

Stormwater Management Design Report

Proposed Residential Development 73/79 Sideroad 19

Township of Centre Wellington (Fergus), Ontario

Submitted to:

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May 5, 2026

Project No. 2401073 / 122025

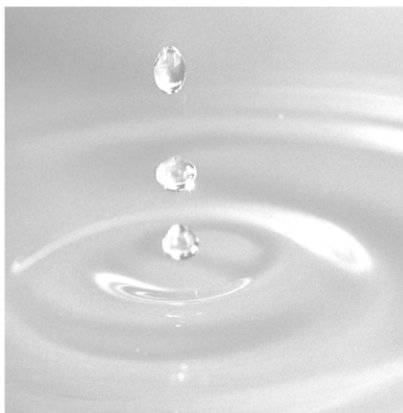


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Certification

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Record of Revisions

Identification	Date	Description of Issued and/or Revision
1	August 5, 2025	Issued for Site Plan Approval
2	February 17, 2026	Re-Issued for Site Plan Approval
3	May 5, 2026	Revised Figures per GRCA Comments

1. Introduction

GEI Consultants Canada Ltd. have been retained by Wrighthaven Homes Ltd. to complete the detailed stormwater management design for the proposed residential development involving properties 73 Sideroad 19 and 79 Sideroad 19 in the Town of Fergus in the Township of Centre Wellington, Ontario (hereafter referred to as the “Site”). The site location is shown on Figure 1 and the Site Plan prepared by GSP Group is included as Figure 2.

This Stormwater Management Design Report accompanies the Final Design Brief for 73/79 Sideroad 19 (GEI Consultants Canada Ltd).

1.1. Site Information

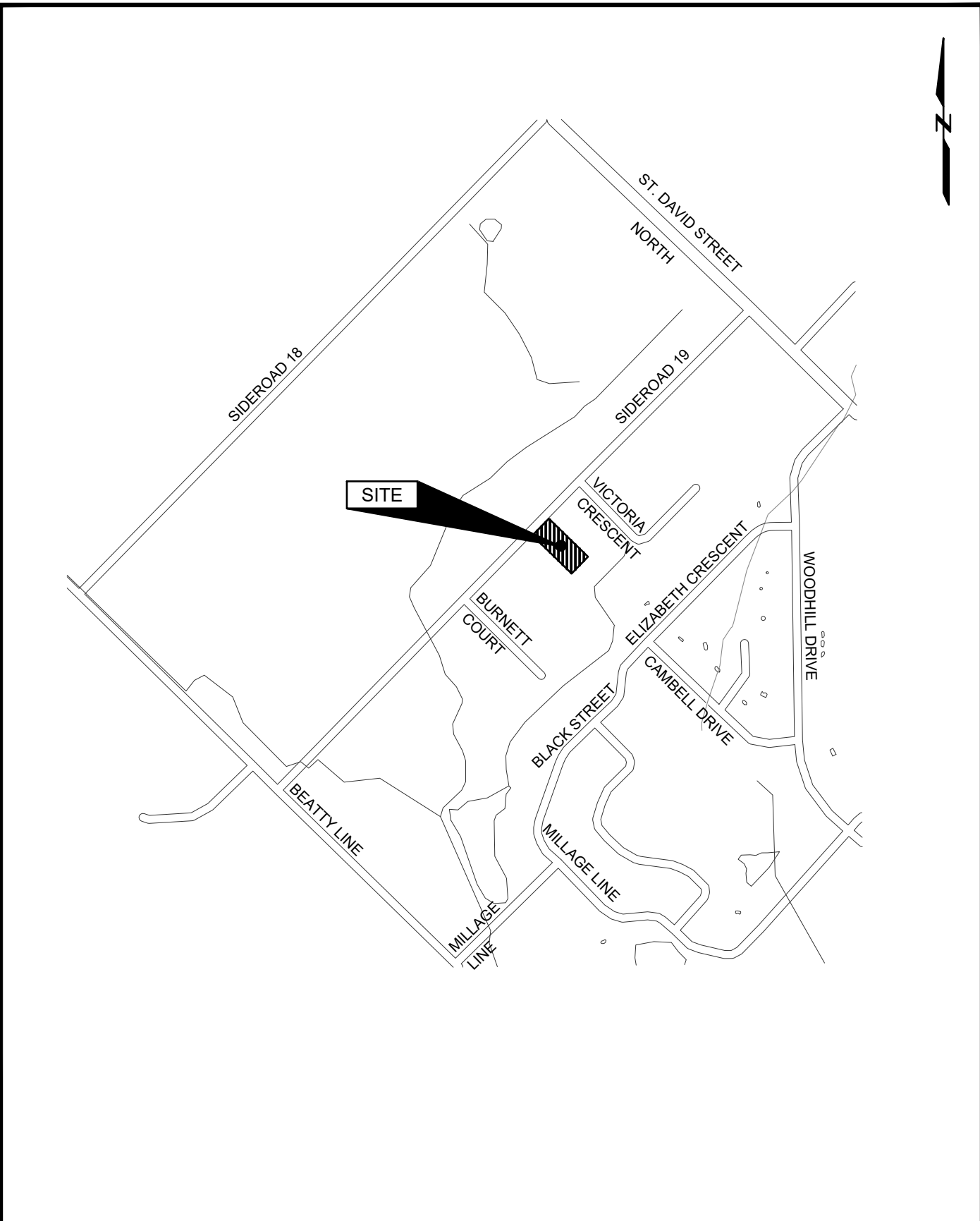
The 1.12-hectare (ha) site is located at 73 and 79 Sideroad 19 in the Town of Fergus in the Township of Centre Wellington. The property is rectangular in shape, with approximately 57m of frontage along Sideroad 19 and a depth of approximately 190m. For the purposes of this report, Sideroad 19 is considered to have a north-south orientation. The Site is bordered by existing residential properties to the north, an existing wetland and residential properties to the east, existing residential properties to the south, and Sideroad 19 to the west.

Topographic survey of the site was completed by Van Harten Surveying Inc., received on August 29, 2022, and March 18, 2024. Topographic survey of the wetland area was also completed by Van Harten Surveying Inc., received on May 23, 2025.

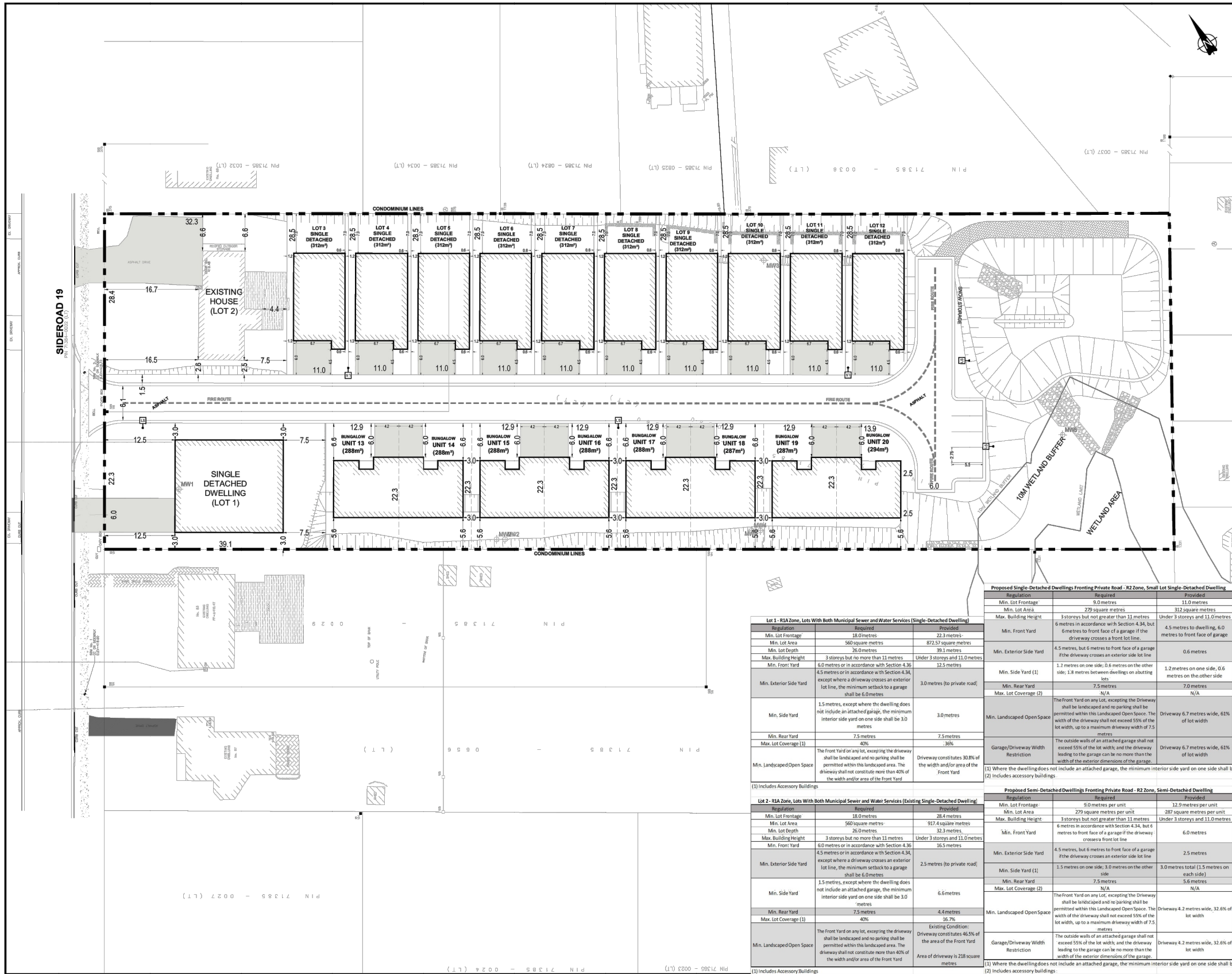
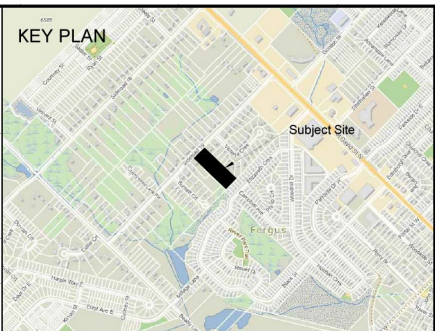
1.2. Report Objectives

The objectives of this report are as follows:

- Document all existing reports and standards within the study area;
- Identify the Township of Centre Wellington (Fergus) stormwater criteria for the design of the stormwater management facilities; and,
- Detail and summarize the stormwater management design to document the existing and post-development conditions.



73/79 SIDEROAD 19 RESIDENTIAL DEVELOPMENT TOWNSHIP OF CENTRE WELLINGTON (FERGUS)	 GEI Consultants	LOCATION PLAN	
WRIGHTHAVEN HOMES LTD.		Project 2401073	MAY 2026 Figure No. 1



SITE PLAN

Part of Park Lot 10, Registered Plan 71
Township of Centre Wellington
Wellington County
73 & 79, Sideroad 19, Fergus

Lot 1 - R1A Zone, Lots With Both Municipal Sewer and Water Services (Single-Detached Dwelling)		
Regulation	Required	Provided
Min. Lot Frontage	18.0 metres	22.3 metres
Min. Lot Area	560 square metres	872.57 square metres
Min. Lot Depth	26.0 metres	39.3 metres
Max. Building Height	3 storeys but no more than 11 metres	Under 3 storeys and 11.0 metres
Min. Front Yard	6.0 metres or in accordance with Section 4.36	12.5 metres
Min. Exterior Side Yard	4.5 metres or in accordance with Section 4.34, except where a driveway crosses an exterior lot line, the minimum setback to a garage shall be 6.0 metres	3.0 metres (to private road)
Min. Side Yard	1.5 metres, except where the dwelling does not include an attached garage, the minimum interior side yard on one side shall be 3.0 metres	3.0 metres
Min. Rear Yard	7.5 metres	7.5 metres
Max. Lot Coverage (1)	40%	36%
Min. Landscaped Open Space	The Front Yard on any lot, excepting the driveway shall be landscaped and no parking shall be permitted within this landscaped area. The driveway shall not constitute more than 40% of the width and/or area of the Front Yard	Driveway constitutes 30.8% of the width and/or area of the Front Yard

(1) Includes Accessory Buildings

Lot 2 - R1A Zone, Lots With Both Municipal Sewer and Water Services (Existing Single-Detached Dwelling)		
Regulation	Required	Provided
Min. Lot Frontage	18.0 metres	22.4 metres
Min. Lot Area	560 square metres	917.4 square metres
Min. Lot Depth	26.0 metres	32.3 metres
Max. Building Height	3 storeys but no more than 11 metres	Under 3 storeys and 11.0 metres
Min. Front Yard	6.0 metres or in accordance with Section 4.36	16.5 metres
Min. Exterior Side Yard	4.5 metres or in accordance with Section 4.34, except where a driveway crosses an exterior lot line, the minimum setback to a garage shall be 6.0 metres	2.5 metres (to private road)
Min. Side Yard	1.5 metres, except where the dwelling does not include an attached garage, the minimum interior side yard on one side shall be 3.0 metres	6.6 metres
Min. Rear Yard	7.5 metres	4.4 metres
Max. Lot Coverage (1)	40%	35.7%
Min. Landscaped Open Space	The Front Yard on any lot, excepting the driveway shall be landscaped and no parking shall be permitted within this landscaped area. The driveway shall not constitute more than 40% of the width and/or area of the Front Yard	Existing Condition: Driveway constitutes 46.3% of the area of the Front Yard Area of driveway is 218 square metres

(1) Includes Accessory Buildings

Proposed Single-Detached Dwellings Fronting Private Road - R2 Zone, Small Lot Single-Detached Dwelling		
Regulation	Required	Provided
Min. Lot Frontage	9.0 metres	11.0 metres
Min. Lot Area	279 square metres	312 square metres
Max. Building Height	3 storeys but not greater than 11 metres	Under 3 storeys and 11.0 metres
Min. Front Yard	6 metres in accordance with Section 4.34, but 6 metres to front face of a garage if the driveway crosses a front lot line	4.5 metres to dwelling, 6.0 metres to front face of garage
Min. Exterior Side Yard	4.5 metres, but 6 metres to front face of a garage if the driveway crosses an exterior side lot line	0.6 metres
Min. Side Yard (1)	1.2 metres on one side; 0.6 metres on the other side; 1.8 metres between dwellings on abutting lots	1.2 metres on one side, 0.6 metres on the other side
Min. Rear Yard	7.5 metres	7.0 metres
Max. Lot Coverage (2)	N/A	N/A
Min. Landscaped Open Space	The Front Yard on any lot, excepting the Driveway shall be landscaped and no parking shall be permitted within this Landscaped Open Space. The width of the driveway shall not exceed 55% of the lot width, up to a maximum driveway width of 7.5 metres	Driveway 6.7 metres wide, 61% of lot width
Garage/Driveway Width Restriction	The outside walls of an attached garage shall not exceed 55% of the lot width, and the driveway leading to the garage can be no more than the width of the exterior dimensions of the garage	Driveway 6.7 metres wide, 61% of lot width

(1) Where the dwelling does not include an attached garage, the minimum interior side yard on one side shall be 3.0 metres
(2) Includes accessory buildings

Proposed Semi-Detached Dwellings Fronting Private Road - R2 Zone, Semi-Detached Dwelling		
Regulation	Required	Provided
Min. Lot Frontage	9.0 metres per unit	12.0 metres per unit
Min. Lot Area	279 square metres per unit	287 square metres per unit
Max. Building Height	3 storeys but not greater than 11 metres	Under 3 storeys and 11.0 metres
Min. Front Yard	6 metres in accordance with Section 4.34, but 6 metres to front face of a garage if the driveway crosses a front lot line	6.0 metres
Min. Exterior Side Yard	4.5 metres, but 6 metres to front face of a garage if the driveway crosses an exterior side lot line	2.5 metres
Min. Side Yard (1)	1.5 metres on one side; 3.0 metres on the other side	3.0 metres total (1.5 metres on each side)
Min. Rear Yard	7.5 metres	5.6 metres
Max. Lot Coverage (2)	N/A	N/A
Min. Landscaped Open Space	The Front Yard on any lot, excepting the Driveway shall be landscaped and no parking shall be permitted within this Landscaped Open Space. The width of the driveway shall not exceed 55% of the lot width, up to a maximum driveway width of 7.5 metres	Driveway 4.2 metres wide, 32.6% of lot width
Garage/Driveway Width Restriction	The outside walls of an attached garage shall not exceed 55% of the lot width, and the driveway leading to the garage can be no more than the width of the exterior dimensions of the garage	Driveway 4.2 metres wide, 32.6% of lot width

(1) Where the dwelling does not include an attached garage, the minimum interior side yard on one side shall be 3.0 metres
(2) Includes accessory buildings



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REVISIONS

September 30, 2025
February 13, 2026

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73/79 SIDEROAD 19 RESIDENTIAL DEVELOPMENT
TOWNSHIP OF CENTRE WELLINGTON (FERGUS)

WRIGHTHAVEN HOMES LTD.



Project 2401073

SITE PLAN

FEBRUARY 2026 FIGURE No. 2

2. Reference Information

2.1. Reports and Standards

The proposed stormwater management design is based on the following reports, standards, and information prepared by others:

Site Background Reports and Historical Drawings:

- **Geotechnical Investigation**, Proposed Residential Development, 79-87 Side Road 19, Township of Centre Wellington (Fergus), Ontario, Ref. No. G4670-22-12, prepared by JLP Services Inc., April 2023. (Attached as Appendix A)
- **Reconstruction of Sideroad 19** – Plan and Profile Sta. 3+530 to Sta. 3+710, prepared by Triton Engineering Services Limited, April 2009.
- **Reconstruction of Victoria Crescent** – Plan and Profile Sideroad 19 to Sta. 7+150, prepared by Triton Engineering Services Limited, June 2009.
- **Reconstruction of Victoria Crescent (Drainage Outlet)** – Plan and Profile Victoria Crescent to Sta. 9+130, prepared by Triton Engineering Services Limited, March 2010.

Reference Standards:

- **Development Manual**, Centre Wellington, dated June 2024.
- **Stormwater Management Planning and Design Manual**, Ministry of Environment, dated March 2003.
- **Drainage Management Manual**, Ministry of Transportation, dated October 1997.
- **MIDUSS Version 2 Reference Manual**, Alan A. Smith Inc., dated February 2004.

2.2. Soils

Soil Conditions

- The subsurface soils for the Site are predominantly silt underlain by sand and sandy silt till (JLP Services, 2023).

Infiltration Rates

- The predominant soils near the proposed stormwater management facility (BH5) are silt and sand. The coefficient of permeability is estimated to be in the range of 1×10^{-5} cm/s to 1×10^{-6} cm/s (JLP Services, 2023).

Groundwater Levels

- Five monitoring wells were installed, resulting in a range of water levels between 414.64m to 417.34m across the Site, based on readings up to May 2025.

Groundwater elevations are shown in the Hydrogeological Study Report for 73/79 Sideroad 19 (GEI Consultants Canada Ltd).

3. Stormwater Management Design

3.1. Design Criteria

The stormwater management criteria established by the Township of Centre Wellington (Fergus) are as follows:

Conveyance Systems

- Storm sewers for the Site shall be designed to convey the 5-year storm event.
- Swales designed to convey the 100-year storm shall be considered significant by the Township and require an easement.
- Connections of roof leaders to laterals is prohibited.
- Foundation drains shall be directed to sump pumps and discharged to grade or a storm lateral.
- The major overland flow route shall be designed to convey the 100-year storm event. Overland flow elevations should not come within 0.15m of the top of foundation grades.

Quantity Control

- The post-development condition peak flows to the wetland will be controlled to the existing condition rate for the 2-year to 100-year storm events.
- The post-development condition peak flows from the Site will be controlled to the existing condition rate for the 2-year to 100-year storm events.

Quality Control

- The Site will provide Enhanced level of protection (80% TSS removal).

Modelling Criteria

As per the Township of Centre Wellington development standards, hydrologic modelling is required to demonstrate the performance for the 2-year to 100-year design events. Based on the following criteria:

- The Township of Centre Wellington (Fergus) mass rainfall data was used to model the 2-year to 100-year design storm events as summarized in Table 3-1.
- The 25mm depth rainfall event and Regional storm event (Hurricane Hazel) was also modelled.
- The Horton infiltration method was used in the MIDUSS model with parameters from the MIDUSS Version 2 Reference Manual. The parameters used are summarized in Table 3-2.

Table 3-1. Chicago Storm Parameters

Parameter	25mm	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	Regional
a	1581.250	695.047	1,459.072	2327.596	3701.648	5089.418	6,933.019	-
b	13.000	6.387	13.690	19.500	25.500	30.000	34.699	-
c	1.000	0.793	0.850	0.894	0.937	0.967	0.998	-
R	0.400	0.375	0.375	0.375	0.375	0.375	0.375	-
td (min)	240	180	180	180	180	180	180	2880
Rainfall depth (mm)	25.000	33.014	49.792	61.359	75.581	86.737	97.921	285.000

Table 3-2. MIDUSS Horton Parameters

Parameter	Impervious Areas	Pervious Areas
Manning's 'n'	0.013 (asphalt)	0.25 (pasture/lawns/sod)
Maximum Infiltration (mm/hr)	0.0	200.0 (silty loam)
Minimum Infiltration (mm/hr)	0.0	13.0 (silty loam)
Lag Constant (hr)	0.05	0.25
Depression Storage (mm)	1.5	5.0

3.2. Design Approach

The stormwater management approach is designed to follow a “treatment train”, which includes lot level, conveyance and end-of-pipe stormwater management practices, designed to filter and control runoff prior to discharging to the wetland.

Lot Level Controls

The stormwater management lot level controls designed for the Site includes the following measures:

- **Roof Drainage to Ground Surface**
 - The lots have been designed to have split drainage with runoff conveyed to the rear yard and street. The runoff will be filtered through the grassed surfaces within and between the lots.
- **Rear Yard Swales**
 - The rear yards of the lots have been designed to include grass swales, which will convey and filter runoff.

Conveyance Controls

The stormwater management conveyance controls designed for the Site includes the following measures:

- **Storm Sewer Network**
 - The minor system (5-year storm event) will be captured by catch basins and conveyed via storm sewers, discharging to the proposed stormwater management facility.
- **Grassed Swales**
 - Swales in the rear yards north of the site access road will convey runoff to the storm sewer network.
 - Swales in the rear yards south of the site access road will convey runoff to the existing wetland.

End-of-Pipe Controls

The stormwater management end-of-pipe controls designed for the Site includes the following measures.

- ***Oil-Grit Separator***
 - The proposed oil-grit separator (EFO4 or approved equivalent) is located at the end of the site access road to provide pre-treatment of flows conveyed by the storm sewer network, which includes runoff from the site access road, prior to discharging to the proposed stormwater management facility. The oil-grit separator sizing report is included in Appendix B.
- ***Stormwater Management Facility***
 - The proposed stormwater management facility has been designed to function as a constructed wetland pond. From Table 3.2, Stormwater Management Planning and Design Manual, 2003, in order to provide Enhanced water quality treatment, a wetland facility requires 111.74 m³/ha of storage volume for a contributing drainage area that is 62% impervious. 40.00 m³/ha of the required storage volume is extended detention storage, while the remaining 71.74 m³/ha is permanent pool storage.
 - Based on the contributing drainage area of 0.84 hectares on the Site (Catchments 2000 and 2001), 33.60 m³ of extended detention storage is required. The stormwater management facility has been designed to provide 599.93 m³ of extended detention storage.
 - Based on the contributing drainage area of 0.84 hectares on the Site (Catchments 2000 and 2001), 60.26 m³ of permanent pool storage is required. The stormwater management facility has been designed with a 0.25 m deep permanent pool, which provides 60.01 m³ of permanent pool storage and a sediment forebay which provides 34.94 m³ of permanent pool storage, for a total permanent pool storage of 94.95 m³.
 - Table 3-3 illustrates sediment loading to the forebay in the stormwater management facility as well as the subsequent cleanout frequency required to maintain this system. Note that this table does not account for the pre-treatment by the oil-grit separator unit, and so the cleanout frequency is very conservative.
 - Stormwater management facility design calculations, including rip-rap sizing for the outlet pipe and overflow weir, are attached in Appendix C. The width of the rip-rap will act as a spreader system by broadening the flow and providing erosion protection.
 - The stormwater management facility will be lined with an impermeable geosynthetic clay liner due to the presence of permeable soil and high groundwater levels. Stability calculations and recommendations for the liner are attached in Appendix G.

Table 3-3. Sediment Loading and Cleanout Frequency

Catchment Area	Percent Impervious	Annual Sediment Loading	TSS Removal	Annual TSS Reduction	Storage (1/3 forebay volume)	Cleanout Frequency
0.84 ha	62%	2.30 m ³	80%	1.84 m ³	11.65 m ³	~ 6 years

3.3. Existing Conditions

Under existing conditions, the Site generally slopes from west to east, towards the existing wetland.

For existing conditions analysis purposes, the Site was modeled as four (4) drainage catchments. The existing development condition drainage catchments are shown in Figure 3 and described below. The existing conditions MIDUSS hydrologic modeling is included in Appendix E.

Catchment 100 (3.40 hectares, 30% impervious) represents external drainage that enters the Site from the north. Runoff from Catchment 100 sheetflows overland to the wetland east of the property.

Catchment 200 (0.99 hectares, 20% impervious) represents the majority of the Site, including the existing dwellings. Runoff from Catchment 200 sheetflows overland to the wetland east of the property.

Catchment 300 (0.08 hectares, 10% impervious) represents the on-site portion of the wetland at the southeast corner of the property. Runoff from Catchment 300 sheetflows overland to the wetland east of the property.

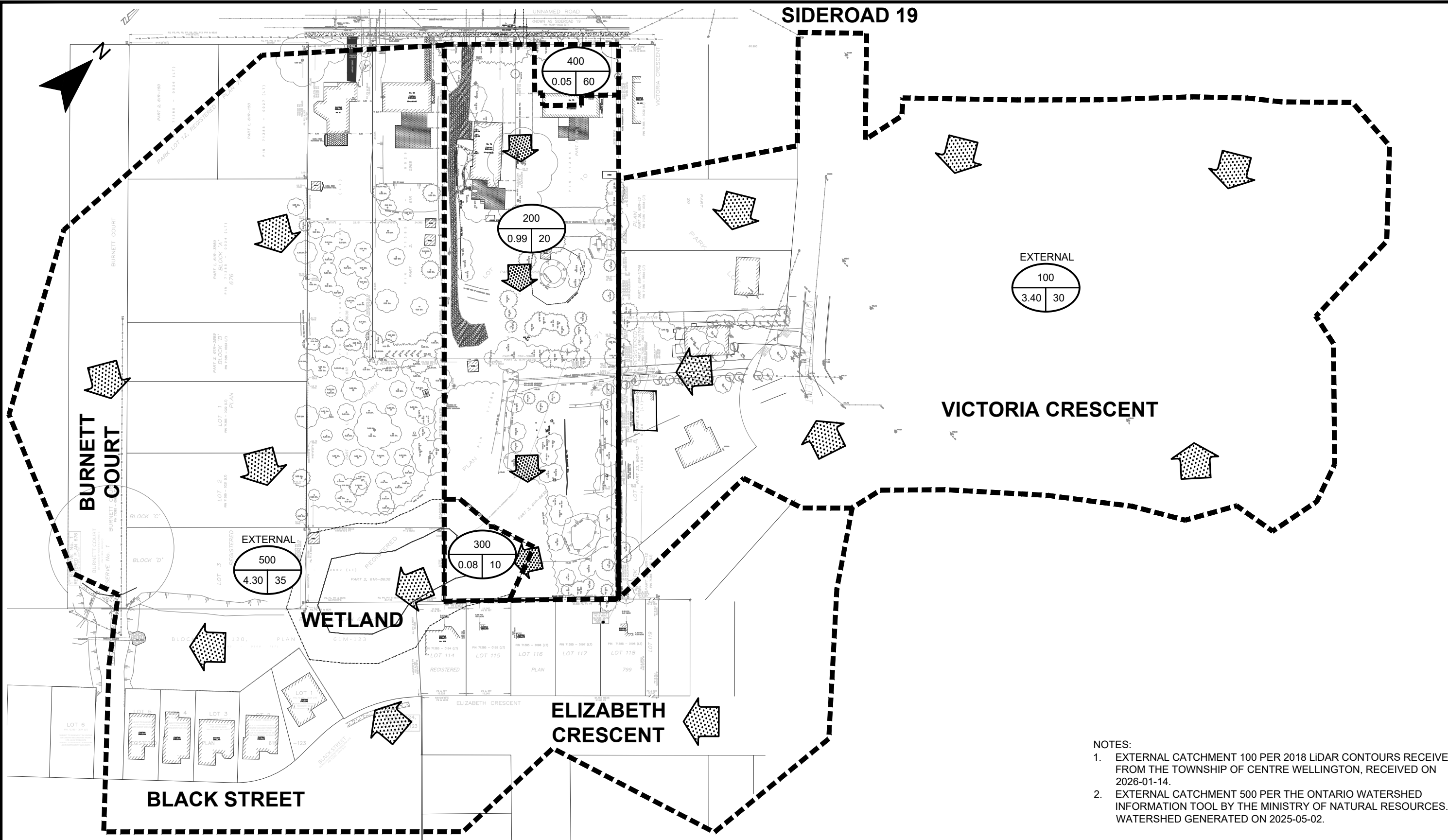
Catchment 400 (0.05 hectares, 60% impervious) represents the northwest portion of the Site, including the front yard and driveway of the existing dwelling to remain. Runoff from Catchment 400 sheetflows overland to the Sideroad 19 right-of-way west of the property.

Note that Catchment 500, which represents the downstream catchment areas that contribute to the downstream stormwater infrastructure, has not been included in the existing conditions and allowable release rate analysis. This catchment has been included in further analysis of the existing wetland, which is described in Section 3.6.

Table 3-4 summarizes the peak flow from each catchment and total peak flows under existing conditions.

Table 3-4. Existing Condition Flow Rates

Catchment	25 mm (m ³ /s)	2-Year (m ³ /s)	5-Year (m ³ /s)	10-Year (m ³ /s)	25-Year (m ³ /s)	50-Year (m ³ /s)	100-Year (m ³ /s)	Regional (m ³ /s)
100	0.191	0.214	0.282	0.321	0.369	0.408	0.452	0.283
200	0.040	0.043	0.055	0.062	0.072	0.088	0.132	0.086
Flow to Wetland	0.220	0.250	0.331	0.377	0.436	0.489	0.555	0.362
300	0.002	0.002	0.002	0.003	0.003	0.006	0.010	0.007
400	0.006	0.007	0.009	0.010	0.011	0.012	0.013	0.006
Flow to SDR 19	0.006	0.007	0.009	0.010	0.011	0.012	0.013	0.006
Total Flow from Site	0.225	0.256	0.339	0.387	0.447	0.503	0.573	0.372



- NOTES:
1. EXTERNAL CATCHMENT 100 PER 2018 LIDAR CONTOURS RECEIVED FROM THE TOWNSHIP OF CENTRE WELLINGTON, RECEIVED ON 2026-01-14.
 2. EXTERNAL CATCHMENT 500 PER THE ONTARIO WATERSHED INFORMATION TOOL BY THE MINISTRY OF NATURAL RESOURCES. WATERSHED GENERATED ON 2025-05-02.

LEGEND <div><div><div>201</div><div>0.110</div><div>80</div></div><div>CATCHMENT NUMBER</div><div>% IMPERVIOUS</div><div>CATCHMENT AREA IN HECTARES</div></div> <div><div><div></div><div></div></div><div>CATCHMENT BOUNDARY</div><div>MAJOR OVERLAND FLOW</div></div> <div><div><div>15</div><div>0</div><div>25</div><div>50</div></div><div>1:1250(m)</div></div>	73/79 SIDEROAD 19 RESIDENTIAL DEVELOPMENT TOWNSHIP OF CENTRE WELLINGTON (FERGUS)	<div><div>GEI</div><div>Consultants</div></div>	EXISTING CONDITIONS DRAINAGE AREAS	
	WRIGHTHAVEN HOMES LTD.		Project 2401073	MAY 2026

3.4. Allowable Release Rates

Table 3-5 identifies the allowable release rates for post-development conditions, established as the existing condition peak flow rates, under all storm events.

Table 3-5. Allowable Release Rates

Catchment	25 mm (m ³ /s)	2-Year (m ³ /s)	5-Year (m ³ /s)	10-Year (m ³ /s)	25-Year (m ³ /s)	50-Year (m ³ /s)	100-Year (m ³ /s)	Regional (m ³ /s)
Allowable Flow to Wetland	0.220	0.250	0.331	0.377	0.436	0.489	0.555	0.362
Allowable Flow to SDR 19	0.006	0.007	0.009	0.010	0.011	0.012	0.013	0.006
Allowable Flow from Site	0.225	0.256	0.339	0.387	0.447	0.503	0.573	0.372

3.5. Post-Development Conditions

Under post-development conditions, the Site generally slopes from west to east, towards the existing wetland, similar to existing conditions.

For post-development analysis purposes, the Site was modeled as eight (8) drainage catchments. The post-development drainage catchments are shown in Figure 4 and described below. The post-development MIDUSS hydrologic modeling is included in Appendix F.

Catchment 1000 (3.40 hectares, 30% impervious) represents external drainage that enters the Site from the north. Minor runoff generated from Catchment 1000 is captured by a municipal storm sewer system and conveyed via a storm sewer easement through the Site to the existing wetland east of the property (refer to the “Design of Municipal Storm Sewer from Victoria Crescent” technical memorandum prepared by GEI Consultants Canada Ltd). Major runoff which exceeds the capacity of the storm sewer will sheetflow overland to the proposed stormwater management facility, ultimately discharging to the wetland. The stormwater management facility has been designed with capacity for this major external runoff.

Catchment 2000 (0.74 hectares, 70% impervious) represents the majority of the proposed road and development, including all units fronting onto the proposed site access road. Minor runoff from Catchment 2000 is captured via on-site storm sewers and conveyed to the proposed stormwater management facility. Major runoff which exceeds the capacity of the storm sewers will sheetflow overland to the proposed facility, ultimately discharging to the wetland.

Catchment 2001 (0.10 hectares, 10% impervious) represents the proposed stormwater management facility at the east end of the Site. Runoff from Catchment 2001 will be attenuated by the proposed stormwater management facility, ultimately discharging to the wetland.

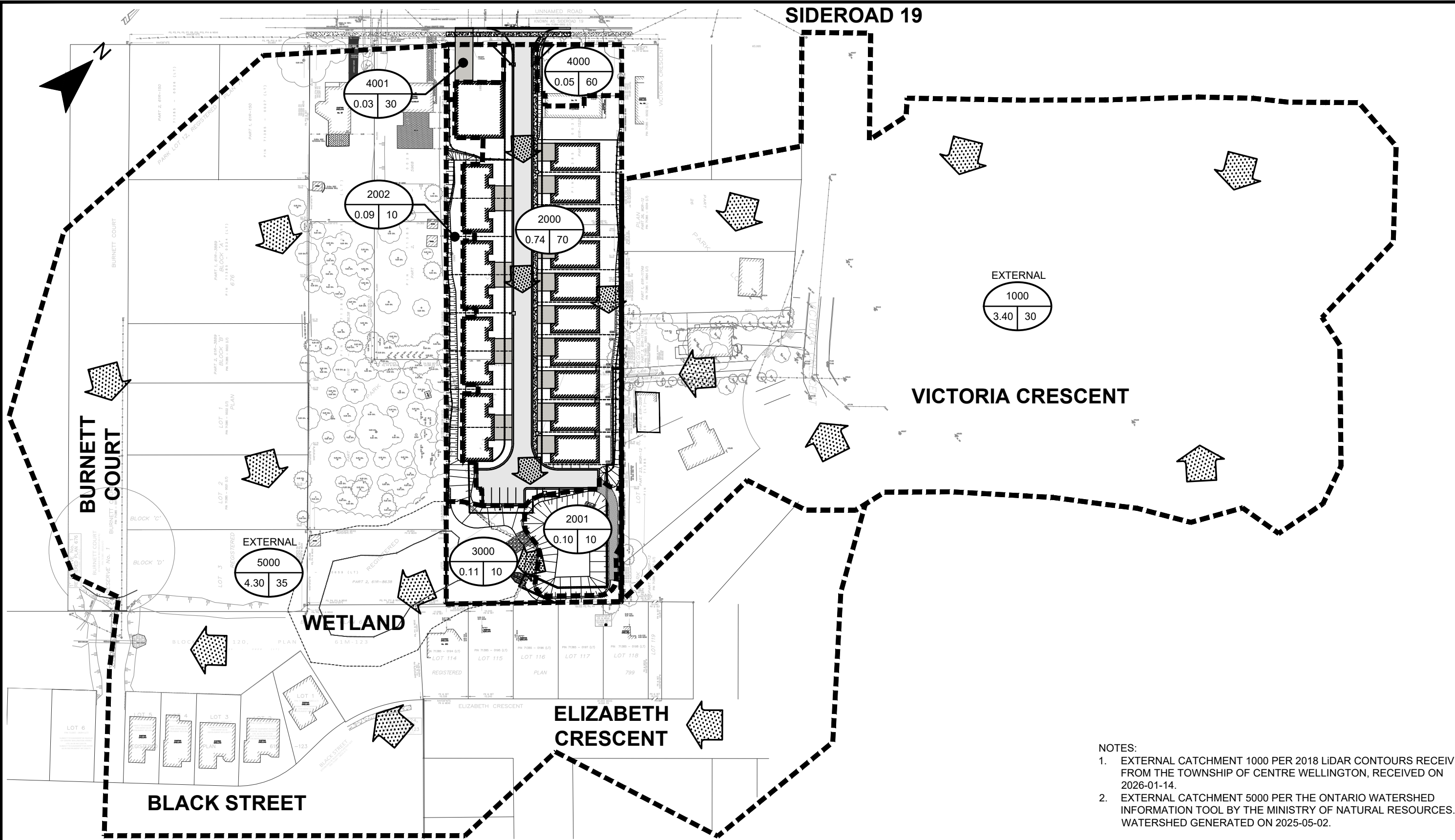
Catchment 2002 (0.09 hectares, 10% impervious) represents the rear yards of units fronting onto the south side of the proposed site access road. Runoff from Catchment 2002 is considered clean so it will discharge uncontrolled to the wetland.

Catchment 3000 (0.11 hectares, 10% impervious) represents the on-site portion of the existing wetland at the southeast corner of the property. Runoff from Catchment 3000 sheetflows overland to the external wetland east of the property.

Catchment 4000 (0.05 hectares, 60% impervious) represents the northwest portion of the Site, including the front yard and driveway of the existing dwelling to remain. Runoff from Catchment 4000 sheetflows overland to the Sideroad 19 right-of-way west of the property, same as existing conditions.

Catchment 4001 (0.03 hectares, 30% impervious) represents the northeast portion of the Site, including the front yard and driveway of the proposed single-detached dwelling. Runoff from Catchment 4001 sheetflows overland to the Sideroad 19 right-of-way west of the property.

Note that Catchment 5000, which represents the downstream catchment areas that contribute to the downstream stormwater infrastructure, has not been included in the post-development conditions analysis. This catchment has been included in further analysis of the existing wetland, which is described in Section 3.6.



- NOTES:
- 1. EXTERNAL CATCHMENT 1000 PER 2018 LIDAR CONTOURS RECEIVED FROM THE TOWNSHIP OF CENTRE WELLINGTON, RECEIVED ON 2026-01-14.
 - 2. EXTERNAL CATCHMENT 5000 PER THE ONTARIO WATERSHED INFORMATION TOOL BY THE MINISTRY OF NATURAL RESOURCES. WATERSHED GENERATED ON 2025-05-02.

LEGEND

201
0.110 | 80

CATCHMENT NUMBER

% IMPERVIOUS

CATCHMENT AREA IN HECTARES

■■■■■■■■

CATCHMENT BOUNDARY

MAJOR OVERLAND FLOW

15 0 25 50

1:1250(m)

73/79 SIDEROAD 19 RESIDENTIAL DEVELOPMENT
TOWNSHIP OF CENTRE WELLINGTON (FERGUS)

WRIGHTHAVEN HOMES LTD.

Project 2401073

POST-DEVELOPMENT
DRAINAGE AREAS

MAY 2026

FIGURE No. 4

LAMBIER, BRADLEY B:\Working\WRIGHTHAVEN HOMES\2401073 - 122025 079 Sideroad 19 Fergus\5 Work in Progress\Drafting\Figures\122025 SWM Figures.dwg - 5/5/2026

3.5.1. Routing

Table 3-6 identifies the available detention capacity, detention capacity used and detention time for the proposed stormwater management facility under each design storm event.

Table 3-6. Proposed Stormwater Management Facility - Stage/Storage/Discharge

	Available Detention Capacity			Actual Detention Capacity Used			Detention Time (hrs)
	Peak Flow m ³ /s	Storage Volume m ³	Storage Elevation m	Peak Flow m ³ /s	Storage Volume m ³	Storage Elevation m	
Top of Permanent Pool – 100mm Knockout	--	--	415.60	--	--	415.60	--
25 mm Storm	--	--	--	0.009	94.81	415.85	9.4
Outlet Catch Basin Lip	0.010	118.91	415.90	--	--	--	--
2-Year Storm	--	--	--	0.012	119.89	415.90	10.1
5-Year Storm	--	--	--	0.067	164.85	416.00	9.8
10-Year Storm	--	--	--	0.080	219.61	416.10	8.8
25-Year Storm	--	--	--	0.093	295.52	416.23	8.2
Overflow Weir	0.103	373.31	416.35	--	--	--	--
50-Year Storm	--	--	--	0.130	384.70	416.37	8.0
Regional Storm	--	--	--	0.169	401.52	416.39	56.0
100-Year Storm	--	--	--	0.265	427.78	416.43	7.8
Top of Pond	2.329	599.93	416.65	--	--	--	--

The detention time for the 25 mm storm is 9.4 hours as shown by the MIDUSS hydrograph included in Appendix F. This detention time is less than the 12-hour requirement from the MOE SWM Manual (2003), however, proposing a smaller orifice to increase detention time would significantly increase the risk of the outlet becoming clogged. Furthermore, this detention time ensures that the proposed stormwater management facility is able to handle back-to-back storm events. Additionally, quality control will be provided upstream, in the oil-grit separator, with additional treatment via the forebay. The MOE criteria for draindown is based on the assumption that the stormwater management facility is being utilized for quality control. In this case, the oil-grit separator has been sized to provide 80% TSS removal.

Table 3-7 summarizes the peak flows under post-development conditions.

