.017 m^3/s	0.064 m^3/s	0.087 m^3/s	0.0123 m^3/s	0.158 m^3/s	0.196 m^3/s
Catchment 20 (uncontrolled)	0.062 m^3/s	0.088 m^3/s	0.105 m^3/s	0.0128 m^3/s	0.146 m^3/s	0.165 m^3/s
Total	**0.075 m^3/s**	**0.142 m^3/s**	**0.186 m^3/s**	**0.250 m^3/s**	**0.304 m^3/s**	**0.361 m^3/s**

4.3. Allowable Release Rates

The post-development flows are to be attenuated to the existing condition levels with an additional 20% water quantity control, for the full range of design storm events up to and including the 100-year design storm. Therefore, the allowable release rate under post-development conditions are as follows:

Table 4-4. Allowable Release Rates

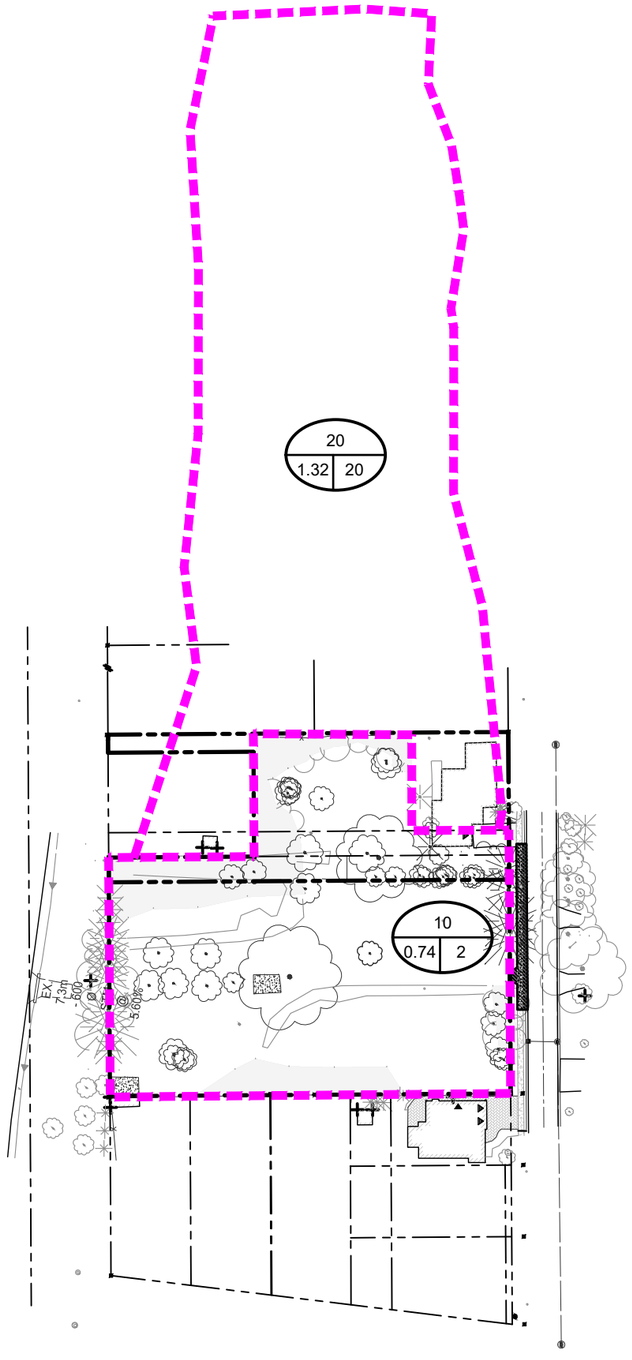
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
Total Flows from Site	0.060 m^3/s	0.114 m^3/s	0.149 m^3/s	0.200 m^3/s	0.243 m^3/s	0.289 m^3/s

4.4. Post-Development Condition Drainage Areas

For the post-development condition, an analysis of four (4) drainage catchments was completed. The post-development drainage catchments are shown on Figure No. 2.

Catchment 100 (0.65-hectares, 65% impervious) represents the majority of the proposed development. Under post-development conditions, runoff generated from Catchment 100 will be captured and conveyed to on-site storm sewers to the proposed underground stormwater tank, ultimately discharging to the roadside ditch along the Wellington Road 7 right-of-way.

191 WELLINGTON ROAD 7
CENTRE WELLINGTON (ELORA)



N

LEGEND

EX. STORM SEWER

DRAINAGE AREA BOUNDARY

201 — CATCHMENT NUMBER
0.110 80 — % IMPERVIOUS
CATCHMENT AREA IN HECTARES

20 10 0 20 40 60
1:1500 (m)

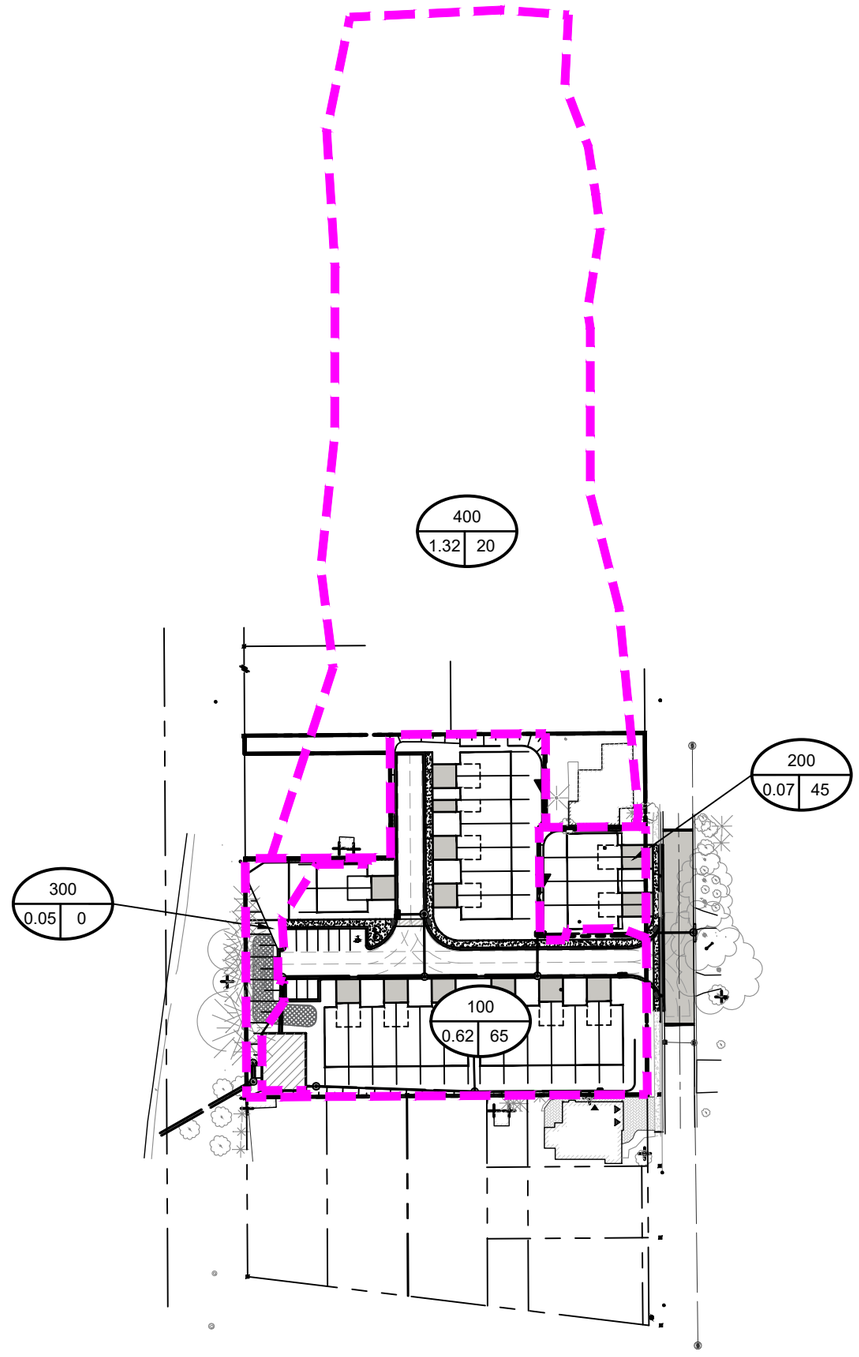
PRE DEVELOPMENT STORMWATER MANAGEMENT FIGURE

Figure No. 1

GEI Consultants Canada

416149
AUGUST 2025
Scale: 1:1500 | NAD 1983 UTM Zone 17N

191 WELLINGTON ROAD 7
CENTRE WELLINGTON (ELORA)



N

LEGEND

PROP. STORM SEWER

DRAINAGE AREA BOUNDARY

201 — CATCHMENT NUMBER
0.110 80 — % IMPERVIOUS
CATCHMENT AREA IN HECTARES

20 10 0 20 40 60
1:1500 (m)

POST DEVELOPMENT STORMWATER MANAGEMENT FIGURE

Figure No. 2

GEI Consultants Canada

416149
AUGUST 2025
Scale: 1:1500 | NAD 1983 UTM Zone 17N

FILE:B:\Working\James Keating Constr\2404979 - 416149 Ross Property - 191 South Street, Elora\design Phase\Drawings\416149 - Design.dwg LAYOUT:POST DEVELOPMENT SWM FIG
LAST SAVED BY:Erlarm.3933, 10/29/2025 10:59:29 AM PLOTTED BY:Armstrong, Erin 10/29/2025 11:01:18 AM

The proposed underground stormwater tank (12.81m length x 11.05m width x 1.36m depth) is anticipated to provide 184.8 m^3 of storage volume and will be an EZ-Storm system or approved equivalent. Minor storm (2-year design storm) flows will be controlled via the proposed 190mm orifice, while 5-year and major storm flows will be controlled via the proposed 375mm outlet pipe. Storm sewers have been sized such that the 100-year design storm event flows from Catchment 100 and 400 are conveyed to the proposed stormwater tank.

Catchment 200 (0.07-hectares, 45% impervious) represents a portion of the townhouse rooftops, rearyards, and landscaped area along the northeast limit of the site. Under post-development conditions, runoff generated from Catchment 200 will either sheetflow uncontrolled or be conveyed via the rearyard swale and storm sewers to the South Street right-of-way.

Catchment 300 (0.05-hectares, 0% impervious) represents the landscaped area along the southwest limits of the site. Under post-development conditions, runoff generated from Catchment 300 is proposed to sheetflow overland, uncontrolled, towards the roadside ditch within the Wellington Road 7 right-of-way.

Catchment 400 (1.32-hectares, 20% impervious) represents the external drainage area northwest of the site (Catchment 20 under existing conditions), consisting of residential land use area with rooftops, driveways, and landscaped areas. Under post-development conditions, runoff generated from Catchment 400 will continue to sheetflow overland to Catchment 300, where flows will be controlled by the proposed underground stormwater tank before eventually discharging to the roadside ditch along the Wellington Road 7 right of way.

Enhanced level quality control will be provided for Catchment 100 and Catchment 400 via the proposed oil/grit separator structure (Stormceptor EFO6 or approved equivalent). Sizing calculations for the oil/grit separator are presented in Appendix D.

4.4.1. Routing

The Hydrologic model MIDUSS was used to create the 2-100-year design storm runoff hydrographs and to route the hydrographs. A copy of the modelling results of the post-development analysis is appended.

The results of the routing analysis are as follows:

Table 4-5. Catchment 300 Underground Stormwater Tank Storage Stage/Storage/Discharge Capacities

	Available Capacity			**Actual Capacity Used**		
	Peak Flow m^3/s	**Storage Volume m^3**	**Storage Elevation m**	**Peak Flow m^3/s**	**Storage Volume m^3**	**Storage Elevation m**
190mm Orifice	0.000	0.0	389.23			
Bottom of Tank	0.000	0.0	389.24	---	---	---
2-Year	---	---	---	0.057	88.8	389.89
375mm Outlet	0.064	108.7	390.04	---	---	---
5-Year	---	---	---	0.095	124.8	390.16
10-Year	---	---	---	0.129	139.1	390.26
25-Year	---	---	---	0.184	155.2	390.38
50-Year	---	---	---	0.220	167.0	390.47
100-Year	---	---	---	0.261	184.2	390.60
Top of Tank and T/G CBMH.10	0.264	184.8	390.60			
Overflow	0.617	185.5	391.10	---	---	---

A summary of the post-development peak flow from the site for all design storm events are provided in the table below.

Table 4-6. Summary of Post-Development Peak Flow Rates

	2-Year	**5-Year**	**10-Year**	**25-Year**	**50-Year**	**100-Year**
Catchment 100 (controlled)	0.057 m^3/s	0.095 m^3/s	0.129 m^3/s	0.183 m^3/s	0.220 m^3/s	0.261 m^3/s
Catchment 200 (uncontrolled)	0.012 m^3/s	0.019 m^3/s	0.017 m^3/s	0.022 m^3/s	0.026 m^3/s	0.041 m^3/s
Catchment 300 (uncontrolled)	0.005 m^3/s	0.011 m^3/s	0.011 m^3/s	0.012 m^3/s	0.016 m^3/s	0.025 m^3/s
Total	**0.060m^3/s**	**0.098 m^3/s**	**0.133 m^3/s**	**0.189 m^3/s**	**0.227 m^3/s**	**0.276 m^3/s**

Table 4-7. Comparison of Allowable Release Rates and Post-Development Flow Rates

	2-Year	**5-Year**	**10-Year**	**25-Year**	**50-Year**	**100-Year**
Allowable Release Rate	0.060 m^3/s	0.114 m^3/s	0.149 m^3/s	0.200 m^3/s	0.243 m^3/s	0.289 m^3/s
Post-Development Flow Rate	0.060m^3/s	0.098 m^3/s	0.133 m^3/s	0.189 m^3/s	0.227 m^3/s	0.276 m^3/s

Therefore, the post-development flow rates have been attenuated to equal or less than the allowable release rates for the 2-through 100-year design storm events.