Table 3-7. Post-Development Flows

Catchment	25 mm (m ³ /s)	2-Year (m ³ /s)	5-Year (m ³ /s)	10-Year (m ³ /s)	25-Year (m ³ /s)	50-Year (m ³ /s)	100-Year (m ³ /s)	Regional (m ³ /s)
1000 (Minor Uncontrolled)	0.180	0.180	0.180	0.180	0.180	0.180	0.180	0.180
1000 (Major), 2000 & 2001 (Controlled)	0.009	0.012	0.067	0.080	0.093	0.130	0.265	0.169
2002 (Controlled)	0.002	0.002	0.002	0.003	0.003	0.006	0.010	0.007
Flow to Wetland	0.189	0.190	0.248	0.260	0.275	0.316	0.455	0.356
3000	0.002	0.002	0.003	0.004	0.004	0.009	0.014	0.009
4000	0.006	0.007	0.009	0.010	0.011	0.012	0.013	0.006
4001	0.002	0.002	0.003	0.003	0.003	0.004	0.006	0.003
Flow to SDR 19	0.008	0.009	0.011	0.013	0.014	0.016	0.017	0.009
Flow from Site	0.195	0.198	0.255	0.269	0.285	0.332	0.483	0.371

A summary of the allowable and post-development peak flow rates is provided in Table 3-8.

Table 3-8. Allowable and Post-Development Flow Comparison

	25 mm (m ³ /s)	2-Year (m ³ /s)	5-Year (m ³ /s)	10-Year (m ³ /s)	25-Year (m ³ /s)	50-Year (m ³ /s)	100-Year (m ³ /s)	Regional (m ³ /s)
Allowable Flow to Wetland	0.220	0.250	0.331	0.377	0.436	0.489	0.555	0.362
Post- Development Flow to Wetland	0.189	0.190	0.248	0.260	0.275	0.316	0.455	0.356
Allowable Flow to SDR 19	0.006	0.007	0.009	0.010	0.011	0.012	0.013	0.006
Post- Development Flow to SDR 19	0.008	0.009	0.011	0.013	0.014	0.016	0.017	0.009
Allowable Flow from Site	0.225	0.256	0.339	0.387	0.447	0.503	0.573	0.372
Post- Development Flow from Site	0.195	0.198	0.255	0.269	0.285	0.332	0.483	0.371

Therefore, the allowable flows to the wetland and the total flows from the site have been met under post-development conditions. Flows to Sideroad 19 are slightly higher than the existing rates due to the proposed single-detached dwelling fronting onto the right-of-way. However, it is standard practice for driveways and front yards to drain towards the right-of-way, and the slight increase in runoff to Sideroad 19 can be considered negligible.

3.5.2. Drainage Conveyance

The following is a description of the post-development drainage conveyance within the Site:

- **External Drainage Conveyance:**
 - The external drainage from north of the Site will be conveyed through a 450mm diameter storm pipe within a 3.0m to 5.0m wide easement located along the north and east limits of the Site, discharging to the existing wetland.
 - Flows exceeding the capacity of the storm sewer will be conveyed via a swale to the on-site storm sewer network to the proposed stormwater management facility. To ensure that the swale has the capacity to convey runoff from the 100-year design storm event, MIDUSS modelling was completed for the section of swale with the smallest cross-sectional area and is included in Appendix F. If the swale reaches capacity, drainage will sheetflow overland to the proposed stormwater management facility, ultimately discharging to the existing wetland.
- **Roadway Drainage Conveyance:**
 - Conveyance will be through a combination of catch basins and storm sewers sized to the 5-year design storm event, to the proposed stormwater management facility to outlet at the existing wetland. Runoff which exceeds the 5-year design storm event will sheetflow overland, either to the Sideroad 19 right-of-way or to the stormwater management facility.
 - Sewer design calculations are presented in the Final Design Brief for 73/79 Sideroad 19 (GEI Consultants Canada Ltd).
- **Rear Yard Conveyance:**
 - Runoff from the rear yards north of the site access road will be conveyed by the storm sewer network described above.
 - Runoff from the rear yards south of the site access road will be conveyed by a swale that discharges directly to the existing wetland. To ensure that the swale has the capacity to convey runoff from the 100-year design storm event, MIDUSS modelling was completed for the section of swale with the smallest cross-sectional area and is included in Appendix F.

3.6. Wetland Analysis

The existing wetland located south of the Site was analyzed using hydrologic modelling to investigate the impact of the proposed development and stormwater management facility on the water level in the wetland and the peak flow rate from the wetland.

Topographic survey of the wetland was completed by Van Harten Surveying Inc., dated May 23, 2025.

The wetland generally slopes from north to south, from the Site to the back corner of Lot 1 on Figure 5. The extents of the wetland were flagged by Aboud & Associates Inc. and confirmed by the GRCA in November 2022 and May 2025. Once the wetland overtops, stormwater flows are conveyed overland towards a culvert that goes under the walkway between Burnett Court and Black Street. The capacity of the culvert causes stormwater drainage to back up into the low-lying area between the lots on Burnett Court and the lots on Black Street, and back into the wetland. In the event that the storage capacity of the low-lying area and the wetland area is exceeded, stormwater would overflow to the Black Street

right-of-way. The culvert and overflow locations are shown on Figure 5. Wetland capacity calculations are included in Appendix D.

In addition to the catchments described in Sections 3.3 and 3.5, an additional catchment was modelled to represent the wetland area itself and external areas that drain to the wetland and are not a part of the proposed development or the catchments described previously. This catchment is described below and is shown in Figures 3 and 4.

Catchment 500 & 5000 (4.30 hectares, 35% impervious) represent the wetland and external areas that drain to the wetland and low-lying area under existing and post-development conditions.

MIDUSS was used to calculate the peak flow rates to and from the wetland under existing conditions and post-development conditions. The existing conditions modeling is included in Appendix E and the post-development modeling is included in Appendix F.

Table 3-9 provides a summary and comparison of the peak flows from the wetland / low-lying area and the water level in the wetland / low-lying area for each design storm event under existing conditions and post-development conditions.

Table 3-9. Existing Wetland - Stage/Storage/Discharge

	Existing Conditions			Post-Development		
	Peak Flow m ³ /s	Storage Volume m ³	Storage Elevation m	Peak Flow m ³ /s	Storage Volume m ³	Storage Elevation m
Bottom of Wetland / Low-Lying Area	--	0.00	414.59	--	0.00	414.59
Invert of Culvert	--	25.89	414.76	--	25.89	414.76
2-Year Storm	0.247	332.04	415.05	0.241	320.22	415.05
5-Year Storm	0.281	541.17	415.17	0.265	527.41	415.16
10-Year Storm	0.410	625.44	415.20	0.375	601.90	415.19
25-Year Storm	0.551	720.87	415.25	0.490	680.24	415.23
50-Year Storm	0.630	827.47	415.29	0.576	750.05	415.26
100-Year Storm	0.741	984.71	415.34	0.699	923.71	415.32
Overflow	--	1,734.11	415.55	--	1,734.11	415.55

As shown in Table 3-9, the post-development peak flow rates from the wetland / low-lying area and the water levels (storage elevations) in the wetland / low-lying area are unchanged or slightly less than existing conditions. Therefore, there is no negative impact from this development on the downstream ponding.

4. Water Balance

The average annual precipitation for the area in which the Site is located is estimated to be about 945.9 mm. This amount is based on precipitation data recorded at the Fergus Shand Dam meteorological station for the period from 1981 to 2010.

It has been estimated that the potential annual evapotranspiration for this area is 586.3 mm for pervious surfaces. Therefore, 359.6 mm remains available for infiltration and runoff. For impervious surfaces within the development, the annual evapotranspiration is estimated to be 183 mm, resulting in approximately 762.9 mm available for runoff and infiltration.

4.1. Existing Conditions

Under existing conditions, the Site is approximately 19% impervious overall. The existing annual average runoff volume towards the wetland is 2,316 m³ and the existing annual average runoff volume towards the Sideroad 19 right-of-way is 261 m³. The existing annual recharge volume for the site is 2,777 m³. Tables 4-2 and 4-3 illustrate the monthly water balance for the Site under existing conditions.

The overall area draining to the wetland, including the Site, is approximately 31% impervious under existing conditions. The existing annual average runoff volume towards the wetland is 24,275 m³. The existing annual recharge volume is 20,792 m³. Tables 4-7 illustrates the monthly water balance for the wetland under existing conditions.

4.2. Post-Development Conditions

Under post-development conditions, the Site is approximately 52% impervious overall. The increase in impervious area results in increased runoff and decreased recharge. Following the development of the Site, the average annual recharge volume will be 1,380 m³, the average annual runoff volume towards the wetland will be 4,863 m³, and the average annual runoff volume towards the Sideroad 19 right-of-way will be 360 m³. Tables 4-5 and 4-6 illustrate the monthly water balance under post-development conditions.

The overall area draining to the wetland, including the Site, is approximately 35% impervious under post-development conditions. The annual average runoff volume towards the wetland will be 32,992 m³. The annual recharge volume will be 13,170 m³. Table 4-8 illustrates the monthly water balance for the wetland under post-development conditions.

To mitigate the change in groundwater recharge anticipated under post-development conditions, a comprehensive review of the site layout and groundwater conditions was completed to investigate the feasibility of low-impact development features such as infiltration galleries and bioswales to enhance infiltration on the Site. Based on provincial and municipal design guidelines, a minimum vertical separation of 1.0m is required between groundwater level and the underside of infiltration systems. Furthermore, a minimum horizontal separation of 5.0m is required between building foundations and infiltration systems.

Groundwater elevations are shown in the Hydrogeological Study Report for 73/79 Sideroad 19 (GEI Consultants Canada Ltd). Finished ground elevations are shown in the Site Grading Plan submitted with this report. Both groundwater and ground elevations decrease across the Site in the easterly direction, from Sideroad 19 to the wetland. However, ground elevations decrease in greater magnitude, resulting in decreased vertical separation between groundwater and ground surface towards the eastern end of the Site. At the end of the proposed swale along the southern edge of the Site and the start of the wetland, groundwater is at ground level. As a result of the 1.0m separation requirement, infiltration facilities are not feasible in the eastern half of the Site.

Looking at the western half of the Site, there is more separation between groundwater and ground elevations. However, there is only one location where infiltration systems can be placed 5.0m away from building foundations, which is the front yard of the proposed single-detached dwelling. However, an infiltration system at this location would conflict with water and sanitary services for the dwelling. Furthermore, this infiltration system would not be significant as it would capture runoff from a relatively small area.

Based on the information presented above, infiltration systems are not feasible on the Site. Furthermore, as detailed in the Hydrogeological Study Report for 73/79 Sideroad 19 (GEI Consultants Canada Ltd), it is expected that the decrease in recharge will not have a significant impact on overall municipal groundwater resources.

Table 4-1. Existing Conditions Water Balance Inputs

	Contributing Area (ha)	Percent Impervious (%)	Soil Type	Vegetation Type	Root Zone Depth (m)	Soil Moisture Retention Capacity (mm)	Runoff Factor	Evapotranspiration Factor for Impervious Surfaces
Site to Wetland	1.07	19	Fine sand	Shallow-rooted crops	0.50	50	0.46	0.34
Site to Right-of-Way	0.05	60	Fine sand	Shallow-rooted crops	0.50	50	0.85	0.34
Overall Area to Wetland	8.77	31	Fine sand	Shallow-rooted crops	0.50	50	0.54	0.34

Table 4-2. Existing Conditions Monthly Water Balance for Site (To Wetland)

Month	Daily Average Temp. (°C)	Monthly Heat Index	Unadjusted Daily Potential Evapotranspiration (mm)	Correction Factor	Adjusted Potential Evapotranspiration (mm)	Average Precipitation (mm)	P-PE (mm)	Accumulative Potential Water Loss (mm)	Storage (mm)	ΔS (mm)	Actual Evapotranspiration (mm)	Moisture Surplus (mm)	Water Runoff (mm)	Snow Melt Runoff (mm)	Total Recharge & Runoff (mm)	Actual Runoff (mm)	Runoff Volume (m³)	Recharge Volume (m³)
Jan	-7.4	0.00	0.0	24.3	0.0	67.9	67.9		186.5	0.0	0.0	0.0	12.7	0.0	12.7	5.8	62	74
Feb	-6.3	0.00	0.0	24.6	0.0	55.9	55.9		242.4	0.0	0.0	0.0	6.4	0.0	6.4	2.9	31	37
Mar	-1.9	0.00	0.0	30.6	0.0	59.6	59.6		302.0	0.0	0.0	0.0	3.2	0.0	3.2	1.5	16	18
Apr	5.7	1.22	0.9	33.6	30.2	74.1	43.9		50.0	0.0	26.4	47.7	23.9	25.2	49.1	22.5	241	284
May	12.2	3.86	2.0	37.8	75.6	86.9	11.3		50.0	0.0	66.0	20.9	22.4	226.8	249.2	114.4	1,224	1442
Jun	17.5	6.66	2.9	38.4	111.4	83.8	-27.6	-27.6	28.0	-22.0	92.3	13.5	17.9	0.0	17.9	8.2	88	104
Jul	20.0	8.16	3.4	38.7	131.6	89.2	-42.4	-69.9	11.0	-17.0	92.7	13.5	15.7	0.0	15.7	7.2	77	91
Aug	19	7.55	3.2	36.0	115.2	96.6	-18.6	-88.5	8.0	-3.0	86.9	12.7	14.2	0.0	14.2	6.5	70	82
Sep	14.9	5.22	2.5	31.2	78.0	93.1	15.1		23.1	15.1	68.1	9.9	12.1	0.0	12.1	5.5	59	70
Oct	8.3	2.15	1.3	28.5	37.1	77.2	40.2		50.0	26.9	32.3	18.0	15.0	0.0	15.0	6.9	74	87
Nov	2.1	0.27	0.3	24.3	7.3	93.0	85.7		50.0	0.0	6.4	86.6	50.8	0.0	50.8	23.3	250	294
Dec	-3.9	0.00	0.0	23.1	0.0	68.6	68.6		118.6	0.0	0.0	0.0	25.4	0.0	25.4	11.7	125	147
Total		35.09			586.3	945.9	359.6				471.1	222.8	219.6	252.0	471.6	216.5	2,316.3	2,730.2

Table 4-3. Existing Conditions Monthly Water Balance for Site (To Right-of-Way)

Month	Daily Average Temp. (°C)	Monthly Heat Index	Unadjusted Daily Potential Evapotranspiration (mm)	Correction Factor	Adjusted Potential Evapotranspiration (mm)	Average Precipitation (mm)	P-PE (mm)	Accumulative Potential Water Loss (mm)	Storage (mm)	ΔS (mm)	Actual Evapotranspiration (mm)	Moisture Surplus (mm)	Water Runoff (mm)	Snow Melt Runoff (mm)	Total Recharge & Runoff (mm)	Actual Runoff (mm)	Runoff Volume (m³)	Recharge Volume (m³)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		186.5	0.0	0.0	0.0	15.0	0.0	15.0	12.7	6	1
Feb	-6.3	0.0	0.0	24.6	0.0	55.9	55.9		242.4	0.0	0.0	0.0	7.5	0.0	7.5	6.4	3	1
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		302.0	0.0	0.0	0.0	3.8	0.0	3.8	3.2	2	0
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		50.0	0.0	18.2	55.9	27.9	25.2	53.1	45.1	23	4
May	12.2	3.9	2.0	37.8	75.6	86.9	11.3		50.0	0.0	45.6	41.3	34.6	226.8	261.4	221.7	111	20
Jun	17.5	6.7	2.9	38.4	111.4	83.8	-27.6	-27.6	28.0	-22.0	63.8	42.0	38.3	0.0	38.3	32.5	16	3
Jul	20.0	8.2	3.4	38.7	131.6	89.2	-42.4	-69.9	11.0	-17.0	64.1	42.1	40.2	0.0	40.2	34.1	17	3
Aug	19	7.6	3.2	36.0	115.2	96.6	-18.6	-88.5	8.0	-3.0	60.1	39.5	39.8	0.0	39.8	33.8	17	3
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		23.1	15.1	47.1	30.9	35.4	0.0	35.4	30.0	15	3
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		50.0	26.9	22.4	27.9	31.7	0.0	31.7	26.9	13	2
Nov	2.1	0.3	0.3	24.3	7.3	93.0	85.7		50.0	0.0	4.4	88.6	60.1	0.0	60.1	51.0	25	5
Dec	-3.9	0.0	0.0	23.1	0.0	68.6	68.6		118.6	0.0	0.0	0.0	30.1	0.0	30.1	25.5	13	2
Total		35.1			586.3	945.9	359.6				325.7	368.2	364.4	252.0	616.4	522.7	261.4	46.8

Table 4-4. Post-Development Conditions Water Balance Inputs

	Contributing Area (ha)	Percent Impervious (%)	Soil Type	Vegetation Type	Root Zone Depth (m)	Soil Moisture Retention Capacity (mm)	Runoff Factor	Evapotranspiration Factor for Impervious Surfaces
Site to Wetland	1.04	53	Fine sand	Shallow-rooted crops	0.50	50	0.79	0.34
Site to Right-of-Way	0.08	49	Fine sand	Shallow-rooted crops	0.50	50	0.78	0.34
Overall Area to Wetland	8.74	35	Fine sand	Shallow-rooted crops	0.50	50	0.71	0.34

Table 4-5. Post-Development Conditions Monthly Water Balance for Site (To Wetland)

Month	Daily Average Temp. (°C)	Monthly Heat Index	Unadjusted Daily Potential Evapotranspiration (mm)	Correction Factor	Adjusted Potential Evapotranspiration (mm)	Average Precipitation (mm)	P-PE (mm)	Accumulative Potential Water Loss (mm)	Storage (mm)	ΔS (mm)	Actual Evapotranspiration (mm)	Moisture Surplus (mm)	Water Runoff (mm)	Snow Melt Runoff (mm)	Total Recharge & Runoff (mm)	Actual Runoff (mm)	Runoff Volume (m³)	Recharge Volume (m³)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		186.5	0.0	0.0	0.0	14.6	0.0	14.6	11.6	120	32
Feb	-6.3	0.0	0.0	24.6	0.0	55.9	55.9		242.4	0.0	0.0	0.0	7.3	0.0	7.3	5.8	60	16
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		302.0	0.0	0.0	0.0	3.7	0.0	3.7	2.9	30	8
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		50.0	0.0	19.7	54.4	27.2	25.2	52.4	41.5	431	113
May	12.2	3.9	2.0	37.8	75.6	86.9	11.3		50.0	0.0	49.3	37.6	32.4	226.8	259.2	205.3	2,135	561
Jun	17.5	6.7	2.9	38.4	111.4	83.8	-27.6	-27.6	28.0	-22.0	69.0	36.8	34.6	0.0	34.6	27.4	285	75
Jul	20.0	8.2	3.4	38.7	131.6	89.2	-42.4	-69.9	11.0	-17.0	69.2	37.0	35.8	0.0	35.8	28.4	295	78
Aug	19	7.6	3.2	36.0	115.2	96.6	-18.6	-88.5	8.0	-3.0	64.9	34.7	35.2	0.0	35.2	27.9	290	76
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		23.1	15.1	50.8	27.2	31.2	0.0	31.2	24.7	257	68
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		50.0	26.9	24.1	26.2	28.7	0.0	28.7	22.7	236	62
Nov	2.1	0.3	0.3	24.3	7.3	93.0	85.7		50.0	0.0	4.8	88.2	58.5	0.0	58.5	46.3	481	127
Dec	-3.9	0.0	0.0	23.1	0.0	68.6	68.6		118.6	0.0	0.0	0.0	29.2	0.0	29.2	23.1	241	63
Total		35.1			586.3	945.9	359.6				351.8	342.1	338.5	252.0	590.5	467.6	4,862.6	1,278.2

Table 4-6. Post-Development Conditions Monthly Water Balance for Site (To Right-of-Way)

Month	Daily Average Temp. (°C)	Monthly Heat Index	Unadjusted Daily Potential Evapotranspiration (mm)	Correction Factor	Adjusted Potential Evapotranspiration (mm)	Average Precipitation (mm)	P-PE (mm)	Accumulative Potential Water Loss (mm)	Storage (mm)	ΔS (mm)	Actual Evapotranspiration (mm)	Moisture Surplus (mm)	Water Runoff (mm)	Snow Melt Runoff (mm)	Total Recharge & Runoff (mm)	Actual Runoff (mm)	Runoff Volume (m³)	Recharge Volume (m³)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		186.5	0.0	0.0	0.0	14.4	0.0	14.4	11.2	9	3
Feb	-6.3	0.0	0.0	24.6	0.0	55.9	55.9		242.4	0.0	0.0	0.0	7.2	0.0	7.2	5.6	4	1
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		302.0	0.0	0.0	0.0	3.6	0.0	3.6	2.8	2	1
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		50.0	0.0	20.5	53.6	26.8	25.2	52.0	40.5	32	9
May	12.2	3.9	2.0	37.8	75.6	86.9	11.3		50.0	0.0	51.2	35.7	31.2	226.8	258.0	201.2	161	45
Jun	17.5	6.7	2.9	38.4	111.4	83.8	-27.6	-27.6	28.0	-22.0	71.7	34.1	32.7	0.0	32.7	25.5	20	6
Jul	20.0	8.2	3.4	38.7	131.6	89.2	-42.4	-69.9	11.0	-17.0	72.0	34.2	33.4	0.0	33.4	26.1	21	6
Aug	19	7.6	3.2	36.0	115.2	96.6	-18.6	-88.5	8.0	-3.0	67.5	32.1	32.8	0.0	32.8	25.5	20	6
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		23.1	15.1	52.9	25.1	29.0	0.0	29.0	22.6	18	5
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		50.0	26.9	25.1	25.2	27.1	0.0	27.1	21.1	17	5
Nov	2.1	0.3	0.3	24.3	7.3	93.0	85.7		50.0	0.0	4.9	88.1	57.6	0.0	57.6	44.9	36	10
Dec	-3.9	0.0	0.0	23.1	0.0	68.6	68.6		118.6	0.0	0.0	0.0	28.8	0.0	28.8	22.4	18	5
Total		35.1			586.3	945.9	359.6				365.8	328.1	324.5	252.0	576.5	449.4	359.5	101.6

Table 4-7. Existing Conditions Monthly Water Balance for Wetland

Month	Daily Average Temp. (°C)	Monthly Heat Index	Unadjusted Daily Potential Evapotranspiration (mm)	Correction Factor	Adjusted Potential Evapotranspiration (mm)	Average Precipitation (mm)	P-PE (mm)	Accumulative Potential Water Loss (mm)	Storage (mm)	ΔS (mm)	Actual Evapotranspiration (mm)	Moisture Surplus (mm)	Water Runoff (mm)	Snow Melt Runoff (mm)	Total Recharge & Runoff (mm)	Actual Runoff (mm)	Runoff Volume (m³)	Recharge Volume (m³)
Jan	-7.4	0.00	0.0	24.3	0.0	67.9	67.9		186.5	0.0	0.0	0.0	13.4	0.0	13.4	7.2	632	542
Feb	-6.3	0.00	0.0	24.6	0.0	55.9	55.9		242.4	0.0	0.0	0.0	6.7	0.0	6.7	3.6	316	271
Mar	-1.9	0.00	0.0	30.6	0.0	59.6	59.6		302.0	0.0	0.0	0.0	3.3	0.0	3.3	1.8	158	135
Apr	5.7	1.22	0.9	33.6	30.2	74.1	43.9		50.0	0.0	24.0	50.1	25.0	25.2	50.2	27.1	2,373	2033
May	12.2	3.86	2.0	37.8	75.6	86.9	11.3		50.0	0.0	60.0	26.9	26.0	226.8	252.8	136.1	11,940	10227
Jun	17.5	6.66	2.9	38.4	111.4	83.8	-27.6	-27.6	28.0	-22.0	84.0	21.8	23.9	0.0	23.9	12.9	1,127	966
Jul	20.0	8.16	3.4	38.7	131.6	89.2	-42.4	-69.9	11.0	-17.0	84.3	21.9	22.9	0.0	22.9	12.3	1,080	925
Aug	19	7.55	3.2	36.0	115.2	96.6	-18.6	-88.5	8.0	-3.0	79.1	20.5	21.7	0.0	21.7	11.7	1,024	877
Sep	14.9	5.22	2.5	31.2	78.0	93.1	15.1		23.1	15.1	61.9	16.1	18.9	0.0	18.9	10.2	891	763
Oct	8.3	2.15	1.3	28.5	37.1	77.2	40.2		50.0	26.9	29.4	20.9	19.9	0.0	19.9	10.7	939	804
Nov	2.1	0.27	0.3	24.3	7.3	93.0	85.7		50.0	0.0	5.8	87.2	53.5	0.0	53.5	28.8	2,529	2166
Dec	-3.9	0.00	0.0	23.1	0.0	68.6	68.6		118.6	0.0	0.0	0.0	26.8	0.0	26.8	14.4	1,265	1083
Total		35.09			586.3	945.9	359.6				428.7	265.2	261.9	252.0	513.9	276.8	24,274.8	20,792.1

Table 4-8. Post-Development Conditions Monthly Water Balance for Wetland

Month	Daily Average Temp. (°C)	Monthly Heat Index	Unadjusted Daily Potential Evapotranspiration (mm)	Correction Factor	Adjusted Potential Evapotranspiration (mm)	Average Precipitation (mm)	P-PE (mm)	Accumulative Potential Water Loss (mm)	Storage (mm)	ΔS (mm)	Actual Evapotranspiration (mm)	Moisture Surplus (mm)	Water Runoff (mm)	Snow Melt Runoff (mm)	Total Recharge & Runoff (mm)	Actual Runoff (mm)	Runoff Volume (m³)	Recharge Volume (m³)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		186.5	0.0	0.0	0.0	13.6	0.0	13.6	9.7	850	339
Feb	-6.3	0.0	0.0	24.6	0.0	55.9	55.9		242.4	0.0	0.0	0.0	6.8	0.0	6.8	4.9	425	170
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		302.0	0.0	0.0	0.0	3.4	0.0	3.4	2.4	213	85
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		50.0	0.0	23.2	50.9	25.4	25.2	50.6	36.2	3,163	1263
May	12.2	3.9	2.0	37.8	75.6	86.9	11.3		50.0	0.0	58.0	28.9	27.2	226.8	254.0	181.5	15,863	6332
Jun	17.5	6.7	2.9	38.4	111.4	83.8	-27.6	-27.6	28.0	-22.0	81.2	24.6	25.9	0.0	25.9	18.5	1,616	645
Jul	20.0	8.2	3.4	38.7	131.6	89.2	-42.4	-69.9	11.0	-17.0	81.5	24.7	25.3	0.0	25.3	18.1	1,579	630
Aug	19	7.6	3.2	36.0	115.2	96.6	-18.6	-88.5	8.0	-3.0	76.5	23.1	24.2	0.0	24.2	17.3	1,512	604
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		23.1	15.1	59.9	18.1	21.2	0.0	21.2	15.1	1,322	528
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		50.0	26.9	28.4	21.9	21.5	0.0	21.5	15.4	1,344	536
Nov	2.1	0.3	0.3	24.3	7.3	93.0	85.7		50.0	0.0	5.6	87.4	54.5	0.0	54.5	38.9	3,402	1358
Dec	-3.9	0.0	0.0	23.1	0.0	68.6	68.6		118.6	0.0	0.0	0.0	27.2	0.0	27.2	19.5	1,701	679
Total		35.1			586.3	945.9	359.6				414.3	279.6	276.2	252.0	528.2	377.5	32,991.7	13,169.6

5. Erosion and Sediment Control Plan

Heavy-duty silt fence will be installed along the property and wetland boundary in all locations where runoff will discharge from the Site to adjacent lands. The silt fence will serve to minimize the opportunity for waterborne sediments to be washed onto the adjacent properties and wetland.

A mud mat will be installed on the site access road to minimize the opportunity for sediment tracking onto the public right-of-way during construction.

Once catch basins or maintenance holes have been installed, silt sacks will be placed under catch basin grates and filter fabric will be placed under access lids. This will be maintained until all building and landscaping has been completed.

Inspection and maintenance of all silt fencing and silt sacks 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 13mm or greater. Maintenance will be carried out, within 48 hours, on any part of the silt fence or silt sack found to need repair.

Upon completion of the grading, any area not subject to active construction within 30 days will be topsoiled and hydroseeded as per OPSS 572.

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

6. 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. Maintenance of storm sewers typically consists of cleaning out leaves, debris and accumulated sediment caught in sumps in catch basins and manholes and inspection and cleanout of inlets and outlets annually or as needed.
2. The oil-grit separator unit (EFO4) should be regularly inspected and maintained in accordance with the owner's manual from the manufacturer included in Appendix B.
3. The stormwater management facility should be inspected on an annual basis and include the following considerations:
 - a. Is the pond level higher than normal permanent pool elevation > 48 hours after a storm? If yes, the outlet structure may be obstructed – check and remove anything obstructing flow out of the pond.
 - b. Is the pond level lower than the normal permanent pool elevation (catch basin top of grate)? If yes, the inlet structure may be obstructed, check and remove anything obstructing the inlet structure or storm sewers upstream.
 - c. Is the vegetation around the stormwater management facility unhealthy or dying? If yes, re-establishment of the upland vegetation is required.
 - d. Is the pond all open water (no bulrushes or vegetation in the water)? Are there areas around the pond with easy access to open water where there should be vegetation? If yes, re-establishment of the wetland vegetation is required.
 - e. Is there an oily sheen on the water near the inlet or outlet? Is the water frothy? Is there an unusual colouring to the water? If yes, this indicates the occurrence of an oil spill, cleanup spill to avoid transfer to the municipal drain.
 - f. Check the sediment depth in the forebay. Is it higher than a third of the depth of the forebay? If yes, the forebay and potentially the permanent pool must be cleaned of sediment. The cleanout frequency of sediment in the forebay to maintain the stormwater management facility is approximately 6 years as per the information provided in Table 3-3.
4. Draining of the permanent pool in the stormwater management facility should include dewatering to lower surrounding groundwater levels and prevent failure of the pond liner due to uplift pressure from groundwater.

7. Conclusions

In summary, the features of the stormwater management design for 73/79 Sideroad 19 are as follows:

- An on-site stormwater management facility has been designed using Township of Centre Wellington (Fergus) stormwater management design criteria and hydrologic modelling in MIDUSS.
- Quantity control has been provided by attenuating post-development peak flow rates to the wetland and from the Site during the 25 mm, 2-year, 5-year, 10-year, 25-year, 50-year, and 100-year and Regional storm events to less than the rates under existing conditions.
- Quality control has been provided by achieving Enhanced level of treatment (80% total suspended solids removal) via a “treatment train” design approach involving grassed areas, swales, an oil-grit separator (EFO4 or approved equivalent), settling within the forebay and permanent pool of the proposed stormwater management facility.
- Erosion and sediment control will be provided via silt fence along the proposed development limits, silt sacks in catch basins, filter fabric in maintenance holes and a mud mat at the construction entrance.

Based on the above works, we trust that this is the information required at this time to support approval of the proposed residential development.

Appendix A Geotechnical Investigation, JLP Services



Geotechnical Investigation

Proposed Residential Development
79-87 Side Road 19
Township of Centre Wellington (Fergus), Ontario

Client:

WrightHaven Homes Limited
925 Gartshore Street, Units 1 & 2
Fergus, Ontario N1M 2W7

Attention: Steven Wright, President
Adam Wright, Project Manager

Type of Document:
Geotechnical Report

Project Number:
G4670-22-12

JLP Services Inc.
Geotechnical and Environmental Consultants
405 York Road
Guelph, ON
N1E 3H3

Date Submitted:
April 18, 2023

Cc: GM BluePlan Engineering Ltd.

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Enclosure 2 to 6:	Borehole Logs
Enclosure 7 to 9:	Grain Size Distribution Curves

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Appendix A:	Limitations and Use of Report
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1. Introduction

JLP Services Inc. (JLP) was retained by WrightHaven Homes Limited to carry out a geotechnical investigation for the proposed residential development located at 79-87 Side Road 19 in the Township of Centre Wellington (Fergus), Ontario.

Although final details concerning the proposed residential development are unavailable at the time of this report, it is understood, from the conceptual plan, that the proposed development consists of twenty (20) townhomes with basement and associated municipal site services, access road and storm water management facility.

The purpose of this investigation was to reveal the subsurface soil and groundwater conditions at the site and to determine the relevant soil properties for preliminary recommendations for the design and construction of building foundations, floor slab-on-grade, municipal site services, paved access road, and storm water management facility.

The conclusions and recommendations given in this report are based on the assumption that the design concept mentioned above will proceed into construction. If changes are made in the design phase and/or during construction, JLP must be retained to review these changes. The outcome of this review may lead to modifications to our recommendations or may require additional field and/or laboratory analyses to determine if the proposed changes are acceptable from a geotechnical standpoint.

2. Site Description

The site is located on southeast side of Side Road 19, about 120m northeast of Burnett Court, in Fergus, Ontario. The site is an open space behind existing residential dwellings on 79 Side Road 19 and is about 1.1 hectares in size. It is surrounded by existing residential dwellings and properties on all sides.

The ground surface is gently sloping with the higher grounds at the north side of the property. The difference in ground surface elevations is about 3.35m between the highest and the lowest borehole locations.

3. Field Work

The fieldwork was carried out over the period of January 30 to 31, 2023 and consisted of five (5) boreholes at the approximate locations shown on the Borehole Location Plan, Enclosure 1.

Prior to the commencement of drilling and sampling operations at the site, the borehole locations were cleared of underground utilities by Ontario One Call contractors and by a private utility locator.

The boreholes were advanced to the sampling depths by means of a track-mounted, power auger machine, equipped with solid and hollow stem augers and split spoon samplers for soil sampling. Standard Penetration tests were carried out at frequent intervals of depth and the results are shown on the Borehole Logs as N-values. The subsurface soils were visually examined, logged and sampled at the borehole locations.

Ground water conditions were observed in the open boreholes during the drilling and sampling operations. Monitoring wells were installed in all five (5) boreholes for subsequent groundwater monitoring to be conducted by GM BluePlan Engineering Limited (GMBP).

JLP engineering staff supervised and directed the fieldwork. The layout of borehole locations and the survey of ground surface elevations was carried out in the field by GMBP. The ground surface elevations at the borehole locations are listed in Table 1 below.

Table 1: Borehole Location and Ground Surface Elevations

Borehole	Ground Surface Elevation (m±)
MW1	419.211
MW2	417.100
MW3	416.939
MW4	416.302
MW5	415.859

4. Subsurface Conditions

Full details of the soil conditions encountered in each borehole are given on the Borehole Logs, Enclosures 2 to 6, inclusive and the following notes are intended to summarize this data.

A deposit of **fill**, about 125mm thick, was encountered locally at the surface of Boreholes 2 and 4. The fill generally consisted of brown sand and gravel, some silt.

Based on visual and tactile examination of the soil samples, the fill is considered to be in a generally loose state of compactness and in moist condition.

A deposit of **topsoil**, about 100 to 650mm thick, was encountered at the surface of Boreholes 1, 3 and 5 and below the fill layer in Boreholes 2 and 4 extending to about 0.1 to 0.8 metres below grade. The topsoil consisted of sandy silt, some organics, and was black in colour. The natural moisture content was found to range between 20 and 34%.

It should be noted that the thickness of topsoil may vary significantly between borehole locations and should not be relied upon to estimate the quantity of topsoil for removal.

A deposit of **silt** was encountered below the topsoil in all the boreholes to depth of about 1.0 to 2.3 metres below grade. This material was brown to grey in colour and consisted of silt, some sand. In Boreholes 1, 2, 3, the silt contained occasional coarse sand inclusions. In Borehole 1, the silt contained trace organic inclusions. In Boreholes 4 and 5, the silt contained scattered organic seams and wood or plant fibres in upper portion. Standard Penetration tests in the silt gave N-values ranging between 5 and 14 blows/300mm, with typical values between 7 and 11 blows/300mm. The natural moisture content was found to range from 8 to 33%, with typical values between 18 and 22%. The relatively high natural moisture content test results in Boreholes 1, 4 and 5 may be attributed to the presence of organics in the deposit.

A typical grain size distribution curve for the silt can be found on Enclosure 7. The grain size analysis results indicate 1% of gravel, 17% of sand, 73% of silt and 9% of clay size particles by weight. The liquid limit (LL), plastic limit (PL) and plasticity index (PI) of the sample of silt is 21.4%, 17.7% and 3.8%, respectively.

Based on the test results and visual and tactile examination of the soil samples, the silt is considered to be in a loose to dense state of compactness and in moist to wet condition.

A deposit of sand was encountered below the silt in all the boreholes extending to depths of about 3.5 and 7.6 metres below grade in Boreholes 1, 3, 4 and 5 and to the termination depth of Borehole 2 at about 5.2 metres below grade. The sand was brown to grey in colour and consisted of trace silt. In Borehole 1, scattered silty seams were observed at about 5.0 metres below grade. Standard Penetration tests in this deposit gave N-values ranging from 6 to 53 blows/300mm, with typical values between 8 and 18 blows/300mm. The natural moisture content was found to range from 12 to 32%, with typical values between 19 and 24%.

A typical grain size distribution curve for the sand can be found on Enclosure 8. The grain size analysis results indicate 0% of gravel, 92% of sand, 7% of silt and 1% of clay size particles by weight.

Based on the test results and visual and tactile examination of the soil samples, the sand is considered to be in a generally loose to compact state of compactness and in moist to wet condition.

A discontinuous deposit of sandy silt till was encountered below the sand in Boreholes 1, 3, 4 and 5 and extending to the termination depths of the boreholes at about 3.7 to 8.2 metres below grade. The sandy silt till was grey in colour and contained trace clay and occasional gravel inclusions. Standard Penetration tests in the sandy silt till gave N-values ranging between 12 and 84 blows/300mm, with typical values between 30 and 53 blows/300mm. The natural moisture content of this material was found to range from 10 to 18%.

A typical grain size distribution curve for the sandy silt till can be found on Enclosure 9. The grain size analysis results indicate 1% of gravel, 21% of sand, 77% of silt and 1% of clay size particles by weight. The liquid limit (LL), plastic limit (PL) and plasticity index (PI) of the sample of sandy silt till are 17.2 %, 13.7% and 3.5 %, respectively.

Based on the test results and visual and tactile examination of the soil samples, the sandy silt till is considered to be in a generally compact to very dense state of compactness and in moist to wet condition.

5.0 Groundwater Conditions

No free water was encountered in any of the boreholes on completion of the fieldwork.

A monitoring well was installed in each of the five (5) boreholes, sealed with bentonite between 0.25 below ground surface and 0.6 metres above top of well screen for groundwater level monitoring. Free water surface levels were measured by personnel from GMBP at depths and elevations noted in Table 2 below.

Table 2: Observed Groundwater Levels

Location	Ground Elevation (m)	March 14, 2023		April 5, 2023	
		Depth Below Existing Grade (m±)	Water Level Elevation (m±)	Depth Below Existing Grade (m±)	Water Level Elevation (m±)
MW 1	419.211	N/R	N/R	2.141	417.070
MW 2	417.100	N/R	N/R	0.120	416.980
MW 3	416.939	1.208	415.731	0.606	416.333
MW 4	416.302	0.679	415.623	0.198	416.104
MW 5	415.859	0.667	415.192	0.295	415.564

*N/R denotes "not recorded" due to well not accessible on the date of reading water levels

An examination of the soil samples indicated that the materials were generally moist to wet.

It is noted that no sub-artesian water pressure was encountered in any of the boreholes.

Based on the foregoing measurements and the moisture content profiles of the soil samples, the localized groundwater table at the site is considered to be located at about 0.5 to 1.0 metre below grade, Elevations 416.2m to 415.1m. The groundwater is believed to be originated within the sand deposit above the less permeable sandy silt till.

Seasonal fluctuation of the groundwater level should be anticipated.

6.0 Discussion and Recommendations

6.1 General

The boreholes generally encountered a surficial deposit of topsoil, followed by a deposit of silt, underlain by a deposit of sand, followed by a deposit of sandy silt till. The groundwater level at the site appears to be stabilized at about 0.1 to 2.1 metres below existing grade, Elevations 417.1 to 415.6m.

Although final details concerning the proposed development are unavailable at the time of this report, it is understood, from the conceptual plan, that the proposed development consists of twenty (20) townhomes with basement and associated municipal site services, access road and storm water management facility. Based on the foregoing, the following discussion is therefore considered preliminary. It should be reviewed when more details are available.

6.2 Site Grading

It is assumed some re-grading will be required at the site depending on the final design grades of the proposed residential development.

Following clearing and grubbing as required, the surficial topsoil may be removed and stockpiled for re-use and/or off-site disposal. The design site grades may be achieved by cut and fill operations. All cut and fill to support the proposed building lots, site services and pavement areas should be carried out following the procedure for “engineered fill” construction.

The procedure for “engineered fill” construction would consist of the following:

1. All vegetation, surficial topsoil, fill and any deleterious materials should be removed from the proposed building lots, site services and pavement areas. Any organic, excessively wet or otherwise deleterious materials should not be used as “engineered fill” material.

2. Existing groundwater monitoring wells and/or potable water wells, if any, should be properly decommissioned in accordance with the Ontario Water Resources Act, R.R.O. 1990, Ontario (O.Reg.) 903 – amended to O.Reg. 128/03.
3. The exposed subgrade should be proof-rolled with a heavy-duty equipment, such as a loaded dump truck, and examined by geotechnical personnel from JLP. Any loose or soft areas encountered during the proof-rolling process should be further sub-excavated and replaced with approved on-site or imported soil materials compacted to a minimum of 98% of the Standard Proctor Maximum Dry Density (SPMDD).
4. Low areas can then be brought up to the design pre-grade level with approved on-site or imported soil materials placed in maximum 200mm thick lifts and compacted to a minimum of 98% of the SPMDD.
5. Moisture conditioning should be applied to the approved on-site and/or imported soil materials for effective compaction. Some of the on-site soil materials may require air drying before they can be properly compacted.
6. The “engineered fill” under all structures to be supported should extend to at least 1.0 metre laterally beyond the edge of their perimeter at the founding level and at least a distance equal to the depths of the fill pad, at the level of the approved subgrade.
7. Temporary fill slopes should be no steeper than 1 vertical to 2 horizontal and should be protected from surface erosion.
8. All imported fill materials should be assessed by JLP prior to transport to the site in accordance with the “On-Site and Excess Soil Management Regulation”, O.Reg. 406/19 and supporting amendments.
9. All imported fill materials should be free from organics, cobbles/boulders and debris and should be tested geotechnically by JLP prior to transport to the site.
10. All topsoil and unsuitable material removal, subgrade preparation, fill placement and compaction should be monitored on a full-time basis by geotechnical staff from JLP to approve materials and to verify that the specified degree of compaction have been achieved.