5. Maintenance Plan

To ensure that the stormwater management system continues to function as designed and constructed, we recommend that the following inspections and maintenance activities be completed on an annual basis:

1. Inspect the water level in the underground stormwater tank. Has the system completely drained within 48 hours after a storm?
2. Is there any noticeable damage to the underground stormwater tank (i.e. outlet structures, overflow weirs)? If yes, complete any necessary repairs and/or installation of replacement structures.
3. Is there any noticeable damage to the asphalt and grassed swales (i.e. erosion, blockages)? If yes, complete any necessary repairs.
4. Is there any indication of a spill (i.e. frothy water, oily sheen on the water)? If yes, investigate, inform the appropriate agencies and complete the necessary clean-up and restoration.
5. Inspect the oil/grit structure and complete any necessary maintenance/repair activities as identified by the manufacturer.
6. Inspect all catchbasins and manholes. Remove and dispose of any accumulated sediment, trash/litter, debris (i.e. sediment, garbage, leaves, etc.).
7. Inspect all swales and overflow locations. Remove an dispose of any accumulated sediment, trash/litter, debris (i.e. sediment, garbage, leaves, etc.).

Please note that any structures identified during the annual inspection to be worn, missing or damaged are to be repaired or replaced within 48 hours.

6. Erosion and Sediment Control Plan

A silt fence is to be installed along the perimeter of the property. The silt fence serves to minimize the opportunity for sediment to leave the site.

Inspection and maintenance of all silt fencing will start after installation is complete. The silt fence will be inspected on a weekly basis during active construction or after a rainfall event of 13 mm or greater. Maintenance will be carried out, within 48 hours, on any part of the silt fence found to need repair.

Once construction and landscaping has been substantially completed, the silt fence will be removed, any accumulated sediment will be removed, and the landscaping will be completed.

After construction of the complete development, erosion will not occur, and sediment transport will be minimal.

7. Conclusions

In summary, the features of the design for the proposed development are as follows:

1. It is proposed that the development will be accessed by South Street and Wellington Road 7 and that the grading of the development is controlled by the existing elevations of South Street and Wellington Road 7 across the frontages of the site.
2. Water supply for majority of the site is proposed to be provided via the extension of a 150mm diameter water service lateral from the existing 150mm watermain on the South Street right-of-way. Water supply for Block 1 will be supplied via the extension of four (4) 25mm diameter water service laterals from the existing 150mm watermain on the South Street right-of-way.
3. Sanitary service for the proposed development will be provided by a 200mm diameter sanitary sewer extended from the existing 200mm diameter sanitary sewer on the South Street right-of-way. Sanitary services for Block 1 will be provided by the extension of four (4) 100mm diameter sanitary service laterals from the existing 200mm diameter sanitary sewer on South Street.
4. Storm service for majority of the development will be provided via a 525mm diameter storm sewer discharging to the roadside ditch along the Wellington Road 7 right-of-way. A portion of the development will be serviced via a 250mm diameter storm sewer discharging to the existing 250mm storm sewer on South Street.
5. Post-development flow rates have been attenuated to equal or less than the allowable release rates for the 2 through 100-year design storm events.
6. Quality control treatment for runoff generated from Catchment 100 and Catchment 400 will be provided by the oil/grit separator structure (Stormceptor EF06 or approved equivalent) prior to discharge from the site.
7. Prior to construction, a silt fence will be installed along the property boundary in all locations where runoff will discharge from the site to adjacent lands. This will minimize the transport of sediment off-site during the construction period.

Appendix A Fire Flow Demands Analysis

Project No: 2404979
Designed By: SJ

FIRE UNDERWRITERS SURVEY CALCULATIONS

191 Wellington Road 7
Township of Centre Wellington (Elora)

Date: 9/3/2025

Parameters from Water Supply for Public Fire Protection, Fire Underwriters Survey (2020)

Type of Construction	
Wood	1.5
Ordinary	1.0
Noncombustible	0.8
Fire-Resistive	0.6

Fire Hazard	
Non-Combustible	-0.25
Limited Combustibility	-0.15
Combustible	0
Free Burning	0.15
Rapid Burning	0.25

Sprinklers	
No	0
System	-30%
Standard Water Supply	-40%
Fully Supervised	-50%

Proximity to closest structure (m)	
0 to 3	25%
3 to 10	20%
10 to 20	15%
20 to 30	10%
Greater than 30	0%

Building	Gross Floor Area (m2)	Construction Coefficient	NFF 220*C*(A)**0.5	Rounded NFF (to nearest 1000L/min)	Occupancy Factor	NFF adjusted for occupancy	Sprinkler Adjustment	Sprinkler Credit	Exposure Coefficient					Exposure Flow Debit	RFF	Rounded RFF (to nearest 1000L/min)	Required Fire Flow (L/s)
									N	S	E	W	Total (max 0.75)				
Townhouse Units	1110	0.8	5864	6000	-0.15	5100	0	0	0.15	0.15	0	0.2	0.5	2550	7650	8000	133

Appendix B Sewer Design Sheets

Chicago Storm Parameters
Intensity = A / (t + B) ^ C

5-Year		100-Year	
A =	544.7	A =	901.1
B =	0.021	B =	0.043
C =	0.686	C =	0.692

STORM SEWER DESIGN

100-Year Design Storm

Township of Centre Wellington (Elora)

Catchment Area	From	To	Area (ha)	Runoff Coefficient	A x C	Cumulative A x C	TC (min.)	Intensity (mm/hr)	5-yr Flow (m^3/s)	100-yr Flow (m^3/s)	Proposed Sewer							100-yr HGL					
											Length (m)	Pipe Size (mm)	Type of Pipe	Grade %	Capacity (m^3/s)	Full Flow Velocity (m/s)	Time of Flow (min.)	HGL Grade %	HGL Capacity (m^3/s)	U/S T/G (m)	U/S HGL (m)	D/S T/G (m)	D/S HGL (m)
--	External Drainage Area	DCBMH.7	0.75	0.34	0.25	0.25	20.00	113.19	0.049	0.080													
--	External Drainage Area	CB.9	0.75	0.34	0.25	0.25	20.00	113.19	0.049	0.080													
8	DCBMH.12	CBMH.4	0.07	0.75	0.05	0.05	10.00	182.59	0.016	0.027	21.7	300	0.013	1.00	0.097	1.37	0.26	**0.07**	0.027	393.62	391.6474	393.75	391.6322
10	CB.9	CBMH.4	0.07	0.75	0.05	0.31	20.00	113.19	0.059	0.096	10.5	300	0.013	2.00	0.137	1.93	0.09	**1.11**	0.106	393.79	391.7488	393.75	391.6322
3	CBMH.4	CBMH.3	0.08	0.75	0.06	0.42	10.26	179.34	0.128	0.208	28.1	450	0.013	0.50	0.202	1.27	0.37	**0.37**	0.180	393.75	391.6322	393.92	391.5282
1	DCBMH.7	CBMH.3	0.12	0.75	0.09	0.34	20.00	113.19	0.066	0.108	15.7	300	0.013	2.00	0.137	1.93	0.14	**1.15**	0.108	394.23	391.7088	393.92	391.5282
9	CBMH.3	DCBMH.1	0.01	0.75	0.01	0.77	10.63	175.02	0.230	0.374	35.8	450	0.013	1.00	0.285	1.79	0.33	**1.717**	0.388	393.92	391.5282	393.33	390.9136
4	DCBMH.1	TANK	0.11	0.75	0.08	0.85	10.97	171.34	0.249	0.405	15.6	450	0.013	3.00	0.494	3.10	0.08	**2.01**	0.420	393.33	390.9136	390.6	390.6
5	CB.15	CBMH.11	0.04	0.75	0.03	0.03	10.00	182.59	0.009	0.015	31.5	250	0.013	0.50	0.042	0.86	0.61	**0.06**	0.015	391.72	389.7747	391.4	389.7558
6	CBMH.11	CBMH.10	0.05	0.75	0.04	0.07	10.61	175.26	0.020	0.032	39.9	250	0.013	0.50	0.042	0.86	0.78	**0.26**	0.032	391.4	389.7558	391	389.652
7	CBMH.10	TANK	0.08	0.75	0.06	0.13	11.39	166.93	0.036	0.058	2.6	250	0.013	1.00	0.059	1.21	0.04	**0.87**	0.058	391	389.652	390.6	389.6294
--	TANK	MH.14	0.00	0.75	0.00	0.31	11.42	166.57	0.089	0.254	2.2	375	0.013	0.50	0.124	1.12	0.03	**1.94**	0.254	390.6	389.6294	391.65	389.5867
											2.2	200	0.013	0.50	0.023	0.74	0.05						
--	MH.14	OGS	0.00	0.75	0.00	0.31	11.47	166.08	0.089	0.254	4.7	525	0.013	0.50	0.304	1.40	0.06	**0.323**	0.254	391.65	389.5867	389.36	389.5716
--	OGS	OUTLET	0.00	0.75	0.00	0.31	11.46	166.25	0.089	0.254	26.8	525	0.013	0.50	0.304	1.40	0.32	**0.323**	0.254	390.36	389.5716	389.49	389.485
2	CB.16	EX.MH17	0.04	0.75	0.03	0.03	10.00	182.59	0.009	0.015	37.7	250	0.013	1.00	0.059	1.21	0.52						

The Cumulative AxC from TANK to OUTLET has been adjusted to reflect the 5-year flows from the proposed underground stormwater tank.

Date: October 28, 2025
Designed By: SJ
Checked by: PG

Project: 191 Wellington Road 7
File: 2404979

PROJECT: 191 Wellington Road 7
Township of Centre Wellington (Elora)
DATE: October 27, 2025
DESIGNED BY: S.J.

SANITARY SEWER DESIGN
Township of Centre Wellington

Average Daily Flow
Residential: 345.6 L/c/d

Q(i) = Cum. Area (ha) * Infiltration Rate / 1000
Infiltration Rate: 0.15 L/s/ha

Peaking Factor : F = 1 + (14/(4+P^0.5)) P = Population/1000

Manning Equation: Full Cap.= (D/2/1000)^2*Pi*(D/4/1000)^0.667*(1/n)*(S/100)^0.5
D = Diameter (mm)
S = Slope (%)
n = 0.013 (PVC & Concrete), 01016 (Vitrified Clay)

n = 0.013

Minimum Full Velocity = 0.80 m/s

Catchment	From M.H.	To M.H.	RESIDENTIAL AREA AND POPULATION							Commercial		Industrial		Institutional		C+I+I	Infiltration	Total Flow	Pipe					
			Area	No. of Units	Population	Cumulative		Peak Factor	Peak Flow	Area	Cum. Area	Area	Cum. Area	Area	Cum. Area	Peak Flow			Distance	Diameter	Slope	Capacity (Full)	Velocity	
			(ha)			Area (ha)	Population		(m^3/s)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(m^3/s)	Q(i) = (m^3/s)	(m^3/s)	(m)	(mm)	(%)	(m^3/s)	Full (m/s)	Actual (m/s)
2	MH.D	MH.B	0.19	4	10	0.19	10	4.000	0.00015								0.000029	0.00018	16.90	200	1.00	0.0328	1.044	0.240
1	MH.C	MH.B	0.26	9	22	0.26	22	4.000	0.00035								0.000039	0.00039	48.10	200	4.00	0.0656	2.088	0.480
3	MH.B	MH.A	0.23	8	19	0.68	51	4.000	0.00081								0.000102	0.00091	58.30	200	1.00	0.0328	1.044	0.418
--	MH.A	EX.MH.1	0.00	0	0	0.68	51	4.000	0.00081								0.000102	0.00091	10.50	200	1.00	0.0328	1.044	0.418
4	Towhnhouse Building	Existing 200mm San	0.04	2	5	0.00	5	4.000	0.00008								0.000000	0.00008	14.25	100	1.00	0.0052	0.662	0.152
5	Towhnhouse Building	Existing 200mm San	0.04	2	5	0.00	5	4.000	0.00008								0.000000	0.00008	14.25	100	1.00	0.0052	0.662	0.152

Appendix C Stormwater Management Analysis

Pre-Development

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                          ie METRIC"
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"                Working\JAMES KEATING CONSTR\2404979 - 416149 Ross Property - 191
South Street, Elora\Design Phase\Design Calcs\Modelling Files\2025-10-27"
"                Output filename:                         2404979 Pre_2yr R2.out"
"                Licensee name:                                                 "
"                Company                                                        "
"                Date & Time last used:                10/27/2025 at 8:13:49 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      240.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      414.876   Coefficient A"
"        0.027   Constant B"
"        0.682   Exponent C"
"        0.375   Fraction R"
"      240.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           100.234    mm/hr"
"             Total depth                  39.504    mm"
"            6   002hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 10"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"           10   Catchment 10"
"        2.000   % Impervious"
"        0.740   Total Area"
"       65.000   Flow length"
"        7.000   Overland Slope"
"        0.725   Pervious Area"
"       65.000   Pervious length"
"        7.000   Pervious slope"
"        0.015   Impervious Area"
"       65.000   Impervious length"
"        7.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.017     0.000     0.000     0.000 c.m/sec"
"             Catchment 10           Pervious   Impervious Total Area "
"             Surface Area           0.725      0.015      0.740      hectare"
"             Time of concentration  19.735     2.420      16.189     minutes"
"             Time to Centroid       109.957    115.029    110.995    minutes"
"             Rainfall depth         39.504     39.504     39.504     mm"
"             Rainfall volume        286.48     5.85       292.33     c.m"
"             Rainfall losses        36.520     1.857      35.827     mm"
"             Runoff depth           2.984      37.647     3.677      mm"
"             Runoff volume          21.64      5.57       27.21      c.m"
"             Runoff coefficient     0.076      0.953      0.093      "
"             Maximum flow           0.016      0.004      0.017      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.017     0.017     0.000     0.000"
" 33          CATCHMENT 20"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"           20   Catchment 20"
"       20.000   % Impervious"
"        1.320   Total Area"
"      300.000   Flow length"
"        2.500   Overland Slope"
"        1.056   Pervious Area"
"      300.000   Pervious length"
"        2.500   Pervious slope"
"        0.264   Impervious Area"
"      300.000   Impervious length"
"        2.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.062     0.017     0.000     0.000 c.m/sec"
"             Catchment 20           Pervious   Impervious Total Area "
"             Surface Area           1.056      0.264      1.320      hectare"
"             Time of concentration  67.284     8.252      22.428     minutes"
"             Time to Centroid       144.894    124.297    129.243    minutes"
"             Rainfall depth         39.504     39.504     39.504     mm"
"             Rainfall volume        417.16     104.29     521.45     c.m"
"             Rainfall losses        36.510     1.614      29.531     mm"
"             Runoff depth           2.994      37.890     9.973      mm"
```

```
"             Runoff volume          31.61      100.03     131.64     c.m"
"             Runoff coefficient     0.076      0.959      0.252      "
"             Maximum flow           0.009      0.061      0.062      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.062     0.075     0.000     0.000"
" 38          START/RE-START TOTALS 20"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                     2.060    hectare"
"             Total Impervious area                    0.279    hectare"
"             Total % impervious                      13.534"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
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South Street, Elora\Design Phase\Design Calcs\Modelling Files\2025-10-27"
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"        5.000   Time Step"
"      240.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
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"            1   Chicago storm"
"      544.711   Coefficient A"
"        0.021   Constant B"
"        0.686   Exponent C"
"        0.375   Fraction R"
"      240.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           130.577    mm/hr"
"             Total depth                  50.743    mm"
"            6   005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 10"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"           10   Catchment 10"
"        2.000   % Impervious"
"        0.740   Total Area"
"       65.000   Flow length"
"        7.000   Overland Slope"
"        0.725   Pervious Area"
"       65.000   Pervious length"
"        7.000   Pervious slope"
"        0.015   Impervious Area"
"       65.000   Impervious length"
"        7.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.064     0.000     0.000     0.000 c.m/sec"
"             Catchment 10           Pervious   Impervious Total Area "
"             Surface Area           0.725      0.015      0.740      hectare"
"             Time of concentration  13.229     2.177      12.102     minutes"
"             Time to Centroid       107.321    113.802    107.982    minutes"
"             Rainfall depth         50.743     50.743     50.743     mm"
"             Rainfall volume        367.99     7.51       375.50     c.m"
"             Rainfall losses        41.977     1.952      41.177     mm"
"             Runoff depth           8.765      48.791     9.566      mm"
"             Runoff volume          63.57      7.22       70.79      c.m"
"             Runoff coefficient     0.173      0.962      0.189      "
"             Maximum flow           0.063      0.005      0.064      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.064     0.064     0.000     0.000"
" 33          CATCHMENT 20"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"           20   Catchment 20"
"       20.000   % Impervious"
"        1.320   Total Area"
"      300.000   Flow length"
"        2.500   Overland Slope"
"        1.056   Pervious Area"
"      300.000   Pervious length"
"        2.500   Pervious slope"
"        0.264   Impervious Area"
"      300.000   Impervious length"
"        2.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.088     0.064     0.000     0.000 c.m/sec"
"             Catchment 20           Pervious   Impervious Total Area "
"             Surface Area           1.056      0.264      1.320      hectare"
"             Time of concentration  45.103     7.424      23.210     minutes"
"             Time to Centroid       134.920    122.191    127.524    minutes"
"             Rainfall depth         50.743     50.743     50.743     mm"
"             Rainfall volume        535.84     133.96     669.81     c.m"
"             Rainfall losses        41.901     1.693      33.860     mm"
"             Runoff depth           8.842      49.050     16.883     mm"
```

```
"             Runoff volume          93.37      129.49     222.86     c.m"
"             Runoff coefficient     0.174      0.967      0.333      "
"             Maximum flow           0.035      0.079      0.088      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.088     0.142     0.000     0.000"
" 38          START/RE-START TOTALS 20"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                     2.060    hectare"
"             Total Impervious area                    0.279    hectare"
"             Total % impervious                      13.534"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
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"                MIDUSS created                          Sunday, February 7, 2010"
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South Street, Elora\Design Phase\Design Calcs\Modelling Files\2025-10-27"
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"                Company                                                        "
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"        5.000   Time Step"
"      240.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      627.308   Coefficient A"
"        0.014   Constant B"
"        0.687   Exponent C"
"        0.375   Fraction R"
"      240.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity          150.154    mm/hr"
"             Total depth                 58.119    mm"
"            6   010hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 10"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"           10   Catchment 10"
"        2.000   % Impervious"
"        0.740   Total Area"
"       65.000   Flow length"
"        7.000   Overland Slope"
"        0.725   Pervious Area"
"       65.000   Pervious length"
"        7.000   Pervious slope"
"        0.015   Impervious Area"
"       65.000   Impervious length"
"        7.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.087     0.000     0.000     0.000 c.m/sec"
"             Catchment 10           Pervious   Impervious Total Area "
"             Surface Area           0.725      0.015      0.740      hectare"
"             Time of concentration  12.039     2.059      11.248     minutes"
"             Time to Centroid       108.635    113.227    108.999    minutes"
"             Rainfall depth         58.119     58.119     58.119     mm"
"             Rainfall volume        421.48     8.60       430.08     c.m"
"             Rainfall losses        44.837     2.100      43.982     mm"
"             Runoff depth           13.282     56.019     14.137     mm"
"             Runoff volume          96.32      8.29       104.61     c.m"
"             Runoff coefficient     0.229      0.964      0.243      "
"             Maximum flow           0.086      0.006      0.087      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.087     0.087     0.000     0.000"
" 33          CATCHMENT 20"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"           20   Catchment 20"
"       20.000   % Impervious"
"        1.320   Total Area"
"      300.000   Flow length"
"        2.500   Overland Slope"
"        1.056   Pervious Area"
"      300.000   Pervious length"
"        2.500   Pervious slope"
"        0.264   Impervious Area"
"      300.000   Impervious length"
"        2.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.105     0.087     0.000     0.000 c.m/sec"
"             Catchment 20           Pervious   Impervious Total Area "
"             Surface Area           1.056      0.264      1.320      hectare"
"             Time of concentration  41.044     7.020      23.552     minutes"
"             Time to Centroid       138.709    121.308    129.763    minutes"
"             Rainfall depth         58.119     58.119     58.119     mm"
"             Rainfall volume        613.74     153.43     767.17     c.m"
"             Rainfall losses        44.827     1.862      36.234     mm"
"             Runoff depth           13.292     56.257     21.885     mm"
```

```
"             Runoff volume          140.36     148.52     288.88     c.m"
"             Runoff coefficient     0.229      0.968      0.377      "
"             Maximum flow           0.052      0.091      0.105      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.105     0.186     0.000     0.000"
" 38          START/RE-START TOTALS 20"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                    2.060    hectare"
"             Total Impervious area                   0.279    hectare"
"             Total % impervious                     13.534"
" 19          EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                              ie METRIC"
"                Job folder:           \\geiconsultants.com\data\Data_Storage\"
"                Working\JAMES KEATING CONSTR\2404979 - 416149 Ross Property - 191
South Street, Elora\Design Phase\Design Calcs\Modelling Files\2025-10-27"
"                Output filename:                        2404979 Pre_25yr R2.out"
"                Licensee name:                                                 "
"                Company                                                        "
"                Date & Time last used:                10/27/2025 at 8:15:56 AM"
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"        5.000   Time Step"
"      240.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      746.059   Coefficient A"
"        0.085   Constant B"
"        0.692   Exponent C"
"        0.375   Fraction R"
"      240.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           175.654    mm/hr"
"             Total depth                  67.239    mm"
"            6   025hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 10"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"           10   Catchment 10"
"        2.000   % Impervious"
"        0.740   Total Area"
"       65.000   Flow length"
"        7.000   Overland Slope"
"        0.725   Pervious Area"
"       65.000   Pervious length"
"        7.000   Pervious slope"
"        0.015   Impervious Area"
"       65.000   Impervious length"
"        7.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.123     0.000     0.000     0.000 c.m/sec"
"             Catchment 10           Pervious   Impervious Total Area "
"             Surface Area           0.725      0.015      0.740      hectare"
"             Time of concentration  11.082     1.934      10.500     minutes"
"             Time to Centroid       109.116    112.498    109.331    minutes"
"             Rainfall depth         67.239     67.239     67.239     mm"
"             Rainfall volume        487.62     9.95       497.57     c.m"
"             Rainfall losses        47.713     2.249      46.804     mm"
"             Runoff depth           19.526     64.989     20.435     mm"
"             Runoff volume          141.60     9.62       151.22     c.m"
"             Runoff coefficient     0.290      0.967      0.304      "
"             Maximum flow           0.119      0.007      0.123      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.123     0.123     0.000     0.000"
" 33          CATCHMENT 20"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"           20   Catchment 20"
"       20.000   % Impervious"
"        1.320   Total Area"
"      300.000   Flow length"
"        2.500   Overland Slope"
"        1.056   Pervious Area"
"      300.000   Pervious length"
"        2.500   Pervious slope"
"        0.264   Impervious Area"
"      300.000   Impervious length"
"        2.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.128     0.123     0.000     0.000 c.m/sec"
"             Catchment 20           Pervious   Impervious Total Area "
"             Surface Area           1.056      0.264      1.320      hectare"
"             Time of concentration  37.783     6.593      23.596     minutes"
"             Time to Centroid       138.702    120.175    130.274    minutes"
"             Rainfall depth         67.239     67.239     67.239     mm"
"             Rainfall volume        710.04     177.51     887.55     c.m"
"             Rainfall losses        47.710     2.058      38.580     mm"
"             Runoff depth           19.529     65.181     28.659     mm"
```

```
"             Runoff volume          206.22     172.08     378.30     c.m"
"             Runoff coefficient     0.290      0.969      0.426      "
"             Maximum flow           0.072      0.105      0.128      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.128     0.250     0.000     0.000"
" 38          START/RE-START TOTALS 20"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                    2.060    hectare"
"             Total Impervious area                   0.279    hectare"
"             Total % impervious                     13.534"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                            ie METRIC"
"                Job folder:           \\geiconsultants.com\data\Data_Storage\"
"                Working\JAMES KEATING CONSTR\2404979 - 416149 Ross Property - 191
South Street, Elora\Design Phase\Design Calcs\Modelling Files\2025-10-27"
"                Output filename:                        2404979 Pre_50yr R2.out"
"                Licensee name:                                                 "
"                Company                                                        "
"                Date & Time last used:                10/27/2025 at 8:16:32 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      240.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      820.361   Coefficient A"
"        0.010   Constant B"
"        0.691   Exponent C"
"        0.375   Fraction R"
"      240.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           194.803    mm/hr"
"             Total depth                  74.358    mm"
"            6   050hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 10"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"           10   Catchment 10"
"        2.000   % Impervious"
"        0.740   Total Area"
"       65.000   Flow length"
"        7.000   Overland Slope"
"        0.725   Pervious Area"
"       65.000   Pervious length"
"        7.000   Pervious slope"
"        0.015   Impervious Area"
"       65.000   Impervious length"
"        7.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.158     0.000     0.000     0.000 c.m/sec"
"             Catchment 10           Pervious   Impervious Total Area "
"             Surface Area           0.725      0.015      0.740      hectare"
"             Time of concentration  10.522     1.855      10.031     minutes"
"             Time to Centroid       109.478    112.168    109.631    minutes"
"             Rainfall depth         74.358     74.358     74.358     mm"
"             Rainfall volume        539.24     11.00      550.25     c.m"
"             Rainfall losses        49.899     2.420      48.949     mm"
"             Runoff depth           24.459     71.938     25.408     mm"
"             Runoff volume          177.38     10.65      188.02     c.m"
"             Runoff coefficient     0.329      0.967      0.342      "
"             Maximum flow           0.154      0.007      0.158      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.158     0.158     0.000     0.000"
" 33          CATCHMENT 20"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"           20   Catchment 20"
"       20.000   % Impervious"
"        1.320   Total Area"
"      300.000   Flow length"
"        2.500   Overland Slope"
"        1.056   Pervious Area"
"      300.000   Pervious length"
"        2.500   Pervious slope"
"        0.264   Impervious Area"
"      300.000   Impervious length"
"        2.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.146     0.158     0.000     0.000 c.m/sec"
"             Catchment 20           Pervious   Impervious Total Area "
"             Surface Area           1.056      0.264      1.320      hectare"
"             Time of concentration  35.872     6.326      23.352     minutes"
"             Time to Centroid       138.555    119.576    130.513    minutes"
"             Rainfall depth         74.358     74.358     74.358     mm"
"             Rainfall volume        785.22     196.30     981.52     c.m"
"             Rainfall losses        49.791     2.095      40.252     mm"
"             Runoff depth           24.567     72.262     34.106     mm"
```