6.3 Site Services

The inverts of the proposed site services are not available at the time of this report. However, it is expected that the storm sewer and watermain inverts will be located at depths ranging

between 2.0 and 4.0 metres below the finished grades. All sewers and watermains should be protected from frost actions by at least 1.4m of soil cover or equivalent thermal insulation.

Reference to the Borehole Logs indicates that the subgrade for site services will generally consist of native sand in loose to compact state, sandy silt till in compact to very dense state or “engineered fill” constructed during site grading. The subgrade will generally provide adequate support for the pipes and allow the use of OPSD 802.010 and/or OPSD 802.031 Class ‘B’ bedding using OPSS.MUNI 1010 Granular ‘A’ material.

Clear crushed stone should not be used as bedding as fine-grained particles may migrate into the voids of the clear stone and cause undesirable settlements. Where the exposed subgrade is less competent than the materials identified in the Borehole Logs, the bedding thickness may have to be increased.

If the trench excavation is above the observed groundwater level, the sides of the open cut excavation should either be cut back at a side slope of 1 vertical to 1 horizontal or supported with trench box or temporary shoring system.

If the trench excavation is below the observed groundwater level, construction dewatering by means of pumping from sump within the excavation or by pumping from well-points may be required to lower the groundwater level to at least 600 mm below the bottom of the trench to facilitate construction. The sides of the open cut excavation should either be cut back at a side slope of 1 vertical to 2 horizontal or supported with trench box or temporary shoring system.

The excavated materials will be generally suitable for re-use as trench backfill provided that they are free of topsoil, organic material and cobbles/boulders. If the on-site materials become wet, they should be air dried prior to re-use as trench backfill. The trench backfill should be placed in maximum 300mm thick layers and uniformly compacted to at least 95% of its Standard Proctor Maximum Dry Density (SPMDD).

The backfill around maintenance holes, catchbasins, valve chambers, thrust blocks and/or service connections should consist of free-draining granular material, such as the OPSS Granular ‘B’ Type I or Type II Modified material and compacted to a minimum of 95% of its SPMDD.

To minimize potential problems and wetting of the subgrade material, backfilling operations should follow closely after excavations, so that only a minimal length of trench is exposed at a time. Should construction be carried out in the winter season, particular attention should be given to make sure no frozen material is used for backfill.

Cobbles and/or boulders may be present in the native sandy silt till deposit, and some difficulty or delays may be anticipated during excavation at depth. Cobbles and/or boulders with nominal diameter larger than 150mm should not be re-used as trench backfill.

6.4 Storm Water Management Facility

Grain size distribution curves were prepared for representative samples of the subsoils obtained at the boreholes. These grain size distribution analyses were performed following applicable ASTM laboratory procedures and are found on Enclosures 7 to 9, inclusive.

The grain size distribution curves were compared to the family of curves presented in the Supplementary Standard SB-6 of the 2012 Building Code Compendium. According to the Unified Soils Classification System and taking into consideration the specific physical nature of the soils, the samples in question are considered to have the properties noted in the following Table 3.

Table 3: Soil Permeability and T-time Estimation

Sample Number	Material					Unified Soils Classification Group	Estimated Co-efficient of Permeability (k) (cm/sec)	Estimated T-time (min/cm)
	Description	Gravel (%)	Sand (%)	Silt (%)	Clay (%)			
BH1 SS5	Sand, trace silt	0	92	7	1	(SP)	$10^{-2} - 10^{-3}$	10
BH3 SS2	Silt, some sand	1	21	77	1	(ML)	$10^{-5} - 10^{-6}$	50
BH5 SS3	Silt, some silt	1	17	73	9	(ML)	$10^{-5} - 10^{-6}$	50

If a storm water management pond is to be constructed for the proposed subdivision, a low permeability liner may be required to maintain a permanent wet pond. The low permeability liner may be constructed with a minimum 1m thick layer of clayey soils conforming to OPSS.MUNI 1205 requirements. Alternatively, a geosynthetic clay liner, such as Bentofix CNSL, or a synthetic liner, such as Nilex Geomembrane PVC 40 mil or similar products, may be used.

If a geosynthetic or synthetic liner is used, a minimum 300mm thick marker layer should be placed above the liner as an indicator/protective soil cover. The liner should be installed as per manufacturer's guidelines and up to a minimum of 0.6m above the design flood level in the pond. An underdrainage system will be required to relieve the hydrostatic uplift against the liner as the bottom of pond is likely lower than the highest observed groundwater level in the vicinity of the pond.

6.5 Pavement Design and Construction

It is envisaged that the subgrade for local roads and collectors will consist of native silt, sand, compacted "engineered fill" and/or compacted trench backfill. All organics or deleterious materials encountered should be stripped from the proposed road pavement areas. The exposed subgrade should be re-compacted from the surface to at least 98% of its standard Proctor maximum dry density (SPMDD) prior to construction of the road pavement. Any loose areas which are detected should be sub-excavated and backfilled with approved imported granular fill. All granular fill materials should be placed in 150 to 200mm thick lifts and compacted to 100% of the SPMDD.

Considering the probable traffic requirements, subgrade conditions and a functional design life of about 25 years, the pavement structure designs listed in Table 4 are recommended:

Table 4: Recommended Pavement Structures

Pavement Components	Local Road (mm)	Collector Road (mm)
Asphaltic Concrete – HL3	40	40
Asphaltic Concrete – HL4	50	60
Granular ‘A’ Base Course	150	150
Granular ‘B’ Type I or Type II Modified Subbase Course	450	600

The granular base and sub-base materials should meet Ontario Provincial Standard Specification OPSS.MUNI.1010 and Township of Centre Wellington requirements and should be compacted to 100% of the Standard Proctor Maximum Dry Density (SPMDD) as per OPSS.MUNI.501 requirements. The asphaltic concrete should conform to OPSS.MUNI.1150 and should be compacted to a minimum of 92.0% of the Maximum Relative Density (MRD) as per OPSS.MUNI.310 requirements.

Frequent inspections by geotechnical personnel from JLP Services Inc. should be carried out during construction to verify the compaction of the subgrade, base courses and asphaltic concrete by in-situ density testing using nuclear gauges.

6.6 Building Foundations

The proposed buildings to be constructed at the site are assumed to be primarily townhome residential dwellings with basements. Due to the relatively high groundwater level observed at the site, it may be prudent to raise the overall site grades to ensure the basement level will be higher than the observed groundwater level at the site or to eliminate the basement level in the design of the proposed buildings.

The proposed buildings can be supported on spread footings founded a minimum of 0.3m into the native undisturbed silt or sand in compact state of compactness or into the properly

constructed “engineered fill” and designed to a geotechnical reaction of 100 kPa at Serviceability Limit States (S.L.S.) and a factored geotechnical resistance of 150 kPa at Ultimate Limit States (U.L.S.).

All exterior footings or footings in unheated areas should be located at least 1.4 metres below finished grade or provided with equivalent thermal insulation for adequate frost protection.

Elevation differences between adjacent footings should not be more than a half of the horizontal distance between them.

It is estimated that the total and differential settlements of spread footings designed to these bearing pressures will be less than 25mm and 20mm respectively, which are normally considered acceptable for the proposed structure.

It is recommended that all foundation excavations be inspected by geotechnical personnel from JLP to ensure the founding soils are similar to those identified in the boreholes or are competent “engineered fill” and that they are capable of supporting the design bearing pressures.

Based on the 2012 Building Code Compendium, the classification of soils for seismic design should be based on the average properties of the top 30 metres of the soil profile. The maximum depth of boreholes was 8.2 metres below existing grade and were terminated in very dense sandy silt till. Assuming this deposit extend to depth, the soils at the site may be classified as Site Class ‘D’ under the site classification for seismic site response of 2012 Building Code Compendium.

6.7 Basement Walls

The basement walls of the proposed buildings may be designed to resist lateral earth pressures and the magnitude of which can be determined from the equation below:

$$p = K(\gamma d + q)$$

where; p = lateral earth pressure, kN/m²

K	=	active earth pressure coefficient, $K = K_a = 0.33$, if retaining structure is permitted to move, otherwise, $K = K_o = 0.50$
γ	=	bulk unit weight of backfill, use 20 kN/m^3
d	=	depth below finished grade, metres
q	=	adjacent surcharge acting close to the wall, kN/m^2

The above equation assumes that there is no hydrostatic pressure build up against the basement walls. As such, the basement walls should be dampproofed and protected with a synthetic vertical drainage layer. A perimeter subdrain system should be installed at footing level outside the building envelope to facilitate drainage. The perimeter subdrain system should consist of 150mm diameter perforated pipe surrounded with a minimum of 300mm of 19mm clear stone all wrapped with a filter fabric, such as Texel 100C or other products with equivalent apparent opening size (AOS).

Water collected in the perimeter drainage system should be directed to the local storm drainage system either by gravity or by a permanent sump pump. Surface runoff around the proposed buildings should be directed away from the building.

Alternatively, the basement walls and floors can be sealed tight using waterproofing systems and designed to resist full hydrostatic pressures.

6.8 Floor Slabs

All topsoil and any deleterious materials encountered should be stripped from the proposed building areas. Any loose material encountered should be sub-excavated and replaced with approved fill. The exposed subgrade should be re-compacted from the surface to a minimum of 98% of the Standard Proctor Maximum Dry Density (SPMDD).

Backfill around the footings and basement walls should be compacted to a minimum of 98% of the SPMDD. The backfill may consist of approved on-site soils or imported granular materials, such as OPSS Granular 'B' Type I (natural sand, some gravel). All fills should be placed in 150 to 200mm thick lifts and compacted to a minimum of 98% of the SPMDD.

A layer of free-draining material, such as OPSS.MUNI 1004 19mm Clear Stone, at least 150mm thick and nominally compacted, or Granular 'A' complying with OPSS Form 1010 Specifications and compacted to 100% Standard Proctor maximum dry density should be placed under the floor slabs to provide a uniform bearing surface and act as a moisture barrier.

Ideally, the basement floors should be located at least 0.6 metres above the highest observed groundwater level, otherwise sub-floor drainage systems together with continual pumping from the drainage systems will be required. It is recommended that a sub-floor drainage system be provided for all townhome dwellings with a basement level due to the relatively high groundwater level observed at the site.

Around the perimeter of the proposed buildings, the ground surface should be sloped on a positive grade away from the structure to promote surface water run-off and reduce groundwater infiltration adjacent to the foundations.

Frequent field review and testing by geotechnical personnel from JLP should be carried out during construction to verify the competency of the subgrade and compaction of granular base and/or backfill by in-situ density testing using nuclear gauges.

6.9 Excavation and Groundwater Control

Excavation to reach the footing founding levels will extend to about 0.9 to 1.2 metres below design pre-grades. Excavations must be carried out in accordance with the current Occupation Health and Safety Act (OHSA) and local regulations.

Assuming the proposed buildings will be raised above the highest groundwater level observed, the side slopes of shallow excavation should be cut back to 1 vertical to 1 horizontal as the native silt, sand and/or "engineered fill" using native soils as fill are considered to be Type 3 soils within the meaning of the OHSA.

Minor seepage from groundwater in the native soil deposits or "engineered fill" should be anticipated during construction. However, it should be possible to control and remove seepage

water from these sources or surface water from precipitation by pumping on as and where required basis.

If the proposed buildings are to be constructed below the observed groundwater levels, localized dewatering will be required to drawdown the groundwater level to at least 0.6m below the lowest excavation depth to facilitate construction. Without effective dewatering, excavation to reach the subgrade for footings and/or site services in the silt and sand deposits will be unmanageable. Construction dewatering may consist of vacuum well points and should be designed and installed by a specialist dewatering contractor.

7.0 Statement of Limitation

The Statement of Limitation including the Terms and Conditions of this report is presented on Appendix 'A' is an integral part of this report.

8.0 Closure

We trust this report is satisfactory for your purposes. Should you have any questions, please do not hesitate to contact this office.

Sincerely,

JLP Services Inc.



Alexander Lee, M.Sc. (Eng.), P.Eng.
Senior Geotechnical Engineer



J. Board, B.A.
General Manager

JLP Services Inc.
Geotechnical Investigation
Proposed Residential Development
79-87 Side Road 19
Township of Centre Wellington (Fergus), Ontario
G4670-22-12
April 18, 2023

Enclosures



MW 1
El:419.25

MW 2
El:417.19

MW 3
El:417.17

MW 4
El:416.22

MW 5
El:415.79

Notes:
1. The soil types at the monitoring boreholes, they are used in the report are as follows:
2. The Ground Surface Benchmark (TBM)
3. The soil sample was taken and then discarded



G

V

CLIENT Wrighthaven Homes Limited

 PROJECT NAME Residential Subdivision

 PROJECT NUMBER G4670-22-12

 PROJECT LOCATION 79 Sideroad 19, Fergus, Ontario

 DATE STARTED 23-1-30 COMPLETED 23-1-30

 GROUND ELEVATION 419.211 m HOLE SIZE 200mm

 DRILLING CONTRACTOR Pontil Drilling

GROUND WATER LEVELS:

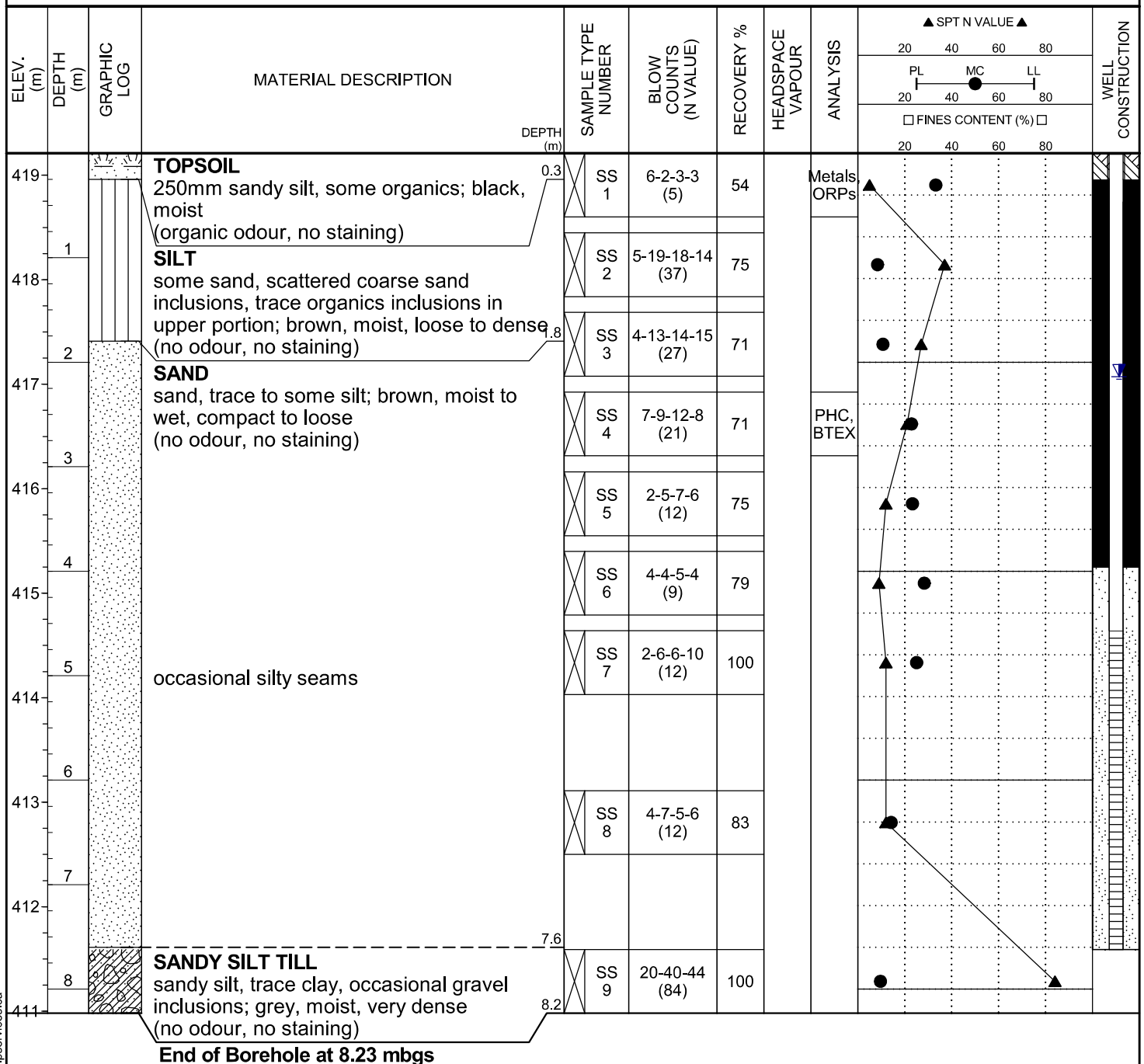
 DRILLING METHOD Hollow Stem

 AT TIME OF DRILLING ---

 LOGGED BY AK/PB CHECKED BY AL

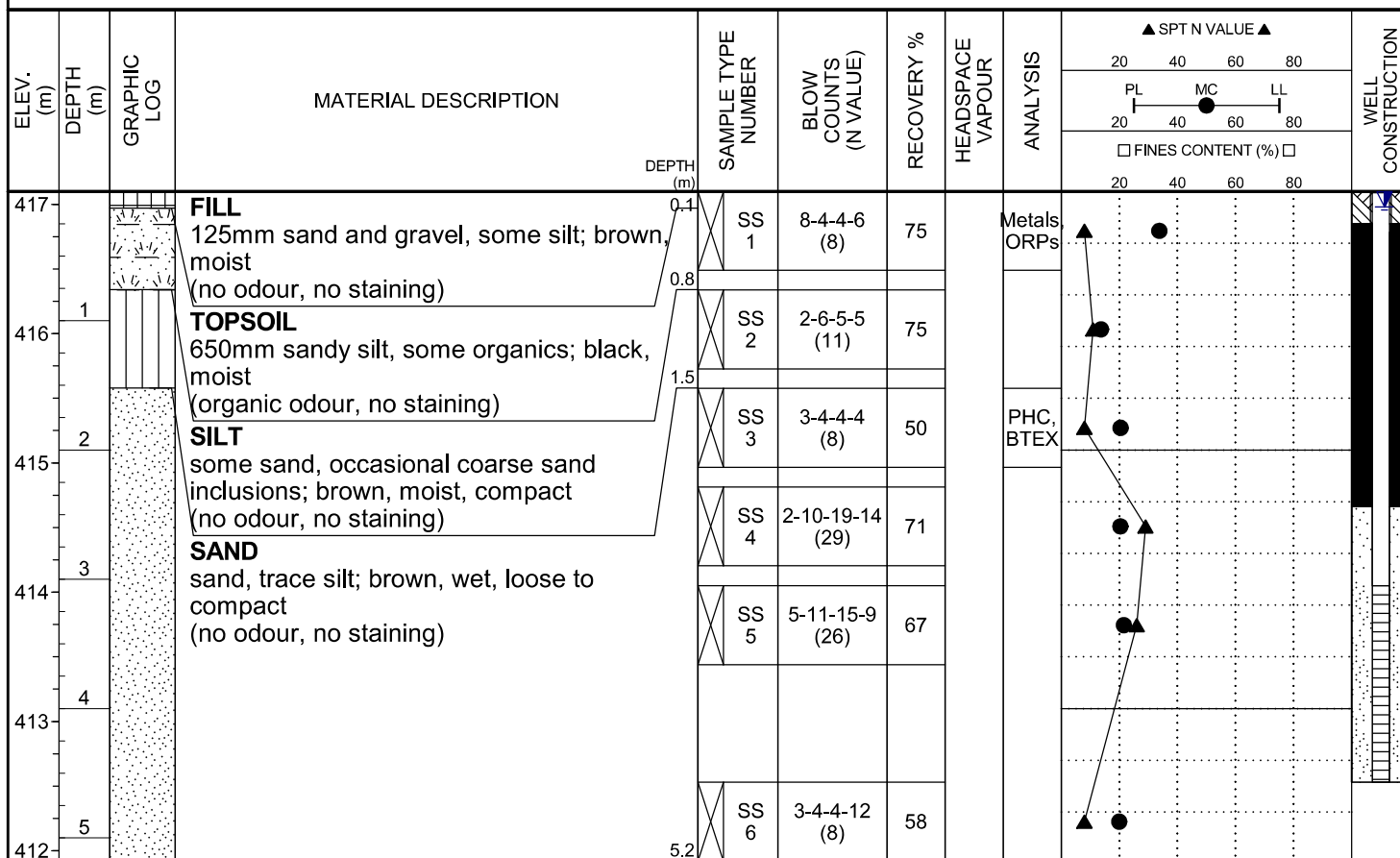
 AT END OF DRILLING ---

NOTES

 AFTER DRILLING 2.14 m / Elev 417.07 m

Water Level Readings:

Date	Depth (m)	Elevation (m)
Mar 14, 2023	N/R	N/R
Apr 05, 2023	2.14	417.07

CLIENT <u>Wrighthaven Homes Limited</u> PROJECT NUMBER <u>G4670-22-12</u> DATE STARTED <u>23-1-30</u> COMPLETED <u>23-1-30</u> DRILLING CONTRACTOR <u>Pontil Drilling</u> DRILLING METHOD <u>Hollow Stem</u> LOGGED BY <u>AK/PB</u> CHECKED BY <u>AL</u> NOTES _____	PROJECT NAME <u>Residential Subdivision</u> PROJECT LOCATION <u>79 Sideroad 19, Fergus, Ontario</u> GROUND ELEVATION <u>417.1 m</u> HOLE SIZE <u>200mm</u> GROUND WATER LEVELS: AT TIME OF DRILLING <u>---</u> AT END OF DRILLING <u>---</u> ▼ AFTER DRILLING <u>0.12 m / Elev 416.98 m</u>
---	---



End of Borehole at 5.18 mbgs

Water Level Readings:

<u>Date</u>	<u>Depth (m)</u>	<u>Elevation (m)</u>
Mar 14, 2023	N/R	N/R
Apr 05, 2023	0.12	416.98

CLIENT Wrighthaven Homes Limited

 PROJECT NAME Residential Subdivision

 PROJECT NUMBER G4670-22-12

 PROJECT LOCATION 79 Sideroad 19, Fergus, Ontario

 DATE STARTED 23-1-31 COMPLETED 23-1-31

 GROUND ELEVATION 416.939 m HOLE SIZE 200mm

 DRILLING CONTRACTOR Pontil Drilling

GROUND WATER LEVELS:

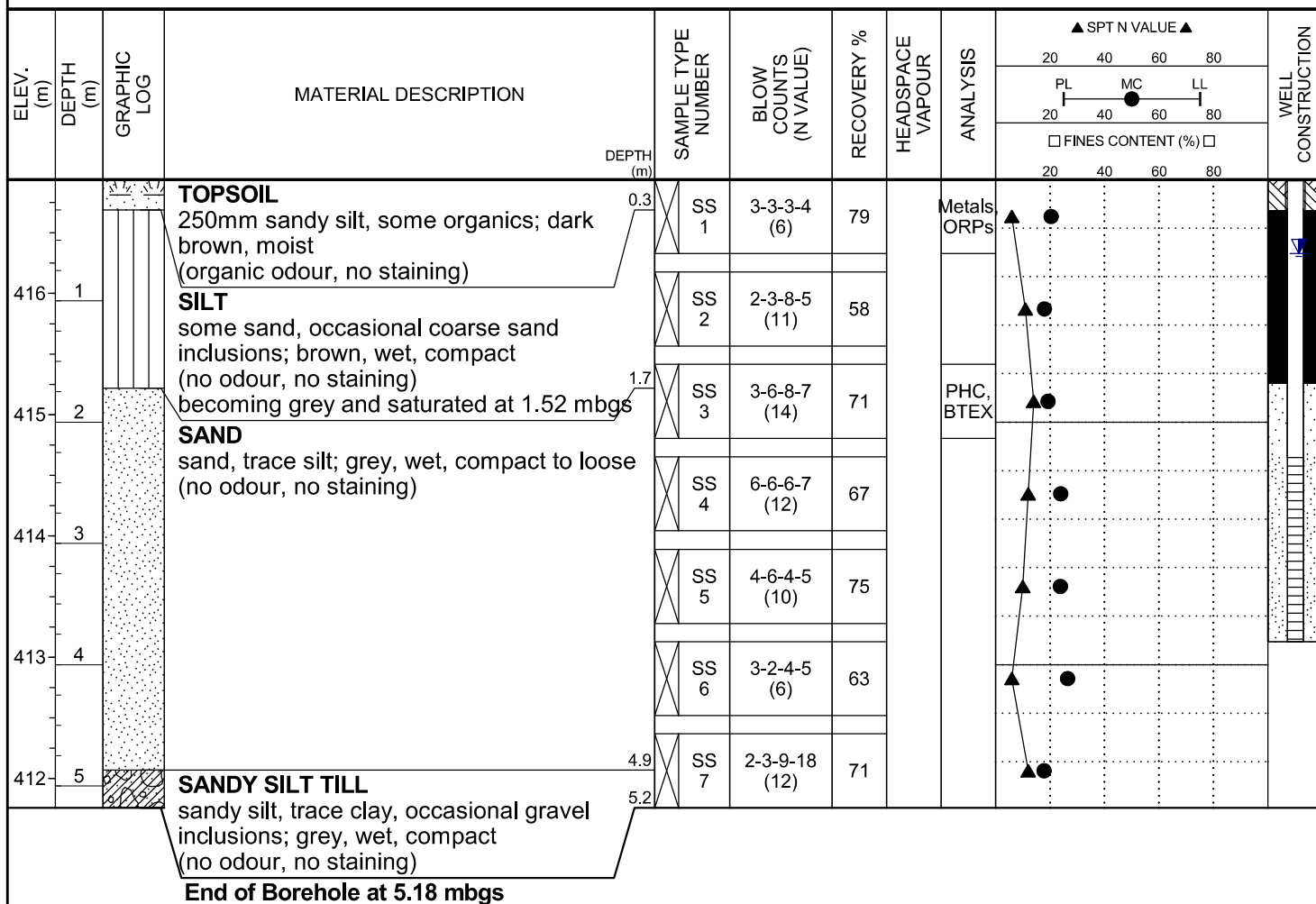
 DRILLING METHOD Hollow Stem

 AT TIME OF DRILLING ---

 LOGGED BY AK/PB CHECKED BY AL

 AT END OF DRILLING ---

NOTES

 AFTER DRILLING 0.61 m / Elev 416.33 m

Water Level Readings:

Date	Depth (m)	Elevation (m)
Mar 14, 2023	1.21	415.73
Apr 05, 2023	0.61	416.33

CLIENT Wrighthaven Homes Limited

 PROJECT NAME Residential Subdivision

 PROJECT NUMBER G4670-22-12

 PROJECT LOCATION 79 Sideroad 19, Fergus, Ontario

 DATE STARTED 23-1-30 COMPLETED 23-1-30

 GROUND ELEVATION 416.302 m HOLE SIZE 200mm

 DRILLING CONTRACTOR Pontil Drilling

GROUND WATER LEVELS:

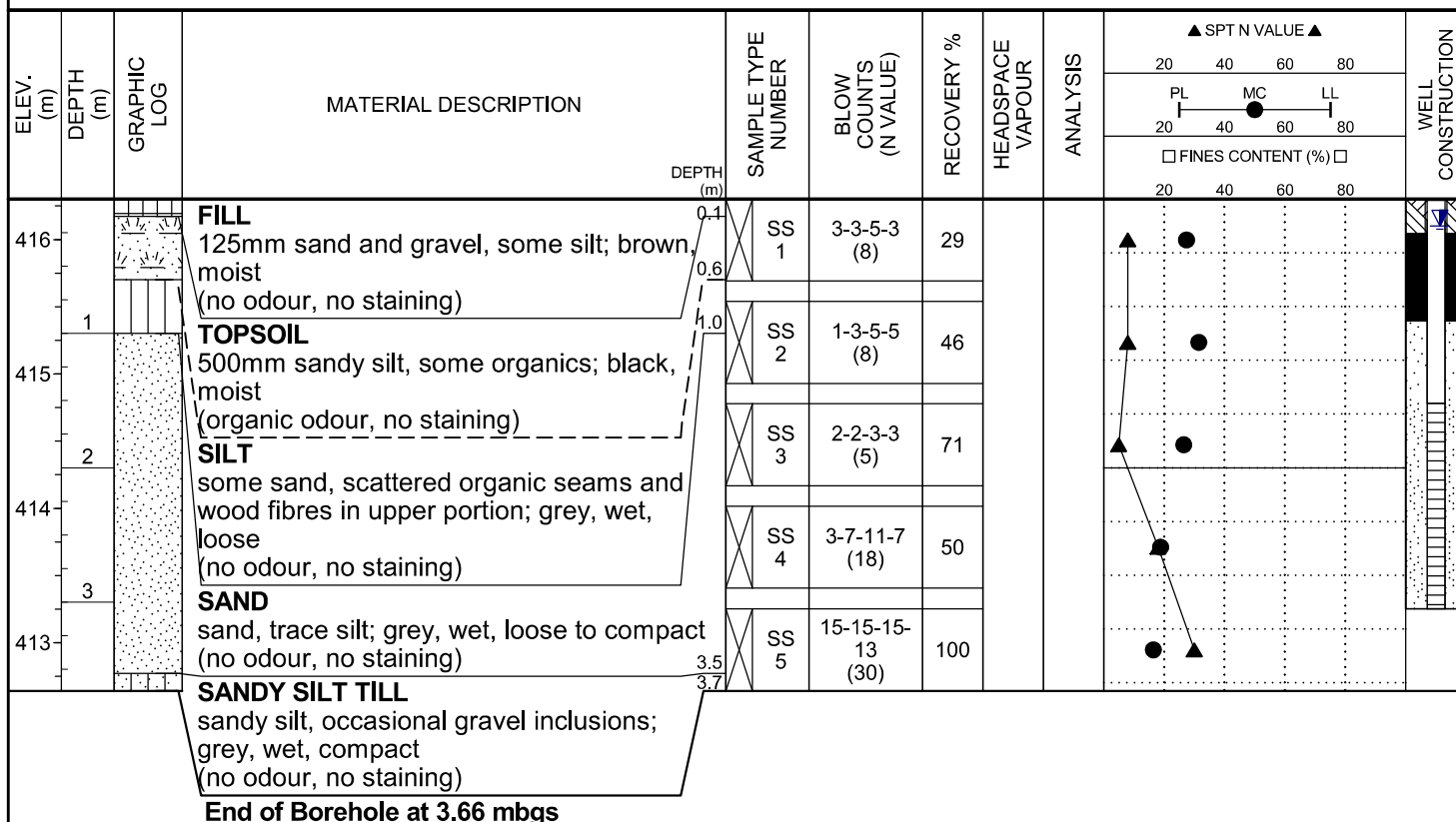
 DRILLING METHOD Hollow Stem

 AT TIME OF DRILLING ---

 LOGGED BY AK/PB CHECKED BY AL

 AT END OF DRILLING ---

NOTES

 AFTER DRILLING 0.20 m / Elev 416.10 m

Water Level Readings:

Date	Depth (m)	Elevation (m)
Mar 14, 2023	0.68	415.62
Apr 05, 2023	0.20	416.10

CLIENT Wrightshaven Homes Limited

 PROJECT NAME Residential Subdivision

 PROJECT NUMBER G4670-22-12

 PROJECT LOCATION 79 Sideroad 19, Fergus, Ontario

 DATE STARTED 23-1-31 COMPLETED 23-1-31

 GROUND ELEVATION 415.859 m HOLE SIZE 200mm

 DRILLING CONTRACTOR Pontil Drilling

GROUND WATER LEVELS:

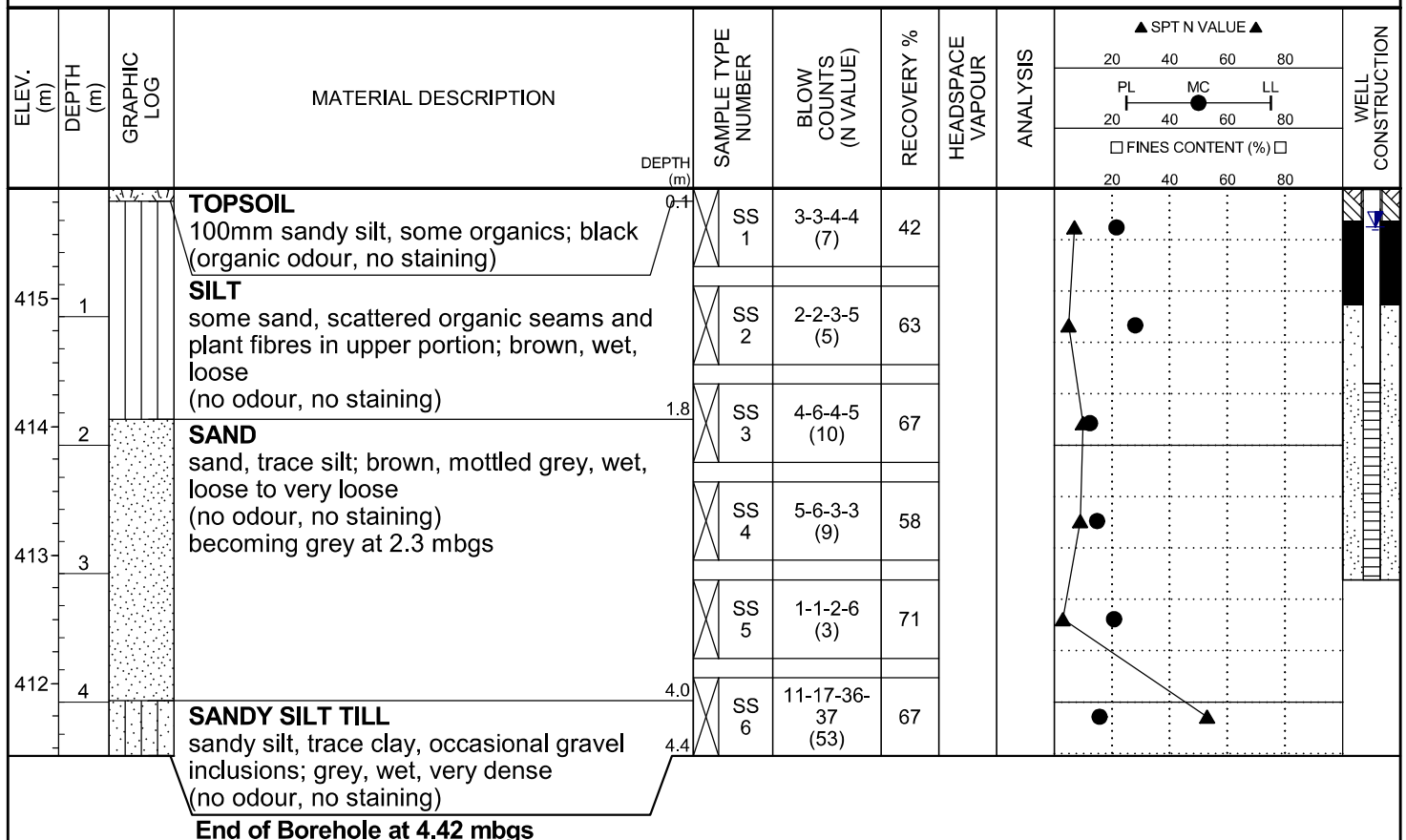
 DRILLING METHOD Hollow Stem

 AT TIME OF DRILLING ---

 LOGGED BY AK/PB CHECKED BY AL

 AT END OF DRILLING ---

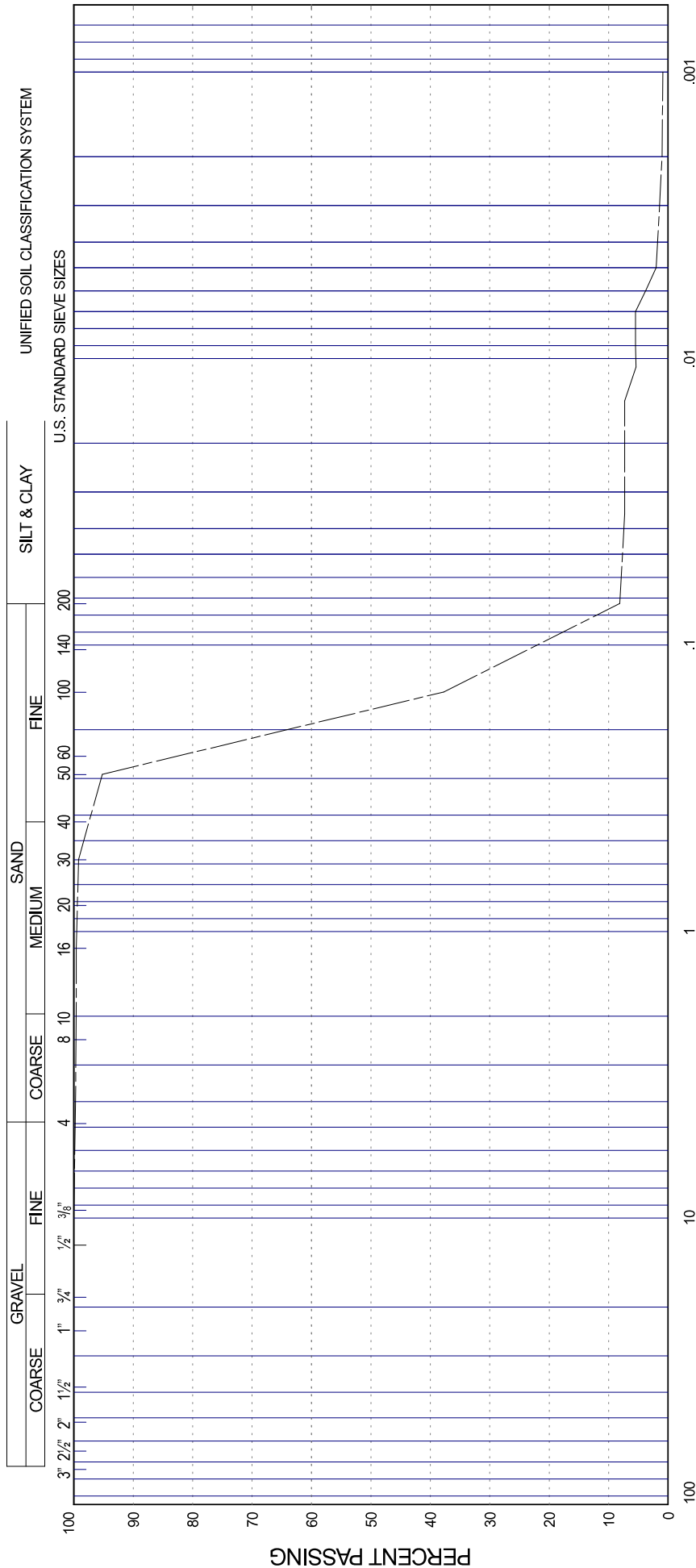
NOTES

 AFTER DRILLING 0.30 m / Elev 415.56 m

Water Level Readings:

Date	Depth (m)	Elevation (m)
Mar 14, 2023	0.67	415.19
Apr 05, 2023	0.29	415.56

GRAIN SIZE DISTRIBUTION

OUR REFERENCE N° G4670-22-12



ENCLOSURE N° 7

PROJECT: Residential Subdivision
LOCATION: 79 - 87 Sideroad , Fergus, ON
BOREHOLE N°: 1
SAMPLE N°: 5
DEPTH: 3.0- 3.6 m±
ELEVATION: 416.3 - 415.7 m±

COEFFICIENT OF UNIFORMITY:
COEFFICIENT OF CURVATURE:

PLASTIC PROPERTIES
LIQUID LIMIT % = -
PLASTIC LIMIT % = -
PLASTICITY INDEX % = -
MOISTURE CONTENT % = 25.3

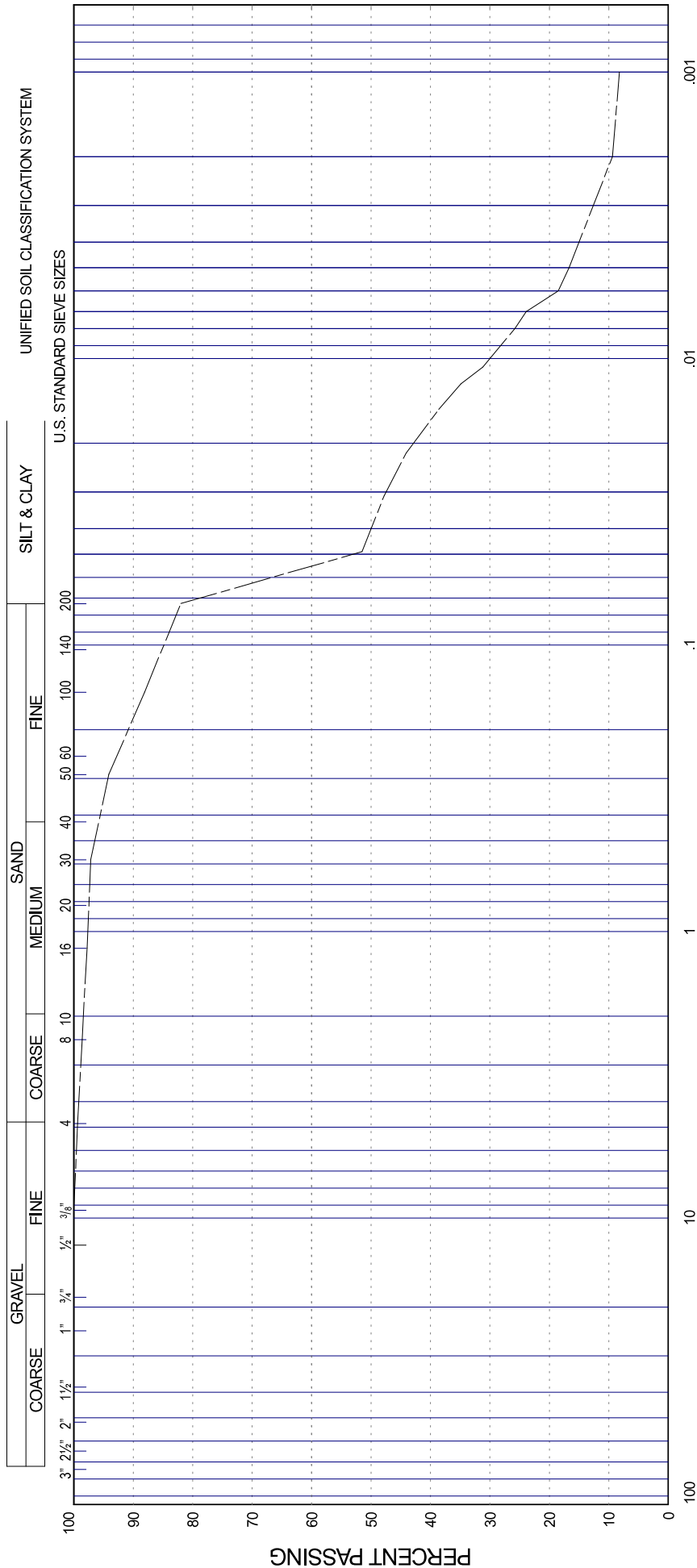
Classification of Sample and Group Symbol:
SAND, trace silt

OUR REFERENCE N° G4670-22-12

SANDY SILT (ML)

GRAIN SIZE DISTRIBUTION

OUR REFERENCE N° G4670-22-12



ENCLOSURE N° 9

Grain Size in Millimeters

PROJECT: Residential Subdivision
LOCATION: 79 - 87 Sideroad, Fergus, ON
BOREHOLE N°: 5
SAMPLE N°: 3
DEPTH: 1.5 - 2.1 m±
ELEVATION: 414.3 - 413.7 m±

COEFFICIENT OF UNIFORMITY:
COEFFICIENT OF CURVATURE:

PLASTIC PROPERTIES
LIQUID LIMIT % = 21.4
PLASTIC LIMIT % = 17.7
PLASTICITY INDEX % = 3.8
MOISTURE CONTENT % = 16.40

Classification of Sample and Group Symbol:

SILT, some sand, trace clay (ML)

Appendix A – Limitations and Use of Report

REPORT TERMS AND CONDITIONS

NOTICE: THE FOLLOWING PROVISIONS SET FORTH IMPORTANT QUALIFICATIONS AND LIMITATIONS ON THE FINDINGS AND RECOMMENDATIONS IN THE REPORT AS WELL AS THE USE OF, AND RELIANCE ON, THE REPORT.