```
"             Runoff volume          259.43     190.77     450.20     c.m"
"             Runoff coefficient     0.330      0.972      0.459      "
"             Maximum flow           0.091      0.116      0.146      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.146     0.304     0.000     0.000"
" 38          START/RE-START TOTALS 20"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                     2.060    hectare"
"             Total Impervious area                    0.279    hectare"
"             Total % impervious                      13.534"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                            ie METRIC"
"                Job folder:           \\geiconsultants.com\data\Data_Storage\"
"                Working\JAMES KEATING CONSTR\2404979 - 416149 Ross Property - 191
South Street, Elora\Design Phase\Design Calcs\Modelling Files\2025-10-27"
"                Output filename:                        2404979 Pre_100yr R2.out"
"                Licensee name:                                                  "
"                Company                                                         "
"                Date & Time last used:                  10/27/2025 at 8:17:03 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      240.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      901.088   Coefficient A"
"        0.043   Constant B"
"        0.692   Exponent C"
"        0.375   Fraction R"
"      240.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           212.921    mm/hr"
"             Total depth                  81.221    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 10"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"           10   Catchment 10"
"        2.000   % Impervious"
"        0.740   Total Area"
"       65.000   Flow length"
"        7.000   Overland Slope"
"        0.725   Pervious Area"
"       65.000   Pervious length"
"        7.000   Pervious slope"
"        0.015   Impervious Area"
"       65.000   Impervious length"
"        7.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.196     0.000     0.000     0.000 c.m/sec"
"             Catchment 10           Pervious   Impervious Total Area "
"             Surface Area           0.725      0.015      0.740      hectare"
"             Time of concentration  10.083     1.791      9.655      minutes"
"             Time to Centroid       109.715    111.857    109.826    minutes"
"             Rainfall depth         81.221     81.221     81.221     mm"
"             Rainfall volume        589.01     12.02      601.03     c.m"
"             Rainfall losses        51.740     2.613      50.757     mm"
"             Runoff depth           29.481     78.607     30.463     mm"
"             Runoff volume          213.80     11.63      225.43     c.m"
"             Runoff coefficient     0.363      0.968      0.375      "
"             Maximum flow           0.192      0.008      0.196      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.196     0.196     0.000     0.000"
" 33          CATCHMENT 20"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"           20   Catchment 20"
"       20.000   % Impervious"
"        1.320   Total Area"
"      300.000   Flow length"
"        2.500   Overland Slope"
"        1.056   Pervious Area"
"      300.000   Pervious length"
"        2.500   Pervious slope"
"        0.264   Impervious Area"
"      300.000   Impervious length"
"        2.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.165     0.196     0.000     0.000 c.m/sec"
"             Catchment 20           Pervious   Impervious Total Area "
"             Surface Area           1.056      0.264      1.320      hectare"
"             Time of concentration  34.377     6.105      23.078     minutes"
"             Time to Centroid       138.076    119.053    130.473    minutes"
"             Rainfall depth         81.221     81.221     81.221     mm"
"             Rainfall volume        857.69     214.42     1072.11    c.m"
"             Rainfall losses        51.517     2.126      41.639     mm"
"             Runoff depth           29.703     79.095     39.582     mm"
```

```
"             Runoff volume          313.67     208.81     522.48     c.m"
"             Runoff coefficient     0.366      0.974      0.487      "
"             Maximum flow           0.112      0.126      0.165      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.165     0.361     0.000     0.000"
" 38          START/RE-START TOTALS 20"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                     2.060    hectare"
"             Total Impervious area                    0.279    hectare"
"             Total % impervious                      13.534"
" 19          EXIT"
```

191 South Street, Township of Centre Wellington (Elora)
Our File: 2404979
October 27, 2025

Catchment 100: Proposed Underground Stormwater Tank

ELEV (m)	INC. DEPTH (m)	SURFACE AREA (m^2)	INCR. VOL (m^3)	ACCUM STORAGE VOL (m^3)	
389.24	0.00	141.55	0.00	0.00	Bottom of Tank
389.44	0.20	141.55	27.18	27.18	
389.64	0.40	141.55	27.18	54.36	
389.84	0.60	141.55	27.18	81.53	
390.04	0.80	141.55	27.18	108.71	Outlet 2
390.24	1.00	141.55	27.18	135.89	
390.44	1.20	141.55	27.18	163.07	
390.60	1.36	141.55	21.74	184.81	Top of Tank
391.00	1.76	0.36	0.14	184.95	Weir & T/G CBMH.10
391.10	1.86	10.00	0.52	185.47	Overflow

TANK DIMENSIONS

Length =	12.81	m
Width =	11.05	m
Height =	1.36	m
Volume =	184.8	m^3

Outlet 1 CALCULATION

Q =	0.100	m^3/s
Cd =	0.6	
H =	1.76	m
2g =	19.62	
A =	0.028	m^2
D=	0.190	m
D/2=	0.095	m
Elev=	389.23	masl

Outlet 2 CALCULATION

Q =	0.274	m^3/s
Cd =	0.6	
H =	0.87	m
2g =	19.62	
A =	0.110	m^2
D=	0.375	m
D/2=	0.1875	m
Elev=	390.04	masl

OVERFLOW WEIR

Q =	0.243	cu m/s
d1 =	0.400	m
h =	0.500	m
H =	0.100	m
2g =	19.620	
L =	6.000	m

DISCHARGE

ELEV (m)	STAGE (m)	STORAGE (m^3)	OUTLET 1 (m^3/s)	OUTLET 2 (m^3/s)	WEIR (m^3/s)	TOTAL (m^3/s)	
389.24	0.00	0.00	0.000	0.000	0.000	0.000	Bottom of Tank
389.44	0.20	27.18	0.026	0.000	0.000	0.026	
389.64	0.40	54.36	0.042	0.000	0.000	0.042	
389.84	0.60	81.53	0.054	0.000	0.000	0.054	
390.04	0.80	108.71	0.064	0.000	0.000	0.064	Outlet 2
390.24	1.00	135.89	0.072	0.045	0.000	0.117	
390.44	1.20	163.07	0.080	0.135	0.000	0.215	
390.60	1.36	184.81	0.085	0.179	0.000	0.264	Top of Tank
391.00	1.76	184.95	0.098	0.258	0.000	0.356	Weir & T/G CBMH.10
391.10	1.86	185.47	0.100	0.274	0.243	0.617	Overflow

Post-Development

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:           \\geiconsultants.com\data\Data_Storage\"
"                Working\JAMES KEATING CONSTR\2404979 - 416149 Ross Property - 191
South Street, Elora\Design Phase\Design Calcs\Modelling Files\2025-10-27"
"                Output filename:                                   Post_2yr.out"
"                Licensee name:                                                 "
"                Company                                                        "
"                Date & Time last used:                10/29/2025 at 1:24:56 PM"
" 31          TIME PARAMETERS"
"        3.000   Time Step"
"      240.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      414.876   Coefficient A"
"        0.027   Constant B"
"        0.682   Exponent C"
"        0.375   Fraction R"
"      240.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           141.792    mm/hr"
"             Total depth                  39.504    mm"
"            6   002hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 200"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          200   Catchment 200"
"       45.000   % Impervious"
"        0.070   Total Area"
"        7.000   Flow length"
"        4.000   Overland Slope"
"        0.038   Pervious Area"
"        7.000   Pervious length"
"        4.000   Pervious slope"
"        0.032   Impervious Area"
"        7.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.012     0.000     0.000     0.000 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
"             Surface Area           0.038      0.032      0.070      hectare"
"             Time of concentration  4.845      0.654      1.080      minutes"
"             Time to Centroid       97.618     111.269    109.882    minutes"
"             Rainfall depth         39.504     39.504     39.504     mm"
"             Rainfall volume        15.21      12.44      27.65      c.m"
"             Rainfall losses        36.097     2.675      21.057     mm"
"             Runoff depth           3.407      36.829     18.447     mm"
"             Runoff volume          1.31       11.60      12.91      c.m"
"             Runoff coefficient     0.086      0.932      0.467      "
"             Maximum flow           0.003      0.011      0.012      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.012     0.012     0.000     0.000"
" 33          CATCHMENT 300"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          300   Catchment 300"
"        0.000   % Impervious"
"        0.050   Total Area"
"       10.000   Flow length"
"       10.000   Overland Slope"
"        0.050   Pervious Area"
"       10.000   Pervious length"
"       10.000   Pervious slope"
"        0.000   Impervious Area"
"       10.000   Impervious length"
"       10.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.005     0.012     0.000     0.000 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           0.050      0.000      0.050      hectare"
"             Time of concentration  4.559      0.616      4.559      minutes"
"             Time to Centroid       97.341     111.133    97.341     minutes"
"             Rainfall depth         39.504     39.504     39.504     mm"
"             Rainfall volume        19.75      0.00       19.75      c.m"
"             Rainfall losses        36.115     2.810      36.115     mm"
"             Runoff depth           3.389      36.694     3.389      mm"
```

```
"             Runoff volume          1.69       0.00       1.69       c.m"
"             Runoff coefficient     0.086      0.000      0.086      "
"             Maximum flow           0.005      0.000      0.005      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.005     0.013     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.005     0.013     0.013     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Outflow from Site"
"             Maximum flow                  0.013    c.m/sec"
"             Hydrograph volume            14.607    c.m"
"                     0.005     0.013     0.013     0.013"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.005     0.000     0.013     0.013"
" 33          CATCHMENT 400"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          400   Catchment 400"
"       20.000   % Impervious"
"        1.320   Total Area"
"      300.000   Flow length"
"        2.500   Overland Slope"
"        1.056   Pervious Area"
"      300.000   Pervious length"
"        2.500   Pervious slope"
"        0.264   Impervious Area"
"      300.000   Impervious length"
"        2.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.068     0.000     0.013     0.013 c.m/sec"
"             Catchment 400          Pervious   Impervious Total Area "
"             Surface Area           1.056      0.264      1.320      hectare"
"             Time of concentration  53.182     7.183      19.340     minutes"
"             Time to Centroid       136.914    122.873    126.584    minutes"
"             Rainfall depth         39.504     39.504     39.504     mm"
```

```
"             Rainfall volume        417.16     104.29     521.45     c.m"
"             Rainfall losses        36.095     1.544      29.185     mm"
"             Runoff depth           3.409      37.960     10.319     mm"
"             Runoff volume          36.00      100.21     136.21     c.m"
"             Runoff coefficient     0.086      0.961      0.261      "
"             Maximum flow           0.013      0.067      0.068      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.068     0.068     0.013     0.013"
" 33          CATCHMENT 100"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          100   Catchment 100"
"       65.000   % Impervious"
"        0.620   Total Area"
"       50.000   Flow length"
"        3.000   Overland Slope"
"        0.217   Pervious Area"
"       50.000   Pervious length"
"        3.000   Pervious slope"
"        0.403   Impervious Area"
"       50.000   Impervious length"
"        3.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.135     0.068     0.013     0.013 c.m/sec"
"             Catchment 100          Pervious   Impervious Total Area "
"             Surface Area           0.217      0.403      0.620      hectare"
"             Time of concentration  17.184     2.321      3.013      minutes"
"             Time to Centroid       107.467    114.292    113.974    minutes"
"             Rainfall depth         39.504     39.504     39.504     mm"
"             Rainfall volume        85.72      159.20     244.92     c.m"
"             Rainfall losses        36.106     2.048      13.968     mm"
"             Runoff depth           3.398      37.456     25.536     mm"
"             Runoff volume          7.37       150.95     158.32     c.m"
"             Runoff coefficient     0.086      0.948      0.646      "
"             Maximum flow           0.007      0.134      0.135      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.135     0.175     0.013     0.013"
" 54          POND DESIGN"
```

```
"        0.175   Current peak flow    c.m/sec"
"        0.270   Target outflow    c.m/sec"
"        294.5   Hydrograph volume    c.m"
"          10.   Number of stages"
"      392.080   Minimum water level    metre"
"      393.950   Maximum water level    metre"
"      392.080   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                389.240     0.000     0.000"
"                389.440   0.02600    27.180"
"                389.640   0.04200    54.360"
"                389.840   0.05400    81.530"
"                390.040   0.06400   108.710"
"                390.240    0.1170   135.890"
"                390.440    0.2150   163.070"
"                390.600    0.2640   184.810"
"                391.000    0.3560   184.950"
"                391.100    0.6170   185.470"
"             Peak outflow                  0.057    c.m/sec"
"             Maximum level               389.893    metre"
"             Maximum storage              88.753    c.m"
"             Centroidal lag                2.350   hours"
"                  0.135     0.175     0.057     0.013 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Outflow from Site"
"             Maximum flow                  0.060    c.m/sec"
"             Hydrograph volume           309.081    c.m"
"                     0.135     0.175     0.057     0.060"
" 38          START/RE-START TOTALS 100"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      2.060    hectare"
"             Total Impervious area                     0.699    hectare"
"             Total % impervious                       33.908"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                            ie METRIC"
"                Job folder:           \\geiconsultants.com\data\Data_Storage\"
"                Working\JAMES KEATING CONSTR\2404979 - 416149 Ross Property - 191
South Street, Elora\Design Phase\Design Calcs\Modelling Files\2025-10-27"
"                Output filename:                                    Post_5yr.out"
"                Licensee name:                                                  "
"                Company                                                         "
"                Date & Time last used:                10/29/2025 at 1:25:32 PM"
" 31          TIME PARAMETERS"
"        3.000   Time Step"
"      240.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      544.711   Coefficient A"
"        0.021   Constant B"
"        0.686   Exponent C"
"        0.375   Fraction R"
"      240.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           185.154    mm/hr"
"             Total depth                  50.743    mm"
"            6   005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 200"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          200   Catchment 200"
"       45.000   % Impervious"
"        0.070   Total Area"
"        7.000   Flow length"
"        4.000   Overland Slope"
"        0.038   Pervious Area"
"        7.000   Pervious length"
"        4.000   Pervious slope"
"        0.032   Impervious Area"
"        7.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.019     0.000     0.000     0.000 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
"             Surface Area           0.038      0.032      0.070      hectare"
"             Time of concentration  3.455      0.588      1.122      minutes"
"             Time to Centroid       97.331     110.169    107.780    minutes"
"             Rainfall depth         50.743     50.743     50.743     mm"
"             Rainfall volume        19.54      15.98      35.52      c.m"
"             Rainfall losses        41.872     3.319      24.524     mm"
"             Runoff depth           8.871      47.423     26.219     mm"
"             Runoff volume          3.42       14.94      18.35      c.m"
"             Runoff coefficient     0.175      0.935      0.517      "
"             Maximum flow           0.009      0.015      0.019      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.019     0.019     0.000     0.000"
" 33          CATCHMENT 300"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          300   Catchment 300"
"        0.000   % Impervious"
"        0.050   Total Area"
"       10.000   Flow length"
"       10.000   Overland Slope"
"        0.050   Pervious Area"
"       10.000   Pervious length"
"       10.000   Pervious slope"
"        0.000   Impervious Area"
"       10.000   Impervious length"
"       10.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.011     0.019     0.000     0.000 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           0.050      0.000      0.050      hectare"
"             Time of concentration  3.251      0.553      3.251      minutes"
"             Time to Centroid       97.137     110.036    97.137     minutes"
"             Rainfall depth         50.743     50.743     50.743     mm"
"             Rainfall volume        25.37      0.00       25.37      c.m"
"             Rainfall losses        41.842     3.473      41.842     mm"
"             Runoff depth           8.900      47.270     8.900      mm"
```

```
"             Runoff volume          4.45       0.00       4.45       c.m"
"             Runoff coefficient     0.175      0.000      0.175      "
"             Maximum flow           0.011      0.000      0.011      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.011     0.025     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.011     0.025     0.025     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Outflow from Site"
"             Maximum flow                  0.025    c.m/sec"
"             Hydrograph volume            22.804    c.m"
"                     0.011     0.025     0.025     0.025"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.011     0.000     0.025     0.025"
" 33          CATCHMENT 400"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          400   Catchment 400"
"       20.000   % Impervious"
"        1.320   Total Area"
"      300.000   Flow length"
"        2.500   Overland Slope"
"        1.056   Pervious Area"
"      300.000   Pervious length"
"        2.500   Pervious slope"
"        0.264   Impervious Area"
"      300.000   Impervious length"
"        2.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.100     0.000     0.025     0.025 c.m/sec"
"             Catchment 400          Pervious   Impervious Total Area "
"             Surface Area           1.056      0.264      1.320      hectare"
"             Time of concentration  37.920     6.456      19.683     minutes"
"             Time to Centroid       130.245    120.797    124.769    minutes"
"             Rainfall depth         50.743     50.743     50.743     mm"
```

```
"             Rainfall volume        535.84     133.96     669.81     c.m"
"             Rainfall losses        41.834     1.605      33.788     mm"
"             Runoff depth           8.909      49.138     16.955     mm"
"             Runoff volume          94.08      129.72     223.81     c.m"
"             Runoff coefficient     0.176      0.968      0.334      "
"             Maximum flow           0.041      0.092      0.100      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.100     0.100     0.025     0.025"
" 33          CATCHMENT 100"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          100   Catchment 100"
"       65.000   % Impervious"
"        0.620   Total Area"
"       50.000   Flow length"
"        3.000   Overland Slope"
"        0.217   Pervious Area"
"       50.000   Pervious length"
"        3.000   Pervious slope"
"        0.403   Impervious Area"
"       50.000   Impervious length"
"        3.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.183     0.100     0.025     0.025 c.m/sec"
"             Catchment 100          Pervious   Impervious Total Area "
"             Surface Area           0.217      0.403      0.620      hectare"
"             Time of concentration  12.252     2.086      3.005      minutes"
"             Time to Centroid       105.715    113.074    112.409    minutes"
"             Rainfall depth         50.743     50.743     50.743     mm"
"             Rainfall volume        110.11     204.49     314.61     c.m"
"             Rainfall losses        41.833     2.450      16.234     mm"
"             Runoff depth           8.910      48.293     34.509     mm"
"             Runoff volume          19.34      194.62     213.96     c.m"
"             Runoff coefficient     0.176      0.952      0.680      "
"             Maximum flow           0.021      0.179      0.183      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.183     0.244     0.025     0.025"
" 54          POND DESIGN"
```

```
"        0.244   Current peak flow    c.m/sec"
"        0.270   Target outflow    c.m/sec"
"        437.8   Hydrograph volume    c.m"
"          10.   Number of stages"
"      392.080   Minimum water level    metre"
"      393.950   Maximum water level    metre"
"      392.080   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                389.240     0.000     0.000"
"                389.440   0.02600    27.180"
"                389.640   0.04200    54.360"
"                389.840   0.05400    81.530"
"                390.040   0.06400   108.710"
"                390.240    0.1170   135.890"
"                390.440    0.2150   163.070"
"                390.600    0.2640   184.810"
"                391.000    0.3560   184.950"
"                391.100    0.6170   185.470"
"             Peak outflow                  0.095    c.m/sec"
"             Maximum level               390.158    metre"
"             Maximum storage             124.760    c.m"
"             Centroidal lag                2.354   hours"
"                  0.183     0.244     0.095     0.025 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Outflow from Site"
"             Maximum flow                  0.098    c.m/sec"
"             Hydrograph volume           460.710    c.m"
"                     0.183     0.244     0.095     0.098"
" 38          START/RE-START TOTALS 100"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      2.060    hectare"
"             Total Impervious area                     0.699    hectare"
"             Total % impervious                       33.908"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                            ie METRIC"
"                Job folder:           \\geiconsultants.com\data\Data_Storage\"
"                Working\JAMES KEATING CONSTR\2404979 - 416149 Ross Property - 191
South Street, Elora\Design Phase\Design Calcs\Modelling Files\2025-10-27"
"                Output filename:                                    Post_10yr.out"
"                Licensee name:                                                  "
"                Company                                                         "
"                Date & Time last used:                10/29/2025 at 1:26:12 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      240.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      627.308   Coefficient A"
"        0.014   Constant B"
"        0.687   Exponent C"
"        0.375   Fraction R"
"      240.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           150.154    mm/hr"
"             Total depth                  58.119    mm"
"            6   010hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 200"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          200   Catchment 200"
"       45.000   % Impervious"
"        0.070   Total Area"
"        7.000   Flow length"
"        4.000   Overland Slope"
"        0.038   Pervious Area"
"        7.000   Pervious length"
"        4.000   Pervious slope"
"        0.032   Impervious Area"
"        7.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.017     0.000     0.000     0.000 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
"             Surface Area           0.038      0.032      0.070      hectare"
"             Time of concentration  3.739      0.640      1.340      minutes"
"             Time to Centroid       99.816     111.634    108.964    minutes"
"             Rainfall depth         58.119     58.119     58.119     mm"
"             Rainfall volume        22.38      18.31      40.68      c.m"
"             Rainfall losses        45.394     4.836      27.143     mm"
"             Runoff depth           12.725     53.283     30.976     mm"
"             Runoff volume          4.90       16.78      21.68      c.m"
"             Runoff coefficient     0.219      0.917      0.533      "
"             Maximum flow           0.007      0.011      0.017      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.017     0.017     0.000     0.000"
" 33          CATCHMENT 300"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          300   Catchment 300"
"        0.000   % Impervious"
"        0.050   Total Area"
"       10.000   Flow length"
"       10.000   Overland Slope"
"        0.050   Pervious Area"
"       10.000   Pervious length"
"       10.000   Pervious slope"
"        0.000   Impervious Area"
"       10.000   Impervious length"
"       10.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.010     0.017     0.000     0.000 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           0.050      0.000      0.050      hectare"
"             Time of concentration  3.518      0.602      3.518      minutes"
"             Time to Centroid       99.582     111.671    99.582     minutes"
"             Rainfall depth         58.119     58.119     58.119     mm"
"             Rainfall volume        29.06      0.00       29.06      c.m"
"             Rainfall losses        45.386     5.162      45.386     mm"
"             Runoff depth           12.733     52.957     12.733     mm"
```

```
"             Runoff volume          6.37       0.00       6.37       c.m"
"             Runoff coefficient     0.219      0.000      0.219      "
"             Maximum flow           0.010      0.000      0.010      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.010     0.026     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.010     0.026     0.026     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Outflow from Site"
"             Maximum flow                  0.026    c.m/sec"
"             Hydrograph volume            28.050    c.m"
"                     0.010     0.026     0.026     0.026"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.010     0.000     0.026     0.026"
" 33          CATCHMENT 400"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          400   Catchment 400"
"       20.000   % Impervious"
"        1.320   Total Area"
"      300.000   Flow length"
"        2.500   Overland Slope"
"        1.056   Pervious Area"
"      300.000   Pervious length"
"        2.500   Pervious slope"
"        0.264   Impervious Area"
"      300.000   Impervious length"
"        2.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.105     0.000     0.026     0.026 c.m/sec"
"             Catchment 400          Pervious   Impervious Total Area "
"             Surface Area           1.056      0.264      1.320      hectare"
"             Time of concentration  41.044     7.020      23.552     minutes"
"             Time to Centroid       138.709    121.308    129.763    minutes"
"             Rainfall depth         58.119     58.119     58.119     mm"
```

```
"             Rainfall volume        613.74     153.43     767.17     c.m"
"             Rainfall losses        44.827     1.862      36.234     mm"
"             Runoff depth           13.292     56.257     21.885     mm"
"             Runoff volume          140.36     148.52     288.88     c.m"
"             Runoff coefficient     0.229      0.968      0.377      "
"             Maximum flow           0.052      0.091      0.105      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.105     0.105     0.026     0.026"
" 33          CATCHMENT 100"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          100   Catchment 100"
"       65.000   % Impervious"
"        0.620   Total Area"
"       50.000   Flow length"
"        3.000   Overland Slope"
"        0.217   Pervious Area"
"       50.000   Pervious length"
"        3.000   Pervious slope"
"        0.403   Impervious Area"
"       50.000   Impervious length"
"        3.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.161     0.105     0.026     0.026 c.m/sec"
"             Catchment 100          Pervious   Impervious Total Area "
"             Surface Area           0.217      0.403      0.620      hectare"
"             Time of concentration  13.262     2.268      3.505      minutes"
"             Time to Centroid       109.871    113.591    113.172    minutes"
"             Rainfall depth         58.119     58.119     58.119     mm"
"             Rainfall volume        126.12     234.22     360.34     c.m"
"             Rainfall losses        44.910     1.986      17.009     mm"
"             Runoff depth           13.209     56.134     41.110     mm"
"             Runoff volume          28.66      226.22     254.88     c.m"
"             Runoff coefficient     0.227      0.966      0.707      "
"             Maximum flow           0.025      0.154      0.161      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.161     0.236     0.026     0.026"
" 54          POND DESIGN"
```

```
"        0.236   Current peak flow    c.m/sec"
"        0.270   Target outflow    c.m/sec"
"        543.8   Hydrograph volume    c.m"
"          10.   Number of stages"
"      392.080   Minimum water level    metre"
"      393.950   Maximum water level    metre"
"      392.080   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                389.240     0.000     0.000"
"                389.440   0.02600    27.180"
"                389.640   0.04200    54.360"
"                389.840   0.05400    81.530"