1. **DEFINITIONS.** The following capitalized terms have the following meanings:

- (a) **“Additional Investigations”** means investigations that JLP has indicated to the Client should be undertaken to take into account any Out-of-Scope Requirements, but that are not otherwise specifically within the scope of investigations conducted for the purpose of the Report.
- (b) **“Applicable Laws”** means and includes without limitation all applicable provincial laws, regulations, guidelines, policies, standards, protocols, and objectives administered by the Ministry of the Environment and Climate Change or any other duly-constituted governmental authority, all as in force as of the date of the Report.
- (c) **“Client”** means the Client as referred to in the Report.
- (d) **“Client Information”** means the information, representations, and instructions provided by the Client, the Client’s representatives, and/or others and upon which the Report is based, in whole or in part.
- (e) **“Findings”** means the evaluations and conclusions set forth in the Report.
- (f) **“JLP”** means JLP Services Inc.
- (g) **“Out-of-Scope Requirements”** means special concerns or requirements of the Client in respect of the subject matter of the Report.
- (h) **“Recommendations”** mean the findings and recommendations referred to in the Report, taking into account any Out-of-Scope Requirements that were disclosed to JLP prior to the date of the Report.
- (i) **“Report”** means the report to which these Terms and Conditions are attached and form part.
- (j) **“Report Documents”** means the underlying documents, records, data, and files, in any medium whatsoever, generated in connection with the preparation of the Report, including without limitation, the instructions and objectives communicated to JLP by the Client, communications between JLP and the Client, and other reports, proposals, or documents prepared by JLP for the Client in connection with the Site.
- (k) **“Site”** means the site in respect of which the Report was prepared.
- (l) **“Site Conditions”** means Site conditions known as a result of, or reasonably imputed by, the investigations that were undertaken as of the date of the Report.

2. **BASIS OF REPORT.** The Report is based on the Site Conditions. Any changes to the Site Conditions after the date of the Report that could or will affect the Site Conditions may or will have a corresponding effect on the Recommendations. The Report does not take into account any (a) Additional Investigations that were not undertaken, or (b) Out-of-Scope Requirements that were not communicated prior to completion of the investigations that were been undertaken as of the date of the Report. Where recommended field services are referred to, they are the minimum services necessary to determine compliance of construction with Applicable Laws,

generally accepted industry-standard practices, and the Recommendations.

3. **RELIANCE & USE.** The Report has been prepared only for the Site and the related design, development, building, or building assessment objectives identified by the Client. The Findings and Recommendations are based on the Site Conditions and the Client Information. In preparing the Report, JLP has relied upon the Client Information and disclaims any responsibility for any inaccuracy, misstatement, omission, unintentional misrepresentation, or other deficiency contained in the Report as a result of such reliance. Unless specifically stated otherwise, the applicability and reliability of the Findings and the Recommendations expressed in the Report are only valid to the extent that (a) there has been no material change to or variation from any of the Client Information, (b) the Client Information contains no untrue statement of a material fact, or (c) the Client Information omits no statement of a material fact necessary in order to make the Client Information not misleading.

The Report and the Findings and Recommendations are for the sole benefit of the Client. No other party may use or rely upon the Report in whole or in part without the prior written consent of JLP, which may be arbitrarily withheld or conditioned.

RELIANCE UPON THE REPORT OR ANY OF THE DETERMINATIONS MADE HEREIN BY A THIRD PARTY WITHOUT JLP'S CONSENT IS PROHIBITED AND JLP MAKES NO REPRESENTATION, GUARANTEE, OR WARRANTY IN FAVOUR OF ANY THIRD PARTY WITH RESPECT TO THE REPORT WHATSOEVER. JLP FULLY DISCLAIMS, AND WILL HAVE NO LIABILITY FOR, ANY LOSS, DAMAGES, OR EXPENSES WHICH ANY THIRD PARTY MAY INCUR OR SUFFER AS A RESULT OF THE USE OF OR RELIANCE ON THE REPORT WHERE JLP HAS NOT EXPRESSLY AUTHORIZED SAME. ANY THIRD PARTY WHO RELIES ON THE REPORT TO ANY EXTENT DOES SO AT SUCH PARTY'S OWN RISK AND COMPLETELY WAIVES ANY AND ALL CLAIMS AGAINST JLP IN CONNECTION WITH THE REPORT, REGARDLESS OF THE THEORY OF LAW (WHETHER IN CONTRACT, TORT, OR ANY THEORY OF LAW COMING INTO EXISTENCE HEREAFTER).

4. **STANDARD OF CARE.** The Report has been prepared in a manner consistent with the degree of care and skill exercised by engineering consultants currently practicing under similar circumstances. No other warranty, expressed or implied, is made or intended in the Report. It is intended that the Findings and Recommendations are meant to assist in reducing the Client's risk associated with environmental impairment at the Site. The Report should not be considered risk mitigation.
5. **ENTIRE REPORT.** The Report also includes the Report Documents. In order to properly understand the Findings and Recommendations, reference must be made to the Report in its entirety. JLP is not responsible for use by any party of a part of the Report only.
6. **GOVERNING FORMAT.** Notwithstanding that JLP may have submitted an electronic version of the Report or any document forming part of the Report, only the signed and sealed physical copy of the Report shall be deemed to be the original and in the event of any dispute or discrepancy, the physical copy shall govern. JLP makes no representation about the compatibility of its electronic or digital file format with the Client's current or future software and/or hardware systems. The documents described herein are JLP's instruments of professional service and shall not be altered without the written consent of JLP.
7. **GENERAL LIMITATIONS.**
- (a) Unless specifically stated otherwise, the Report does not contain environmental consulting advice.
 - (b) The Report contains no opinion or determination as to any matters governed by laws other than the laws of the Province of Ontario and the federal laws of Canada applicable therein as of the date hereof.
 - (c) During any future development of the Site, conditions not observed during JLP's investigations may become apparent. If this occurs, JLP should be contacted to assess the situation and whether there is a need for additional testing.

Appendix B Oil-Grit Separator Sizing

Stormceptor®EF Sizing Report

Imbrium® Systems

ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

07/09/2025

Province:	Ontario	Project Name:	079 Sideroad 19
City:	Centre Wellington	Project Number:	122025
Nearest Rainfall Station:	WATERLOO WELLINGTON AP	Designer Name:	Parth Lad
Climate Station Id:	6149387	Designer Company:	GEI Consultants Canada Ltd.
Years of Rainfall Data:	34	Designer Email:	plad@geiconsultants.com
		Designer Phone:	519-824-8150
Site Name:	No external drainage	EOR Name:	
		EOR Company:	
Drainage Area (ha):	0.74	EOR Email:	
% Imperviousness:	70.00	EOR Phone:	
Runoff Coefficient 'c': 0.72			

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

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	20.19
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Influent TSS Concentration (mg/L):	100
Estimated Average Annual Sediment Load (kg/yr):	290
Estimated Average Annual Sediment Volume (L/yr):	236

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	80
EFO5	86
EFO6	90
EFO8	94
EFO10	97
EFO12	98

Recommended Stormceptor EFO Model: **EFO4**
 Estimated Net Annual Sediment (TSS) Load Reduction (%): **80**
 Water Quality Runoff Volume Capture (%): **> 90**

Stormceptor® EF Sizing Report

THIRD-PARTY TESTING AND VERIFICATION

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

PERFORMANCE

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

PARTICLE SIZE DISTRIBUTION (PSD)

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

Particle 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

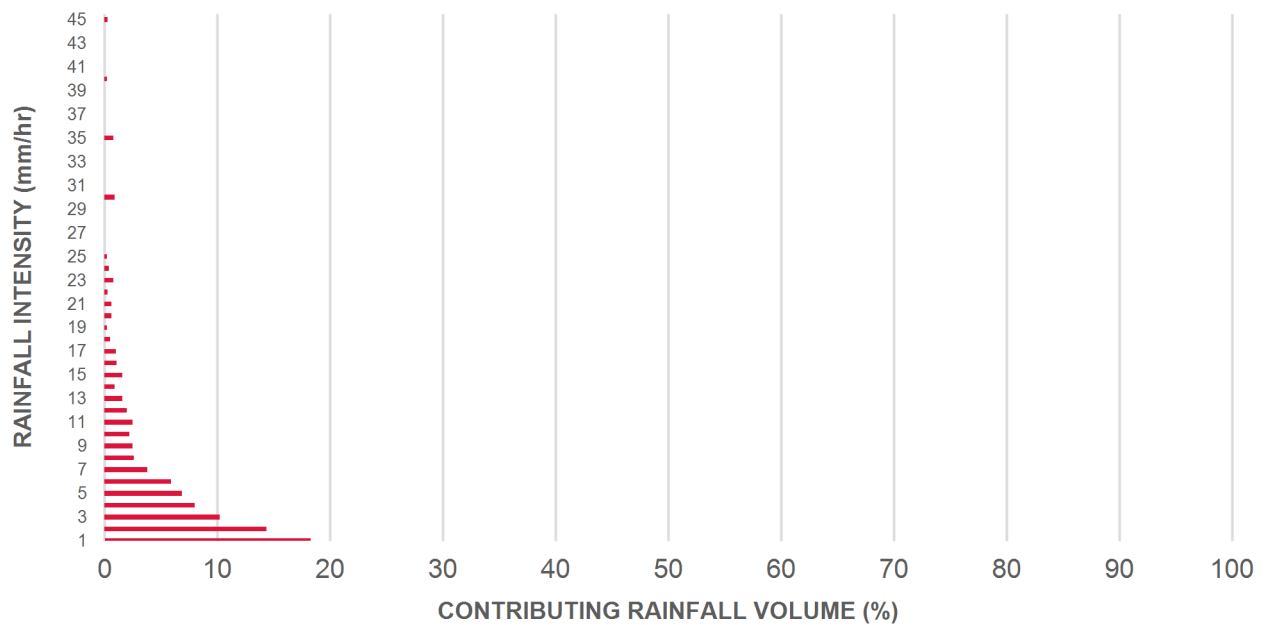
Stormceptor®EF Sizing Report

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	0.74	44.0	37.0	100	8.5	8.5
1.00	18.3	26.8	1.48	89.0	74.0	100	18.3	26.8
2.00	14.4	41.3	2.96	178.0	148.0	91	13.1	39.9
3.00	10.2	51.5	4.44	267.0	222.0	82	8.4	48.3
4.00	8.0	59.5	5.92	355.0	296.0	79	6.3	54.6
5.00	6.9	66.4	7.41	444.0	370.0	75	5.2	59.8
6.00	5.9	72.3	8.89	533.0	444.0	72	4.2	64.1
7.00	3.8	76.1	10.37	622.0	518.0	69	2.6	66.7
8.00	2.6	78.7	11.85	711.0	592.0	65	1.7	68.4
9.00	2.5	81.1	13.33	800.0	667.0	64	1.6	70.0
10.00	2.2	83.3	14.81	889.0	741.0	64	1.4	71.3
11.00	2.5	85.8	16.29	978.0	815.0	63	1.6	72.9
12.00	2.0	87.8	17.77	1066.0	889.0	62	1.2	74.2
13.00	1.6	89.4	19.26	1155.0	963.0	62	1.0	75.1
14.00	0.9	90.4	20.74	1244.0	1037.0	61	0.6	75.7
15.00	1.6	91.9	22.22	1333.0	1111.0	59	0.9	76.6
16.00	1.1	93.0	23.70	1422.0	1185.0	57	0.6	77.3
17.00	1.0	94.0	25.18	1511.0	1259.0	56	0.6	77.8
18.00	0.5	94.6	26.66	1600.0	1333.0	54	0.3	78.1
19.00	0.2	94.8	28.14	1689.0	1407.0	52	0.1	78.3
20.00	0.6	95.4	29.62	1777.0	1481.0	49	0.3	78.6
21.00	0.6	96.1	31.10	1866.0	1555.0	47	0.3	78.9
22.00	0.3	96.4	32.59	1955.0	1629.0	45	0.1	79.0
23.00	0.8	97.2	34.07	2044.0	1703.0	43	0.4	79.4
24.00	0.4	97.6	35.55	2133.0	1777.0	41	0.2	79.5
25.00	0.2	97.8	37.03	2222.0	1851.0	40	0.1	79.6
30.00	0.9	98.7	44.44	2666.0	2222.0	33	0.3	79.9
35.00	0.8	99.5	51.84	3110.0	2592.0	28	0.2	80.1
40.00	0.2	99.7	59.25	3555.0	2962.0	25	0.1	80.2
45.00	0.3	100.0	66.65	3999.0	3333.0	22	0.1	80.2
Estimated Net Annual Sediment (TSS) Load Reduction =								80 %

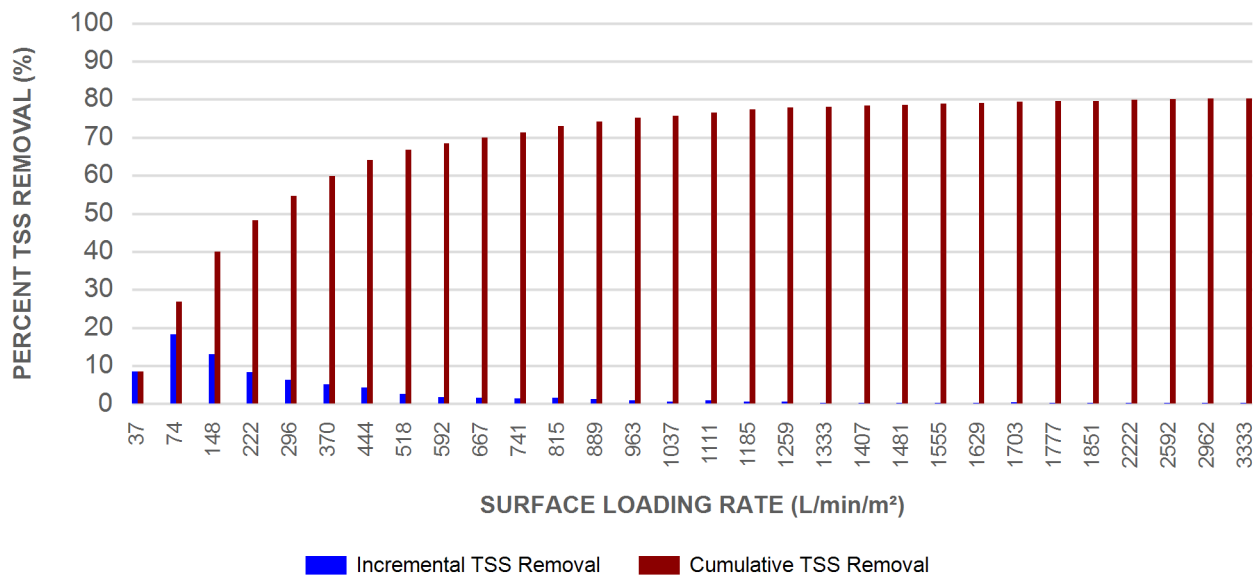
Climate Station ID: 6149387 Years of Rainfall Data: 34

Stormceptor®EF Sizing Report

RAINFALL DATA FROM WATERLOO WELLINGTON AP RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Stormceptor® EF Sizing Report

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

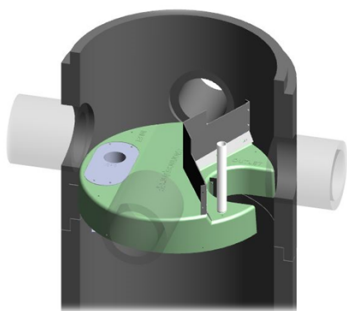
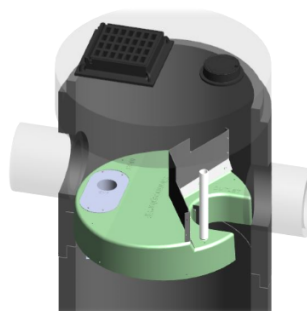
► **Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test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

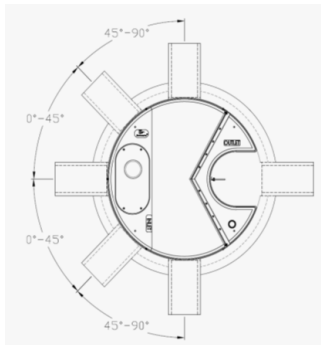
► **Stormceptor® EF and EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend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



Stormceptor® EF Sizing Report



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)	(ft³)	(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/ft³)

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

STANDARD STORMCEPTOR EF/EFO DRAWINGS

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

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

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

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

PART 1 – GENERAL

1.1 WORK INCLUDED

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

1.2 REFERENCE STANDARDS & PROCEDURES

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

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

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

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

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 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

Stormceptor®EF Sizing Report**3.1 GENERAL**

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

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

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m² to 1400 L/min/m², and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m² and 1400 L/min/m² shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m² shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m². No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m².

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m² shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m², and shall be calculated using a simple proportioning formula, with 1400 L/min/m² in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m².

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

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

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

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

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

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

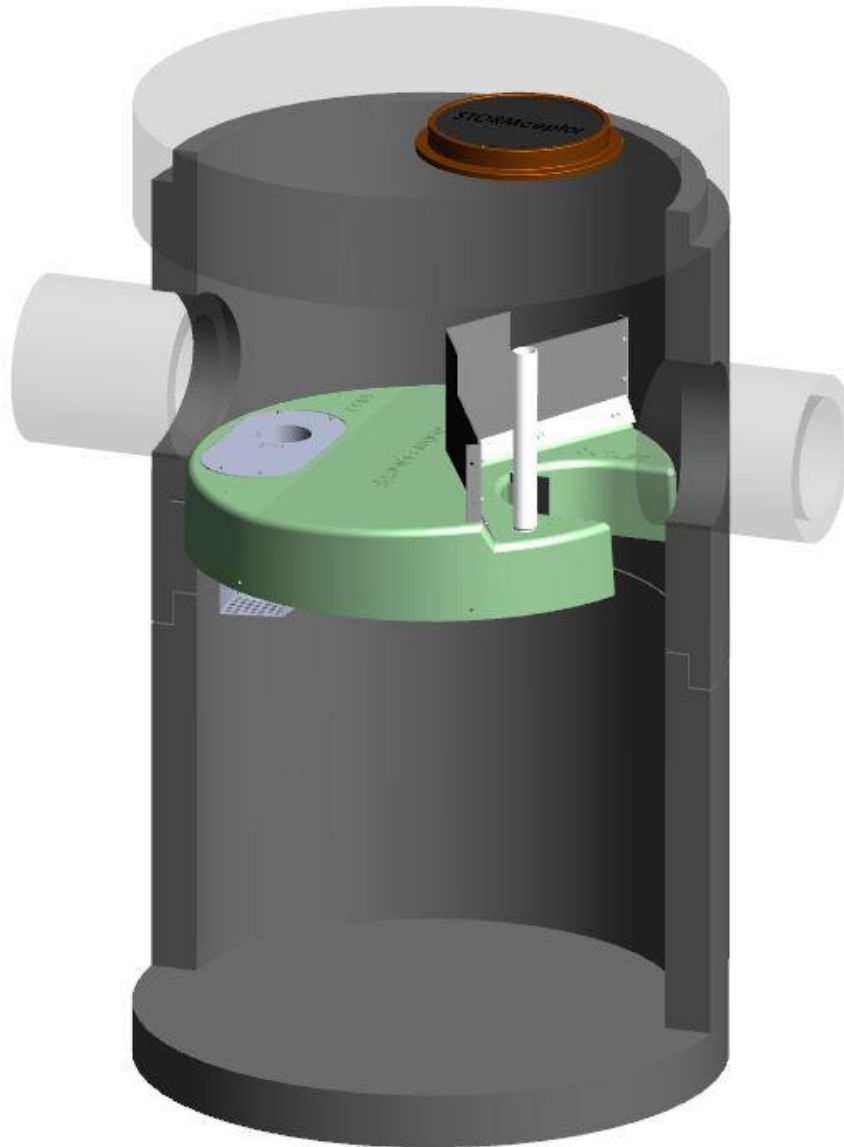
Stormceptor®EF Sizing Report

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/m² to 2600 L/min/m²) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators**. However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

Stormceptor® **EF**

Owner's Manual



Stormceptor is protected by one or more of the following patents:

Canadian Patent No. 2,137,942
Canadian Patent No. 2,180,305
Canadian Patent No. 2,327,768
Canadian Patent No. 2,694,159
Canadian Patent No. 2,697,287
U.S. Patent No. 6,068,765
U.S. Patent No. 6,371,690
U.S. Patent No. 7,582,216
U.S. Patent No. 7,666,303
Australia Patent No. 693.164
Australia Patent No. 729,096
Australia Patent No. 2008,279,378
Australia Patent No. 2008,288,900
Japanese Patent No. 5,997,750
Japanese Patent No. 5,555,160
Korean Patent No. 0519212
Korean Patent No. 1451593
New Zealand Patent No. 583,008
New Zealand Patent No. 583,583
South African Patent No. 2010/00682
South African Patent No. 2010/01796
Patent pending

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1 - Stormceptor EF Overview

2 - Stormceptor EF Operation, Components

3 - Stormceptor EF Model Details

4 - Stormceptor EF Identification

5 - Stormceptor EF Inspection & Maintenance

6 – Stormceptor Contacts

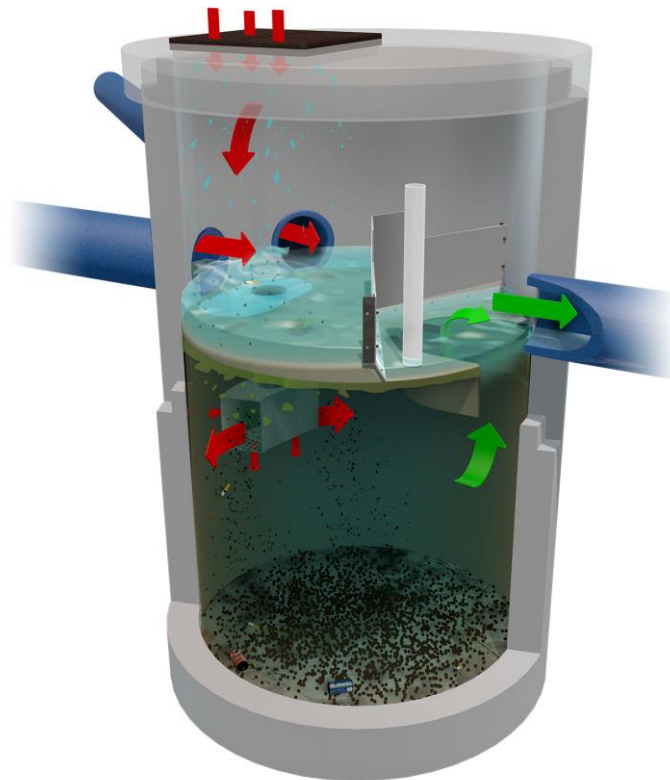
OVERVIEW

Stormceptor® EF is a continuation and evolution of the most globally recognized oil grit separator (OGS) stormwater treatment technology - **Stormceptor®**. Also known as a hydrodynamic separator, the enhanced flow Stormceptor EF is a high performing oil grit separator that effectively removes a wide variety of pollutants from stormwater and snowmelt runoff at flow rates higher than the original Stormceptor. Stormceptor EF captures and retains sediment (TSS), free oils, gross pollutants and other pollutants that attach to particles, such as nutrients and metals. Stormceptor EF's patent-pending treatment and scour prevention platform ensures sediment is retained during all rainfall events.

Stormceptor EF offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe, multiple inlet pipes, and/or from the surface through an inlet grate. Stormceptor EF can also serve as a junction structure, accommodate a 90-degree inlet to outlet bend angle, and be modified to ensure performance in submerged conditions. With its scour prevention and internal bypass, Stormceptor EF can be installed online, eliminating the need for costly additional bypass structures.

OPERATION

- Stormwater enters the Stormceptor upper chamber through the inlet pipe(s) or a surface inlet grate. A specially designed insert reduces the influent velocity by creating a pond upstream of the insert's weir. Sediment particles immediately begin to settle. Swirling flow sweeps water, sediment, and floatables across the sloped surface of the insert to the inlet opening of the drop pipe, where a strong vortex draws water, sediment, oil, and debris down the drop pipe cone.
- Influent exits the cone into the drop pipe duct. The duct has two large rectangular outlet openings as well as perforations in the backside and floor of the duct. Influent is diffused through these various opening in multiple directions and at low velocity into the lower chamber.
- Free oils and other floatables rise up within the channel surrounding the central riser pipe and are trapped beneath the insert, while sediment settles to the sump. Pollutants are retained for later removal during maintenance cleaning.
- Treated effluent enters the outlet riser, moves upward, and discharges to the top side of the insert downstream of the weir, where it flows out the outlet pipe.
- During intense storm events with very high influent flow rates, the pond height on the upstream side of the weir may exceed the height of the weir, and the excess flow passes over the top of the weir to the downstream side of the insert, and exits through the outlet pipe. This internal bypass feature allows for in-line installation, avoiding the cost of additional bypass structures. During bypass, the pond separates sediment from all incoming flows, while full treatment in the lower chamber continues at the maximum flow rate.
- Stormceptor EF's patent-pending enhanced flow and scour prevention technology ensures pollutants are captured and retained, allowing excess flows to bypass during infrequent, high intensity storms.



COMPONENTS

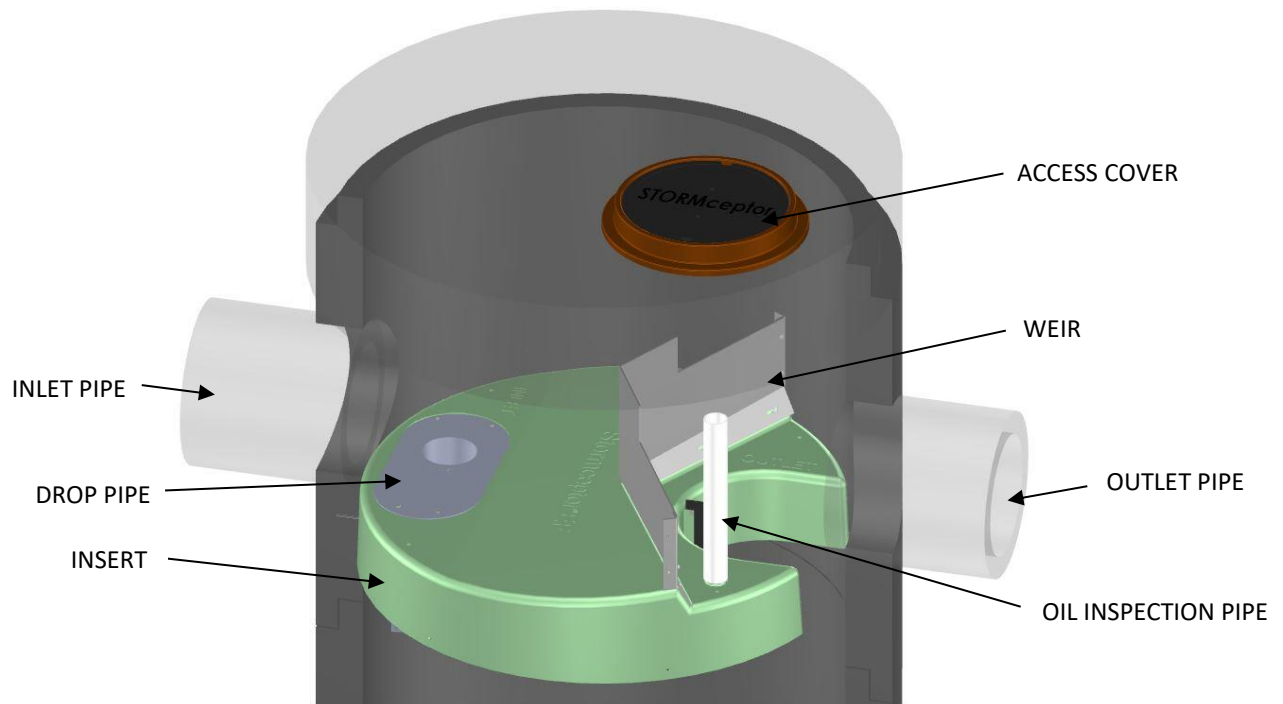


Figure 1

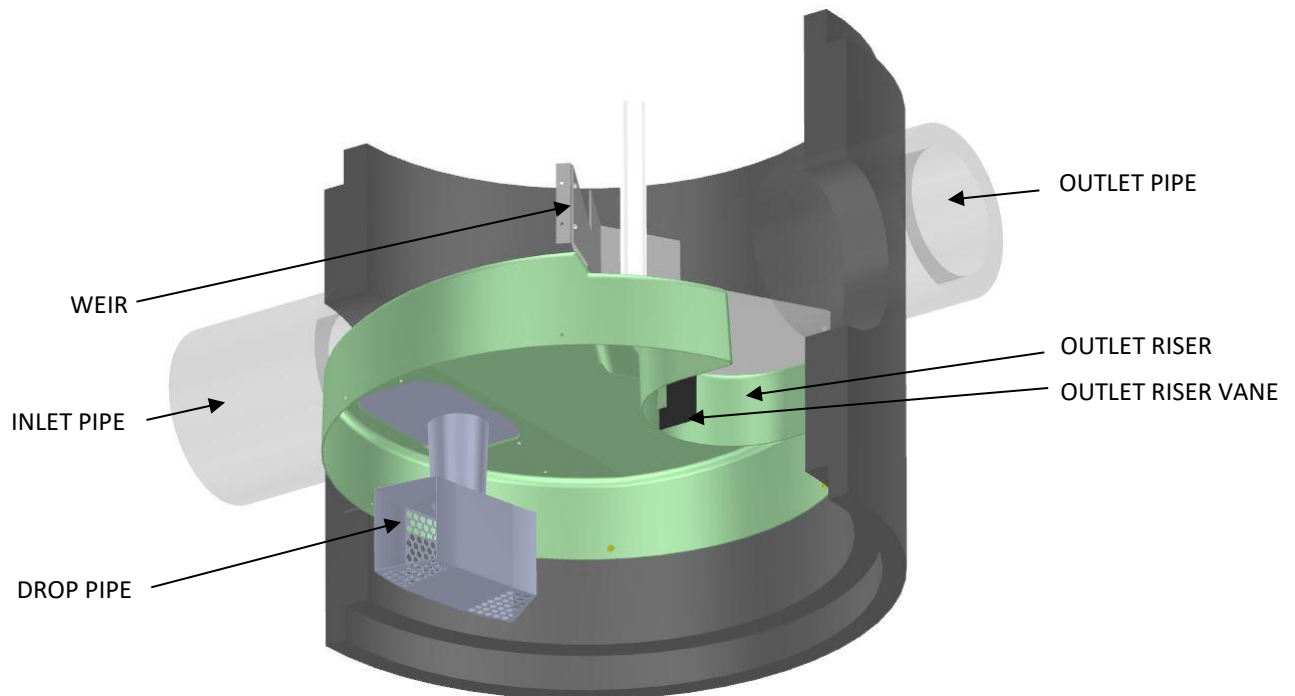


Figure 2

OUTLET PLATFORM (UP position)

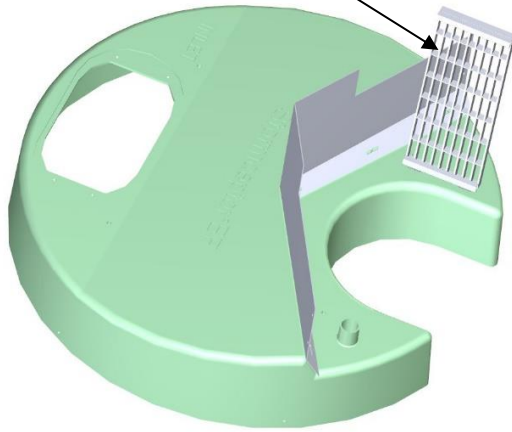


Figure 3A

OUTLET PLATFORM (DOWN position)

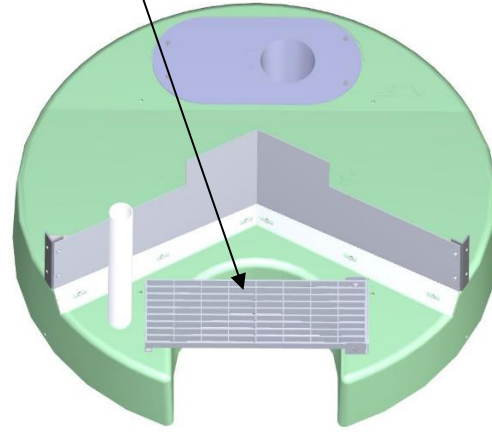


Figure 3B

- **Insert** – separates vessel into upper and lower chambers, and provides double-wall containment of hydrocarbons
- **Weir** – creates stormwater ponding and driving head on top side of insert
- **Drop pipe** – conveys stormwater and pollutants into the lower chamber
- **Outlet riser** – conveys treated stormwater from the lower chamber to the outlet pipe, and provides primary inspection and maintenance access into the lower chamber
- **Outlet riser vane** – prevents formation of a vortex in the outlet riser during high flow rate conditions
- **Outlet platform (optional)** – safety platform in the event of manned entry into the unit
- **Oil inspection pipe** – primary access for measuring oil depth

PRODUCT DETAILS

METRIC DIMENSIONS AND CAPACITIES

Table 1

Stormceptor Model	Inside Diameter (m)	Minimum Surface to Outlet Invert Depth (mm)	Depth Below Outlet Pipe Invert (mm)	Wet Volume (L)	Sediment Capacity ¹ (m ³)	Hydrocarbon Storage Capacity ² (L)	Maximum Flow Rate into Lower Chamber ³ (L/s)	Peak Conveyance Flow Rate ⁴ (L/s)
EF4 / EFO4	1.22	1219/914	1524	1780	1.19	265	22.1 / 10.4	425
EF5/EFO5	1.52	1219	1626	3150	1.95	420	34.6 / 16.2	708
EF6 / EFO6	1.83	1219	1930	5070	3.47	610	49.6 / 23.4	990
EF8 / EFO8	2.44	1219	2591	12090	8.78	1070	88.3 / 41.6	1700
EF10 / EFO10	3.05	1219	3251	23700	17.79	1670	138 / 65	2830
EF12 / EFO12	3.66	1219	3886	40800	31.22	2475	198.7 / 93.7	2830

¹ Sediment Capacity is measured from the floor to the bottom of the drop pipe duct. Sediment Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.

² Hydrocarbon Storage Capacity is measured from the bottom of the outlet riser to the underside of the insert. Hydrocarbon Storage Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.

³ EF Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 1135 L/min/m². EFO Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 535 L/min/m².

⁴ Peak Conveyance Flow Rate is limited by a maximum velocity of 1.5 m/s.

U.S. DIMENSIONS AND CAPACITIES

Table 2

Stormceptor Model	Inside Diameter (ft)	Minimum Surface to Outlet Invert Depth (in)	Depth Below Outlet Pipe Invert (in)	Wet Volume (gal)	Sediment Capacity ¹ (ft ³)	Hydrocarbon Storage Capacity ² (gal)	Maximum Flow Rate into Lower Chamber ³ (cfs)	Peak Conveyance Flow Rate ⁴ (cfs)
EF4 / EFO4	4	48 / 36	60	471	42	70	0.78 / 0.37	15
EF5 / EFO5	5	48	64	833	75	111	1.22 / 0.57	25
EF6 / EFO6	6	48	76	1339	123	160	1.75 / 0.83	35
EF8 / EFO8	8	48	102	3194	310	280	3.12 / 1.47	60
EF10 / EFO10	10	48	128	6261	628	440	4.87 / 2.30	100
EF12 / EFO12	12	48	153	10779	1103	655	7.02 / 3.31	100

¹ Sediment Capacity is measured from the floor to the bottom of the drop pipe duct. Sediment Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.

² Hydrocarbon Storage Capacity is measured from the bottom of the outlet riser to the underside of the insert. Hydrocarbon Storage Capacity can be increased to accommodate specific site designs and pollutant loads. Contact your local representative for assistance.

³ EF Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 27.9 gpm/ft². EFO Maximum Flow Rate into Lower Chamber is based on a maximum surface loading rate (SLR) into the lower chamber of 13.1 gpm/ft².

⁴ Peak Conveyance Flow Rate is limited by a maximum velocity of 5 fps.

IDENTIFICATION

Each Stormceptor EF/EFO unit is easily identifiable by the trade name **Stormceptor®** embossed on the access cover at grade as shown in **Figure 3**. The tradename **Stormceptor®** is also embossed on the top of the insert upstream of the weir as shown in **Figure 3**.

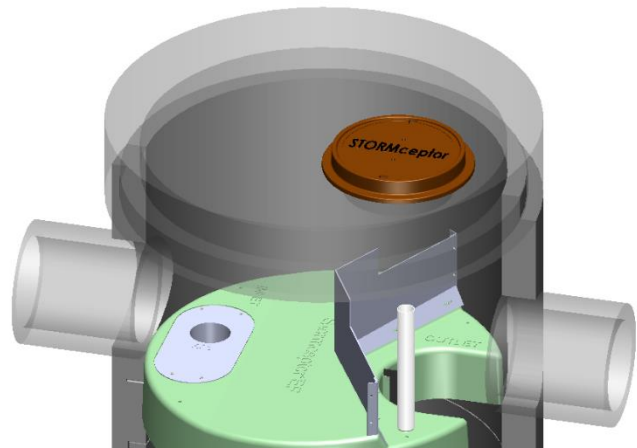


Figure 4

The specific Stormceptor EF/EFO model number is identified on the top of the aluminum Drop Pipe as shown in **Figure 4**. The unit serial number is identified on the top of the insert upstream of the weir as shown in **Figure 4**.

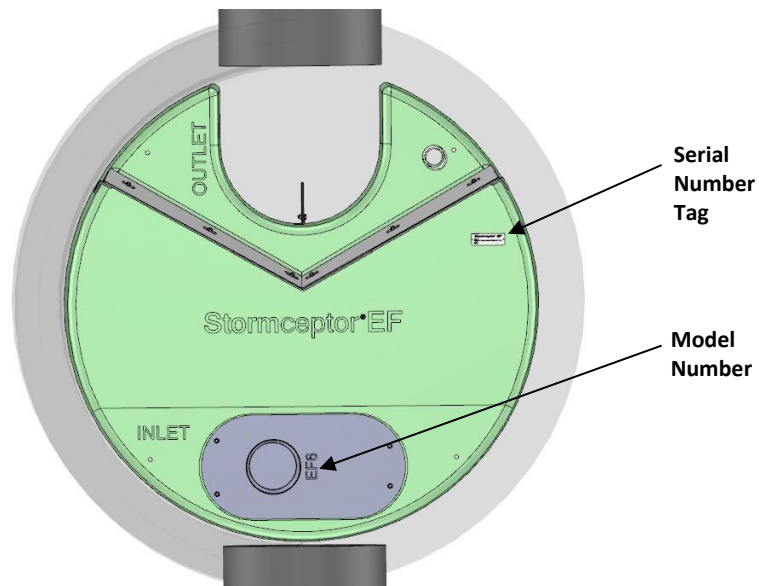


Figure 5

INSPECTION AND MAINTENANCE

It is very important to perform regular inspection and maintenance. Regular inspection and maintenance ensures maximum operation efficiency, keeps maintenance costs low, and provides continued of natural waterways.

Quick Reference

- Typical inspection and maintenance is performed from grade
- Remove manhole **cover(s)** or **inlet grate** to access insert and lower chamber
NOTE: EF4/EFO4 & EF5/EFO5 require the removal of a **flow deflector** beneath inlet grate
- Use Sludge Judge® or similar sediment probe to check sediment depth through the **outlet riser**
- Oil dipstick can be inserted through the **oil inspection pipe**
- Visually inspect the **insert** for debris, remove debris if present
- Visually inspect the **drop pipe** opening for blockage, remove blockage if present
- Visually inspect **insert** and **weir** for damage, schedule repair if needed
- Insert vacuum hose and jetting wand through the outlet riser and extract sediment and floatables
- Replace flow deflector (EF4/EFO4 & EF5/EFO5), inlet grate, and cover(s)
- **NOTE:** If the unit has an **outlet platform**, the outlet platform is typically in the UP position (see Figure 3A) for normal treatment conditions, and for inspection and maintenance. If manned entry into the unit is required, the outlet platform must first be placed in the DOWN position (see Figure 3B). After manned entry is completed, return the outlet platform to the UP position for treatment.

When is inspection needed?

- Post-construction inspection is required prior to putting the Stormceptor into service.
- Routine inspections are recommended during the first year of operation to accurately assess pollutant accumulation.
- Inspection frequency in subsequent years is based on the maintenance plan developed in the first year.
- Inspections should also be performed immediately after oil, fuel, or other chemical spills.

What equipment is typically required for inspection?

- Manhole access cover lifting tool
- Oil dipstick / Sediment probe with ball valve (typically ¾-inch to 1-inch diameter)
- Flashlight
- Camera
- Data log / Inspection Report
- Safety cones and caution tape
- Hard hat, safety shoes, safety glasses, and chemical-resistant gloves

When is maintenance cleaning needed?