"                390.040   0.06400   108.710"
"                390.240    0.1170   135.890"
"                390.440    0.2150   163.070"
"                390.600    0.2640   184.810"
"                391.000    0.3560   184.950"
"                391.100    0.6170   185.470"
"             Peak outflow                  0.129    c.m/sec"
"             Maximum level               390.264    metre"
"             Maximum storage             139.101    c.m"
"             Centroidal lag                2.394   hours"
"                  0.161     0.236     0.129     0.026 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Outflow from Site"
"             Maximum flow                  0.133    c.m/sec"
"             Hydrograph volume           572.591    c.m"
"                     0.161     0.236     0.129     0.133"
" 38          START/RE-START TOTALS 100"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      2.060    hectare"
"             Total Impervious area                     0.699    hectare"
"             Total % impervious                       33.908"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                            ie METRIC"
"                Job folder:           \\geiconsultants.com\data\Data_Storage\"
"                Working\JAMES KEATING CONSTR\2404979 - 416149 Ross Property - 191
South Street, Elora\Design Phase\Design Calcs\Modelling Files\2025-10-27"
"                Output filename:                                    Post_25yr.out"
"                Licensee name:                                                  "
"                Company                                                         "
"                Date & Time last used:                10/29/2025 at 1:26:55 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      240.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      746.059   Coefficient A"
"        0.085   Constant B"
"        0.692   Exponent C"
"        0.375   Fraction R"
"      240.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           175.654    mm/hr"
"             Total depth                  67.239    mm"
"            6   025hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 200"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          200   Catchment 200"
"       45.000   % Impervious"
"        0.070   Total Area"
"        7.000   Flow length"
"        4.000   Overland Slope"
"        0.038   Pervious Area"
"        7.000   Pervious length"
"        4.000   Pervious slope"
"        0.032   Impervious Area"
"        7.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.022     0.000     0.000     0.000 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
"             Surface Area           0.038      0.032      0.070      hectare"
"             Time of concentration  3.442      0.601      1.375      minutes"
"             Time to Centroid       100.486    111.156    108.249    minutes"
"             Rainfall depth         67.239     67.239     67.239     mm"
"             Rainfall volume        25.89      21.18      47.07      c.m"
"             Rainfall losses        48.411     5.774      29.224     mm"
"             Runoff depth           18.828     61.465     38.015     mm"
"             Runoff volume          7.25       19.36      26.61      c.m"
"             Runoff coefficient     0.280      0.914      0.565      "
"             Maximum flow           0.009      0.013      0.022      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.022     0.022     0.000     0.000"
" 33          CATCHMENT 300"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          300   Catchment 300"
"        0.000   % Impervious"
"        0.050   Total Area"
"       10.000   Flow length"
"       10.000   Overland Slope"
"        0.050   Pervious Area"
"       10.000   Pervious length"
"       10.000   Pervious slope"
"        0.000   Impervious Area"
"       10.000   Impervious length"
"       10.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.012     0.022     0.000     0.000 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           0.050      0.000      0.050      hectare"
"             Time of concentration  3.239      0.565      3.239      minutes"
"             Time to Centroid       100.274    111.177    100.274    minutes"
"             Rainfall depth         67.239     67.239     67.239     mm"
"             Rainfall volume        33.62      0.00       33.62      c.m"
"             Rainfall losses        48.248     6.186      48.248     mm"
"             Runoff depth           18.991     61.053     18.991     mm"
```

```
"             Runoff volume          9.50       0.00       9.50       c.m"
"             Runoff coefficient     0.282      0.000      0.282      "
"             Maximum flow           0.012      0.000      0.012      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.012     0.035     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.012     0.035     0.035     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Outflow from Site"
"             Maximum flow                  0.035    c.m/sec"
"             Hydrograph volume            36.106    c.m"
"                     0.012     0.035     0.035     0.035"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.012     0.000     0.035     0.035"
" 33          CATCHMENT 400"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          400   Catchment 400"
"       20.000   % Impervious"
"        1.320   Total Area"
"      300.000   Flow length"
"        2.500   Overland Slope"
"        1.056   Pervious Area"
"      300.000   Pervious length"
"        2.500   Pervious slope"
"        0.264   Impervious Area"
"      300.000   Impervious length"
"        2.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.128     0.000     0.035     0.035 c.m/sec"
"             Catchment 400          Pervious   Impervious Total Area "
"             Surface Area           1.056      0.264      1.320      hectare"
"             Time of concentration  37.783     6.593      23.596     minutes"
"             Time to Centroid       138.702    120.175    130.274    minutes"
"             Rainfall depth         67.239     67.239     67.239     mm"
```

```
"             Rainfall volume        710.04     177.51     887.55     c.m"
"             Rainfall losses        47.710     2.058      38.580     mm"
"             Runoff depth           19.529     65.181     28.659     mm"
"             Runoff volume          206.22     172.08     378.30     c.m"
"             Runoff coefficient     0.290      0.969      0.426      "
"             Maximum flow           0.072      0.105      0.128      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.128     0.128     0.035     0.035"
" 33          CATCHMENT 100"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          100   Catchment 100"
"       65.000   % Impervious"
"        0.620   Total Area"
"       50.000   Flow length"
"        3.000   Overland Slope"
"        0.217   Pervious Area"
"       50.000   Pervious length"
"        3.000   Pervious slope"
"        0.403   Impervious Area"
"       50.000   Impervious length"
"        3.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.192     0.128     0.035     0.035 c.m/sec"
"             Catchment 100          Pervious   Impervious Total Area "
"             Surface Area           0.217      0.403      0.620      hectare"
"             Time of concentration  12.208     2.130      3.530      minutes"
"             Time to Centroid       110.342    112.890    112.536    minutes"
"             Rainfall depth         67.239     67.239     67.239     mm"
"             Rainfall volume        145.91     270.97     416.88     c.m"
"             Rainfall losses        47.742     2.120      18.088     mm"
"             Runoff depth           19.497     65.119     49.151     mm"
"             Runoff volume          42.31      262.43     304.74     c.m"
"             Runoff coefficient     0.290      0.968      0.731      "
"             Maximum flow           0.035      0.181      0.192      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.192     0.286     0.035     0.035"
" 54          POND DESIGN"
```

```
"        0.286   Current peak flow    c.m/sec"
"        0.270   Target outflow    c.m/sec"
"        683.0   Hydrograph volume    c.m"
"          10.   Number of stages"
"      392.080   Minimum water level    metre"
"      393.950   Maximum water level    metre"
"      392.080   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                389.240     0.000     0.000"
"                389.440   0.02600    27.180"
"                389.640   0.04200    54.360"
"                389.840   0.05400    81.530"
"                390.040   0.06400   108.710"
"                390.240    0.1170   135.890"
"                390.440    0.2150   163.070"
"                390.600    0.2640   184.810"
"                391.000    0.3560   184.950"
"                391.100    0.6170   185.470"
"             Peak outflow                  0.184    c.m/sec"
"             Maximum level               390.382    metre"
"             Maximum storage             155.164    c.m"
"             Centroidal lag                2.372   hours"
"                  0.192     0.286     0.184     0.035 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Outflow from Site"
"             Maximum flow                  0.189    c.m/sec"
"             Hydrograph volume           719.820    c.m"
"                     0.192     0.286     0.184     0.189"
" 38          START/RE-START TOTALS 100"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      2.060    hectare"
"             Total Impervious area                     0.699    hectare"
"             Total % impervious                       33.908"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                            ie METRIC"
"                Job folder:           \\geiconsultants.com\data\Data_Storage\"
"                Working\JAMES KEATING CONSTR\2404979 - 416149 Ross Property - 191
South Street, Elora\Design Phase\Design Calcs\Modelling Files\2025-10-27"
"                Output filename:                                    Post_50yr.out"
"                Licensee name:                                                  "
"                Company                                                         "
"                Date & Time last used:                10/29/2025 at 1:27:32 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      240.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      820.361   Coefficient A"
"        0.010   Constant B"
"        0.691   Exponent C"
"        0.375   Fraction R"
"      240.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           194.803    mm/hr"
"             Total depth                  74.358    mm"
"            6   050hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 200"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          200   Catchment 200"
"       45.000   % Impervious"
"        0.070   Total Area"
"        7.000   Flow length"
"        4.000   Overland Slope"
"        0.038   Pervious Area"
"        7.000   Pervious length"
"        4.000   Pervious slope"
"        0.032   Impervious Area"
"        7.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.026     0.000     0.000     0.000 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
"             Surface Area           0.038      0.032      0.070      hectare"
"             Time of concentration  3.268      0.576      1.387      minutes"
"             Time to Centroid       101.060    110.975    107.990    minutes"
"             Rainfall depth         74.358     74.358     74.358     mm"
"             Rainfall volume        28.63      23.42      52.05      c.m"
"             Rainfall losses        50.449     6.524      30.683     mm"
"             Runoff depth           23.908     67.834     43.675     mm"
"             Runoff volume          9.20       21.37      30.57      c.m"
"             Runoff coefficient     0.322      0.912      0.587      "
"             Maximum flow           0.012      0.015      0.026      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.026     0.026     0.000     0.000"
" 33          CATCHMENT 300"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          300   Catchment 300"
"        0.000   % Impervious"
"        0.050   Total Area"
"       10.000   Flow length"
"       10.000   Overland Slope"
"        0.050   Pervious Area"
"       10.000   Pervious length"
"       10.000   Pervious slope"
"        0.000   Impervious Area"
"       10.000   Impervious length"
"       10.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.016     0.026     0.000     0.000 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           0.050      0.000      0.050      hectare"
"             Time of concentration  3.075      0.542      3.075      minutes"
"             Time to Centroid       100.863    110.989    100.863    minutes"
"             Rainfall depth         74.358     74.358     74.358     mm"
"             Rainfall volume        37.18      0.00       37.18      c.m"
"             Rainfall losses        50.290     7.006      50.290     mm"
"             Runoff depth           24.067     67.352     24.068     mm"
```

```
"             Runoff volume          12.03      0.00       12.03      c.m"
"             Runoff coefficient     0.324      0.000      0.324      "
"             Maximum flow           0.016      0.000      0.016      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.016     0.042     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.016     0.042     0.042     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Outflow from Site"
"             Maximum flow                  0.042    c.m/sec"
"             Hydrograph volume            42.606    c.m"
"                     0.016     0.042     0.042     0.042"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.016     0.000     0.042     0.042"
" 33          CATCHMENT 400"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          400   Catchment 400"
"       20.000   % Impervious"
"        1.320   Total Area"
"      300.000   Flow length"
"        2.500   Overland Slope"
"        1.056   Pervious Area"
"      300.000   Pervious length"
"        2.500   Pervious slope"
"        0.264   Impervious Area"
"      300.000   Impervious length"
"        2.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.146     0.000     0.042     0.042 c.m/sec"
"             Catchment 400          Pervious   Impervious Total Area "
"             Surface Area           1.056      0.264      1.320      hectare"
"             Time of concentration  35.872     6.326      23.352     minutes"
"             Time to Centroid       138.555    119.576    130.513    minutes"
"             Rainfall depth         74.358     74.358     74.358     mm"
```

```
"             Rainfall volume        785.22     196.30     981.52     c.m"
"             Rainfall losses        49.791     2.095      40.252     mm"
"             Runoff depth           24.567     72.262     34.106     mm"
"             Runoff volume          259.43     190.77     450.20     c.m"
"             Runoff coefficient     0.330      0.972      0.459      "
"             Maximum flow           0.091      0.116      0.146      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.146     0.146     0.042     0.042"
" 33          CATCHMENT 100"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          100   Catchment 100"
"       65.000   % Impervious"
"        0.620   Total Area"
"       50.000   Flow length"
"        3.000   Overland Slope"
"        0.217   Pervious Area"
"       50.000   Pervious length"
"        3.000   Pervious slope"
"        0.403   Impervious Area"
"       50.000   Impervious length"
"        3.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.217     0.146     0.042     0.042 c.m/sec"
"             Catchment 100          Pervious   Impervious Total Area "
"             Surface Area           0.217      0.403      0.620      hectare"
"             Time of concentration  11.591     2.044      3.524      minutes"
"             Time to Centroid       110.732    112.561    112.278    minutes"
"             Rainfall depth         74.358     74.358     74.358     mm"
"             Rainfall volume        161.36     299.66     461.02     c.m"
"             Rainfall losses        49.795     2.259      18.896     mm"
"             Runoff depth           24.563     72.099     55.461     mm"
"             Runoff volume          53.30      290.56     343.86     c.m"
"             Runoff coefficient     0.330      0.970      0.746      "
"             Maximum flow           0.043      0.201      0.217      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.217     0.325     0.042     0.042"
" 54          POND DESIGN"
```

```
"        0.325   Current peak flow    c.m/sec"
"        0.270   Target outflow    c.m/sec"
"        794.1   Hydrograph volume    c.m"
"          10.   Number of stages"
"      392.080   Minimum water level    metre"
"      393.950   Maximum water level    metre"
"      392.080   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                389.240     0.000     0.000"
"                389.440   0.02600    27.180"
"                389.640   0.04200    54.360"
"                389.840   0.05400    81.530"
"                390.040   0.06400   108.710"
"                390.240    0.1170   135.890"
"                390.440    0.2150   163.070"
"                390.600    0.2640   184.810"
"                391.000    0.3560   184.950"
"                391.100    0.6170   185.470"
"             Peak outflow                  0.220    c.m/sec"
"             Maximum level               390.469    metre"
"             Maximum storage             166.993    c.m"
"             Centroidal lag                2.358   hours"
"                  0.217     0.325     0.220     0.042 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Outflow from Site"
"             Maximum flow                  0.227    c.m/sec"
"             Hydrograph volume           835.771    c.m"
"                     0.217     0.325     0.220     0.227"
" 38          START/RE-START TOTALS 100"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      2.060    hectare"
"             Total Impervious area                     0.699    hectare"
"             Total % impervious                       33.908"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                            ie METRIC"
"                Job folder:           \\geiconsultants.com\data\Data_Storage\"
"                Working\JAMES KEATING CONSTR\2404979 - 416149 Ross Property - 191
South Street, Elora\Design Phase\Design Calcs\Modelling Files\2025-10-27"
"                Output filename:                                    Post_100yr.out"
"                Licensee name:                                                  "
"                Company                                                         "
"                Date & Time last used:                10/29/2025 at 1:18:58 PM"
" 31          TIME PARAMETERS"
"        3.000   Time Step"
"      240.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      901.088   Coefficient A"
"        0.043   Constant B"
"        0.692   Exponent C"
"        0.375   Fraction R"
"      240.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           302.460    mm/hr"
"             Total depth                  81.221    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 200"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          200   Catchment 200"
"       45.000   % Impervious"
"        0.070   Total Area"
"        7.000   Flow length"
"        4.000   Overland Slope"
"        0.038   Pervious Area"
"        7.000   Pervious length"
"        4.000   Pervious slope"
"        0.032   Impervious Area"
"        7.000   Impervious length"
"        4.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.041     0.000     0.000     0.000 c.m/sec"
"             Catchment 200          Pervious   Impervious Total Area "
"             Surface Area           0.038      0.032      0.070      hectare"
"             Time of concentration  2.690      0.483      1.192      minutes"
"             Time to Centroid       100.076    108.662    105.905    minutes"
"             Rainfall depth         81.221     81.221     81.221     mm"
"             Rainfall volume        31.27      25.58      56.85      c.m"
"             Rainfall losses        51.766     5.093      30.763     mm"
"             Runoff depth           29.455     76.128     50.458     mm"
"             Runoff volume          11.34      23.98      35.32      c.m"
"             Runoff coefficient     0.363      0.937      0.621      "
"             Maximum flow           0.020      0.024      0.041      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.041     0.041     0.000     0.000"
" 33          CATCHMENT 300"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          300   Catchment 300"
"        0.000   % Impervious"
"        0.050   Total Area"
"       10.000   Flow length"
"       10.000   Overland Slope"
"        0.050   Pervious Area"
"       10.000   Pervious length"
"       10.000   Pervious slope"
"        0.000   Impervious Area"
"       10.000   Impervious length"
"       10.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.025     0.041     0.000     0.000 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           0.050      0.000      0.050      hectare"
"             Time of concentration  2.531      0.455      2.531      minutes"
"             Time to Centroid       99.871     108.742    99.871     minutes"
"             Rainfall depth         81.221     81.221     81.221     mm"
"             Rainfall volume        40.61      0.00       40.61      c.m"
"             Rainfall losses        51.886     5.171      51.886     mm"
"             Runoff depth           29.335     76.049     29.335     mm"
```

```
"             Runoff volume          14.67      0.00       14.67      c.m"
"             Runoff coefficient     0.361      0.000      0.361      "
"             Maximum flow           0.025      0.000      0.025      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.025     0.065     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.025     0.065     0.065     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Outflow from Site"
"             Maximum flow                  0.065    c.m/sec"
"             Hydrograph volume            49.988    c.m"
"                     0.025     0.065     0.065     0.065"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.025     0.000     0.065     0.065"
" 33          CATCHMENT 400"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          400   Catchment 400"
"       20.000   % Impervious"
"        1.320   Total Area"
"      300.000   Flow length"
"        2.500   Overland Slope"
"        1.056   Pervious Area"
"      300.000   Pervious length"
"        2.500   Pervious slope"
"        0.264   Impervious Area"
"      300.000   Impervious length"
"        2.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.197     0.000     0.065     0.065 c.m/sec"
"             Catchment 400          Pervious   Impervious Total Area "
"             Surface Area           1.056      0.264      1.320      hectare"
"             Time of concentration  29.529     5.305      19.825     minutes"
"             Time to Centroid       134.559    117.611    127.770    minutes"
"             Rainfall depth         81.221     81.221     81.221     mm"
```

```
"             Rainfall volume        857.69     214.42     1072.11    c.m"
"             Rainfall losses        51.489     1.743      41.540     mm"
"             Runoff depth           29.732     79.478     39.681     mm"
"             Runoff volume          313.97     209.82     523.79     c.m"
"             Runoff coefficient     0.366      0.979      0.489      "
"             Maximum flow           0.130      0.165      0.197      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.197     0.197     0.065     0.065"
" 33          CATCHMENT 100"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          100   Catchment 100"
"       65.000   % Impervious"
"        0.620   Total Area"
"       50.000   Flow length"
"        3.000   Overland Slope"
"        0.217   Pervious Area"
"       50.000   Pervious length"
"        3.000   Pervious slope"
"        0.403   Impervious Area"
"       50.000   Impervious length"
"        3.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.322     0.197     0.065     0.065 c.m/sec"
"             Catchment 100          Pervious   Impervious Total Area "
"             Surface Area           0.217      0.403      0.620      hectare"
"             Time of concentration  9.541      1.714      3.034      minutes"
"             Time to Centroid       108.871    111.074    110.702    minutes"
"             Rainfall depth         81.221     81.221     81.221     mm"
"             Rainfall volume        176.25     327.32     503.57     c.m"
"             Rainfall losses        51.613     2.651      19.788     mm"
"             Runoff depth           29.608     78.570     61.433     mm"
"             Runoff volume          64.25      316.64     380.88     c.m"
"             Runoff coefficient     0.365      0.967      0.756      "
"             Maximum flow           0.071      0.303      0.322      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.322     0.451     0.065     0.065"
" 54          POND DESIGN"
```

```
"        0.451   Current peak flow    c.m/sec"
"        0.270   Target outflow    c.m/sec"
"        904.7   Hydrograph volume    c.m"
"          10.   Number of stages"
"      392.080   Minimum water level    metre"
"      393.950   Maximum water level    metre"
"      392.080   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                389.240     0.000     0.000"
"                389.440   0.02600    27.180"
"                389.640   0.04200    54.360"
"                389.840   0.05400    81.530"
"                390.040   0.06400   108.710"
"                390.240    0.1170   135.890"
"                390.440    0.2150   163.070"
"                390.600    0.2640   184.810"
"                391.000    0.3560   184.950"
"                391.100    0.6170   185.470"
"             Peak outflow                  0.261    c.m/sec"
"             Maximum level               390.596    metre"
"             Maximum storage             184.204    c.m"
"             Centroidal lag                2.302   hours"
"                  0.322     0.451     0.261     0.065 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                Total Outflow from Site"
"             Maximum flow                  0.276    c.m/sec"
"             Hydrograph volume           954.918    c.m"
"                     0.322     0.451     0.261     0.276"
" 38          START/RE-START TOTALS 100"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      2.060    hectare"
"             Total Impervious area                     0.699    hectare"
"             Total % impervious                       33.908"
" 19          EXIT"
```