- If the post-construction inspection indicates presence of construction sediment of a depth greater than a few inches, maintenance is recommended at that time.
- For optimum performance and normal operation the unit should be cleaned out once the sediment depth reaches the recommended maintenance sediment depth, see **Table 3**.
- Maintain immediately after an oil, fuel, or other chemical spill.

Table 3

Recommended Sediment Depths for Maintenance Service*	
MODEL	Sediment Depth (in/mm)
EF4 / EFO4	8 / 203
EF5 / EFO5	12 / 305
EF6 / EFO6	12 / 305
EF8 / EFO8	24 / 610
EF10 / EFO10	24 / 610
EF12 / EFO12	24 / 610

* Based on a minimum distance of 41 inches (1,041 mm) from bottom of outlet riser to top of sediment bed

The frequency of inspection and maintenance may need to be adjusted based on site conditions to ensure the unit is operating and performing as intended. Maintenance costs will vary based on the size of the unit, site conditions, local requirements, disposal costs, and transportation distance.

What equipment is typically required for maintenance?

- Vacuum truck equipped with water hose and jet nozzle
- Small pump and tubing for oil removal
- Manhole access cover lifting tool
- Oil dipstick / Sediment probe with ball valve (typically ¾-inch to 1-inch diameter)
- Flashlight
- Camera
- Data log / Inspection Report
- Safety cones
- Hard hats, safety shoes, safety glasses, chemical-resistant gloves, and hearing protection for service providers
- Gas analyzer, respiratory gear, and safety harness for specially trained personnel if confined space entry is required (adhere to all OSHA / CCOSH standards)

What conditions can compromise Stormceptor performance?

- Presence of construction sediment and debris in the unit prior to activation
- Excessive sediment depth beyond the recommended maintenance depth
- Oil spill in excess of the oil storage capacity
- Clogging or restriction of the drop pipe inlet opening with debris
- Downstream blockage that results in a backwater condition

Maintenance Procedures

- Maintenance should be conducted during dry weather conditions when no flow is entering the unit.
- Stormceptor is maintained from grade through a standard surface manhole access cover or inlet grate.
- In the case of submerged or tailwater conditions, extra measures are likely required, such as plugging the inlet and outlet pipes prior to conducting maintenance.
- Inspection and maintenance of upstream catch basins and other stormwater conveyance structures is also recommended to extend the time between future maintenance cycles.
- Sediment depth inspections are performed through the **Outlet Riser** and oil presence can be determined through the **Oil Inspection Pipe**.
- Oil presence and sediment depth are determined by inserting a Sludge Judge® or measuring stick to quantify the pollutant depths.

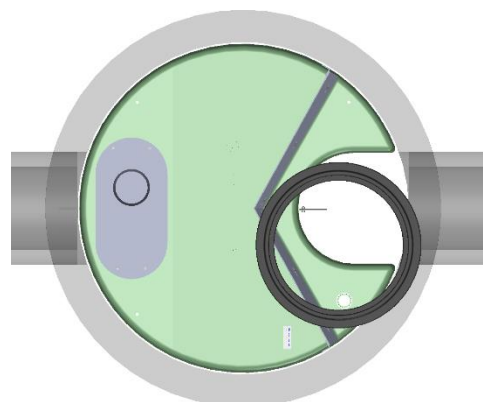


Figure 6

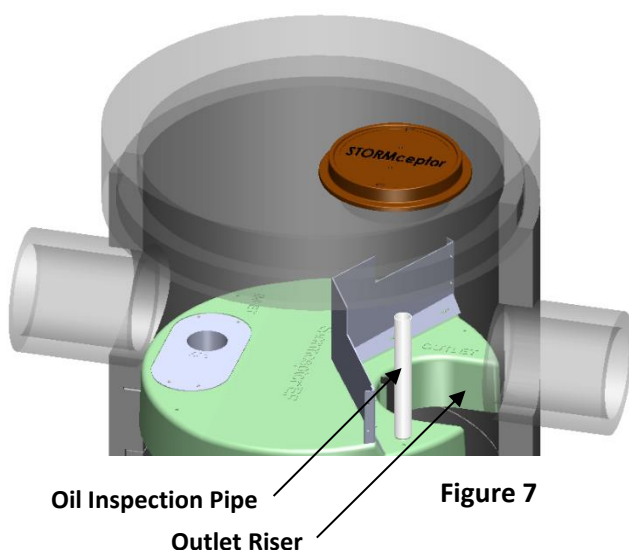


Figure 7



Figure 8

- Visually inspect the insert, weir, and drop pipe inlet opening to ensure there is no damage or blockage.
- **NOTE:** If the unit has an **outlet platform**, the outlet platform is typically in the UP position (see Figure 3A) for normal treatment conditions, and for inspection and maintenance. If manned entry into the unit is required, the outlet platform must first be placed in the DOWN position (see Figure 3B). After manned entry is completed, return the outlet platform to the UP position for treatment.

- When maintenance is required, a standard vacuum truck is used to remove the pollutants from the lower chamber of the unit through the **Outlet Riser**.



Figure 9

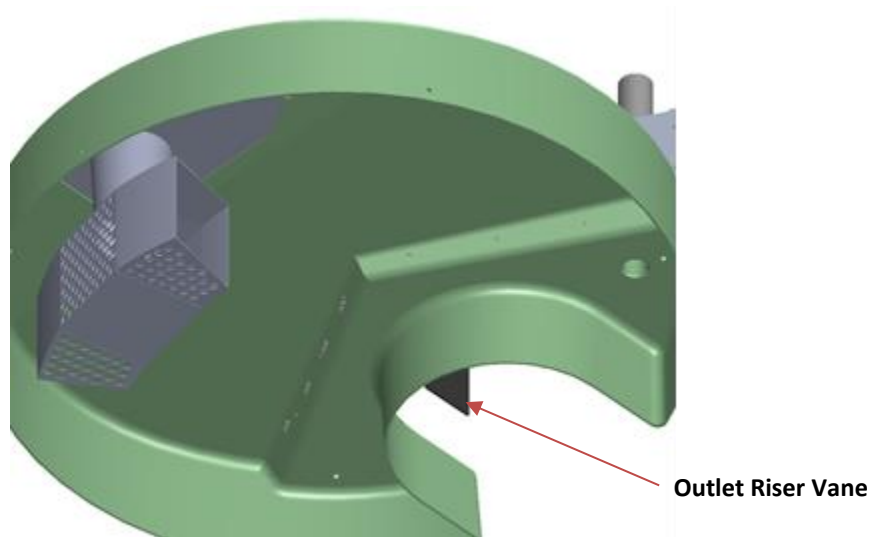


Figure 10

NOTE: The Outlet Riser Vane is durable and flexible and designed to allow maintenance activities with minimal, if any, interference.

Removable Flow Deflector

- Top grated inlets for the Stormceptor EF4/EFO4 & EF5/EFO5 models require a removable flow deflector staged underneath a 24-inch x 24-inch (600 mm x 600 mm) square inlet grate to direct flow towards the inlet side of the insert, and avoid flow and pollutants from entering the outlet side of the insert from grade. The EF6/EFO6 and larger models do not require the flow deflector.

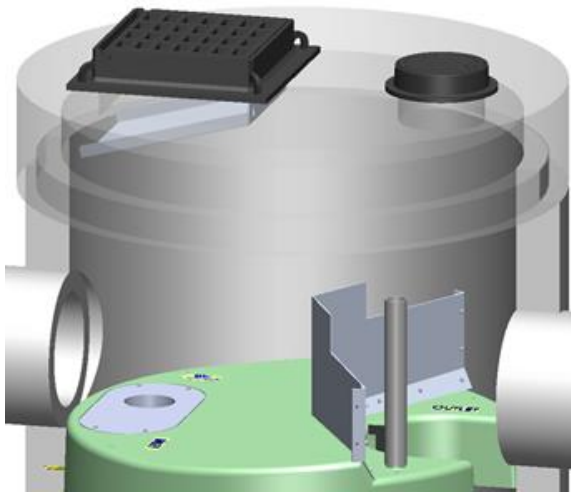
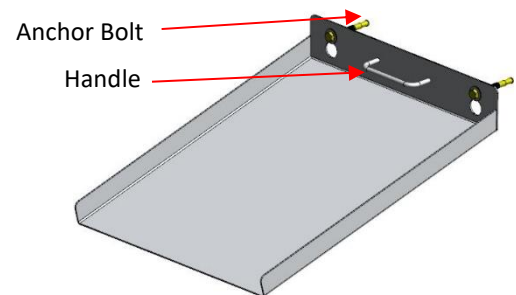


Figure 11

How to Remove:

1. Loosen anchor bolts
2. Pull up and out using the handle



Removable Flow Deflector

Hydrocarbon Spills

Stormceptor is often installed on high pollutant load hotspot sites with vehicular traffic where hydrocarbon spill potential exists. Should a spill occur, or presence of oil be identified within a Stormceptor EF/EFO, it should be cleaned immediately by a licensed liquid waste hauler.

Disposal

Maintenance providers are to follow all federal, state/ provincial, and local requirements for disposal of material.

Oil Sheens

When oil is present in stormwater runoff, a sheen may be noticeable at the Stormceptor outlet. An oil rainbow or sheen can be noticeable at very low oil concentrations (< 10 mg/L). Despite the appearance of a sheen, Stormceptor EF/EFO may still be functioning as intended.

Oil Level Alarm

To mitigate spill liability with 24/7 detection, an electronic monitoring system can be employed to trigger a visual and audible alarm when a pre-set level of oil is captured within the lower chamber or when an oil spill occurs. The oil level alarm is available as an optional feature to include with Stormceptor EF/EFO as shown in **Figure 11**. For additional details about the Oil Level Alarm please visit <http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-systems>.

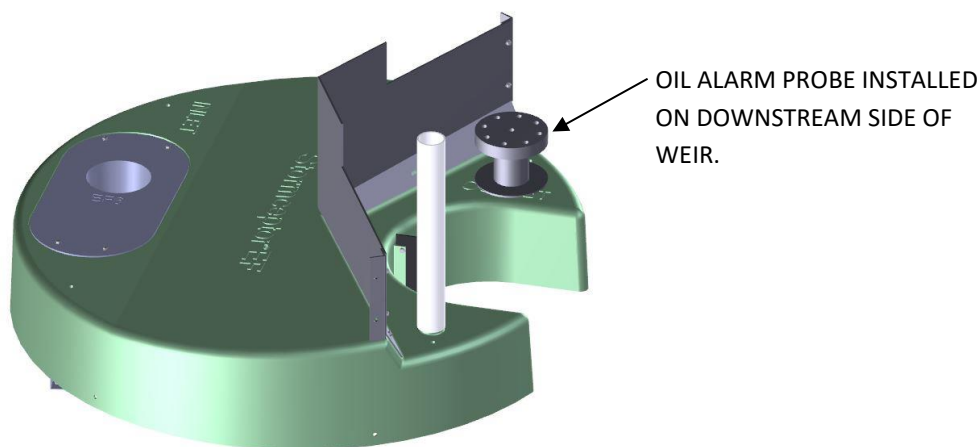


Figure 12

Replacement Parts

Stormceptor has no moving parts to wear out. Therefore inspection and maintenance activities are generally focused on pollutant removal. Since there are no moving parts during operation in a Stormceptor, broken, damaged, or worn parts are not typically encountered. However, if replacement parts are necessary, they may be purchased by contacting your local Stormceptor representative.

Stormceptor Inspection and Maintenance Log

Stormceptor Model No: _____

Serial Number: _____

Installation Date: _____

Location Description of Unit: _____

Recommended Sediment Maintenance Depth: _____

DATE	SEDIMENT DEPTH (inch or mm)	OIL DEPTH (inch or mm)	SERVICE REQUIRED (Yes / No)	MAINTENANCE PERFORMED	MAINTENANCE PROVIDER	COMMENTS

Other Comments:

Contact Information

Questions regarding Stormceptor EF/EFO can be addressed by contacting your local Imbrium representative or by visiting our website at www.imbriumsystems.com.

Imbrium Systems Inc. & Imbrium Systems LLC

Canada	1-416-960-9900 / 1-800-565-4801
United States	1-301-279-8827 / 1-888-279-8826
International	+1-416-960-9900 / +1-301-279-8827

www.imbriumsystems.com

info@imbriumsystems.com

Appendix C Stormwater Management Facility Design Calculations

079 Sideroad 19
Township of Centre Wellington
File No.: 122025
12/23/2025
Water Quality Storage Calculations

Site Area Draining to "Wetland" Pond

Drainage Area (ha)	Impervious Area (ha)	% Impervious
0.84	0.52	62%

Storage Requirements for "Wetland" Pond (MOE SWM Table 3.2)

Impervious Level	Enhanced (m³/ha)	Normal (m ³ /ha)	Basic (m ³ /ha)
35%	80	60	60
55%	105	70	60
70%	120	80	60
85%	140	90	60

Calculated Storage Requirements for "Wetland" Pond

Protection Level	% TSS Removal	Total Storage (m ³ /ha)	Extended Detention (m ³ /ha)	Extended Detention (m ³)	Permanent Pool (m ³ /ha)	Permanent Pool (m ³)
Enhanced	80%	111.74	40.00	33.60	71.74	60.26
Normal	70%	75.25	40.00	33.60	35.25	29.61
Basic	60%	60.00	40.00	33.60	20.00	16.80

079 Sideroad 19
Township of Centre Wellington (Fergus)
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Stage / Storage Volume Calculations - On-Site SWM Facility

Elevation (m)	Depth (m)	Accum. Pond	Accum. Detention	
		Volume (m ³)	Volume (m ³)	
414.35	0.00	0.00	0.00	Bottom of Forebay
414.40	0.05	0.18	0.00	
414.45	0.10	0.35	0.00	
414.50	0.15	0.82	0.00	
414.55	0.20	1.41	0.00	
414.60	0.25	2.14	0.00	
414.65	0.30	3.00	0.00	
414.70	0.35	4.01	0.00	
414.75	0.40	5.19	0.00	
414.80	0.45	6.53	0.00	
414.85	0.50	8.05	0.00	
414.90	0.55	9.75	0.00	
414.95	0.60	11.65	0.00	
415.00	0.65	13.75	0.00	
415.05	0.70	16.07	0.00	
415.10	0.75	18.61	0.00	Top of Forebay
415.15	0.80	21.38	0.00	
415.20	0.85	24.38	0.00	
415.25	0.90	27.64	0.00	
415.30	0.95	31.16	0.00	
415.35	1.00	34.94	0.00	
415.40	1.05	39.00	0.00	
415.45	1.10	51.26	0.00	
415.50	1.15	64.66	0.00	
415.55	1.20	79.22	0.00	Top of Perm. Pool
415.60	1.25	94.95	0.00	
415.65	1.30	111.87	16.92	
415.70	1.35	130.21	35.26	
415.75	1.40	149.55	54.60	
415.80	1.45	169.93	74.98	
415.85	1.50	191.36	96.41	
415.90	1.55	213.86	118.91	
415.95	1.60	237.46	142.51	
416.00	1.65	262.17	167.22	CB Lip Elevation
416.05	1.70	288.03	193.08	
416.10	1.75	315.04	220.09	
416.15	1.80	343.23	248.28	
416.20	1.85	372.63	277.68	
416.25	1.90	403.26	308.31	
416.30	1.95	435.12	340.17	
416.35	2.00	468.26	373.31	
416.40	2.05	502.68	407.73	
416.45	2.10	538.42	443.47	Overflow Weir
416.50	2.15	575.48	480.53	
416.55	2.20	613.90	518.95	
416.60	2.25	653.69	558.74	
416.65	2.30	694.88	599.93	Top of Bank

079 Sideroad 19
Township of Centre Wellington (Fergus)
File No.: 122025

Orifice No. 1

INV 415.60 m
 Q = 0.010 m³/s
 Cd = 0.600
 H = 0.300 m
 h = 0.250 m
 2g = 19.620

 A = 0.008 m²
 D = 0.100 m

Orifice No. 2

INV 415.60 m
 Q = 0.125 m³/s
 Cd = 0.600
 H = 1.050 m
 h = 0.925 m
 2g = 19.620

 A = 0.049 m²
 D = 0.250 m

$$Q = CdA\sqrt{2gh}$$

Overflow Weir						
Elev	d1	h	H	2g	L	Q
m	m	m	m		m	m ³ /s
416.35	0.75	0.75	0.00	19.62	5.00	0.000
416.40	0.80	0.75	0.05	19.62	5.00	0.077
416.45	0.85	0.75	0.10	19.62	5.00	0.221
416.50	0.90	0.75	0.15	19.62	5.00	0.411
416.55	0.95	0.75	0.20	19.62	5.00	0.641
416.60	1.00	0.75	0.25	19.62	5.00	0.906
416.65	1.05	0.75	0.30	19.62	5.00	1.204

Detention Storage
Stage-Storage-Discharge Table

Elevation	Stage	Storage	Orifice #1 Discharge	Orifice #2 Discharge	Weir Discharge	Total Discharge	
(m)	(m)	(m ³)	(m ³ /s)	(m ³ /s)	(m ³ /s)	(m ³ /s)	
415.60	0.00	0.00	0.000	0.000	0.000	0.000	Top of Perm. Pool
415.65	0.05	16.92	0.002	0.000	0.000	0.002	
415.70	0.10	35.26	0.005	0.000	0.000	0.005	
415.75	0.15	54.60	0.007	0.000	0.000	0.007	
415.80	0.20	74.98	0.008	0.000	0.000	0.008	
415.85	0.25	96.41	0.009	0.000	0.000	0.009	
415.90	0.30	118.91	0.010	0.000	0.000	0.010	CB Lip Elevation
415.95	0.35	142.51	0.000	0.062	0.000	0.062	
416.00	0.40	167.22	0.000	0.068	0.000	0.068	
416.05	0.45	193.08	0.000	0.074	0.000	0.074	
416.10	0.50	220.09	0.000	0.080	0.000	0.080	
416.15	0.55	248.28	0.000	0.085	0.000	0.085	
416.20	0.60	277.68	0.000	0.090	0.000	0.090	
416.25	0.65	308.31	0.000	0.095	0.000	0.095	
416.30	0.70	340.17	0.000	0.099	0.000	0.099	
416.35	0.75	373.31	0.000	0.103	0.000	0.103	Overflow Weir
416.40	0.80	407.73	0.000	0.107	0.077	0.184	
416.45	0.85	443.47	0.000	0.111	0.221	0.332	
416.50	0.90	480.53	0.000	0.115	0.411	0.526	
416.55	0.95	518.95	0.000	0.118	0.641	0.760	
416.60	1.00	558.74	0.000	0.122	0.906	1.028	
416.65	1.05	599.93	1.000	0.125	1.204	2.329	Top of Bank

079 Sideroad 19
Township of Centre Wellington
File No.: 122025
1/23/2026
Sediment and Forebay Calculations

Site Area Draining to "Wetland" Pond

Drainage Area (ha)	Impervious Area (ha)	% Impervious
0.84	0.52	62%

Forebay Dimensions

Length (m)	Width (m)	Depth (m)
12.00	7.00	1.00

Annual Sediment Loadings (MOE SWM Table 6.3)

Impervious Level	Loading (m3/ha)
35%	0.6
55%	1.9
70%	2.8
85%	3.8

Calculated Sediment Loading and Cleanout Frequency

Annual Loading (m3)	TSS Removal	Annual Removal (m3)	Storage Volume * (m3)	Cleanout Frequency (years)
2.30	80%	1.84	11.65	6.3

* 1/3 of forebay volume

Forebay Settling Length (MOE SWM Equation 4.5)

25mm Flow Rate (m3/s)	Forebay L:W Ratio (m)	Settling Velocity (m/s)	Required Settling Length (m)
0.009	1.71	0.0003	7.17

Provided Forebay Length (m)
12.00

Forebay Dispersion Length (MOE SWM Equation 4.6)

5-yr Flow Rate (m3/s)	Forebay Depth (m)	Maximum Velocity (m/s)	Required Dispersion Length (m)
0.067	1.00	0.50	1.07

Provided Forebay Length (m)	Cross-Sectional Area	Provided Velocity (m/s)
12.00	3.50	0.02

079 Sideroad 19
Township of Centre Wellington
File No: 122025
1/22/2026

Riprap Outlet Protection Design Calculations (Storm Sewer Easement Outlet)

Flow Rate

Pipe Diameter (D_o) =	0.450 m
Maximum Flow =	0.260 m ³ /s

The rip rap will be sized to stay in place at a flow rate of 0.260 m³/s.

Rip Rap Required Dimensions

Dimensions for the rip rap were taken from Figure 7.45 (Erosion and Sediment Control Handbook, 1986)

Rip Rap Depth (d) =	0.38 m	
Apron Length (L_a) =	3.50 m	
Median Stone Size (d_{50}) =	0.12 m	
Upstream Apron Width (W_u) =	1.35 m	(3 x D_o)
Downstream Apron Width (W_d) =	3.950 m	($D_o + L_a$)

The above represents the minimum parameters of the rip rap to prevent wash out.

Conclusions

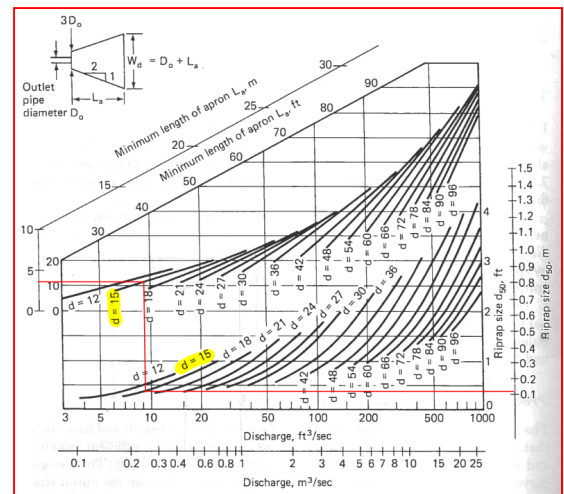
Therefore, the proposed 200 mm diameter rip rap with a depth of 0.40m will stay in place at the maximum design flow rate.

The required apron length (L_a) of 3.5 m is equal to the specified length of 3.5 m.

The required upstream and downstream apron widths of 1.35 m and 3.95 m are less than the specified width of 4.0 m.

References:

Goldman, Steven J., Jackson, Katharine, and Bursztynsky, Taras A., 1986 Erosion and Sediment Control Handbook. New York: McGraw-Hill Incorporated.



079 Sideroad 19
Township of Centre Wellington
File No: 122025
12/23/2025

Riprap Outlet Protection Design Calculations (SWM Pond Outlet Pipe)

Flow Rate

Pipe Diameter (D_o) =	0.375 m
Maximum Flow =	0.175 m ³ /s

The rip rap will be sized to stay in place at a flow rate of 0.175 m³/s, the capacity of the outlet pipe (375mm pipe at 1.00%).

Rip Rap Required Dimensions

Dimensions for the rip rap were taken from Figure 7.45 (Erosion and Sediment Control Handbook, 1986)

Rip Rap Depth (d) =	0.30 m	
Apron Length (L_a) =	3.50 m	
Median Stone Size (d_{50}) =	0.11 m	
Upstream Apron Width (W_u) =	1.125 m	(3 x D_o)
Downstream Apron Width (W_d) =	3.875 m	($D_o + L_a$)

The above represents the minimum parameters of the rip rap to prevent wash out.

Conclusions

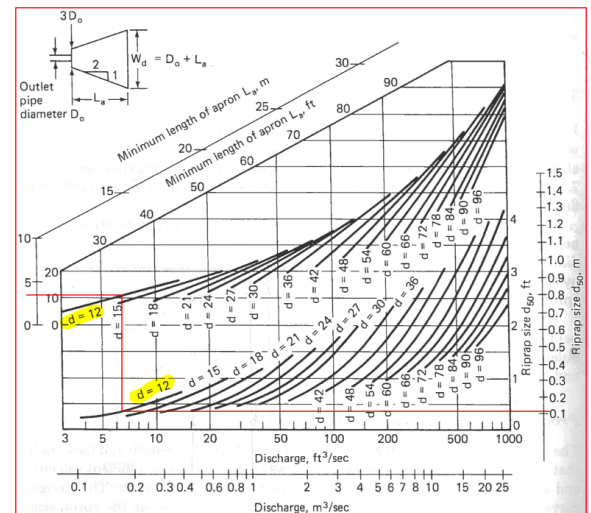
Therefore, the proposed 200 mm diameter rip rap with a depth of 0.40m will stay in place at the maximum design flow rate.

The required apron length (L_a) of 3.5 m is equal to the specified length of 3.5 m (6.7 m - 3.2 m).

The required upstream and downstream apron widths of 1.35 m and 3.45 m are less than the specified widths of 5.0 m and 5.0 m.

References:

Goldman, Steven J., Jackson, Katharine, and Bursztynsky, Taras A., 1986 Erosion and Sediment Control Handbook. New York: McGraw-Hill Incorporated.



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Township of Centre Wellington
File No: 122025
12/23/2025

Riprap Outlet Protection Design Calculations (SWM Pond Overflow Weir)

Flow Rate

Maximum Flow = 0.228 m³/s

The rip rap will be sized to stay in place at a flow rate of 0.228 m³/s, the 100-year design storm flow over the weir.

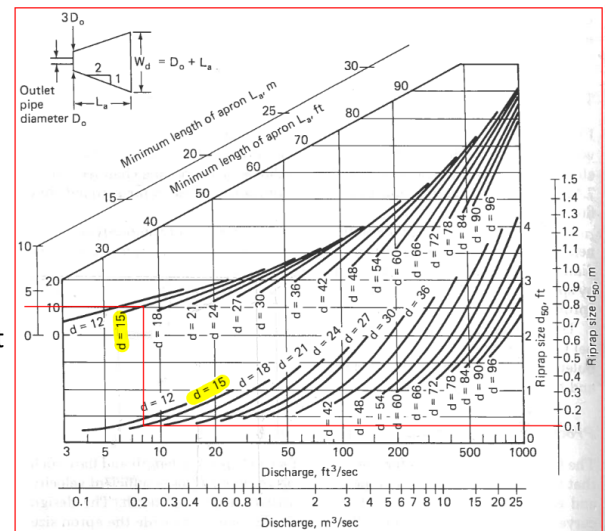
Rip Rap Required Dimensions

Dimensions for the rip rap were taken from Figure 7.45 (Erosion and Sediment Control Handbook, 1986)

Rip Rap Depth (d) = 0.38 m
Apron Length (L_a) = 3.00 m
Median Stone Size (d₅₀) = 0.1 m

The above represents the minimum parameters of the rip rap to prevent wash out.

Conclusions



Therefore, the proposed 200 mm diameter rip rap with a depth of 0.40m will stay in place at the maximum design flow rate.

The required apron length (L_a) of 3.0 m is less than the specified length of 6.7 m.

References:

Goldman, Steven J., Jackson, Katharine, and Bursztynsky, Taras A., 1986 Erosion and Sediment Control Handbook. New York: McGraw-Hill Incorporated.

Appendix D Wetland Capacity Calculations

079 Sideroad 19
Township of Centre Wellington (Fergus)
File No.: 122025
6/16/2025

Stage / Storage Volume Calculations - Existing Wetland

Elevation	Depth	Pond Surface Area	Pond Volume	Accum. Volume	
(m)	(m)	(m ²)	(m ³)	(m ³)	
414.55	0.00		0.00	0.00	
414.65	0.10		1.28	1.28	
414.75	0.20		24.61	25.89	
414.85	0.30		61.68	87.57	Culvert (channel flow)
414.95	0.40		102.32	189.89	
415.05	0.50		136.74	326.63	
415.15	0.60		176.44	503.07	Culvert (orifice flow)
415.25	0.70		225.26	728.33	
415.35	0.80		281.68	1,010.01	
415.45	0.90		337.98	1,347.99	
415.55	1.00		386.12	1,734.11	Overflow (weir flow)
415.65	1.10		386.12	2,120.23	
415.75	1.20		386.12	2,506.35	

Culvert (Channel Flow)

Pipe INV =	414.76	m				
Pipe AREA =	0.61	m ²	for 1030 x 740 CSP Pipe Arch per MTO Drainage Manual			
Pipe DIA. =	0.881	m	diameter of equivalent circular pipe			
Pipe S. =	1.31%					
n =	0.024	for CSP Pipe Arch per MTO Drainage Manual				
						$Q = (1.00/n)A(R_h^{2/3})S^{1/2}$

Elev	h	θ	A	P	Rh	Q
m	m	rad.	m ²	m	m	m ³ /s
414.85	0.09	1.30	0.03	0.57	0.06	0.023
414.95	0.19	1.93	0.10	0.85	0.11	0.108
415.05	0.29	2.44	0.17	1.08	0.16	0.248

Culvert (Orifice Flow)

$$Q = CdA\sqrt{2gh}$$

Elev	Cd	A	2g	H	h	Q
m		m ²		m	m	m ³ /s
415.15	0.600	0.610	19.62	415.13	0.02	0.229
415.25	0.600	0.610	19.62	415.13	0.12	0.562
415.35	0.600	0.610	19.62	415.13	0.22	0.760
415.45	0.600	0.610	19.62	415.13	0.32	0.917
415.55	0.600	0.610	19.62	415.13	0.42	1.051
415.65	0.600	0.610	19.62	415.13	0.52	1.169
415.75	0.600	0.610	19.62	415.13	0.62	1.277

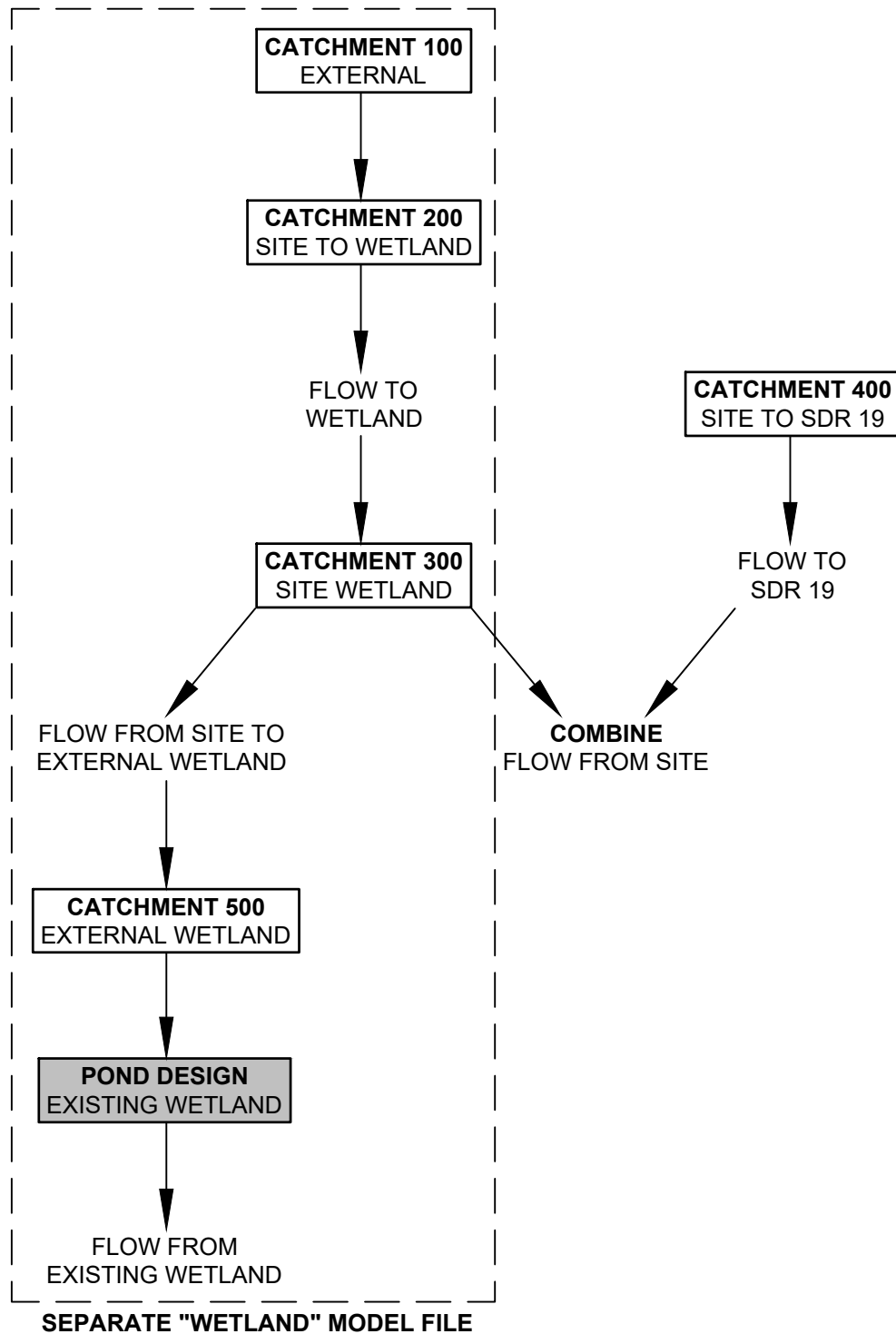
079 Sideroad 19
Township of Centre Wellington (Fergus)
File No.: 122025

Overflow (Weir Flow)						
Elev	d1	h	H	2g	L	Q
m	m	m	m		m	m ³ /s
415.55	1.00	1.00	0.00	19.62	1.00	0.000
415.65	1.10	1.00	0.10	19.62	7.00	0.307
415.75	1.20	1.00	0.20	19.62	14.00	1.774

Wetland
Stage-Storage-Discharge Table

Elevation	Stage	Storage	Culvert Discharge	Overflow Discharge	Total Discharge	
(m)	(m)	(m ³)	(m ³ /s)	(m ³ /s)	(m ³ /s)	
414.55	0.00	0.00	0.000	0.000	0.000	
414.65	0.10	1.28	0.000	0.000	0.000	
414.75	0.20	25.89	0.000	0.000	0.000	
414.85	0.30	87.57	0.023	0.000	0.023	Culvert (channel flow)
414.95	0.40	189.89	0.108	0.000	0.108	
415.05	0.50	326.63	0.248	0.000	0.248	
415.15	0.60	503.07	0.229	0.000	0.229	Culvert (orifice flow)
415.25	0.70	728.33	0.562	0.000	0.562	
415.35	0.80	1,010.01	0.760	0.000	0.760	
415.45	0.90	1,347.99	0.917	0.000	0.917	
415.55	1.00	1,734.11	1.051	0.000	1.051	Overflow (weir flow)
415.65	1.10	2,120.23	1.169	0.307	1.476	
415.75	1.20	2,506.35	1.277	1.774	3.050	

Appendix E Existing Conditions Hydrologic Modelling



73/79 SIDEROAD 19 RESIDENTIAL DEVELOPMENT
TOWNSHIP OF CENTRE WELLINGTON (FERGUS)

WRIGHTHAVEN HOMES LTD.



Project 2401073

EXISTING CONDITIONS
MIDUSS HYDROLOGIC
MODEL SCHEMATIC

JUNE 2025

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                        B:\Working\WRIGHTHAVEN HOMES\"
"          2401073 - 122025 079 Sideroad 19 Fergus\5 Work in Progress\Design
Calcs\2026-01-22 SWM Calcs"
"          Output filename:                    122025 Pre 25mm.out"
"          Licensee name:                      "
"          Company                            "
"          Date & Time last used:              1/23/2026 at 9:19:43 AM"
" 31          TIME PARAMETERS"
"          5.000  Time Step"
"          240.000  Max. Storm length"
"          5000.000  Max. Hydrograph"
" 32          STORM Chicago storm"
"          1  Chicago storm"
"          1581.250  Coefficient A"
"          13.000  Constant B"
"          1.000  Exponent C"
"          0.400  Fraction R"
"          240.000  Duration"
"          1.000  Time step multiplier"
"          Maximum intensity                    84.725  mm/hr"
"          Total depth                        25.000  mm"
"          6  001hyd  Hydrograph extension used in this file"
" 33          CATCHMENT 100"
"          1  Triangular SCS"
"          1  Equal length"
"          2  Horton equation"
"          100  EXTERNAL"
"          30.000  % Impervious"
"          3.400  Total Area"
"          150.000  Flow length"
"          2.000  Overland Slope"
"          2.380  Pervious Area"
"          150.000  Pervious length"
"          2.000  Pervious slope"
"          1.020  Impervious Area"
"          150.000  Impervious length"
"          2.000  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          200.000  Pervious Max.infiltration"
"          13.000  Pervious Min.infiltration"
"          0.250  Pervious Lag constant (hours)"
"          5.000  Pervious Depression storage"
"          0.013  Impervious Manning 'n'"
"          0.000  Impervious Max.infiltration"
"          0.000  Impervious Min.infiltration"
"          0.050  Impervious Lag constant (hours)"

```

"	1.500	Impervious Depression storage"				
"		0.191	0.000	0.000	0.000 c.m/sec"	
"		Catchment 100	Pervious	Impervious	Total Area	"
"		Surface Area	2.380	1.020	3.400	hectare"
"		Time of concentration	---	5.714	5.714	minutes"
"		Time to Centroid	0.000	115.659	115.659	minutes"
"		Rainfall depth	25.000	25.000	25.000	mm"
"		Rainfall volume	595.00	255.00	850.00	c.m"
"		Rainfall losses	25.000	1.646	17.994	mm"
"		Runoff depth	0.000	23.354	7.006	mm"
"		Runoff volume	0.00	238.21	238.21	c.m"
"		Runoff coefficient	0.000	0.934	0.280	"
"		Maximum flow	0.000	0.191	0.191	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.191	0.191	0.000	0.000"	
" 33		CATCHMENT 200"				
"	1	Triangular SCS"				
"	1	Equal length"				
"	2	Horton equation"				
"	200	SITE"				
"	20.000	% Impervious"				
"	0.990	Total Area"				
"	30.000	Flow length"				
"	2.000	Overland Slope"				
"	0.792	Pervious Area"				
"	30.000	Pervious length"				
"	2.000	Pervious slope"				
"	0.198	Impervious Area"				
"	30.000	Impervious length"				
"	2.000	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	200.000	Pervious Max.infiltration"				
"	13.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.013	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.050	Impervious Lag constant (hours)"				
"	1.500	Impervious Depression storage"				
"		0.040	0.191	0.000	0.000 c.m/sec"	
"		Catchment 200	Pervious	Impervious	Total Area	"
"		Surface Area	0.792	0.198	0.990	hectare"
"		Time of concentration	---	2.175	2.175	minutes"
"		Time to Centroid	0.000	110.635	110.635	minutes"
"		Rainfall depth	25.000	25.000	25.000	mm"
"		Rainfall volume	198.00	49.50	247.50	c.m"
"		Rainfall losses	25.000	1.816	20.363	mm"
"		Runoff depth	0.000	23.184	4.637	mm"

"	Runoff volume	0.00	45.90	45.90	c.m"
"	Runoff coefficient	0.000	0.927	0.185	"
"	Maximum flow	0.000	0.040	0.040	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.040	0.220	0.000	0.000"	
" 33	CATCHMENT 300"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	2 Horton equation"				
"	300 SITE WETLAND"				
"	10.000 % Impervious"				
"	0.080 Total Area"				
"	25.000 Flow length"				
"	2.000 Overland Slope"				
"	0.072 Pervious Area"				
"	25.000 Pervious length"				
"	2.000 Pervious slope"				
"	0.008 Impervious Area"				
"	25.000 Impervious length"				
"	2.000 Impervious slope"				
"	0.250 Pervious Manning 'n'"				
"	200.000 Pervious Max.infiltration"				
"	13.000 Pervious Min.infiltration"				
"	0.250 Pervious Lag constant (hours)"				
"	5.000 Pervious Depression storage"				
"	0.013 Impervious Manning 'n'"				
"	0.000 Impervious Max.infiltration"				
"	0.000 Impervious Min.infiltration"				
"	0.050 Impervious Lag constant (hours)"				
"	1.500 Impervious Depression storage"				
"	0.002	0.220	0.000	0.000 c.m/sec"	
"	Catchment 300	Pervious	Impervious	Total Area "	
"	Surface Area	0.072	0.008	0.080	hectare"
"	Time of concentration	---	1.950	1.950	minutes"
"	Time to Centroid	0.000	110.316	110.316	minutes"
"	Rainfall depth	25.000	25.000	25.000	mm"
"	Rainfall volume	18.00	2.00	20.00	c.m"
"	Rainfall losses	25.000	1.809	22.681	mm"
"	Runoff depth	0.000	23.191	2.319	mm"
"	Runoff volume	0.00	1.86	1.86	c.m"
"	Runoff coefficient	0.000	0.928	0.093	"
"	Maximum flow	0.000	0.002	0.002	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.002	0.222	0.000	0.000"	
" 40	HYDROGRAPH Copy to Outflow"				
"	8 Copy to Outflow"				
"	0.002	0.222	0.222	0.000"	
" 40	HYDROGRAPH Combine 1"				