Appendix D Oil/Grit Separator Sizing Results

Stormceptor®

Rinker MATERIALS™

Stormceptor® EF Sizing Report

Imbrium® Systems
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

09/04/2025

Province:	Ontario
City:	Township of Centre Wellington (Elora)
Nearest Rainfall Station:	WATERLOO WELLINGTON AP
Climate Station Id:	6149387
Years of Rainfall Data:	34

Site Name:	

Drainage Area (ha):	2.01
% Imperviousness:	35.00

Runoff Coefficient 'c': 0.51

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

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	38.84
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	Yes
Upstream Orifice Control Flow Rate to Stormceptor (L/s):	261.00
Peak Conveyance (maximum) Flow Rate (L/s):	
Influent TSS Concentration (mg/L):	200
Estimated Average Annual Sediment Load (kg/yr):	807
Estimated Average Annual Sediment Volume (L/yr):	656

Project Name:	191 Wellington Rd 7 and 290 South St
Project Number:	2404979
Designer Name:	Sabrina Jivani
Designer Company:	GEI
Designer Email:	sjivani@geiconsultants.com
Designer Phone:	416-689-7699
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	69
EFO5	76
EFO6	82
EFO8	89
EFO10	93
EFO12	96

Recommended Stormceptor EFO Model: EFO6

Estimated Net Annual Sediment (TSS) Load Reduction (%): 82

Water Quality Runoff Volume Capture (%): > 90

imbrium

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.

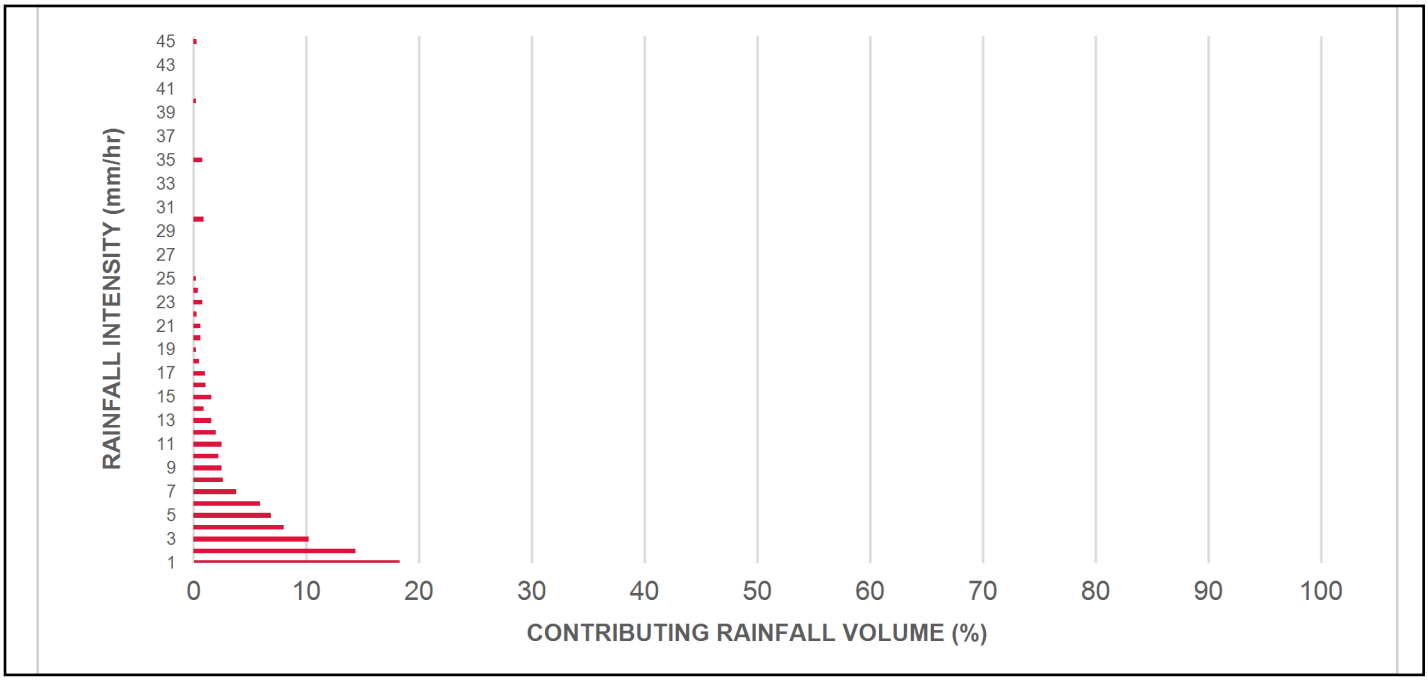
Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

Upstream Flow Controlled Results

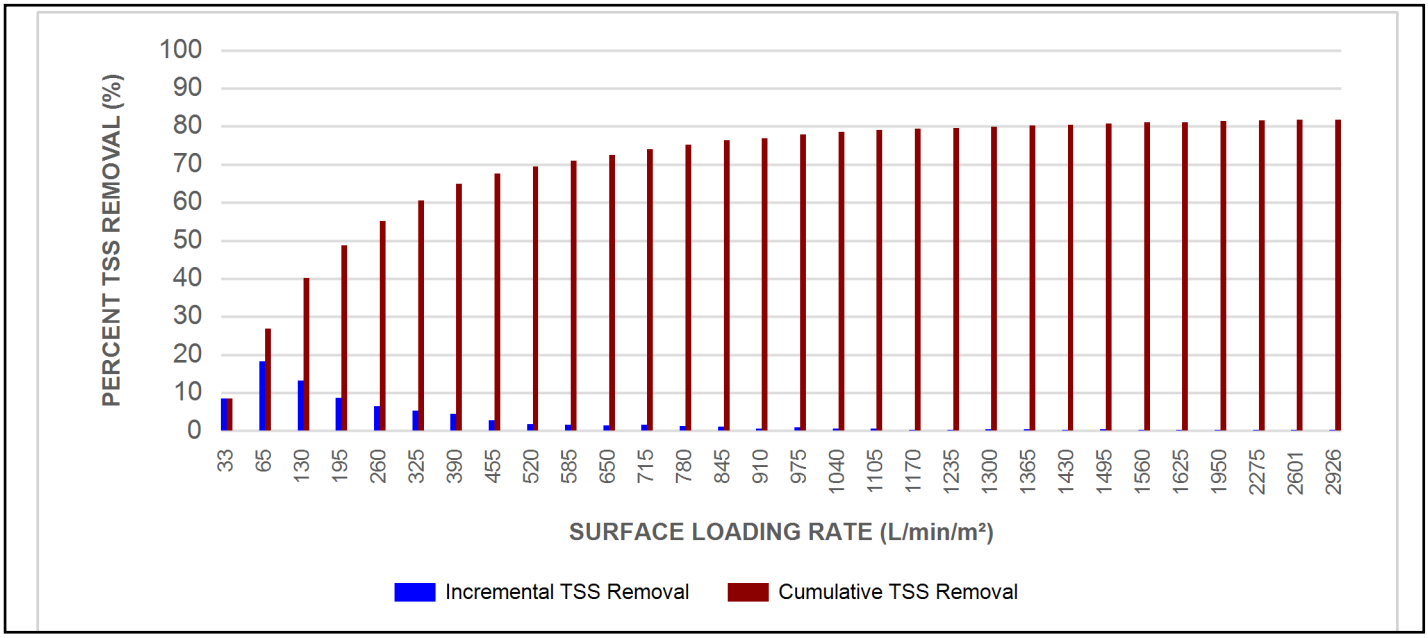
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	8.5	8.5	1.42	85.0	33.0	100	8.5	8.5
1.00	18.3	26.8	2.85	171.0	65.0	100	18.3	26.8
2.00	14.4	41.3	5.70	342.0	130.0	92	13.3	40.1
3.00	10.2	51.5	8.55	513.0	195.0	84	8.6	48.7
4.00	8.0	59.5	11.40	684.0	260.0	80	6.4	55.2
5.00	6.9	66.4	14.25	855.0	325.0	78	5.4	60.5
6.00	5.9	72.3	17.10	1026.0	390.0	74	4.4	64.9
7.00	3.8	76.1	19.95	1197.0	455.0	72	2.7	67.6
8.00	2.6	78.7	22.80	1368.0	520.0	68	1.8	69.4
9.00	2.5	81.1	25.65	1539.0	585.0	66	1.6	71.0
10.00	2.2	83.3	28.50	1710.0	650.0	64	1.4	72.4
11.00	2.5	85.8	31.35	1881.0	715.0	64	1.6	74.0
12.00	2.0	87.8	34.20	2052.0	780.0	63	1.3	75.2
13.00	1.6	89.4	37.05	2223.0	845.0	63	1.0	76.3
14.00	0.9	90.4	39.90	2394.0	910.0	62	0.6	76.8
15.00	1.6	91.9	42.75	2565.0	975.0	62	1.0	77.8
16.00	1.1	93.0	45.60	2736.0	1040.0	61	0.7	78.5
17.00	1.0	94.0	48.45	2907.0	1105.0	59	0.6	79.1
18.00	0.5	94.6	51.30	3078.0	1170.0	58	0.3	79.4
19.00	0.2	94.8	54.15	3249.0	1235.0	56	0.1	79.5
20.00	0.6	95.4	57.00	3420.0	1300.0	55	0.3	79.9
21.00	0.6	96.1	59.85	3591.0	1365.0	53	0.3	80.2
22.00	0.3	96.4	62.70	3762.0	1430.0	51	0.1	80.4
23.00	0.8	97.2	65.54	3933.0	1495.0	49	0.4	80.8
24.00	0.4	97.6	68.39	4104.0	1560.0	47	0.2	81.0
25.00	0.2	97.8	71.24	4275.0	1625.0	45	0.1	81.0
30.00	0.9	98.7	85.49	5130.0	1950.0	38	0.3	81.4
35.00	0.8	99.5	99.74	5985.0	2275.0	32	0.3	81.6
40.00	0.2	99.7	113.99	6839.0	2601.0	28	0.1	81.7
45.00	0.3	100.0	128.24	7694.0	2926.0	25	0.1	81.8
Estimated Net Annual Sediment (TSS) Load Reduction =								**82 %**

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



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
EF5 / EFO5	1.5	5	90	762	30	762	30	710	25
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

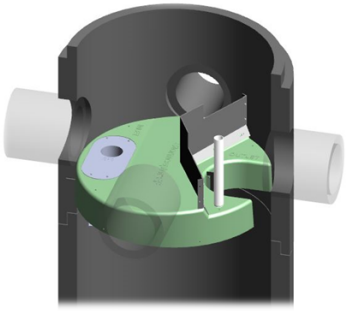
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test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

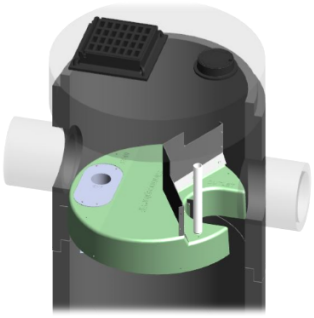
DESIGN FLEXIBILITY

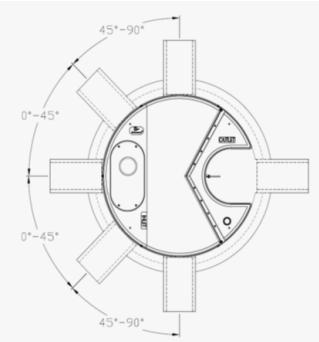
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend 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
EF5 / EFO5	1.5	5	1.62	5.3	420	111	305	10	2124	75	2612	5758
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 TREAMENT 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
	5 ft (1524 mm) Diameter OGS Units:	1.95 m^3 sediment / 420 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.

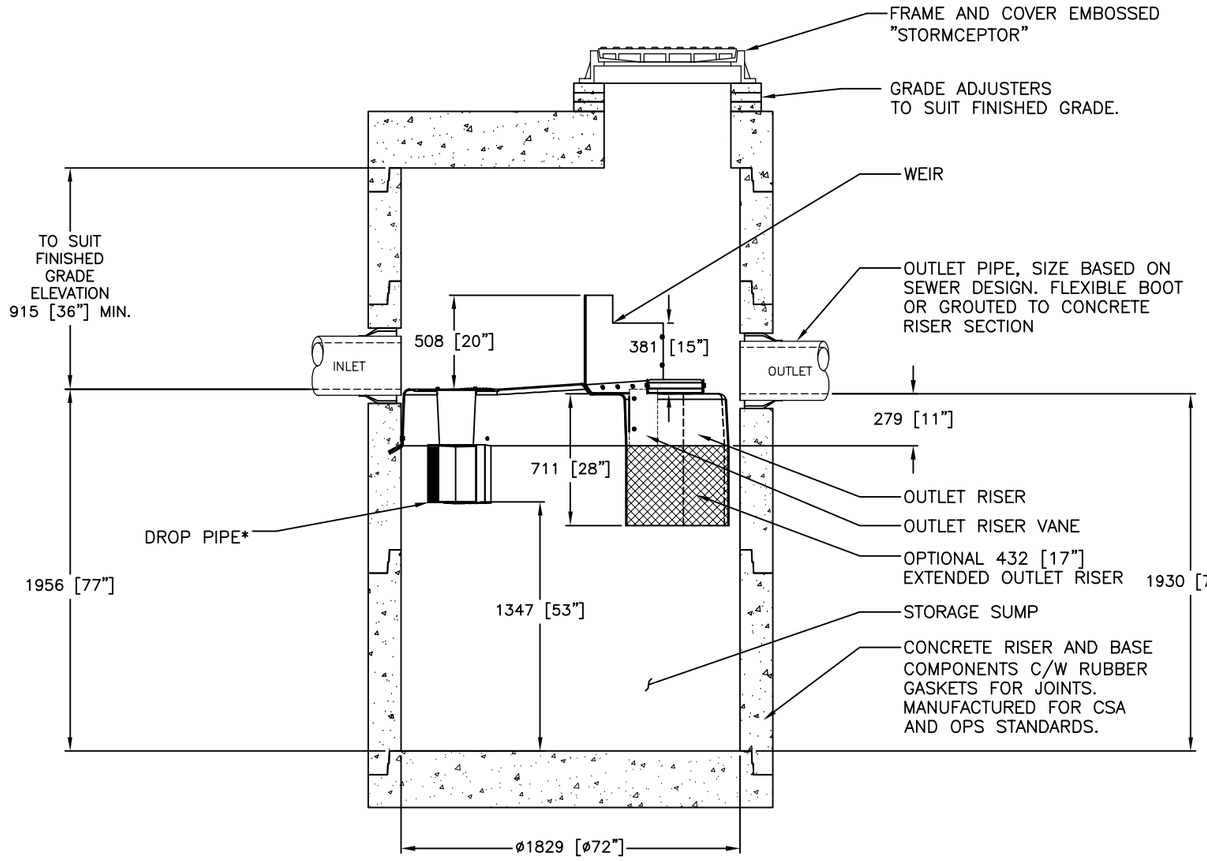
3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid

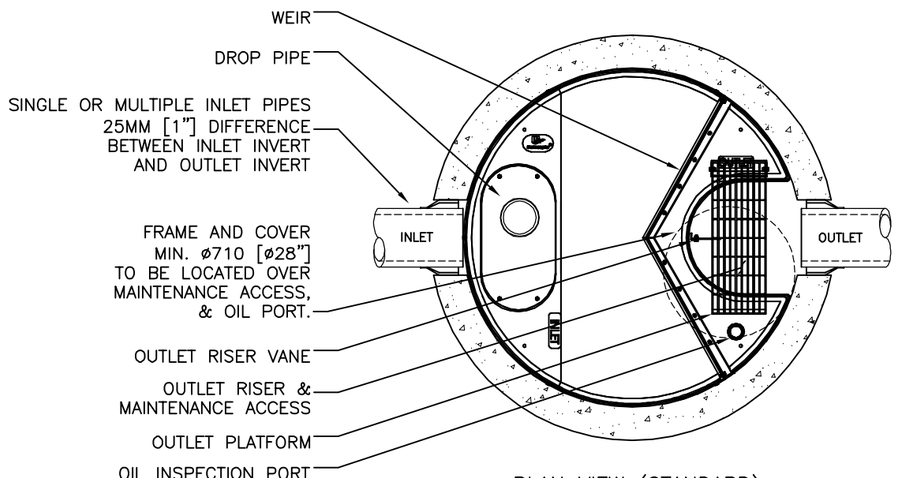
Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density 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.

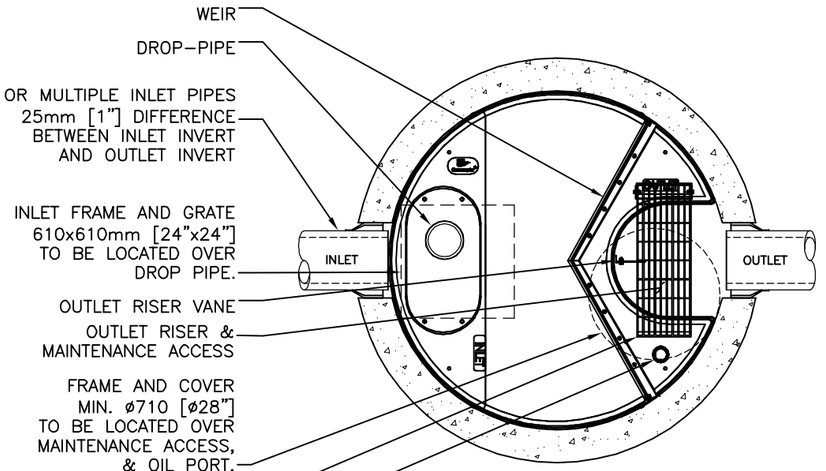
DRAWING NOT TO BE USED FOR CONSTRUCTION



SECTION VIEW



PLAN VIEW (STANDARD)



PLAN VIEW (INLET TOP)

GENERAL NOTES:

* MAXIMUM SURFACE LOADING RATE (SLR) INTO LOWER CHAMBER THROUGH DROP PIPE IS 1135 L/min/m^2 (27.9 gpm/ft^2) FOR STORMCEPTOR EF6 AND 535 L/min/m^2 (13.1 gpm/ft^2) FOR STORMCEPTOR EFO6 (OIL CAPTURE CONFIGURATION).

1. ALL DIMENSIONS INDICATED ARE IN MILLIMETERS (INCHES) UNLESS OTHERWISE SPECIFIED.
2. STORMCEPTOR STRUCTURE INLET AND OUTLET PIPE SIZE AND ORIENTATION SHOWN FOR INFORMATIONAL PURPOSES ONLY.
3. UNLESS OTHERWISE NOTED, BYPASS INFRASTRUCTURE, SUCH AS ALL UPSTREAM DIVERSION STRUCTURES, CONNECTING STRUCTURES, OR PIPE CONDUITS CONNECTING TO COMPLETE THE STORMCEPTOR SYSTEM SHALL BE PROVIDED AND ADDRESSED SEPARATELY.
4. DRAWING FOR INFORMATION PURPOSES ONLY. REFER TO ENGINEER'S SITE/UTILITY PLAN FOR STRUCTURE ORIENTATION.
5. NO PRODUCT SUBSTITUTIONS SHALL BE ACCEPTED UNLESS SUBMITTED 10 DAYS PRIOR TO PROJECT BID DATE, OR AS DIRECTED BY THE ENGINEER OF RECORD.

INSTALLATION NOTES

A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STRUCTURE (LIFTING CLUTCHES PROVIDED)
C. CONTRACTOR WILL INSTALL AND LEVEL THE STRUCTURE, SEALING THE JOINTS, LINE ENTRY AND EXIT POINTS (NON-SHRINK GROUT WITH APPROVED WATERSTOP OR FLEXIBLE BOOT)
D. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT THE DEVICE FROM CONSTRUCTION-RELATED EROSION RUNOFF.
E. DEVICE ACTIVATION, BY CONTRACTOR, SHALL OCCUR ONLY AFTER SITE HAS BEEN STABILIZED AND THE STORMCEPTOR UNIT IS CLEAN AND FREE OF DEBRIS.

FOR SITE SPECIFIC DRAWINGS PLEASE CONTACT YOUR LOCAL STORMCEPTOR REPRESENTATIVE. SITE SPECIFIC DRAWINGS ARE BASED ON THE BEST AVAILABLE INFORMATION AT THE TIME. SOME FIELD REVISIONS TO THE SYSTEM LOCATION OR CONNECTION PIPING MAY BE NECESSARY BASED ON AVAILABLE SPACE OR SITE CONFIGURATION REVISIONS. ELEVATIONS SHOULD BE MAINTAINED EXCEPT WHERE NOTED ON BYPASS STRUCTURE (IF REQUIRED).

STANDARD DETAIL
NOT FOR CONSTRUCTION

SITE SPECIFIC DATA REQUIREMENTS

STORMCEPTOR MODEL	EFO6				
STRUCTURE ID					*
HYDROCARBON STORAGE REQ'D (L)					*
WATER QUALITY FLOW RATE (L/s)					*
PEAK FLOW RATE (L/s)					*
RETURN PERIOD OF PEAK FLOW (yrs)					*
DRAINAGE AREA (HA)					*
DRAINAGE AREA IMPERVIOUSNESS (%)					*
PIPE DATA:	I.E.	MAT'L	DIA	SLOPE %	HGL
INLET #1	*	*	*	*	*
INLET #2	*	*	*	*	*
OUTLET	*	*	*	*	*

* PER ENGINEER OF RECORD

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MARK	DATE	REVISION DESCRIPTION	BY
1	6/8/18	OUTLET PLATFORM	JSK
0	05/26/17	INITIAL RELEASE	JSK

Stormceptor® EF

imbrium®
407 FAIRVIEW DRIVE, WHITBY, ON L1N 9J9
TF 800-565-4801 CA 416-980-5900 INTL +1-416-980-5900

THE STORMCEPTOR® SYSTEM IS PROTECTED BY ONE OR MORE OF THE FOLLOWING PATENTS: CA 2,329,354; CA 2,432,720; CA 2,514,179; CA 2,514,180; CA 2,514,181; CA 2,514,182; CA 2,514,183; CA 2,514,184; CA 2,514,185; CA 2,514,186; CA 2,514,187; CA 2,514,188; CA 2,514,189; CA 2,514,190; CA 2,514,191; CA 2,514,192; CA 2,514,193; CA 2,514,194; CA 2,514,195; CA 2,514,196; CA 2,514,197; CA 2,514,198; CA