```

"          6   Combine "
"          1   Node #"
"            EX FLOW FROM SITE"
"            Maximum flow          0.222   c.m/sec"
"            Hydrograph volume    285.972   c.m"
"              0.002    0.222    0.222    0.222"
" 40      HYDROGRAPH Start - New Tributary"
"          2   Start - New Tributary"
"            0.002    0.000    0.222    0.222"
" 33      CATCHMENT 400"
"          1   Triangular SCS"
"          1   Equal length"
"          2   Horton equation"
"        400   SITE REMAIN"
"      60.000   % Impervious"
"        0.050   Total Area"
"     10.000   Flow length"
"        2.000   Overland Slope"
"        0.020   Pervious Area"
"     10.000   Pervious length"
"        2.000   Pervious slope"
"        0.030   Impervious Area"
"     10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"    200.000   Pervious Max.infiltration"
"     13.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.013   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"              0.006    0.000    0.222    0.222 c.m/sec"
"      Catchment 400      Pervious      Impervious      Total Area "
"      Surface Area      0.020      0.030      0.050      hectare"
"      Time of concentration      ---      1.125      1.125      minutes"
"      Time to Centroid      0.000      109.234      109.234      minutes"
"      Rainfall depth      25.000      25.000      25.000      mm"
"      Rainfall volume      5.00      7.50      12.50      c.m"
"      Rainfall losses      25.000      2.121      11.272      mm"
"      Runoff depth      0.000      22.879      13.728      mm"
"      Runoff volume      0.00      6.86      6.86      c.m"
"      Runoff coefficient      0.000      0.915      0.549      "
"      Maximum flow      0.000      0.006      0.006      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"          4   Add Runoff "
"            0.006    0.006    0.222    0.222"
" 40      HYDROGRAPH Copy to Outflow"

```

"	8	Copy to Outflow"				
"		0.006	0.006	0.006	0.222"	
" 40		HYDROGRAPH	Combine	1"		
"	6	Combine "				
"	1	Node #"				
"		EX FLOW FROM SITE"				
"		Maximum flow		0.225	c.m/sec"	
"		Hydrograph volume		292.835	c.m"	
"		0.006	0.006	0.006	0.225"	
" 38		START/RE-START TOTALS 400"				
"	3	Runoff Totals on EXIT"				
"		Total Catchment area		4.520	hectare"	
"		Total Impervious area		1.256	hectare"	
"		Total % impervious		27.788"		
" 19		EXIT"				

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                        B:\Working\WRIGHTHAVEN HOMES\"
"          2401073 - 122025 079 Sideroad 19 Fergus\5 Work in Progress\Design
Calcs\2026-01-22 SWM Calcs"
"          Output filename:                    122025 Pre 2yr.out"
"          Licensee name:                      "
"          Company                            "
"          Date & Time last used:              1/23/2026 at 10:25:28 AM"
" 31          TIME PARAMETERS"
"          5.000  Time Step"
"          240.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 32          STORM Chicago storm"
"          1  Chicago storm"
"          695.047 Coefficient A"
"          6.387  Constant B"
"          0.793  Exponent C"
"          0.375  Fraction R"
"          180.000 Duration"
"          1.000  Time step multiplier"
"          Maximum intensity                    99.625  mm/hr"
"          Total depth                          33.014  mm"
"          6  002hyd  Hydrograph extension used in this file"
" 33          CATCHMENT 100"
"          1  Triangular SCS"
"          1  Equal length"
"          2  Horton equation"
"          100  EXTERNAL"
"          30.000 % Impervious"
"          3.400  Total Area"
"          150.000 Flow length"
"          2.000  Overland Slope"
"          2.380  Pervious Area"
"          150.000 Pervious length"
"          2.000  Pervious slope"
"          1.020  Impervious Area"
"          150.000 Impervious length"
"          2.000  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          200.000 Pervious Max.infiltration"
"          13.000  Pervious Min.infiltration"
"          0.250  Pervious Lag constant (hours)"
"          5.000  Pervious Depression storage"
"          0.013  Impervious Manning 'n'"
"          0.000  Impervious Max.infiltration"
"          0.000  Impervious Min.infiltration"
"          0.050  Impervious Lag constant (hours)"

```


"	1.500	Impervious Depression storage"				
"		0.214	0.000	0.000	0.000 c.m/sec"	
"		Catchment 100	Pervious	Impervious	Total Area	"
"		Surface Area	2.380	1.020	3.400	hectare"
"		Time of concentration	---	5.355	5.355	minutes"
"		Time to Centroid	0.000	91.059	91.059	minutes"
"		Rainfall depth	33.014	33.014	33.014	mm"
"		Rainfall volume	785.73	336.74	1122.47	c.m"
"		Rainfall losses	33.014	1.644	23.603	mm"
"		Runoff depth	0.000	31.369	9.411	mm"
"		Runoff volume	0.00	319.97	319.97	c.m"
"		Runoff coefficient	0.000	0.950	0.285	"
"		Maximum flow	0.000	0.214	0.214	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.214	0.214	0.000	0.000"	
" 33		CATCHMENT 200"				
"	1	Triangular SCS"				
"	1	Equal length"				
"	2	Horton equation"				
"	200	SITE"				
"	20.000	% Impervious"				
"	0.990	Total Area"				
"	30.000	Flow length"				
"	2.000	Overland Slope"				
"	0.792	Pervious Area"				
"	30.000	Pervious length"				
"	2.000	Pervious slope"				
"	0.198	Impervious Area"				
"	30.000	Impervious length"				
"	2.000	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	200.000	Pervious Max.infiltration"				
"	13.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.013	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.050	Impervious Lag constant (hours)"				
"	1.500	Impervious Depression storage"				
"		0.043	0.214	0.000	0.000 c.m/sec"	
"		Catchment 200	Pervious	Impervious	Total Area	"
"		Surface Area	0.792	0.198	0.990	hectare"
"		Time of concentration	---	2.039	2.039	minutes"
"		Time to Centroid	0.000	86.155	86.155	minutes"
"		Rainfall depth	33.014	33.014	33.014	mm"
"		Rainfall volume	261.47	65.37	326.84	c.m"
"		Rainfall losses	33.014	1.944	26.800	mm"
"		Runoff depth	0.000	31.070	6.214	mm"

"	Runoff volume	0.00	61.52	61.52	c.m"
"	Runoff coefficient	0.000	0.941	0.188	"
"	Maximum flow	0.000	0.043	0.043	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"		0.043	0.250	0.000	0.000"
" 33	CATCHMENT 300"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	2 Horton equation"				
"	300 SITE WETLAND"				
"	10.000 % Impervious"				
"	0.080 Total Area"				
"	25.000 Flow length"				
"	2.000 Overland Slope"				
"	0.072 Pervious Area"				
"	25.000 Pervious length"				
"	2.000 Pervious slope"				
"	0.008 Impervious Area"				
"	25.000 Impervious length"				
"	2.000 Impervious slope"				
"	0.250 Pervious Manning 'n'"				
"	200.000 Pervious Max.infiltration"				
"	13.000 Pervious Min.infiltration"				
"	0.250 Pervious Lag constant (hours)"				
"	5.000 Pervious Depression storage"				
"	0.013 Impervious Manning 'n'"				
"	0.000 Impervious Max.infiltration"				
"	0.000 Impervious Min.infiltration"				
"	0.050 Impervious Lag constant (hours)"				
"	1.500 Impervious Depression storage"				
"		0.002	0.250	0.000	0.000 c.m/sec"
"	Catchment 300	Pervious	Impervious	Total Area	"
"	Surface Area	0.072	0.008	0.080	hectare"
"	Time of concentration	---	1.828	1.828	minutes"
"	Time to Centroid	0.000	85.761	85.761	minutes"
"	Rainfall depth	33.014	33.014	33.014	mm"
"	Rainfall volume	23.77	2.64	26.41	c.m"
"	Rainfall losses	33.014	1.949	29.907	mm"
"	Runoff depth	0.000	31.065	3.106	mm"
"	Runoff volume	0.00	2.49	2.49	c.m"
"	Runoff coefficient	0.000	0.941	0.094	"
"	Maximum flow	0.000	0.002	0.002	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"		0.002	0.251	0.000	0.000"
" 40	HYDROGRAPH Copy to Outflow"				
"	8 Copy to Outflow"				
"		0.002	0.251	0.251	0.000"
" 40	HYDROGRAPH Combine 1"				

```

"          6   Combine "
"          1   Node #"
"            EX FLOW FROM SITE"
"            Maximum flow          0.251    c.m/sec"
"            Hydrograph volume    383.972    c.m"
"              0.002    0.251    0.251    0.251"
" 40      HYDROGRAPH Start - New Tributary"
"          2   Start - New Tributary"
"            0.002    0.000    0.251    0.251"
" 33      CATCHMENT 400"
"          1   Triangular SCS"
"          1   Equal length"
"          2   Horton equation"
"        400   SITE REMAIN"
"      60.000   % Impervious"
"        0.050   Total Area"
"      10.000   Flow length"
"        2.000   Overland Slope"
"        0.020   Pervious Area"
"      10.000   Pervious length"
"        2.000   Pervious slope"
"        0.030   Impervious Area"
"      10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"    200.000   Pervious Max.infiltration"
"      13.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.013   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"              0.007    0.000    0.251    0.251 c.m/sec"
"      Catchment 400      Pervious      Impervious      Total Area "
"      Surface Area      0.020      0.030      0.050      hectare"
"      Time of concentration      ---      1.055      1.055      minutes"
"      Time to Centroid      0.000      84.596      84.596      minutes"
"      Rainfall depth      33.014      33.014      33.014      mm"
"      Rainfall volume      6.60      9.90      16.51      c.m"
"      Rainfall losses      33.014      2.461      14.682      mm"
"      Runoff depth      0.000      30.553      18.332      mm"
"      Runoff volume      0.00      9.17      9.17      c.m"
"      Runoff coefficient      0.000      0.925      0.555      "
"      Maximum flow      0.000      0.007      0.007      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"          4   Add Runoff "
"            0.007    0.007    0.251    0.251"
" 40      HYDROGRAPH Copy to Outflow"

```

"	8	Copy to Outflow"				
"		0.007	0.007	0.007	0.251"	
" 40		HYDROGRAPH	Combine	1"		
"	6	Combine "				
"	1	Node #"				
"		EX FLOW FROM SITE"				
"		Maximum flow	0.256	c.m/sec"		
"		Hydrograph volume	393.138	c.m"		
"		0.007	0.007	0.007	0.256"	
" 38		START/RE-START TOTALS 400"				
"	3	Runoff Totals on EXIT"				
"		Total Catchment area	4.520	hectare"		
"		Total Impervious area	1.256	hectare"		
"		Total % impervious	27.788"			
" 19		EXIT"				

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                        B:\Working\WRIGHTHAVEN HOMES\"
"          2401073 - 122025 079 Sideroad 19 Fergus\5 Work in Progress\Design
Calcs\2026-01-22 SWM Calcs"
"          Output filename:                    122025 Pre 5yr.out"
"          Licensee name:                      "
"          Company                            "
"          Date & Time last used:              1/23/2026 at 11:02:27 AM"
" 31          TIME PARAMETERS"
"          5.000  Time Step"
"          240.000  Max. Storm length"
"          5000.000  Max. Hydrograph"
" 32          STORM Chicago storm"
"          1  Chicago storm"
"          1459.072  Coefficient A"
"          13.690  Constant B"
"          0.850  Exponent C"
"          0.375  Fraction R"
"          180.000  Duration"
"          1.000  Time step multiplier"
"          Maximum intensity          119.775  mm/hr"
"          Total depth          49.792  mm"
"          6  005hyd  Hydrograph extension used in this file"
" 33          CATCHMENT 100"
"          1  Triangular SCS"
"          1  Equal length"
"          2  Horton equation"
"          100  EXTERNAL"
"          30.000  % Impervious"
"          3.400  Total Area"
"          150.000  Flow length"
"          2.000  Overland Slope"
"          2.380  Pervious Area"
"          150.000  Pervious length"
"          2.000  Pervious slope"
"          1.020  Impervious Area"
"          150.000  Impervious length"
"          2.000  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          200.000  Pervious Max.infiltration"
"          13.000  Pervious Min.infiltration"
"          0.250  Pervious Lag constant (hours)"
"          5.000  Pervious Depression storage"
"          0.013  Impervious Manning 'n'"
"          0.000  Impervious Max.infiltration"
"          0.000  Impervious Min.infiltration"
"          0.050  Impervious Lag constant (hours)"

```

"	1.500	Impervious Depression storage"				
"		0.282	0.000	0.000	0.000 c.m/sec"	
"		Catchment 100	Pervious	Impervious	Total Area	"
"		Surface Area	2.380	1.020	3.400	hectare"
"		Time of concentration	---	4.975	4.975	minutes"
"		Time to Centroid	0.000	89.324	89.324	minutes"
"		Rainfall depth	49.792	49.792	49.792	mm"
"		Rainfall volume	1185.04	507.88	1692.92	c.m"
"		Rainfall losses	49.792	1.847	35.408	mm"
"		Runoff depth	0.000	47.945	14.383	mm"
"		Runoff volume	0.00	489.04	489.04	c.m"
"		Runoff coefficient	0.000	0.963	0.289	"
"		Maximum flow	0.000	0.282	0.282	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.282	0.282	0.000	0.000"	
" 33		CATCHMENT 200"				
"	1	Triangular SCS"				
"	1	Equal length"				
"	2	Horton equation"				
"	200	SITE"				
"	20.000	% Impervious"				
"	0.990	Total Area"				
"	30.000	Flow length"				
"	2.000	Overland Slope"				
"	0.792	Pervious Area"				
"	30.000	Pervious length"				
"	2.000	Pervious slope"				
"	0.198	Impervious Area"				
"	30.000	Impervious length"				
"	2.000	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	200.000	Pervious Max.infiltration"				
"	13.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.013	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.050	Impervious Lag constant (hours)"				
"	1.500	Impervious Depression storage"				
"		0.055	0.282	0.000	0.000 c.m/sec"	
"		Catchment 200	Pervious	Impervious	Total Area	"
"		Surface Area	0.792	0.198	0.990	hectare"
"		Time of concentration	---	1.894	1.894	minutes"
"		Time to Centroid	0.000	84.922	84.922	minutes"
"		Rainfall depth	49.792	49.792	49.792	mm"
"		Rainfall volume	394.35	98.59	492.94	c.m"
"		Rainfall losses	49.792	2.201	40.274	mm"
"		Runoff depth	0.000	47.591	9.518	mm"

"	Runoff volume	0.00	94.23	94.23	c.m"
"	Runoff coefficient	0.000	0.956	0.191	"
"	Maximum flow	0.000	0.055	0.055	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.055	0.331	0.000	0.000"	
" 33	CATCHMENT 300"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	2 Horton equation"				
"	300 SITE WETLAND"				
"	10.000 % Impervious"				
"	0.080 Total Area"				
"	25.000 Flow length"				
"	2.000 Overland Slope"				
"	0.072 Pervious Area"				
"	25.000 Pervious length"				
"	2.000 Pervious slope"				
"	0.008 Impervious Area"				
"	25.000 Impervious length"				
"	2.000 Impervious slope"				
"	0.250 Pervious Manning 'n'"				
"	200.000 Pervious Max.infiltration"				
"	13.000 Pervious Min.infiltration"				
"	0.250 Pervious Lag constant (hours)"				
"	5.000 Pervious Depression storage"				
"	0.013 Impervious Manning 'n'"				
"	0.000 Impervious Max.infiltration"				
"	0.000 Impervious Min.infiltration"				
"	0.050 Impervious Lag constant (hours)"				
"	1.500 Impervious Depression storage"				
"	0.002	0.331	0.000	0.000 c.m/sec"	
"	Catchment 300	Pervious	Impervious	Total Area "	
"	Surface Area	0.072	0.008	0.080	hectare"
"	Time of concentration	---	1.698	1.698	minutes"
"	Time to Centroid	0.000	84.637	84.637	minutes"
"	Rainfall depth	49.792	49.792	49.792	mm"
"	Rainfall volume	35.85	3.98	39.83	c.m"
"	Rainfall losses	49.792	2.199	45.032	mm"
"	Runoff depth	0.000	47.593	4.759	mm"
"	Runoff volume	0.00	3.81	3.81	c.m"
"	Runoff coefficient	0.000	0.956	0.096	"
"	Maximum flow	0.000	0.002	0.002	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.002	0.332	0.000	0.000"	
" 40	HYDROGRAPH Copy to Outflow"				
"	8 Copy to Outflow"				
"	0.002	0.332	0.332	0.000"	
" 40	HYDROGRAPH Combine 1"				

```

"          6   Combine "
"          1   Node #"
"            EX FLOW FROM SITE"
"            Maximum flow          0.332    c.m/sec"
"            Hydrograph volume    587.075    c.m"
"              0.002    0.332    0.332    0.332"
" 40      HYDROGRAPH Start - New Tributary"
"          2   Start - New Tributary"
"            0.002    0.000    0.332    0.332"
" 33      CATCHMENT 400"
"          1   Triangular SCS"
"          1   Equal length"
"          2   Horton equation"
"        400   SITE REMAIN"
"      60.000   % Impervious"
"        0.050   Total Area"
"      10.000   Flow length"
"        2.000   Overland Slope"
"        0.020   Pervious Area"
"      10.000   Pervious length"
"        2.000   Pervious slope"
"        0.030   Impervious Area"
"      10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"    200.000   Pervious Max.infiltration"
"      13.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.013   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"              0.009    0.000    0.332    0.332 c.m/sec"
"      Catchment 400      Pervious      Impervious      Total Area "
"      Surface Area      0.020      0.030      0.050      hectare"
"      Time of concentration      ---      0.980      0.980      minutes"
"      Time to Centroid      0.000      83.649      83.649      minutes"
"      Rainfall depth      49.792      49.792      49.792      mm"
"      Rainfall volume      9.96      14.94      24.90      c.m"
"      Rainfall losses      49.792      3.090      21.770      mm"
"      Runoff depth      0.000      46.702      28.021      mm"
"      Runoff volume      0.00      14.01      14.01      c.m"
"      Runoff coefficient      0.000      0.938      0.563      "
"      Maximum flow      0.000      0.009      0.009      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"          4   Add Runoff "
"            0.009    0.009    0.332    0.332"
" 40      HYDROGRAPH Copy to Outflow"

```


"	8	Copy to Outflow"				
"		0.009	0.009	0.009	0.332"	
" 40		HYDROGRAPH	Combine	1"		
"	6	Combine "				
"	1	Node #"				
"		EX FLOW FROM SITE"				
"		Maximum flow		0.339	c.m/sec"	
"		Hydrograph volume		601.085	c.m"	
"		0.009	0.009	0.009	0.339"	
" 38		START/RE-START TOTALS 400"				
"	3	Runoff Totals on EXIT"				
"		Total Catchment area		4.520	hectare"	
"		Total Impervious area		1.256	hectare"	
"		Total % impervious		27.788"		
" 19		EXIT"				

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                        B:\Working\WRIGHTHAVEN HOMES\"
"          2401073 - 122025 079 Sideroad 19 Fergus\5 Work in Progress\Design
Calcs\2026-01-22 SWM Calcs"
"          Output filename:                    122025 Pre 10yr.out"
"          Licensee name:                      "
"          Company                            "
"          Date & Time last used:              1/23/2026 at 11:06:33 AM"
" 31          TIME PARAMETERS"
"          5.000  Time Step"
"          240.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 32          STORM Chicago storm"
"          1  Chicago storm"
"          2327.596 Coefficient A"
"          19.500  Constant B"
"          0.894  Exponent C"
"          0.375  Fraction R"
"          180.000 Duration"
"          1.000  Time step multiplier"
"          Maximum intensity                    132.071  mm/hr"
"          Total depth                        61.359  mm"
"          6  010hyd  Hydrograph extension used in this file"
" 33          CATCHMENT 100"
"          1  Triangular SCS"
"          1  Equal length"
"          2  Horton equation"
"          100  EXTERNAL"
"          30.000 % Impervious"
"          3.400  Total Area"
"          150.000 Flow length"
"          2.000  Overland Slope"
"          2.380  Pervious Area"
"          150.000 Pervious length"
"          2.000  Pervious slope"
"          1.020  Impervious Area"
"          150.000 Impervious length"
"          2.000  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          200.000 Pervious Max.infiltration"
"          13.000  Pervious Min.infiltration"
"          0.250  Pervious Lag constant (hours)"
"          5.000  Pervious Depression storage"
"          0.013  Impervious Manning 'n'"
"          0.000  Impervious Max.infiltration"
"          0.000  Impervious Min.infiltration"
"          0.050  Impervious Lag constant (hours)"

```

"	1.500	Impervious Depression storage"				
"		0.321	0.000	0.000	0.000 c.m/sec"	
"		Catchment 100	Pervious	Impervious	Total Area	"
"		Surface Area	2.380	1.020	3.400	hectare"
"		Time of concentration	---	4.784	4.784	minutes"
"		Time to Centroid	0.000	88.560	88.560	minutes"
"		Rainfall depth	61.359	61.359	61.359	mm"
"		Rainfall volume	1460.35	625.86	2086.21	c.m"
"		Rainfall losses	61.359	1.930	43.531	mm"
"		Runoff depth	0.000	59.429	17.829	mm"
"		Runoff volume	0.00	606.17	606.17	c.m"
"		Runoff coefficient	0.000	0.969	0.291	"
"		Maximum flow	0.000	0.321	0.321	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.321	0.321	0.000	0.000"	
" 33		CATCHMENT 200"				
"	1	Triangular SCS"				
"	1	Equal length"				
"	2	Horton equation"				
"	200	SITE"				
"	20.000	% Impervious"				
"	0.990	Total Area"				
"	30.000	Flow length"				
"	2.000	Overland Slope"				
"	0.792	Pervious Area"				
"	30.000	Pervious length"				
"	2.000	Pervious slope"				
"	0.198	Impervious Area"				
"	30.000	Impervious length"				
"	2.000	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	200.000	Pervious Max.infiltration"				
"	13.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.013	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	0.321	0.000	0.000 c.m/sec"	
"		Catchment 200	Pervious	Impervious	Total Area	"
"		Surface Area	0.792	0.198	0.990	hectare"
"		Time of concentration	---	1.821	1.821	minutes"
"		Time to Centroid	0.000	84.428	84.428	minutes"
"		Rainfall depth	61.359	61.359	61.359	mm"
"		Rainfall volume	485.97	121.49	607.46	c.m"
"		Rainfall losses	61.359	2.355	49.558	mm"
"		Runoff depth	0.000	59.004	11.801	mm"

"	Runoff volume	0.00	116.83	116.83	c.m"
"	Runoff coefficient	0.000	0.962	0.192	"
"	Maximum flow	0.000	0.062	0.062	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"		0.062	0.377	0.000	0.000"
" 33	CATCHMENT 300"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	2 Horton equation"				
"	300 SITE WETLAND"				
"	10.000 % Impervious"				
"	0.080 Total Area"				
"	25.000 Flow length"				
"	2.000 Overland Slope"				
"	0.072 Pervious Area"				
"	25.000 Pervious length"				
"	2.000 Pervious slope"				
"	0.008 Impervious Area"				
"	25.000 Impervious length"				
"	2.000 Impervious slope"				
"	0.250 Pervious Manning 'n'"				
"	200.000 Pervious Max.infiltration"				
"	13.000 Pervious Min.infiltration"				
"	0.250 Pervious Lag constant (hours)"				
"	5.000 Pervious Depression storage"				
"	0.013 Impervious Manning 'n'"				
"	0.000 Impervious Max.infiltration"				
"	0.000 Impervious Min.infiltration"				
"	0.050 Impervious Lag constant (hours)"				
"	1.500 Impervious Depression storage"				
"		0.003	0.377	0.000	0.000 c.m/sec"
"	Catchment 300	Pervious	Impervious	Total Area	"
"	Surface Area	0.072	0.008	0.080	hectare"
"	Time of concentration	---	1.633	1.633	minutes"
"	Time to Centroid	0.000	84.203	84.203	minutes"
"	Rainfall depth	61.359	61.359	61.359	mm"
"	Rainfall volume	44.18	4.91	49.09	c.m"
"	Rainfall losses	61.359	2.329	55.456	mm"
"	Runoff depth	0.000	59.030	5.903	mm"
"	Runoff volume	0.00	4.72	4.72	c.m"
"	Runoff coefficient	0.000	0.962	0.096	"
"	Maximum flow	0.000	0.003	0.003	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"		0.003	0.379	0.000	0.000"
" 40	HYDROGRAPH Copy to Outflow"				
"	8 Copy to Outflow"				
"		0.003	0.379	0.379	0.000"
" 40	HYDROGRAPH Combine 1"				

```

"          6   Combine "
"          1   Node #"
"          EX FLOW FROM SITE"
"          Maximum flow          0.379    c.m/sec"
"          Hydrograph volume    727.724    c.m"
"          0.003    0.379    0.379    0.379"
" 40    HYDROGRAPH Start - New Tributary"
"          2   Start - New Tributary"
"          0.003    0.000    0.379    0.379"
" 33    CATCHMENT 400"
"          1   Triangular SCS"
"          1   Equal length"
"          2   Horton equation"
"          400  SITE REMAIN"
"          60.000 % Impervious"
"          0.050  Total Area"
"          10.000 Flow length"
"          2.000  Overland Slope"
"          0.020  Pervious Area"
"          10.000 Pervious length"
"          2.000  Pervious slope"
"          0.030  Impervious Area"
"          10.000 Impervious length"
"          2.000  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          200.000 Pervious Max.infiltration"
"          13.000 Pervious Min.infiltration"
"          0.250  Pervious Lag constant (hours)"
"          5.000  Pervious Depression storage"
"          0.013  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    0.000    0.379    0.379 c.m/sec"
"          Catchment 400    Pervious    Impervious    Total Area "
"          Surface Area    0.020    0.030    0.050    hectare"
"          Time of concentration    ---    0.942    0.942    minutes"
"          Time to Centroid    0.000    83.325    83.325    minutes"
"          Rainfall depth    61.359    61.359    61.359    mm"
"          Rainfall volume    12.27    18.41    30.68    c.m"
"          Rainfall losses    61.359    3.596    26.701    mm"
"          Runoff depth    0.000    57.763    34.658    mm"
"          Runoff volume    0.00    17.33    17.33    c.m"
"          Runoff coefficient    0.000    0.941    0.565    "
"          Maximum flow    0.000    0.010    0.010    c.m/sec"
" 40    HYDROGRAPH Add Runoff "
"          4   Add Runoff "
"          0.010    0.010    0.379    0.379"
" 40    HYDROGRAPH Copy to Outflow"

```

"	8	Copy to Outflow"				
"		0.010	0.010	0.010	0.379"	
" 40		HYDROGRAPH	Combine	1"		
"	6	Combine "				
"	1	Node #"				
"		EX FLOW FROM SITE"				
"		Maximum flow		0.387	c.m/sec"	
"		Hydrograph volume		745.053	c.m"	
"		0.010	0.010	0.010	0.387"	
" 38		START/RE-START TOTALS 400"				
"	3	Runoff Totals on EXIT"				
"		Total Catchment area		4.520	hectare"	
"		Total Impervious area		1.256	hectare"	
"		Total % impervious		27.788"		
" 19		EXIT"				

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                        B:\Working\WRIGHTHAVEN HOMES\"
"          2401073 - 122025 079 Sideroad 19 Fergus\5 Work in Progress\Design
Calcs\2026-01-22 SWM Calcs"
"          Output filename:                    122025 Pre 25yr.out"
"          Licensee name:                      "
"          Company                            "
"          Date & Time last used:              1/23/2026 at 11:09:00 AM"
" 31          TIME PARAMETERS"
"          5.000  Time Step"
"          240.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 32          STORM Chicago storm"
"          1  Chicago storm"
"          3701.648 Coefficient A"
"          25.500  Constant B"
"          0.937  Exponent C"
"          0.375  Fraction R"
"          180.000 Duration"
"          1.000  Time step multiplier"
"          Maximum intensity          149.252  mm/hr"
"          Total depth                75.581  mm"
"          6  025hyd  Hydrograph extension used in this file"
" 33          CATCHMENT 100"
"          1  Triangular SCS"
"          1  Equal length"
"          2  Horton equation"
"          100  EXTERNAL"
"          30.000 % Impervious"
"          3.400  Total Area"
"          150.000 Flow length"
"          2.000  Overland Slope"
"          2.380  Pervious Area"
"          150.000 Pervious length"
"          2.000  Pervious slope"
"          1.020  Impervious Area"
"          150.000 Impervious length"
"          2.000  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          200.000 Pervious Max.infiltration"
"          13.000  Pervious Min.infiltration"
"          0.250  Pervious Lag constant (hours)"
"          5.000  Pervious Depression storage"
"          0.013  Impervious Manning 'n'"
"          0.000  Impervious Max.infiltration"
"          0.000  Impervious Min.infiltration"
"          0.050  Impervious Lag constant (hours)"

```

"	1.500	Impervious Depression storage"				
"		0.369	0.000	0.000	0.000 c.m/sec"	
"		Catchment 100	Pervious	Impervious	Total Area	"
"		Surface Area	2.380	1.020	3.400	hectare"
"		Time of concentration	62.069	4.556	10.609	minutes"
"		Time to Centroid	139.388	87.864	93.287	minutes"
"		Rainfall depth	75.581	75.581	75.581	mm"
"		Rainfall volume	1798.82	770.92	2569.75	c.m"
"		Rainfall losses	71.874	2.048	50.926	mm"
"		Runoff depth	3.707	73.533	24.655	mm"
"		Runoff volume	88.22	750.04	838.26	c.m"
"		Runoff coefficient	0.049	0.973	0.326	"
"		Maximum flow	0.020	0.369	0.369	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.369	0.369	0.000	0.000"	
" 33		CATCHMENT 200"				
"	1	Triangular SCS"				
"	1	Equal length"				
"	2	Horton equation"				
"	200	SITE"				
"	20.000	% Impervious"				
"	0.990	Total Area"				
"	30.000	Flow length"				
"	2.000	Overland Slope"				
"	0.792	Pervious Area"				
"	30.000	Pervious length"				
"	2.000	Pervious slope"				
"	0.198	Impervious Area"				
"	30.000	Impervious length"				
"	2.000	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	200.000	Pervious Max.infiltration"				
"	13.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.013	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.050	Impervious Lag constant (hours)"				
"	1.500	Impervious Depression storage"				
"		0.072	0.369	0.000	0.000 c.m/sec"	
"		Catchment 200	Pervious	Impervious	Total Area	"
"		Surface Area	0.792	0.198	0.990	hectare"
"		Time of concentration	23.632	1.735	5.428	minutes"
"		Time to Centroid	103.139	84.033	87.256	minutes"
"		Rainfall depth	75.581	75.581	75.581	mm"
"		Rainfall volume	598.60	149.65	748.25	c.m"
"		Rainfall losses	71.875	2.522	58.004	mm"
"		Runoff depth	3.706	73.059	17.577	mm"

"	Runoff volume	29.35	144.66	174.01	c.m"
"	Runoff coefficient	0.049	0.967	0.233	"
"	Maximum flow	0.014	0.072	0.072	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"		0.072	0.436	0.000	0.000"
" 33	CATCHMENT 300"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	2 Horton equation"				
"	300 SITE WETLAND"				
"	10.000 % Impervious"				
"	0.080 Total Area"				
"	25.000 Flow length"				
"	2.000 Overland Slope"				
"	0.072 Pervious Area"				
"	25.000 Pervious length"				
"	2.000 Pervious slope"				
"	0.008 Impervious Area"				
"	25.000 Impervious length"				
"	2.000 Impervious slope"				
"	0.250 Pervious Manning 'n'"				
"	200.000 Pervious Max.infiltration"				
"	13.000 Pervious Min.infiltration"				
"	0.250 Pervious Lag constant (hours)"				
"	5.000 Pervious Depression storage"				
"	0.013 Impervious Manning 'n'"				
"	0.000 Impervious Max.infiltration"				
"	0.000 Impervious Min.infiltration"				
"	0.050 Impervious Lag constant (hours)"				
"	1.500 Impervious Depression storage"				
"		0.003	0.436	0.000	0.000 c.m/sec"
"	Catchment 300	Pervious	Impervious	Total Area	"
"	Surface Area	0.072	0.008	0.080	hectare"
"	Time of concentration	21.183	1.555	7.706	minutes"
"	Time to Centroid	100.821	83.836	89.159	minutes"
"	Rainfall depth	75.581	75.581	75.581	mm"
"	Rainfall volume	54.42	6.05	60.46	c.m"
"	Rainfall losses	71.875	2.523	64.940	mm"
"	Runoff depth	3.705	73.058	10.641	mm"
"	Runoff volume	2.67	5.84	8.51	c.m"
"	Runoff coefficient	0.049	0.967	0.141	"
"	Maximum flow	0.001	0.003	0.003	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"		0.003	0.439	0.000	0.000"
" 40	HYDROGRAPH Copy to Outflow"				
"	8 Copy to Outflow"				
"		0.003	0.439	0.439	0.000"
" 40	HYDROGRAPH Combine 1"				

```

"      6   Combine "
"      1   Node #"
"      EX FLOW FROM SITE"
"      Maximum flow          0.439   c.m/sec"
"      Hydrograph volume    1020.783   c.m"
"      0.003   0.439   0.439   0.439"
" 40      HYDROGRAPH Start - New Tributary"
"      2   Start - New Tributary"
"      0.003   0.000   0.439   0.439"
" 33      CATCHMENT 400"
"      1   Triangular SCS"
"      1   Equal length"
"      2   Horton equation"
"      400  SITE REMAIN"
"      60.000 % Impervious"
"      0.050  Total Area"
"      10.000 Flow length"
"      2.000  Overland Slope"
"      0.020  Pervious Area"
"      10.000 Pervious length"
"      2.000  Pervious slope"
"      0.030  Impervious Area"
"      10.000 Impervious length"
"      2.000  Impervious slope"
"      0.250  Pervious Manning 'n'"
"      200.000 Pervious Max.infiltration"
"      13.000 Pervious Min.infiltration"
"      0.250  Pervious Lag constant (hours)"
"      5.000  Pervious Depression storage"
"      0.013  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   0.000   0.439   0.439 c.m/sec"
"      Catchment 400      Pervious      Impervious      Total Area "
"      Surface Area      0.020      0.030      0.050      hectare"
"      Time of concentration 12.224      0.897      1.276      minutes"
"      Time to Centroid    92.344      83.119      83.428      minutes"
"      Rainfall depth      75.581      75.581      75.581      mm"
"      Rainfall volume      15.12      22.67      37.79      c.m"
"      Rainfall losses      71.884      4.393      31.389      mm"
"      Runoff depth        3.697      71.188      44.191      mm"
"      Runoff volume        0.74      21.36      22.10      c.m"
"      Runoff coefficient    0.049      0.942      0.585      "
"      Maximum flow        0.001      0.011      0.011      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"      4   Add Runoff "
"      0.011   0.011   0.439   0.439"
" 40      HYDROGRAPH Copy to Outflow"

```

"	8	Copy to Outflow"				
"		0.011	0.011	0.011	0.439"	
" 40		HYDROGRAPH	Combine	1"		
"	6	Combine "				
"	1	Node #"				
"		EX FLOW FROM SITE"				
"		Maximum flow		0.447	c.m/sec"	
"		Hydrograph volume		1042.879	c.m"	
"		0.011	0.011	0.011	0.447"	
" 38		START/RE-START TOTALS 400"				
"	3	Runoff Totals on EXIT"				
"		Total Catchment area		4.520	hectare"	
"		Total Impervious area		1.256	hectare"	
"		Total % impervious		27.788"		
" 19		EXIT"				

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                        B:\Working\WRIGHTHAVEN HOMES\"
"          2401073 - 122025 079 Sideroad 19 Fergus\5 Work in Progress\Design
Calcs\2026-01-22 SWM Calcs"
"          Output filename:                    122025 Pre 50yr.out"
"          Licensee name:                      "
"          Company                            "
"          Date & Time last used:              1/23/2026 at 11:10:15 AM"
" 31          TIME PARAMETERS"
"          5.000  Time Step"
"          240.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 32          STORM Chicago storm"
"          1  Chicago storm"
"          5089.418 Coefficient A"
"          30.000  Constant B"
"          0.967  Exponent C"
"          0.375  Fraction R"
"          180.000 Duration"
"          1.000  Time step multiplier"
"          Maximum intensity                    162.242  mm/hr"
"          Total depth                        86.737  mm"
"          6  050hyd  Hydrograph extension used in this file"
" 33          CATCHMENT 100"
"          1  Triangular SCS"
"          1  Equal length"
"          2  Horton equation"
"          100  EXTERNAL"
"          30.000  % Impervious"
"          3.400  Total Area"
"          150.000 Flow length"
"          2.000  Overland Slope"
"          2.380  Pervious Area"
"          150.000 Pervious length"
"          2.000  Pervious slope"
"          1.020  Impervious Area"
"          150.000 Impervious length"
"          2.000  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          200.000 Pervious Max.infiltration"
"          13.000  Pervious Min.infiltration"
"          0.250  Pervious Lag constant (hours)"
"          5.000  Pervious Depression storage"
"          0.013  Impervious Manning 'n'"
"          0.000  Impervious Max.infiltration"
"          0.000  Impervious Min.infiltration"
"          0.050  Impervious Lag constant (hours)"

```

"	1.500	Impervious Depression storage"				
"		0.408	0.000	0.000	0.000 c.m/sec"	
"		Catchment 100	Pervious	Impervious	Total Area	"
"		Surface Area	2.380	1.020	3.400	hectare"
"		Time of concentration	40.814	4.406	13.919	minutes"
"		Time to Centroid	127.829	87.508	98.043	minutes"
"		Rainfall depth	86.737	86.737	86.737	mm"
"		Rainfall volume	2064.34	884.72	2949.05	c.m"
"		Rainfall losses	73.927	2.228	52.417	mm"
"		Runoff depth	12.810	84.509	34.320	mm"
"		Runoff volume	304.88	861.99	1166.88	c.m"
"		Runoff coefficient	0.148	0.974	0.396	"
"		Maximum flow	0.080	0.402	0.408	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.408	0.408	0.000	0.000"	
" 33		CATCHMENT 200"				
"	1	Triangular SCS"				
"	1	Equal length"				
"	2	Horton equation"				
"	200	SITE"				
"	20.000	% Impervious"				
"	0.990	Total Area"				
"	30.000	Flow length"				
"	2.000	Overland Slope"				
"	0.792	Pervious Area"				
"	30.000	Pervious length"				
"	2.000	Pervious slope"				
"	0.198	Impervious Area"				
"	30.000	Impervious length"				
"	2.000	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	200.000	Pervious Max.infiltration"				
"	13.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.013	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	0.408	0.000	0.000 c.m/sec"	
"		Catchment 200	Pervious	Impervious	Total Area	"
"		Surface Area	0.792	0.198	0.990	hectare"
"		Time of concentration	15.539	1.678	6.917	minutes"
"		Time to Centroid	100.269	83.836	90.048	minutes"
"		Rainfall depth	86.737	86.737	86.737	mm"
"		Rainfall volume	686.96	171.74	858.69	c.m"
"		Rainfall losses	73.958	2.620	59.691	mm"
"		Runoff depth	12.779	84.117	27.046	mm"

"	Runoff volume	101.21	166.55	267.76	c.m"
"	Runoff coefficient	0.147	0.970	0.312	"
"	Maximum flow	0.051	0.079	0.088	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.088	0.489	0.000	0.000"	
" 33	CATCHMENT 300"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	2 Horton equation"				
"	300 SITE WETLAND"				
"	10.000 % Impervious"				
"	0.080 Total Area"				
"	25.000 Flow length"				
"	2.000 Overland Slope"				
"	0.072 Pervious Area"				
"	25.000 Pervious length"				
"	2.000 Pervious slope"				
"	0.008 Impervious Area"				
"	25.000 Impervious length"				
"	2.000 Impervious slope"				
"	0.250 Pervious Manning 'n'"				
"	200.000 Pervious Max.infiltration"				
"	13.000 Pervious Min.infiltration"				
"	0.250 Pervious Lag constant (hours)"				
"	5.000 Pervious Depression storage"				
"	0.013 Impervious Manning 'n'"				
"	0.000 Impervious Max.infiltration"				
"	0.000 Impervious Min.infiltration"				
"	0.050 Impervious Lag constant (hours)"				
"	1.500 Impervious Depression storage"				
"	0.006	0.489	0.000	0.000 c.m/sec"	
"	Catchment 300	Pervious	Impervious	Total Area	"
"	Surface Area	0.072	0.008	0.080	hectare"
"	Time of concentration	13.929	1.504	8.689	minutes"
"	Time to Centroid	98.536	83.651	92.258	minutes"
"	Rainfall depth	86.737	86.737	86.737	mm"
"	Rainfall volume	62.45	6.94	69.39	c.m"
"	Rainfall losses	73.930	2.676	66.805	mm"
"	Runoff depth	12.806	84.061	19.932	mm"
"	Runoff volume	9.22	6.72	15.95	c.m"
"	Runoff coefficient	0.148	0.969	0.230	"
"	Maximum flow	0.005	0.003	0.006	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.006	0.493	0.000	0.000"	
" 40	HYDROGRAPH Copy to Outflow"				
"	8 Copy to Outflow"				
"	0.006	0.493	0.493	0.000"	
" 40	HYDROGRAPH Combine 1"				

```

"          6   Combine "
"          1   Node #"
"          EX FLOW FROM SITE"
"          Maximum flow          0.493   c.m/sec"
"          Hydrograph volume      1450.578   c.m"
"          0.006   0.493   0.493   0.493"
" 40      HYDROGRAPH Start - New Tributary"
"          2   Start - New Tributary"
"          0.006   0.000   0.493   0.493"
" 33      CATCHMENT 400"
"          1   Triangular SCS"
"          1   Equal length"
"          2   Horton equation"
"          400  SITE REMAIN"
"          60.000 % Impervious"
"          0.050  Total Area"
"          10.000 Flow length"
"          2.000  Overland Slope"
"          0.020  Pervious Area"
"          10.000 Pervious length"
"          2.000  Pervious slope"
"          0.030  Impervious Area"
"          10.000 Impervious length"
"          2.000  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          200.000 Pervious Max.infiltration"
"          13.000 Pervious Min.infiltration"
"          0.250  Pervious Lag constant (hours)"
"          5.000  Pervious Depression storage"
"          0.013  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   0.493   0.493 c.m/sec"
"          Catchment 400      Pervious      Impervious Total Area "
"          Surface Area      0.020      0.030      0.050      hectare"
"          Time of concentration 8.038      0.868      1.544      minutes"
"          Time to Centroid      92.171      83.030      83.892      minutes"
"          Rainfall depth      86.737      86.737      86.737      mm"
"          Rainfall volume      17.35      26.02      43.37      c.m"
"          Rainfall losses      73.979      5.087      32.644      mm"
"          Runoff depth      12.758      81.650      54.093      mm"
"          Runoff volume      2.55      24.49      27.05      c.m"
"          Runoff coefficient      0.147      0.941      0.624      "
"          Maximum flow      0.002      0.012      0.012      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"          4   Add Runoff "
"          0.012   0.012   0.493   0.493"
" 40      HYDROGRAPH Copy to Outflow"

```

"	8	Copy to Outflow"				
"		0.012	0.012	0.012	0.493"	
" 40		HYDROGRAPH	Combine	1"		
"	6	Combine "				
"	1	Node #"				
"		EX FLOW FROM SITE"				
"		Maximum flow		0.503	c.m/sec"	
"		Hydrograph volume		1477.625	c.m"	
"		0.012	0.012	0.012	0.503"	
" 38		START/RE-START TOTALS 400"				
"	3	Runoff Totals on EXIT"				
"		Total Catchment area		4.520	hectare"	
"		Total Impervious area		1.256	hectare"	
"		Total % impervious		27.788"		
" 19		EXIT"				


```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                        B:\Working\WRIGHTHAVEN HOMES\"
"          2401073 - 122025 079 Sideroad 19 Fergus\5 Work in Progress\Design
Calcs\2026-01-22 SWM Calcs"
"          Output filename:                    122025 Pre 100yr.out"
"          Licensee name:                      "
"          Company                            "
"          Date & Time last used:              1/23/2026 at 9:09:52 AM"
" 31          TIME PARAMETERS"
"          5.000  Time Step"
"          240.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 32          STORM Chicago storm"
"          1  Chicago storm"
"          6933.019 Coefficient A"
"          34.699 Constant B"
"          0.998 Exponent C"
"          0.375 Fraction R"
"          180.000 Duration"
"          1.000 Time step multiplier"
"          Maximum intensity                    174.661  mm/hr"
"          Total depth                        97.921  mm"
"          6  100hyd Hydrograph extension used in this file"
" 33          CATCHMENT 100"
"          1  Triangular SCS"
"          1  Equal length"
"          2  Horton equation"
"          100  EXTERNAL"
"          30.000 % Impervious"
"          3.400 Total Area"
"          150.000 Flow length"
"          2.000 Overland Slope"
"          2.380 Pervious Area"
"          150.000 Pervious length"
"          2.000 Pervious slope"
"          1.020 Impervious Area"
"          150.000 Impervious length"
"          2.000 Impervious slope"
"          0.250 Pervious Manning 'n'"
"          200.000 Pervious Max.infiltration"
"          13.000 Pervious Min.infiltration"
"          0.250 Pervious Lag constant (hours)"
"          5.000 Pervious Depression storage"
"          0.013 Impervious Manning 'n'"
"          0.000 Impervious Max.infiltration"
"          0.000 Impervious Min.infiltration"
"          0.050 Impervious Lag constant (hours)"

```

"	1.500	Impervious Depression storage"				
"	0.452	0.000	0.000	0.000	c.m/sec"	
"	Catchment 100	Pervious	Impervious	Total Area	"	
"	Surface Area	2.380	1.020	3.400	hectare"	
"	Time of concentration	35.783	4.278	15.451	minutes"	
"	Time to Centroid	122.544	87.206	99.738	minutes"	
"	Rainfall depth	97.921	97.921	97.921	mm"	
"	Rainfall volume	2330.53	998.80	3329.33	c.m"	
"	Rainfall losses	75.419	2.378	53.507	mm"	
"	Runoff depth	22.502	95.544	44.415	mm"	
"	Runoff volume	535.55	974.55	1510.10	c.m"	
"	Runoff coefficient	0.230	0.976	0.454	"	
"	Maximum flow	0.154	0.438	0.452	c.m/sec"	
" 40	HYDROGRAPH Add Runoff "					
"	4	Add Runoff "				
"	0.452	0.452	0.000	0.000"		
" 33	CATCHMENT 200"					
"	1	Triangular SCS"				
"	1	Equal length"				
"	2	Horton equation"				
"	200	SITE"				
"	20.000	% Impervious"				
"	0.990	Total Area"				
"	30.000	Flow length"				
"	2.000	Overland Slope"				
"	0.792	Pervious Area"				
"	30.000	Pervious length"				
"	2.000	Pervious slope"				
"	0.198	Impervious Area"				
"	30.000	Impervious length"				
"	2.000	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	200.000	Pervious Max.infiltration"				
"	13.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.013	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.050	Impervious Lag constant (hours)"				
"	1.500	Impervious Depression storage"				
"	0.132	0.452	0.000	0.000	c.m/sec"	
"	Catchment 200	Pervious	Impervious	Total Area	"	
"	Surface Area	0.792	0.198	0.990	hectare"	
"	Time of concentration	13.624	1.629	7.449	minutes"	
"	Time to Centroid	99.037	83.701	91.143	minutes"	
"	Rainfall depth	97.921	97.921	97.921	mm"	
"	Rainfall volume	775.54	193.88	969.42	c.m"	
"	Rainfall losses	75.493	2.755	60.945	mm"	
"	Runoff depth	22.429	95.167	36.976	mm"	

"	Runoff volume	177.64	188.43	366.07	c.m"
"	Runoff coefficient	0.229	0.972	0.378	"
"	Maximum flow	0.092	0.086	0.132	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.132	0.555	0.000	0.000"	
" 33	CATCHMENT 300"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	2 Horton equation"				
"	300 SITE WETLAND"				
"	10.000 % Impervious"				
"	0.080 Total Area"				
"	25.000 Flow length"				
"	2.000 Overland Slope"				
"	0.072 Pervious Area"				
"	25.000 Pervious length"				
"	2.000 Pervious slope"				
"	0.008 Impervious Area"				
"	25.000 Impervious length"				
"	2.000 Impervious slope"				
"	0.250 Pervious Manning 'n'"				
"	200.000 Pervious Max.infiltration"				
"	13.000 Pervious Min.infiltration"				
"	0.250 Pervious Lag constant (hours)"				
"	5.000 Pervious Depression storage"				
"	0.013 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	0.555	0.000	0.000 c.m/sec"	
"	Catchment 300	Pervious	Impervious	Total Area	"
"	Surface Area	0.072	0.008	0.080	hectare"
"	Time of concentration	12.212	1.460	8.772	minutes"
"	Time to Centroid	97.540	83.516	93.053	minutes"
"	Rainfall depth	97.921	97.921	97.921	mm"
"	Rainfall volume	70.50	7.83	78.34	c.m"
"	Rainfall losses	75.470	2.861	68.210	mm"
"	Runoff depth	22.451	95.061	29.712	mm"
"	Runoff volume	16.16	7.60	23.77	c.m"
"	Runoff coefficient	0.229	0.971	0.303	"
"	Maximum flow	0.009	0.004	0.010	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.010	0.561	0.000	0.000"	
" 40	HYDROGRAPH Copy to Outflow"				
"	8 Copy to Outflow"				
"	0.010	0.561	0.561	0.000"	
" 40	HYDROGRAPH Combine 1"				

```

"          6   Combine "
"          1   Node #"
"            EX FLOW FROM SITE"
"            Maximum flow          0.561    c.m/sec"
"            Hydrograph volume    1899.931    c.m"
"              0.010    0.561    0.561    0.561"
" 40      HYDROGRAPH Start - New Tributary"
"          2   Start - New Tributary"
"            0.010    0.000    0.561    0.561"
" 33      CATCHMENT 400"
"          1   Triangular SCS"
"          1   Equal length"
"          2   Horton equation"
"        400   SITE REMAIN"
"      60.000   % Impervious"
"        0.050   Total Area"
"     10.000   Flow length"
"        2.000   Overland Slope"
"        0.020   Pervious Area"
"     10.000   Pervious length"
"        2.000   Pervious slope"
"        0.030   Impervious Area"
"     10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"    200.000   Pervious Max.infiltration"
"     13.000   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.013   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"              0.013    0.000    0.561    0.561 c.m/sec"
"      Catchment 400      Pervious      Impervious Total Area "
"      Surface Area      0.020      0.030      0.050      hectare"
"      Time of concentration 7.047      0.843      1.705      minutes"
"      Time to Centroid    92.094      82.965      84.233      minutes"
"      Rainfall depth      97.921      97.921      97.921      mm"
"      Rainfall volume     19.58      29.38      48.96      c.m"
"      Rainfall losses     75.635      5.873      33.778      mm"
"      Runoff depth        22.286      92.048      64.143      mm"
"      Runoff volume       4.46      27.61      32.07      c.m"
"      Runoff coefficient   0.228      0.940      0.655      "
"      Maximum flow        0.003      0.013      0.013      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"          4   Add Runoff "
"            0.013    0.013    0.561    0.561"
" 40      HYDROGRAPH Copy to Outflow"

```

"	8	Copy to Outflow"				
"		0.013	0.013	0.013	0.561"	
" 40		HYDROGRAPH	Combine	1"		
"	6	Combine "				
"	1	Node #"				
"		EX FLOW FROM SITE"				
"		Maximum flow		0.573	c.m/sec"	
"		Hydrograph volume		1932.003	c.m"	
"		0.013	0.013	0.013	0.573"	
" 38		START/RE-START TOTALS 400"				
"	3	Runoff Totals on EXIT"				
"		Total Catchment area		4.520	hectare"	
"		Total Impervious area		1.256	hectare"	
"		Total % impervious		27.788"		
" 19		EXIT"				

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                          B:\Working\WRIGHTHAVEN HOMES\"
"          2401073 - 122025 079 Sideroad 19 Fergus\5 Work in Progress\Design
Calcs\2026-01-22 SWM Calcs"
"          Output filename:                      122025 Pre REG.out"
"          Licensee name:                      "
"          Company                              "
"          Date & Time last used:                1/23/2026 at 10:39:58 AM"
" 31          TIME PARAMETERS"
"          60.000  Time Step"
"          2880.000  Max. Storm length"
"          5760.000  Max. Hydrograph"
" 32          STORM Historic"
"          5  Historic"
"          2880.000  Duration"
"          48.000  Rainfall intensity values"
"                  2.028      2.028      2.028      2.028      2.028"
"                  2.028      2.028      2.028      2.028      2.028"
"                  2.028      2.028      2.028      2.028      2.028"
"                  2.028      2.028      2.028      2.028      2.028"
"                  2.028      2.028      2.028      2.028      2.028"
"                  2.028      2.026      2.026      2.026      2.028"
"                  2.026      6.000      4.000      6.000      13.000"
"                  17.000      13.000      23.000      13.000      13.000"
"                  53.000      38.000      13.000"
"          Maximum intensity                      53.000      mm/hr"
"          Total depth                          285.000      mm"
"          6  200hyd  Hydrograph extension used in this file"
" 33          CATCHMENT 100"
"          1  Triangular SCS"
"          1  Equal length"
"          2  Horton equation"
"          100  EXTERNAL"
"          30.000  % Impervious"
"          3.400  Total Area"
"          150.000  Flow length"
"          2.000  Overland Slope"
"          2.380  Pervious Area"
"          150.000  Pervious length"
"          2.000  Pervious slope"
"          1.020  Impervious Area"
"          150.000  Impervious length"
"          2.000  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          200.000  Pervious Max.infiltration"
"          13.000  Pervious Min.infiltration"

```

"	0.250	Pervious Lag constant (hours)"			
"	5.000	Pervious Depression storage"			
"	0.013	Impervious Manning 'n'"			
"	0.000	Impervious Max.infiltration"			
"	0.000	Impervious Min.infiltration"			
"	0.050	Impervious Lag constant (hours)"			
"	1.500	Impervious Depression storage"			
"		0.283	0.000	0.000	0.000 c.m/sec"
"		Catchment 100	Pervious	Impervious	Total Area "
"		Surface Area	2.380	1.020	3.400 hectare"
"		Time of concentration	45.467	6.893	21.943 minutes"
"		Time to Centroid	2801.985	2242.481	2460.773 minutes"
"		Rainfall depth	285.000	285.000	285.000 mm"
"		Rainfall volume	6783.00	2907.00	9690.00 c.m"
"		Rainfall losses	213.498	24.215	156.713 mm"
"		Runoff depth	71.502	260.785	128.287 mm"
"		Runoff volume	1701.75	2660.01	4361.76 c.m"
"		Runoff coefficient	0.251	0.915	0.450 "
"		Maximum flow	0.193	0.129	0.283 c.m/sec"
" 40		HYDROGRAPH Add Runoff "			
"	4	Add Runoff "			
"		0.283	0.283	0.000	0.000"
" 33		CATCHMENT 200"			
"	1	Triangular SCS"			
"	1	Equal length"			
"	2	Horton equation"			
"	200	SITE"			
"	20.000	% Impervious"			
"	0.990	Total Area"			
"	30.000	Flow length"			
"	2.000	Overland Slope"			
"	0.792	Pervious Area"			
"	30.000	Pervious length"			
"	2.000	Pervious slope"			
"	0.198	Impervious Area"			
"	30.000	Impervious length"			
"	2.000	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	200.000	Pervious Max.infiltration"			
"	13.000	Pervious Min.infiltration"			
"	0.250	Pervious Lag constant (hours)"			
"	5.000	Pervious Depression storage"			
"	0.013	Impervious Manning 'n'"			
"	0.000	Impervious Max.infiltration"			
"	0.000	Impervious Min.infiltration"			
"	0.050	Impervious Lag constant (hours)"			
"	1.500	Impervious Depression storage"			
"		0.086	0.283	0.000	0.000 c.m/sec"
"		Catchment 200	Pervious	Impervious	Total Area "
"		Surface Area	0.792	0.198	0.990 hectare"

"	Time of concentration	17.311	2.624	10.608	minutes"
"	Time to Centroid	2778.669	2256.890	2540.530	minutes"
"	Rainfall depth	285.000	285.000	285.000	mm"
"	Rainfall volume	2257.20	564.30	2821.50	c.m"
"	Rainfall losses	212.059	40.040	177.656	mm"
"	Runoff depth	72.941	244.960	107.344	mm"
"	Runoff volume	577.69	485.02	1062.71	c.m"
"	Runoff coefficient	0.256	0.860	0.377	"
"	Maximum flow	0.061	0.025	0.086	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"		0.086	0.362	0.000	0.000"
" 33	CATCHMENT 300"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	2 Horton equation"				
"	300 SITE WETLAND"				
"	10.000 % Impervious"				
"	0.080 Total Area"				
"	25.000 Flow length"				
"	2.000 Overland Slope"				
"	0.072 Pervious Area"				
"	25.000 Pervious length"				
"	2.000 Pervious slope"				
"	0.008 Impervious Area"				
"	25.000 Impervious length"				
"	2.000 Impervious slope"				
"	0.250 Pervious Manning 'n'"				
"	200.000 Pervious Max.infiltration"				
"	13.000 Pervious Min.infiltration"				
"	0.250 Pervious Lag constant (hours)"				
"	5.000 Pervious Depression storage"				
"	0.013 Impervious Manning 'n'"				
"	0.000 Impervious Max.infiltration"				
"	0.000 Impervious Min.infiltration"				
"	0.050 Impervious Lag constant (hours)"				
"	1.500 Impervious Depression storage"				
"		0.007	0.362	0.000	0.000 c.m/sec"
"	Catchment 300	Pervious	Impervious	Total Area	"
"	Surface Area	0.072	0.008	0.080	hectare"
"	Time of concentration	15.517	2.352	11.921	minutes"
"	Time to Centroid	2776.514	2263.863	2636.466	minutes"
"	Rainfall depth	285.000	285.000	285.000	mm"
"	Rainfall volume	205.20	22.80	228.00	c.m"
"	Rainfall losses	212.698	40.417	195.470	mm"
"	Runoff depth	72.302	244.583	89.530	mm"
"	Runoff volume	52.06	19.57	71.62	c.m"
"	Runoff coefficient	0.254	0.858	0.314	"
"	Maximum flow	0.006	0.001	0.007	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				

"	4	Add Runoff "				
"		0.007	0.368	0.000	0.000"	
" 40		HYDROGRAPH Copy to Outflow"				
"	8	Copy to Outflow"				
"		0.007	0.368	0.368	0.000"	
" 40		HYDROGRAPH Combine 1"				
"	6	Combine "				
"	1	Node #"				
"		EX FLOW FROM SITE"				
"		Maximum flow	0.368	c.m/sec"		
"		Hydrograph volume	5496.092	c.m"		
"		0.007	0.368	0.368	0.368"	
" 40		HYDROGRAPH Start - New Tributary"				
"	2	Start - New Tributary"				
"		0.007	0.000	0.368	0.368"	
" 33		CATCHMENT 400"				
"	1	Triangular SCS"				
"	1	Equal length"				
"	2	Horton equation"				
"	400	SITE REMAIN"				
"	60.000	% Impervious"				
"	0.050	Total Area"				
"	10.000	Flow length"				
"	2.000	Overland Slope"				
"	0.020	Pervious Area"				
"	10.000	Pervious length"				
"	2.000	Pervious slope"				
"	0.030	Impervious Area"				
"	10.000	Impervious length"				
"	2.000	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	200.000	Pervious Max.infiltration"				
"	13.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.013	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.050	Impervious Lag constant (hours)"				
"	1.500	Impervious Depression storage"				
"		0.006	0.000	0.368	0.368 c.m/sec"	
"		Catchment 400	Pervious	Impervious	Total Area "	
"		Surface Area	0.020	0.030	0.050	hectare"
"		Time of concentration	8.955	1.358	2.524	minutes"
"		Time to Centroid	2765.806	2280.645	2355.141	minutes"
"		Rainfall depth	285.000	285.000	285.000	mm"
"		Rainfall volume	57.00	85.50	142.50	c.m"
"		Rainfall losses	218.170	39.398	110.907	mm"
"		Runoff depth	66.830	245.602	174.093	mm"
"		Runoff volume	13.37	73.68	87.05	c.m"

"	Runoff coefficient	0.234	0.862	0.611	"
"	Maximum flow	0.002	0.004	0.006	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.006 0.006 0.368 0.368"				
" 40	HYDROGRAPH Copy to Outflow"				
"	8 Copy to Outflow"				
"	0.006 0.006 0.006 0.368"				
" 40	HYDROGRAPH Combine 1"				
"	6 Combine "				
"	1 Node #"				
"	EX FLOW FROM SITE"				
"	Maximum flow	0.372	c.m/sec"		
"	Hydrograph volume	5583.138	c.m"		
"	0.006 0.006 0.006 0.372"				
" 38	START/RE-START TOTALS 400"				
"	3 Runoff Totals on EXIT"				
"	Total Catchment area		4.520	hectare"	
"	Total Impervious area		1.256	hectare"	
"	Total % impervious		27.788"		
" 19	EXIT"				

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                        B:\Working\WRIGHTHAVEN HOMES\"
"          2401073 - 122025 079 Sideroad 19 Fergus\5 Work in Progress\Design
Calcs\2026-01-22 SWM Calcs"
"          Output filename:                    122025 Pre 2yr-wetland.out"
"          Licensee name:                      "
"          Company                            "
"          Date & Time last used:              1/23/2026 at 10:57:35 AM"
" 31          TIME PARAMETERS"
"          5.000  Time Step"
"          240.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 32          STORM Chicago storm"
"          1  Chicago storm"
"          695.047 Coefficient A"
"          6.387  Constant B"
"          0.793  Exponent C"
"          0.375  Fraction R"
"          180.000 Duration"
"          1.000  Time step multiplier"
"          Maximum intensity                    99.625  mm/hr"
"          Total depth                        33.014  mm"
"          6 002hyd Hydrograph extension used in this file"
" 33          CATCHMENT 100"
"          1  Triangular SCS"
"          1  Equal length"
"          2  Horton equation"
"          100  EXTERNAL"
"          30.000 % Impervious"
"          3.400  Total Area"
"          150.000 Flow length"
"          2.000  Overland Slope"
"          2.380  Pervious Area"
"          150.000 Pervious length"
"          2.000  Pervious slope"
"          1.020  Impervious Area"
"          150.000 Impervious length"
"          2.000  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          200.000 Pervious Max.infiltration"
"          13.000  Pervious Min.infiltration"
"          0.250  Pervious Lag constant (hours)"
"          5.000  Pervious Depression storage"
"          0.013  Impervious Manning 'n'"
"          0.000  Impervious Max.infiltration"
"          0.000  Impervious Min.infiltration"
"          0.050  Impervious Lag constant (hours)"

```

"	1.500	Impervious Depression storage"				
"		0.214	0.000	0.000	0.000 c.m/sec"	
"		Catchment 100	Pervious	Impervious	Total Area	"
"		Surface Area	2.380	1.020	3.400	hectare"
"		Time of concentration	---	5.355	5.355	minutes"
"		Time to Centroid	0.000	91.059	91.059	minutes"
"		Rainfall depth	33.014	33.014	33.014	mm"
"		Rainfall volume	785.73	336.74	1122.47	c.m"
"		Rainfall losses	33.014	1.644	23.603	mm"
"		Runoff depth	0.000	31.369	9.411	mm"
"		Runoff volume	0.00	319.97	319.97	c.m"
"		Runoff coefficient	0.000	0.950	0.285	"
"		Maximum flow	0.000	0.214	0.214	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.214	0.214	0.000	0.000"	
" 33		CATCHMENT 200"				
"	1	Triangular SCS"				
"	1	Equal length"				
"	2	Horton equation"				
"	200	SITE"				
"	20.000	% Impervious"				
"	0.990	Total Area"				
"	30.000	Flow length"				
"	2.000	Overland Slope"				
"	0.792	Pervious Area"				
"	30.000	Pervious length"				
"	2.000	Pervious slope"				
"	0.198	Impervious Area"				
"	30.000	Impervious length"				
"	2.000	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	200.000	Pervious Max.infiltration"				
"	13.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.013	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.050	Impervious Lag constant (hours)"				
"	1.500	Impervious Depression storage"				
"		0.043	0.214	0.000	0.000 c.m/sec"	
"		Catchment 200	Pervious	Impervious	Total Area	"
"		Surface Area	0.792	0.198	0.990	hectare"
"		Time of concentration	---	2.039	2.039	minutes"
"		Time to Centroid	0.000	86.155	86.155	minutes"
"		Rainfall depth	33.014	33.014	33.014	mm"
"		Rainfall volume	261.47	65.37	326.84	c.m"
"		Rainfall losses	33.014	1.944	26.800	mm"
"		Runoff depth	0.000	31.070	6.214	mm"

"	Runoff volume	0.00	61.52	61.52	c.m"
"	Runoff coefficient	0.000	0.941	0.188	"
"	Maximum flow	0.000	0.043	0.043	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"		0.043	0.250	0.000	0.000"
" 33	CATCHMENT 300"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	2 Horton equation"				
"	300 SITE WETLAND"				
"	10.000 % Impervious"				
"	0.080 Total Area"				
"	25.000 Flow length"				
"	2.000 Overland Slope"				
"	0.072 Pervious Area"				
"	25.000 Pervious length"				
"	2.000 Pervious slope"				
"	0.008 Impervious Area"				
"	25.000 Impervious length"				
"	2.000 Impervious slope"				
"	0.250 Pervious Manning 'n'"				
"	200.000 Pervious Max.infiltration"				
"	13.000 Pervious Min.infiltration"				
"	0.250 Pervious Lag constant (hours)"				
"	5.000 Pervious Depression storage"				
"	0.013 Impervious Manning 'n'"				
"	0.000 Impervious Max.infiltration"				
"	0.000 Impervious Min.infiltration"				
"	0.050 Impervious Lag constant (hours)"				
"	1.500 Impervious Depression storage"				
"		0.002	0.250	0.000	0.000 c.m/sec"
"	Catchment 300	Pervious	Impervious	Total Area	"
"	Surface Area	0.072	0.008	0.080	hectare"
"	Time of concentration	---	1.828	1.828	minutes"
"	Time to Centroid	0.000	85.761	85.761	minutes"
"	Rainfall depth	33.014	33.014	33.014	mm"
"	Rainfall volume	23.77	2.64	26.41	c.m"
"	Rainfall losses	33.014	1.949	29.907	mm"
"	Runoff depth	0.000	31.065	3.106	mm"
"	Runoff volume	0.00	2.49	2.49	c.m"
"	Runoff coefficient	0.000	0.941	0.094	"
"	Maximum flow	0.000	0.002	0.002	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"		0.002	0.251	0.000	0.000"
" 33	CATCHMENT 500"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	2 Horton equation"				

```

"      500  EXTERNAL WETLAND"
"    35.000  % Impervious"
"      4.300  Total Area"
"   150.000  Flow length"
"      1.000  Overland Slope"
"      2.795  Pervious Area"
"   150.000  Pervious length"
"      1.000  Pervious slope"
"      1.505  Impervious Area"
"   150.000  Impervious length"
"      1.000  Impervious slope"
"      0.250  Pervious Manning 'n'"
"   200.000  Pervious Max.infiltration"
"     13.000  Pervious Min.infiltration"
"      0.250  Pervious Lag constant (hours)"
"      5.000  Pervious Depression storage"
"      0.013  Impervious Manning 'n'"
"      0.000  Impervious Max.infiltration"
"      0.000  Impervious Min.infiltration"
"      0.050  Impervious Lag constant (hours)"
"      1.500  Impervious Depression storage"
"          0.321      0.251      0.000      0.000 c.m/sec"
"      Catchment 500      Pervious      Impervious      Total Area  "
"      Surface Area      2.795      1.505      4.300      hectare"
"      Time of concentration      ---      6.593      6.593      minutes"
"      Time to Centroid      0.000      92.935      92.935      minutes"
"      Rainfall depth      33.014      33.014      33.014      mm"
"      Rainfall volume      922.74      496.86      1419.59      c.m"
"      Rainfall losses      33.014      1.804      22.090      mm"
"      Runoff depth      0.000      31.210      10.924      mm"
"      Runoff volume      0.00      469.71      469.71      c.m"
"      Runoff coefficient      0.000      0.945      0.331      "
"      Maximum flow      0.000      0.321      0.321      c.m/sec"
" 40      HYDROGRAPH Add Runoff  "
"      4      Add Runoff  "
"          0.321      0.572      0.000      0.000"
" 54      POND DESIGN"
"      0.572      Current peak flow      c.m/sec"
"      0.001      Target outflow      c.m/sec"
"      853.7      Hydrograph volume      c.m"
"      13.      Number of stages"
"      0.000      Minimum water level      metre"
"      3.000      Maximum water level      metre"
"      0.000      Starting water level      metre"
"      0      Keep Design Data: 1 = True; 0 = False"
"          Level Discharge      Volume"
"      414.550      0.000      0.000"
"      414.650      1.01E-05      1.280"
"      414.750      2.01E-05      25.890"
"      414.850      0.02300      87.570"

```

"	414.950	0.1080	189.890"		
"	415.050	0.2480	326.630"		
"	415.150	0.2290	503.070"		
"	415.250	0.5620	728.330"		
"	415.350	0.7600	1010.010"		
"	415.450	0.9170	1347.990"		
"	415.550	1.051	1734.110"		
"	415.650	1.476	2120.230"		
"	415.750	3.050	2506.350"		
"	Peak outflow	0.247	c.m/sec"		
"	Maximum level	415.053	metre"		
"	Maximum storage	332.041	c.m"		
"	Centroidal lag	2.018	hours"		
"	0.321	0.572	0.247	0.000	c.m/sec"
" 38	START/RE-START TOTALS 500"				
"	3 Runoff Totals on EXIT"				
"	Total Catchment area	8.770	hectare"		
"	Total Impervious area	2.731	hectare"		
"	Total % impervious	31.140"			
" 19	EXIT"				

```

"                MIDUSS Output ----->"
"                MIDUSS version                      Version 2.25  rev. 473"
"                MIDUSS created                      Sunday, February 7, 2010"
"            10  Units used:                          ie METRIC"
"                Job folder:                          B:\Working\WRIGHTHAVEN HOMES\"
"                2401073 - 122025 079 Sideroad 19 Fergus\5 Work in Progress\Design
Calcs\2026-01-22 SWM Calcs"
"                Output filename:                     122025 Pre 5yr-wetland.out"
"                Licensee name:                       "
"                Company                               "
"                Date & Time last used:                1/23/2026 at 11:13:35 AM"
" 31            TIME PARAMETERS"
"            5.000  Time Step"
"            240.000 Max. Storm length"
"            5000.000 Max. Hydrograph"
" 32            STORM Chicago storm"
"            1  Chicago storm"
"            1459.072 Coefficient A"
"            13.690 Constant B"
"            0.850 Exponent C"
"            0.375 Fraction R"
"            180.000 Duration"
"            1.000 Time step multiplier"
"                Maximum intensity                    119.775  mm/hr"
"                Total depth                          49.792  mm"
"            6  005hyd Hydrograph extension used in this file"
" 33            CATCHMENT 100"
"            1  Triangular SCS"
"            1  Equal length"
"            2  Horton equation"
"            100 EXTERNAL"
"            30.000 % Impervious"
"            3.400 Total Area"
"            150.000 Flow length"
"            2.000 Overland Slope"
"            2.380 Pervious Area"
"            150.000 Pervious length"
"            2.000 Pervious slope"
"            1.020 Impervious Area"
"            150.000 Impervious length"
"            2.000 Impervious slope"
"            0.250 Pervious Manning 'n'"
"            200.000 Pervious Max.infiltration"
"            13.000 Pervious Min.infiltration"
"            0.250 Pervious Lag constant (hours)"
"            5.000 Pervious Depression storage"
"            0.013 Impervious Manning 'n'"
"            0.000 Impervious Max.infiltration"
"            0.000 Impervious Min.infiltration"
"            0.050 Impervious Lag constant (hours)"

```


"	1.500	Impervious Depression storage"				
"		0.282	0.000	0.000	0.000 c.m/sec"	
"		Catchment 100	Pervious	Impervious	Total Area	"
"		Surface Area	2.380	1.020	3.400	hectare"
"		Time of concentration	---	4.975	4.975	minutes"
"		Time to Centroid	0.000	89.324	89.324	minutes"
"		Rainfall depth	49.792	49.792	49.792	mm"
"		Rainfall volume	1185.04	507.88	1692.92	c.m"
"		Rainfall losses	49.792	1.847	35.408	mm"
"		Runoff depth	0.000	47.945	14.383	mm"
"		Runoff volume	0.00	489.04	489.04	c.m"
"		Runoff coefficient	0.000	0.963	0.289	"
"		Maximum flow	0.000	0.282	0.282	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.282	0.282	0.000	0.000"	
" 33		CATCHMENT 200"				
"	1	Triangular SCS"				
"	1	Equal length"				
"	2	Horton equation"				
"	200	SITE"				
"	20.000	% Impervious"				
"	0.990	Total Area"				
"	30.000	Flow length"				
"	2.000	Overland Slope"				
"	0.792	Pervious Area"				
"	30.000	Pervious length"				
"	2.000	Pervious slope"				
"	0.198	Impervious Area"				
"	30.000	Impervious length"				
"	2.000	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	200.000	Pervious Max.infiltration"				
"	13.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.013	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.050	Impervious Lag constant (hours)"				
"	1.500	Impervious Depression storage"				
"		0.055	0.282	0.000	0.000 c.m/sec"	
"		Catchment 200	Pervious	Impervious	Total Area	"
"		Surface Area	0.792	0.198	0.990	hectare"
"		Time of concentration	---	1.894	1.894	minutes"
"		Time to Centroid	0.000	84.922	84.922	minutes"
"		Rainfall depth	49.792	49.792	49.792	mm"
"		Rainfall volume	394.35	98.59	492.94	c.m"
"		Rainfall losses	49.792	2.201	40.274	mm"
"		Runoff depth	0.000	47.591	9.518	mm"

"	Runoff volume	0.00	94.23	94.23	c.m"
"	Runoff coefficient	0.000	0.956	0.191	"
"	Maximum flow	0.000	0.055	0.055	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.055	0.331	0.000	0.000"	
" 33	CATCHMENT 300"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	2 Horton equation"				
"	300 SITE WETLAND"				
"	10.000 % Impervious"				
"	0.080 Total Area"				
"	25.000 Flow length"				
"	2.000 Overland Slope"				
"	0.072 Pervious Area"				
"	25.000 Pervious length"				
"	2.000 Pervious slope"				
"	0.008 Impervious Area"				
"	25.000 Impervious length"				
"	2.000 Impervious slope"				
"	0.250 Pervious Manning 'n'"				
"	200.000 Pervious Max.infiltration"				
"	13.000 Pervious Min.infiltration"				
"	0.250 Pervious Lag constant (hours)"				
"	5.000 Pervious Depression storage"				
"	0.013 Impervious Manning 'n'"				
"	0.000 Impervious Max.infiltration"				
"	0.000 Impervious Min.infiltration"				
"	0.050 Impervious Lag constant (hours)"				
"	1.500 Impervious Depression storage"				
"	0.002	0.331	0.000	0.000 c.m/sec"	
"	Catchment 300	Pervious	Impervious	Total Area	"
"	Surface Area	0.072	0.008	0.080	hectare"
"	Time of concentration	---	1.698	1.698	minutes"
"	Time to Centroid	0.000	84.637	84.637	minutes"
"	Rainfall depth	49.792	49.792	49.792	mm"
"	Rainfall volume	35.85	3.98	39.83	c.m"
"	Rainfall losses	49.792	2.199	45.032	mm"
"	Runoff depth	0.000	47.593	4.759	mm"
"	Runoff volume	0.00	3.81	3.81	c.m"
"	Runoff coefficient	0.000	0.956	0.096	"
"	Maximum flow	0.000	0.002	0.002	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.002	0.332	0.000	0.000"	
" 33	CATCHMENT 500"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	2 Horton equation"				

```

"      500    EXTERNAL WETLAND"
"      35.000 % Impervious"
"      4.300  Total Area"
"     150.000 Flow length"
"      1.000  Overland Slope"
"      2.795  Pervious Area"
"     150.000 Pervious length"
"      1.000  Pervious slope"
"      1.505  Impervious Area"
"     150.000 Impervious length"
"      1.000  Impervious slope"
"      0.250  Pervious Manning 'n'"
"     200.000 Pervious Max.infiltration"
"     13.000  Pervious Min.infiltration"
"      0.250  Pervious Lag constant (hours)"
"      5.000  Pervious Depression storage"
"      0.013  Impervious Manning 'n'"
"      0.000  Impervious Max.infiltration"
"      0.000  Impervious Min.infiltration"
"      0.050  Impervious Lag constant (hours)"
"      1.500  Impervious Depression storage"
"          0.412      0.332      0.000      0.000 c.m/sec"
"      Catchment 500      Pervious      Impervious Total Area "
"      Surface Area      2.795      1.505      4.300      hectare"
"      Time of concentration      ---      6.125      6.125      minutes"
"      Time to Centroid      0.000      90.892      90.892      minutes"
"      Rainfall depth      49.792      49.792      49.792      mm"
"      Rainfall volume      1391.68      749.36      2141.04      c.m"
"      Rainfall losses      49.792      1.809      32.998      mm"
"      Runoff depth      0.000      47.983      16.794      mm"
"      Runoff volume      0.00      722.14      722.14      c.m"
"      Runoff coefficient      0.000      0.964      0.337      "
"      Maximum flow      0.000      0.412      0.412      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"      4      Add Runoff "
"          0.412      0.744      0.000      0.000"
" 54      POND DESIGN"
"      0.744      Current peak flow      c.m/sec"
"      0.001      Target outflow      c.m/sec"
"     1309.2      Hydrograph volume      c.m"
"      13.      Number of stages"
"      0.000      Minimum water level      metre"
"      3.000      Maximum water level      metre"
"      0.000      Starting water level      metre"
"      0      Keep Design Data: 1 = True; 0 = False"
"          Level Discharge      Volume"
"      414.550      0.000      0.000"
"      414.650      1.01E-05      1.280"
"      414.750      2.01E-05      25.890"
"      414.850      0.02300      87.570"

```

"	414.950	0.1080	189.890"		
"	415.050	0.2480	326.630"		
"	415.150	0.2290	503.070"		
"	415.250	0.5620	728.330"		
"	415.350	0.7600	1010.010"		
"	415.450	0.9170	1347.990"		
"	415.550	1.051	1734.110"		
"	415.650	1.476	2120.230"		
"	415.750	3.050	2506.350"		
"	Peak outflow		0.281	c.m/sec"	
"	Maximum level		415.167	metre"	
"	Maximum storage		541.168	c.m"	
"	Centroidal lag		2.168	hours"	
"	0.412	0.744	0.281	0.000 c.m/sec"	
" 38	START/RE-START TOTALS 500"				
"	3 Runoff Totals on EXIT"				
"	Total Catchment area		8.770	hectare"	
"	Total Impervious area		2.731	hectare"	
"	Total % impervious		31.140"		
" 19	EXIT"				

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                        B:\Working\WRIGHTHAVEN HOMES\"
"          2401073 - 122025 079 Sideroad 19 Fergus\5 Work in Progress\Design
Calcs\2026-01-22 SWM Calcs"
"          Output filename:                    122025 Pre 10yr-wetland.out"
"          Licensee name:                      "
"          Company                            "
"          Date & Time last used:              1/23/2026 at 11:37:44 AM"
" 31          TIME PARAMETERS"
"          5.000  Time Step"
"          240.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 32          STORM Chicago storm"
"          1  Chicago storm"
"          2327.596 Coefficient A"
"          19.500  Constant B"
"          0.894  Exponent C"
"          0.375  Fraction R"
"          180.000 Duration"
"          1.000  Time step multiplier"
"          Maximum intensity                    132.071  mm/hr"
"          Total depth                        61.359  mm"
"          6 010hyd Hydrograph extension used in this file"
" 33          CATCHMENT 100"
"          1  Triangular SCS"
"          1  Equal length"
"          2  Horton equation"
"          100  EXTERNAL"
"          30.000 % Impervious"
"          3.400  Total Area"
"          150.000 Flow length"
"          2.000  Overland Slope"
"          2.380  Pervious Area"
"          150.000 Pervious length"
"          2.000  Pervious slope"
"          1.020  Impervious Area"
"          150.000 Impervious length"
"          2.000  Impervious slope"
"          0.250 Pervious Manning 'n'"
"          200.000 Pervious Max.infiltration"
"          13.000 Pervious Min.infiltration"
"          0.250 Pervious Lag constant (hours)"
"          5.000  Pervious Depression storage"
"          0.013 Impervious Manning 'n'"
"          0.000 Impervious Max.infiltration"
"          0.000 Impervious Min.infiltration"
"          0.050 Impervious Lag constant (hours)"

```

"	1.500	Impervious Depression storage"				
"		0.321	0.000	0.000	0.000 c.m/sec"	
"		Catchment 100	Pervious	Impervious	Total Area	"
"		Surface Area	2.380	1.020	3.400	hectare"
"		Time of concentration	---	4.784	4.784	minutes"
"		Time to Centroid	0.000	88.560	88.560	minutes"
"		Rainfall depth	61.359	61.359	61.359	mm"
"		Rainfall volume	1460.35	625.86	2086.21	c.m"
"		Rainfall losses	61.359	1.930	43.531	mm"
"		Runoff depth	0.000	59.429	17.829	mm"
"		Runoff volume	0.00	606.17	606.17	c.m"
"		Runoff coefficient	0.000	0.969	0.291	"
"		Maximum flow	0.000	0.321	0.321	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.321	0.321	0.000	0.000"	
" 33		CATCHMENT 200"				
"	1	Triangular SCS"				
"	1	Equal length"				
"	2	Horton equation"				
"	200	SITE"				
"	20.000	% Impervious"				
"	0.990	Total Area"				
"	30.000	Flow length"				
"	2.000	Overland Slope"				
"	0.792	Pervious Area"				
"	30.000	Pervious length"				
"	2.000	Pervious slope"				
"	0.198	Impervious Area"				
"	30.000	Impervious length"				
"	2.000	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	200.000	Pervious Max.infiltration"				
"	13.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.013	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	0.321	0.000	0.000 c.m/sec"	
"		Catchment 200	Pervious	Impervious	Total Area	"
"		Surface Area	0.792	0.198	0.990	hectare"
"		Time of concentration	---	1.821	1.821	minutes"
"		Time to Centroid	0.000	84.428	84.428	minutes"
"		Rainfall depth	61.359	61.359	61.359	mm"
"		Rainfall volume	485.97	121.49	607.46	c.m"
"		Rainfall losses	61.359	2.355	49.558	mm"
"		Runoff depth	0.000	59.004	11.801	mm"

"	Runoff volume	0.00	116.83	116.83	c.m"
"	Runoff coefficient	0.000	0.962	0.192	"
"	Maximum flow	0.000	0.062	0.062	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"		0.062	0.377	0.000	0.000"
" 33	CATCHMENT 300"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	2 Horton equation"				
"	300 SITE WETLAND"				
"	10.000 % Impervious"				
"	0.080 Total Area"				
"	25.000 Flow length"				
"	2.000 Overland Slope"				
"	0.072 Pervious Area"				
"	25.000 Pervious length"				
"	2.000 Pervious slope"				
"	0.008 Impervious Area"				
"	25.000 Impervious length"				
"	2.000 Impervious slope"				
"	0.250 Pervious Manning 'n'"				
"	200.000 Pervious Max.infiltration"				
"	13.000 Pervious Min.infiltration"				
"	0.250 Pervious Lag constant (hours)"				
"	5.000 Pervious Depression storage"				
"	0.013 Impervious Manning 'n'"				
"	0.000 Impervious Max.infiltration"				
"	0.000 Impervious Min.infiltration"				
"	0.050 Impervious Lag constant (hours)"				
"	1.500 Impervious Depression storage"				
"		0.003	0.377	0.000	0.000 c.m/sec"
"	Catchment 300	Pervious	Impervious	Total Area	"
"	Surface Area	0.072	0.008	0.080	hectare"
"	Time of concentration	---	1.633	1.633	minutes"
"	Time to Centroid	0.000	84.203	84.203	minutes"
"	Rainfall depth	61.359	61.359	61.359	mm"
"	Rainfall volume	44.18	4.91	49.09	c.m"
"	Rainfall losses	61.359	2.329	55.456	mm"
"	Runoff depth	0.000	59.030	5.903	mm"
"	Runoff volume	0.00	4.72	4.72	c.m"
"	Runoff coefficient	0.000	0.962	0.096	"
"	Maximum flow	0.000	0.003	0.003	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"		0.003	0.379	0.000	0.000"
" 33	CATCHMENT 500"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	2 Horton equation"				

```

"      500    EXTERNAL WETLAND"
"      35.000 % Impervious"
"      4.300  Total Area"
"     150.000 Flow length"
"      1.000  Overland Slope"
"      2.795  Pervious Area"
"     150.000 Pervious length"
"      1.000  Pervious slope"
"      1.505  Impervious Area"
"     150.000 Impervious length"
"      1.000  Impervious slope"
"      0.250  Pervious Manning 'n'"
"     200.000 Pervious Max.infiltration"
"     13.000  Pervious Min.infiltration"
"      0.250  Pervious Lag constant (hours)"
"      5.000  Pervious Depression storage"
"      0.013  Impervious Manning 'n'"
"      0.000  Impervious Max.infiltration"
"      0.000  Impervious Min.infiltration"
"      0.050  Impervious Lag constant (hours)"
"      1.500  Impervious Depression storage"
"          0.474      0.379      0.000      0.000 c.m/sec"
"      Catchment 500      Pervious      Impervious Total Area "
"      Surface Area      2.795      1.505      4.300      hectare"
"      Time of concentration      ---      5.890      5.890      minutes"
"      Time to Centroid      0.000      90.058      90.058      minutes"
"      Rainfall depth      61.359      61.359      61.359      mm"
"      Rainfall volume      1714.99      923.46      2638.45      c.m"
"      Rainfall losses      61.359      1.999      40.583      mm"
"      Runoff depth      0.000      59.360      20.776      mm"
"      Runoff volume      0.00      893.37      893.37      c.m"
"      Runoff coefficient      0.000      0.967      0.339      "
"      Maximum flow      0.000      0.474      0.474      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"      4      Add Runoff "
"          0.474      0.853      0.000      0.000"
" 54      POND DESIGN"
"      0.853  Current peak flow      c.m/sec"
"      0.001  Target outflow      c.m/sec"
"     1621.1  Hydrograph volume      c.m"
"      13.    Number of stages"
"      0.000  Minimum water level      metre"
"      3.000  Maximum water level      metre"
"      0.000  Starting water level      metre"
"      0      Keep Design Data: 1 = True; 0 = False"
"          Level Discharge      Volume"
"      414.550      0.000      0.000"
"      414.650  1.01E-05      1.280"
"      414.750  2.01E-05      25.890"
"      414.850  0.02300      87.570"

```


"	414.950	0.1080	189.890"		
"	415.050	0.2480	326.630"		
"	415.150	0.2290	503.070"		
"	415.250	0.5620	728.330"		
"	415.350	0.7600	1010.010"		
"	415.450	0.9170	1347.990"		
"	415.550	1.051	1734.110"		
"	415.650	1.476	2120.230"		
"	415.750	3.050	2506.350"		
"	Peak outflow		0.410	c.m/sec"	
"	Maximum level		415.204	metre"	
"	Maximum storage		625.437	c.m"	
"	Centroidal lag		1.971	hours"	
"	0.474	0.853	0.410	0.000 c.m/sec"	
" 38	START/RE-START TOTALS 500"				
"	3 Runoff Totals on EXIT"				
"	Total Catchment area		8.770	hectare"	
"	Total Impervious area		2.731	hectare"	
"	Total % impervious		31.140"		
" 19	EXIT"				

```

"                MIDUSS Output ----->"
"                MIDUSS version                      Version 2.25  rev. 473"
"                MIDUSS created                      Sunday, February 7, 2010"
"            10  Units used:                          ie METRIC"
"                Job folder:                        B:\Working\WRIGHTHAVEN HOMES\"
"                2401073 - 122025 079 Sideroad 19 Fergus\5 Work in Progress\Design
Calcs\2026-01-22 SWM Calcs"
"                Output filename:                    122025 Pre 25yr-wetland.out"
"                Licensee name:                      "
"                Company                             "
"                Date & Time last used:              1/23/2026 at 11:41:07 AM"
" 31            TIME PARAMETERS"
"            5.000  Time Step"
"            240.000 Max. Storm length"
"            1500.000 Max. Hydrograph"
" 32            STORM Chicago storm"
"            1  Chicago storm"
"            3701.648 Coefficient A"
"            25.500  Constant B"
"            0.937  Exponent C"
"            0.375  Fraction R"
"            180.000 Duration"
"            1.000  Time step multiplier"
"                Maximum intensity                    149.252  mm/hr"
"                Total depth                          75.581  mm"
"            6  025hyd  Hydrograph extension used in this file"
" 33            CATCHMENT 100"
"            1  Triangular SCS"
"            1  Equal length"
"            2  Horton equation"
"            100  EXTERNAL"
"            30.000 % Impervious"
"            3.400  Total Area"
"            150.000 Flow length"
"            2.000  Overland Slope"
"            2.380  Pervious Area"
"            150.000 Pervious length"
"            2.000  Pervious slope"
"            1.020  Impervious Area"
"            150.000 Impervious length"
"            2.000  Impervious slope"
"            0.250  Pervious Manning 'n'"
"            200.000 Pervious Max.infiltration"
"            13.000  Pervious Min.infiltration"
"            0.250  Pervious Lag constant (hours)"
"            5.000  Pervious Depression storage"
"            0.013  Impervious Manning 'n'"
"            0.000  Impervious Max.infiltration"
"            0.000  Impervious Min.infiltration"
"            0.050  Impervious Lag constant (hours)"

```

"	1.500	Impervious Depression storage"				
"		0.369	0.000	0.000	0.000 c.m/sec"	
"		Catchment 100	Pervious	Impervious	Total Area	"
"		Surface Area	2.380	1.020	3.400	hectare"
"		Time of concentration	62.069	4.556	10.609	minutes"
"		Time to Centroid	139.388	87.864	93.287	minutes"
"		Rainfall depth	75.581	75.581	75.581	mm"
"		Rainfall volume	1798.82	770.92	2569.75	c.m"
"		Rainfall losses	71.874	2.048	50.926	mm"
"		Runoff depth	3.707	73.533	24.655	mm"
"		Runoff volume	88.22	750.04	838.26	c.m"
"		Runoff coefficient	0.049	0.973	0.326	"
"		Maximum flow	0.020	0.369	0.369	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.369	0.369	0.000	0.000"	
" 33		CATCHMENT 200"				
"	1	Triangular SCS"				
"	1	Equal length"				
"	2	Horton equation"				
"	200	SITE"				
"	20.000	% Impervious"				
"	0.990	Total Area"				
"	30.000	Flow length"				
"	2.000	Overland Slope"				
"	0.792	Pervious Area"				
"	30.000	Pervious length"				
"	2.000	Pervious slope"				
"	0.198	Impervious Area"				
"	30.000	Impervious length"				
"	2.000	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	200.000	Pervious Max.infiltration"				
"	13.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.013	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.050	Impervious Lag constant (hours)"				
"	1.500	Impervious Depression storage"				
"		0.072	0.369	0.000	0.000 c.m/sec"	
"		Catchment 200	Pervious	Impervious	Total Area	"
"		Surface Area	0.792	0.198	0.990	hectare"
"		Time of concentration	23.632	1.735	5.428	minutes"
"		Time to Centroid	103.139	84.033	87.256	minutes"
"		Rainfall depth	75.581	75.581	75.581	mm"
"		Rainfall volume	598.60	149.65	748.25	c.m"
"		Rainfall losses	71.875	2.522	58.004	mm"
"		Runoff depth	3.706	73.059	17.577	mm"

"	Runoff volume	29.35	144.66	174.01	c.m"
"	Runoff coefficient	0.049	0.967	0.233	"
"	Maximum flow	0.014	0.072	0.072	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.072	0.436	0.000	0.000"	
" 33	CATCHMENT 300"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	2 Horton equation"				
"	300 SITE WETLAND"				
"	10.000 % Impervious"				
"	0.080 Total Area"				
"	25.000 Flow length"				
"	2.000 Overland Slope"				
"	0.072 Pervious Area"				
"	25.000 Pervious length"				
"	2.000 Pervious slope"				
"	0.008 Impervious Area"				
"	25.000 Impervious length"				
"	2.000 Impervious slope"				
"	0.250 Pervious Manning 'n'"				
"	200.000 Pervious Max.infiltration"				
"	13.000 Pervious Min.infiltration"				
"	0.250 Pervious Lag constant (hours)"				
"	5.000 Pervious Depression storage"				
"	0.013 Impervious Manning 'n'"				
"	0.000 Impervious Max.infiltration"				
"	0.000 Impervious Min.infiltration"				
"	0.050 Impervious Lag constant (hours)"				
"	1.500 Impervious Depression storage"				
"	0.003	0.436	0.000	0.000 c.m/sec"	
"	Catchment 300	Pervious	Impervious	Total Area	"
"	Surface Area	0.072	0.008	0.080	hectare"
"	Time of concentration	21.183	1.555	7.706	minutes"
"	Time to Centroid	100.821	83.836	89.159	minutes"
"	Rainfall depth	75.581	75.581	75.581	mm"
"	Rainfall volume	54.42	6.05	60.46	c.m"
"	Rainfall losses	71.875	2.523	64.940	mm"
"	Runoff depth	3.705	73.058	10.641	mm"
"	Runoff volume	2.67	5.84	8.51	c.m"
"	Runoff coefficient	0.049	0.967	0.141	"
"	Maximum flow	0.001	0.003	0.003	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.003	0.439	0.000	0.000"	
" 33	CATCHMENT 500"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	2 Horton equation"				

```

"          500    EXTERNAL WETLAND"
"      35.000    % Impervious"
"          4.300    Total Area"
"    150.000    Flow length"
"          1.000    Overland Slope"
"          2.795    Pervious Area"
"    150.000    Pervious length"
"          1.000    Pervious slope"
"          1.505    Impervious Area"
"    150.000    Impervious length"
"          1.000    Impervious slope"
"          0.250    Pervious Manning 'n'"
"    200.000    Pervious Max.infiltration"
"          13.000    Pervious Min.infiltration"
"          0.250    Pervious Lag constant (hours)"
"          5.000    Pervious Depression storage"
"          0.013    Impervious Manning 'n'"
"          0.000    Impervious Max.infiltration"
"          0.000    Impervious Min.infiltration"
"          0.050    Impervious Lag constant (hours)"
"          1.500    Impervious Depression storage"
"              0.550      0.439      0.000      0.000 c.m/sec"
"      Catchment 500      Pervious      Impervious      Total Area  "
"      Surface Area      2.795      1.505      4.300      hectare"
"      Time of concentration  76.416      5.609      11.673      minutes"
"      Time to Centroid      152.931      89.232      94.687      minutes"
"      Rainfall depth      75.581      75.581      75.581      mm"
"      Rainfall volume      2112.48      1137.49      3249.98      c.m"
"      Rainfall losses      71.873      2.070      47.442      mm"
"      Runoff depth      3.707      73.511      28.139      mm"
"      Runoff volume      103.62      1106.34      1209.96      c.m"
"      Runoff coefficient      0.049      0.973      0.372      "
"      Maximum flow      0.019      0.549      0.550      c.m/sec"
" 40      HYDROGRAPH Add Runoff  "
"      4      Add Runoff  "
"              0.550      0.988      0.000      0.000"
" 54      POND DESIGN"
"      0.988      Current peak flow      c.m/sec"
"      0.001      Target outflow      c.m/sec"
"    2230.7      Hydrograph volume      c.m"
"          13.      Number of stages"
"      0.000      Minimum water level      metre"
"      3.000      Maximum water level      metre"
"      0.000      Starting water level      metre"
"          0      Keep Design Data: 1 = True; 0 = False"
"              Level Discharge      Volume"
"      414.550      0.000      0.000"
"      414.650      1.01E-05      1.280"
"      414.750      2.01E-05      25.890"
"      414.850      0.02300      87.570"

```

"	414.950	0.1080	189.890"		
"	415.050	0.2480	326.630"		
"	415.150	0.2290	503.070"		
"	415.250	0.5620	728.330"		
"	415.350	0.7600	1010.010"		
"	415.450	0.9170	1347.990"		
"	415.550	1.051	1734.110"		
"	415.650	1.476	2120.230"		
"	415.750	3.050	2506.350"		
"	Peak outflow		0.551	c.m/sec"	
"	Maximum level		415.247	metre"	
"	Maximum storage		720.871	c.m"	
"	Centroidal lag		2.014	hours"	
"	0.550	0.988	0.551	0.000 c.m/sec"	
" 38	START/RE-START TOTALS 500"				
"	3 Runoff Totals on EXIT"				
"	Total Catchment area		8.770	hectare"	
"	Total Impervious area		2.731	hectare"	
"	Total % impervious		31.140"		
" 19	EXIT"				

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                        B:\Working\WRIGHTHAVEN HOMES\"
"          2401073 - 122025 079 Sideroad 19 Fergus\5 Work in Progress\Design
Calcs\2026-01-22 SWM Calcs"
"          Output filename:                    122025 Pre 50yr-wetland.out"
"          Licensee name:                      "
"          Company                            "
"          Date & Time last used:              1/23/2026 at 11:46:06 AM"
" 31          TIME PARAMETERS"
"          5.000  Time Step"
"          240.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 32          STORM Chicago storm"
"          1  Chicago storm"
"          5089.418 Coefficient A"
"          30.000  Constant B"
"          0.967  Exponent C"
"          0.375  Fraction R"
"          180.000 Duration"
"          1.000  Time step multiplier"
"          Maximum intensity                    162.242  mm/hr"
"          Total depth                        86.737  mm"
"          6  050hyd  Hydrograph extension used in this file"
" 33          CATCHMENT 100"
"          1  Triangular SCS"
"          1  Equal length"
"          2  Horton equation"
"          100  EXTERNAL"
"          30.000  % Impervious"
"          3.400  Total Area"
"          150.000 Flow length"
"          2.000  Overland Slope"
"          2.380  Pervious Area"
"          150.000 Pervious length"
"          2.000  Pervious slope"
"          1.020  Impervious Area"
"          150.000 Impervious length"
"          2.000  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          200.000 Pervious Max.infiltration"
"          13.000  Pervious Min.infiltration"
"          0.250  Pervious Lag constant (hours)"
"          5.000  Pervious Depression storage"
"          0.013  Impervious Manning 'n'"
"          0.000  Impervious Max.infiltration"
"          0.000  Impervious Min.infiltration"
"          0.050  Impervious Lag constant (hours)"

```

"	1.500	Impervious Depression storage"				
"		0.408	0.000	0.000	0.000 c.m/sec"	
"		Catchment 100	Pervious	Impervious	Total Area	"
"		Surface Area	2.380	1.020	3.400	hectare"
"		Time of concentration	40.814	4.406	13.919	minutes"
"		Time to Centroid	127.829	87.508	98.043	minutes"
"		Rainfall depth	86.737	86.737	86.737	mm"
"		Rainfall volume	2064.34	884.72	2949.05	c.m"
"		Rainfall losses	73.927	2.228	52.417	mm"
"		Runoff depth	12.810	84.509	34.320	mm"
"		Runoff volume	304.88	861.99	1166.88	c.m"
"		Runoff coefficient	0.148	0.974	0.396	"
"		Maximum flow	0.080	0.402	0.408	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.408	0.408	0.000	0.000"	
" 33		CATCHMENT 200"				
"	1	Triangular SCS"				
"	1	Equal length"				
"	2	Horton equation"				
"	200	SITE"				
"	20.000	% Impervious"				
"	0.990	Total Area"				
"	30.000	Flow length"				
"	2.000	Overland Slope"				
"	0.792	Pervious Area"				
"	30.000	Pervious length"				
"	2.000	Pervious slope"				
"	0.198	Impervious Area"				
"	30.000	Impervious length"				
"	2.000	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	200.000	Pervious Max.infiltration"				
"	13.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.013	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	0.408	0.000	0.000 c.m/sec"	
"		Catchment 200	Pervious	Impervious	Total Area	"
"		Surface Area	0.792	0.198	0.990	hectare"
"		Time of concentration	15.539	1.678	6.917	minutes"
"		Time to Centroid	100.269	83.836	90.048	minutes"
"		Rainfall depth	86.737	86.737	86.737	mm"
"		Rainfall volume	686.96	171.74	858.69	c.m"
"		Rainfall losses	73.958	2.620	59.691	mm"
"		Runoff depth	12.779	84.117	27.046	mm"

"	Runoff volume	101.21	166.55	267.76	c.m"
"	Runoff coefficient	0.147	0.970	0.312	"
"	Maximum flow	0.051	0.079	0.088	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.088	0.489	0.000	0.000"	
" 33	CATCHMENT 300"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	2 Horton equation"				
"	300 SITE WETLAND"				
"	10.000 % Impervious"				
"	0.080 Total Area"				
"	25.000 Flow length"				
"	2.000 Overland Slope"				
"	0.072 Pervious Area"				
"	25.000 Pervious length"				
"	2.000 Pervious slope"				
"	0.008 Impervious Area"				
"	25.000 Impervious length"				
"	2.000 Impervious slope"				
"	0.250 Pervious Manning 'n'"				
"	200.000 Pervious Max.infiltration"				
"	13.000 Pervious Min.infiltration"				
"	0.250 Pervious Lag constant (hours)"				
"	5.000 Pervious Depression storage"				
"	0.013 Impervious Manning 'n'"				
"	0.000 Impervious Max.infiltration"				
"	0.000 Impervious Min.infiltration"				
"	0.050 Impervious Lag constant (hours)"				
"	1.500 Impervious Depression storage"				
"	0.006	0.489	0.000	0.000 c.m/sec"	
"	Catchment 300	Pervious	Impervious	Total Area	"
"	Surface Area	0.072	0.008	0.080	hectare"
"	Time of concentration	13.929	1.504	8.689	minutes"
"	Time to Centroid	98.536	83.651	92.258	minutes"
"	Rainfall depth	86.737	86.737	86.737	mm"
"	Rainfall volume	62.45	6.94	69.39	c.m"
"	Rainfall losses	73.930	2.676	66.805	mm"
"	Runoff depth	12.806	84.061	19.932	mm"
"	Runoff volume	9.22	6.72	15.95	c.m"
"	Runoff coefficient	0.148	0.969	0.230	"
"	Maximum flow	0.005	0.003	0.006	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.006	0.493	0.000	0.000"	
" 33	CATCHMENT 500"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	2 Horton equation"				

```

"          500    EXTERNAL WETLAND"
"      35.000    % Impervious"
"          4.300    Total Area"
"    150.000    Flow length"
"          1.000    Overland Slope"
"          2.795    Pervious Area"
"    150.000    Pervious length"
"          1.000    Pervious slope"
"          1.505    Impervious Area"
"    150.000    Impervious length"
"          1.000    Impervious slope"
"          0.250    Pervious Manning 'n'"
"    200.000    Pervious Max.infiltration"
"          13.000    Pervious Min.infiltration"
"          0.250    Pervious Lag constant (hours)"
"          5.000    Pervious Depression storage"
"          0.013    Impervious Manning 'n'"
"          0.000    Impervious Max.infiltration"
"          0.000    Impervious Min.infiltration"
"          0.050    Impervious Lag constant (hours)"
"          1.500    Impervious Depression storage"
"              0.607      0.493      0.000      0.000 c.m/sec"
"      Catchment 500      Pervious      Impervious      Total Area  "
"      Surface Area      2.795      1.505      4.300      hectare"
"      Time of concentration  50.248      5.425      15.274      minutes"
"      Time to Centroid      138.122      88.818      99.652      minutes"
"      Rainfall depth      86.737      86.737      86.737      mm"
"      Rainfall volume      2424.29      1305.39      3729.68      c.m"
"      Rainfall losses      73.922      2.225      48.828      mm"
"      Runoff depth      12.815      84.512      37.909      mm"
"      Runoff volume      358.18      1271.91      1630.09      c.m"
"      Runoff coefficient      0.148      0.974      0.437      "
"      Maximum flow      0.079      0.603      0.607      c.m/sec"
" 40      HYDROGRAPH Add Runoff  "
"      4      Add Runoff  "
"              0.607      1.100      0.000      0.000"
" 54      POND DESIGN"
"      1.100      Current peak flow      c.m/sec"
"      0.001      Target outflow      c.m/sec"
"    3080.7      Hydrograph volume      c.m"
"          13.      Number of stages"
"      0.000      Minimum water level      metre"
"      3.000      Maximum water level      metre"
"      0.000      Starting water level      metre"
"          0      Keep Design Data: 1 = True; 0 = False"
"              Level Discharge      Volume"
"      414.550      0.000      0.000"
"      414.650      1.01E-05      1.280"
"      414.750      2.01E-05      25.890"
"      414.850      0.02300      87.570"

```

"	414.950	0.1080	189.890"		
"	415.050	0.2480	326.630"		
"	415.150	0.2290	503.070"		
"	415.250	0.5620	728.330"		
"	415.350	0.7600	1010.010"		
"	415.450	0.9170	1347.990"		
"	415.550	1.051	1734.110"		
"	415.650	1.476	2120.230"		
"	415.750	3.050	2506.350"		
"	Peak outflow	0.630	c.m/sec"		
"	Maximum level	415.285	metre"		
"	Maximum storage	827.471	c.m"		
"	Centroidal lag	2.066	hours"		
"	0.607	1.100	0.630	0.000	c.m/sec"
" 38	START/RE-START TOTALS 500"				
"	3 Runoff Totals on EXIT"				
"	Total Catchment area	8.770	hectare"		
"	Total Impervious area	2.731	hectare"		
"	Total % impervious	31.140"			
" 19	EXIT"				

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                        B:\Working\WRIGHTHAVEN HOMES\"
"          2401073 - 122025 079 Sideroad 19 Fergus\5 Work in Progress\Design
Calcs\2026-01-22 SWM Calcs"
"          Output filename:                    122025 Pre 100yr-wetland.out"
"          Licensee name:                      "
"          Company                            "
"          Date & Time last used:              1/23/2026 at 9:42:52 AM"
" 31          TIME PARAMETERS"
"          5.000  Time Step"
"          180.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 32          STORM Chicago storm"
"          1  Chicago storm"
"          6933.019 Coefficient A"
"          34.669 Constant B"
"          0.998 Exponent C"
"          0.375 Fraction R"
"          180.000 Duration"
"          1.000 Time step multiplier"
"          Maximum intensity                    174.792  mm/hr"
"          Total depth                        97.935  mm"
"          6  100hyd Hydrograph extension used in this file"
" 33          CATCHMENT 100"
"          1  Triangular SCS"
"          1  Equal length"
"          2  Horton equation"
"          100 EXTERNAL"
"          30.000 % Impervious"
"          3.400 Total Area"
"          150.000 Flow length"
"          2.000 Overland Slope"
"          2.380 Pervious Area"
"          150.000 Pervious length"
"          2.000 Pervious slope"
"          1.020 Impervious Area"
"          150.000 Impervious length"
"          2.000 Impervious slope"
"          0.250 Pervious Manning 'n'"
"          200.000 Pervious Max.infiltration"
"          13.000 Pervious Min.infiltration"
"          0.250 Pervious Lag constant (hours)"
"          5.000 Pervious Depression storage"
"          0.013 Impervious Manning 'n'"
"          0.000 Impervious Max.infiltration"
"          0.000 Impervious Min.infiltration"
"          0.050 Impervious Lag constant (hours)"

```

"	1.500	Impervious Depression storage"				
"		0.453	0.000	0.000	0.000 c.m/sec"	
"		Catchment 100	Pervious	Impervious	Total Area	"
"		Surface Area	2.380	1.020	3.400	hectare"
"		Time of concentration	35.769	4.277	15.450	minutes"
"		Time to Centroid	122.505	87.201	99.726	minutes"
"		Rainfall depth	97.935	97.935	97.935	mm"
"		Rainfall volume	2330.85	998.94	3329.79	c.m"
"		Rainfall losses	75.416	2.379	53.505	mm"
"		Runoff depth	22.519	95.556	44.430	mm"
"		Runoff volume	535.95	974.67	1510.62	c.m"
"		Runoff coefficient	0.230	0.976	0.454	"
"		Maximum flow	0.154	0.438	0.453	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.453	0.453	0.000	0.000"	
" 33		CATCHMENT 200"				
"	1	Triangular SCS"				
"	1	Equal length"				
"	2	Horton equation"				
"	200	SITE"				
"	20.000	% Impervious"				
"	0.990	Total Area"				
"	30.000	Flow length"				
"	2.000	Overland Slope"				
"	0.792	Pervious Area"				
"	30.000	Pervious length"				
"	2.000	Pervious slope"				
"	0.198	Impervious Area"				
"	30.000	Impervious length"				
"	2.000	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	200.000	Pervious Max.infiltration"				
"	13.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.013	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.050	Impervious Lag constant (hours)"				
"	1.500	Impervious Depression storage"				
"		0.132	0.453	0.000	0.000 c.m/sec"	
"		Catchment 200	Pervious	Impervious	Total Area	"
"		Surface Area	0.792	0.198	0.990	hectare"
"		Time of concentration	13.619	1.628	7.448	minutes"
"		Time to Centroid	99.012	83.696	91.131	minutes"
"		Rainfall depth	97.935	97.935	97.935	mm"
"		Rainfall volume	775.65	193.91	969.56	c.m"
"		Rainfall losses	75.489	2.755	60.942	mm"
"		Runoff depth	22.446	95.180	36.993	mm"

"	Runoff volume	177.77	188.46	366.23	c.m"
"	Runoff coefficient	0.229	0.972	0.378	"
"	Maximum flow	0.092	0.086	0.132	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.132	0.556	0.000	0.000"	
" 33	CATCHMENT 300"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	2 Horton equation"				
"	300 SITE WETLAND"				
"	10.000 % Impervious"				
"	0.080 Total Area"				
"	25.000 Flow length"				
"	2.000 Overland Slope"				
"	0.072 Pervious Area"				
"	25.000 Pervious length"				
"	2.000 Pervious slope"				
"	0.008 Impervious Area"				
"	25.000 Impervious length"				
"	2.000 Impervious slope"				
"	0.250 Pervious Manning 'n'"				
"	200.000 Pervious Max.infiltration"				
"	13.000 Pervious Min.infiltration"				
"	0.250 Pervious Lag constant (hours)"				
"	5.000 Pervious Depression storage"				
"	0.013 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	0.556	0.000	0.000 c.m/sec"	
"	Catchment 300	Pervious	Impervious	Total Area	"
"	Surface Area	0.072	0.008	0.080	hectare"
"	Time of concentration	12.207	1.460	8.770	minutes"
"	Time to Centroid	97.516	83.512	93.037	minutes"
"	Rainfall depth	97.935	97.935	97.935	mm"
"	Rainfall volume	70.51	7.83	78.35	c.m"
"	Rainfall losses	75.468	2.861	68.207	mm"
"	Runoff depth	22.467	95.074	29.728	mm"
"	Runoff volume	16.18	7.61	23.78	c.m"
"	Runoff coefficient	0.229	0.971	0.304	"
"	Maximum flow	0.009	0.004	0.010	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.010	0.562	0.000	0.000"	
" 33	CATCHMENT 500"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	2 Horton equation"				

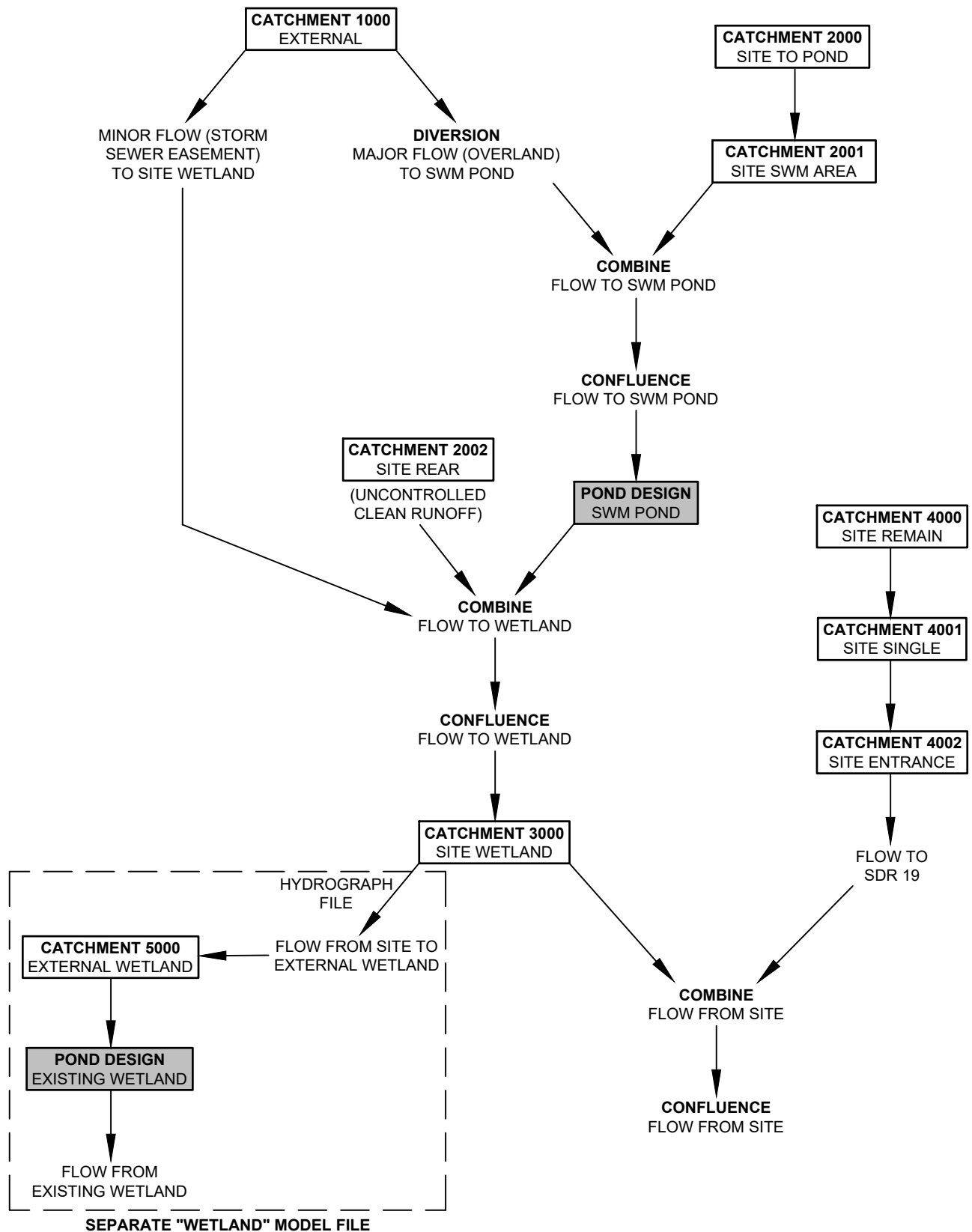
```

"      500    EXTERNAL WETLAND"
"      35.000 % Impervious"
"      4.300  Total Area"
"     150.000 Flow length"
"      1.000  Overland Slope"
"      2.795  Pervious Area"
"     150.000 Pervious length"
"      1.000  Pervious slope"
"      1.505  Impervious Area"
"     150.000 Impervious length"
"      1.000  Impervious slope"
"      0.250  Pervious Manning 'n'"
"     200.000 Pervious Max.infiltration"
"     13.000  Pervious Min.infiltration"
"      0.250  Pervious Lag constant (hours)"
"      5.000  Pervious Depression storage"
"      0.013  Impervious Manning 'n'"
"      0.000  Impervious Max.infiltration"
"      0.000  Impervious Min.infiltration"
"      0.050  Impervious Lag constant (hours)"
"      1.500  Impervious Depression storage"
"          0.668      0.562      0.000      0.000 c.m/sec"
"      Catchment 500      Pervious      Impervious Total Area "
"      Surface Area      2.795      1.505      4.300      hectare"
"      Time of concentration 44.037      5.265      17.057      minutes"
"      Time to Centroid      131.266      88.439      101.464      minutes"
"      Rainfall depth      97.935      97.935      97.935      mm"
"      Rainfall volume      2737.28      1473.92      4211.20      c.m"
"      Rainfall losses      75.422      2.266      49.817      mm"
"      Runoff depth      22.513      95.669      48.118      mm"
"      Runoff volume      629.24      1439.82      2069.06      c.m"
"      Runoff coefficient      0.230      0.977      0.491      "
"      Maximum flow      0.155      0.656      0.668      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"      4      Add Runoff "
"          0.668      1.229      0.000      0.000"
" 54      POND DESIGN"
"      1.229      Current peak flow      c.m/sec"
"      0.001      Target outflow      c.m/sec"
"     3969.7      Hydrograph volume      c.m"
"      13.      Number of stages"
"      0.000      Minimum water level      metre"
"      3.000      Maximum water level      metre"
"      0.000      Starting water level      metre"
"      0      Keep Design Data: 1 = True; 0 = False"
"          Level Discharge      Volume"
"      414.550      0.000      0.000"
"      414.650      1.01E-05      1.280"
"      414.750      2.01E-05      25.890"
"      414.850      0.02300      87.570"

```

"	414.950	0.1080	189.890"		
"	415.050	0.2480	326.630"		
"	415.150	0.2290	503.070"		
"	415.250	0.5620	728.330"		
"	415.350	0.7600	1010.010"		
"	415.450	0.9170	1347.990"		
"	415.550	1.051	1734.110"		
"	415.650	1.476	2120.230"		
"	415.750	3.050	2506.350"		
"	Peak outflow		0.741	c.m/sec"	
"	Maximum level		415.341	metre"	
"	Maximum storage		984.708	c.m"	
"	Centroidal lag		2.072	hours"	
"	0.668	1.229	0.741	0.000 c.m/sec"	
" 38	START/RE-START TOTALS 500"				
"	3 Runoff Totals on EXIT"				
"	Total Catchment area		8.770	hectare"	
"	Total Impervious area		2.731	hectare"	
"	Total % impervious		31.140"		
" 19	EXIT"				

Appendix F Post-Development Hydrologic Modelling



73/79 SIDEROAD 19 RESIDENTIAL DEVELOPMENT
TOWNSHIP OF CENTRE WELLINGTON (FERGUS)

WRIGHTHAVEN HOMES LTD.



Project 2401073

POST-DEVELOPMENT
MIDUSS HYDROLOGIC
MODEL SCHEMATIC

JUNE 2025

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                        B:\Working\WRIGHTHAVEN HOMES\"
"          2401073 - 122025 079 Sideroad 19 Fergus\5 Work in Progress\Design
Calcs\2026-01-22 SWM Calcs"
"          Output filename:                    122025 Post 25mm.out"
"          Licensee name:                      "
"          Company                            "
"          Date & Time last used:              1/23/2026 at 9:22:46 AM"
" 31          TIME PARAMETERS"
"          5.000  Time Step"
"          240.000  Max. Storm length"
"          5000.000  Max. Hydrograph"
" 32          STORM Chicago storm"
"          1  Chicago storm"
"          1581.250  Coefficient A"
"          13.000  Constant B"
"          1.000  Exponent C"
"          0.400  Fraction R"
"          240.000  Duration"
"          1.000  Time step multiplier"
"          Maximum intensity                    84.725  mm/hr"
"          Total depth                        25.000  mm"
"          6  001hyd  Hydrograph extension used in this file"
" 33          CATCHMENT 1000"
"          1  Triangular SCS"
"          1  Equal length"
"          2  Horton equation"
"          1000  EXTERNAL"
"          30.000  % Impervious"
"          3.400  Total Area"
"          150.000  Flow length"
"          2.000  Overland Slope"
"          2.380  Pervious Area"
"          150.000  Pervious length"
"          2.000  Pervious slope"
"          1.020  Impervious Area"
"          150.000  Impervious length"
"          2.000  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          200.000  Pervious Max.infiltration"
"          13.000  Pervious Min.infiltration"
"          0.250  Pervious Lag constant (hours)"
"          5.000  Pervious Depression storage"
"          0.013  Impervious Manning 'n'"
"          0.000  Impervious Max.infiltration"
"          0.000  Impervious Min.infiltration"
"          0.050  Impervious Lag constant (hours)"

```

"	1.500	Impervious Depression storage"			
"		0.191	0.000	0.000	0.000 c.m/sec"
"		Catchment 1000	Pervious	Impervious	Total Area "
"		Surface Area	2.380	1.020	3.400 hectare"
"		Time of concentration	---	5.714	5.714 minutes"
"		Time to Centroid	0.000	115.659	115.659 minutes"
"		Rainfall depth	25.000	25.000	25.000 mm"
"		Rainfall volume	595.00	255.00	850.00 c.m"
"		Rainfall losses	25.000	1.646	17.994 mm"
"		Runoff depth	0.000	23.354	7.006 mm"
"		Runoff volume	0.00	238.21	238.21 c.m"
"		Runoff coefficient	0.000	0.934	0.280 "
"		Maximum flow	0.000	0.191	0.191 c.m/sec"
" 40		HYDROGRAPH Add Runoff "			
"	4	Add Runoff "			
"		0.191	0.191	0.000	0.000"
" 56		DIVERSION"			
"	1000	Node number"			
"	0.180	Overflow threshold"			
"	1.000	Required diverted fraction"			
"	0	Conduit type; 1=Pipe;2=Channel"			
"		Peak of diverted flow	0.011	c.m/sec"	
"		Volume of diverted flow	3.343	c.m"	
"		DIV01000.001hyd"			
"		Major flow to pond"			
"		0.191	0.191	0.180	0.000 c.m/sec"
" 40		HYDROGRAPH	Combine	10"	
"	6	Combine "			
"	10	Node #"			
"		FLOW TO WETLAND"			
"		Maximum flow	0.180	c.m/sec"	
"		Hydrograph volume	234.869	c.m"	
"		0.191	0.191	0.180	0.180"
" 40		HYDROGRAPH Start - New Tributary"			
"	2	Start - New Tributary"			
"		0.191	0.000	0.180	0.180"
" 33		CATCHMENT 2000"			
"	1	Triangular SCS"			
"	1	Equal length"			
"	2	Horton equation"			
"	2000	SITE"			
"	70.000	% Impervious"			
"	0.740	Total Area"			
"	20.000	Flow length"			
"	2.000	Overland Slope"			
"	0.222	Pervious Area"			
"	20.000	Pervious length"			
"	2.000	Pervious slope"			
"	0.518	Impervious Area"			
"	20.000	Impervious length"			

"	2.000	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	200.000	Pervious Max.infiltration"				
"	13.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.013	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.050	Impervious Lag constant (hours)"				
"	1.500	Impervious Depression storage"				
"		0.107	0.000	0.180	0.180 c.m/sec"	
"		Catchment 2000	Pervious	Impervious	Total Area	"
"		Surface Area	0.222	0.518	0.740	hectare"
"		Time of concentration	---	1.706	1.706	minutes"
"		Time to Centroid	0.000	109.962	109.962	minutes"
"		Rainfall depth	25.000	25.000	25.000	mm"
"		Rainfall volume	55.50	129.50	185.00	c.m"
"		Rainfall losses	25.000	1.785	8.750	mm"
"		Runoff depth	0.000	23.215	16.250	mm"
"		Runoff volume	0.00	120.25	120.25	c.m"
"		Runoff coefficient	0.000	0.929	0.650	"
"		Maximum flow	0.000	0.107	0.107	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.107	0.107	0.180	0.180"	
" 33		CATCHMENT 2001"				
"	1	Triangular SCS"				
"	1	Equal length"				
"	2	Horton equation"				
"	2001	SITE SWM"				
"	10.000	% Impervious"				
"	0.100	Total Area"				
"	20.000	Flow length"				
"	2.000	Overland Slope"				
"	0.090	Pervious Area"				
"	20.000	Pervious length"				
"	2.000	Pervious slope"				
"	0.010	Impervious Area"				
"	20.000	Impervious length"				
"	2.000	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	200.000	Pervious Max.infiltration"				
"	13.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.013	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.050	Impervious Lag constant (hours)"				

```

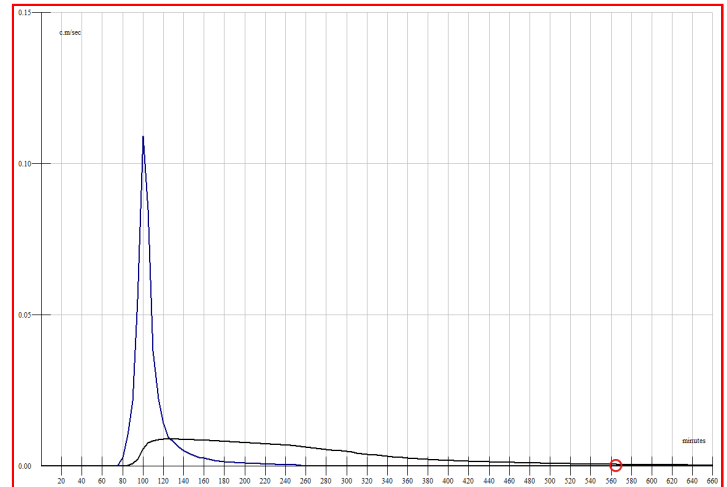
"      1.500 Impervious Depression storage"
"      0.002      0.107      0.180      0.180 c.m/sec"
"      Catchment 2001      Pervious      Impervious      Total Area      "
"      Surface Area      0.090      0.010      0.100      hectare"
"      Time of concentration      ---      1.706      1.706      minutes"
"      Time to Centroid      0.000      109.962      109.962      minutes"
"      Rainfall depth      25.000      25.000      25.000      mm"
"      Rainfall volume      22.50      2.50      25.00      c.m"
"      Rainfall losses      25.000      1.785      22.679      mm"
"      Runoff depth      0.000      23.215      2.321      mm"
"      Runoff volume      0.00      2.32      2.32      c.m"
"      Runoff coefficient      0.000      0.929      0.093      "
"      Maximum flow      0.000      0.002      0.002      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"      4      Add Runoff "
"      0.002      0.109      0.180      0.180"
" 40      HYDROGRAPH Copy to Outflow"
"      8      Copy to Outflow"
"      0.002      0.109      0.109      0.180"
" 40      HYDROGRAPH Combine      20"
"      6      Combine "
" 20      Node #"
"      FLOW TO POND"
"      Maximum flow      0.109      c.m/sec"
"      Hydrograph volume      122.575      c.m"
"      0.002      0.109      0.109      0.109"
" 40      HYDROGRAPH Start - New Tributary"
"      2      Start - New Tributary"
"      0.002      0.000      0.109      0.109"
" 47      FILEI_0 Read/Open DIV01000.001hyd"
"      1      1=read/open; 2=write/save"
"      2      1=rainfall; 2=hydrograph"
"      2      1=runoff; 2=inflow; 3=outflow; 4=junction"
"      DIV01000.001hyd"
"      Major flow to pond"
"      Total volume      3.343      c.m"
"      Maximum flow      0.011      c.m/sec"
"      0.002      0.011      0.109      0.109 c.m/sec"
" 40      HYDROGRAPH Copy to Outflow"
"      8      Copy to Outflow"
"      0.002      0.011      0.011      0.109"
" 40      HYDROGRAPH Combine      20"
"      6      Combine "
" 20      Node #"
"      FLOW TO POND"
"      Maximum flow      0.109      c.m/sec"
"      Hydrograph volume      125.917      c.m"
"      0.002      0.011      0.011      0.109"
" 40      HYDROGRAPH Confluence      20"
"      7      Confluence "

```

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"      20   Node #"
"      FLOW TO POND"
"      Maximum flow      0.109   c.m/sec"
"      Hydrograph volume  125.917 c.m"
"      0.002   0.109   0.011   0.000"
" 54      POND DESIGN"
"      0.109   Current peak flow   c.m/sec"
"      0.001   Target outflow   c.m/sec"
"      125.9   Hydrograph volume   c.m"
"      22.   Number of stages"
"      0.000   Minimum water level   metre"
"      3.000   Maximum water level   metre"
"      0.000   Starting water level   metre"
"      0   Keep Design Data: 1 = True; 0 = False"
"      Level Discharge   Volume"
"      415.600   0.000   0.000"
"      415.650   0.00200   16.920"
"      415.700   0.00500   35.260"
"      415.750   0.00700   54.600"
"      415.800   0.00800   74.980"
"      415.850   0.00900   96.410"
"      415.900   0.01000   118.910"
"      415.950   0.06200   142.510"
"      416.000   0.06800   167.220"
"      416.050   0.07400   193.080"
"      416.100   0.08000   220.090"
"      416.150   0.08500   248.280"
"      416.200   0.09000   277.680"
"      416.250   0.09500   308.310"
"      416.300   0.09900   340.170"
"      416.350   0.1030   373.310"
"      416.400   0.1840   407.730"
"      416.450   0.3320   443.470"
"      416.500   0.5260   480.530"
"      416.550   0.7600   518.950"
"      416.600   1.028   558.740"
"      416.650   2.329   599.930"
"      Peak outflow      0.009   c.m/sec"
"      Maximum level     415.846   metre"
"      Maximum storage    94.813   c.m"
"      Centroidal lag     4.273   hours"
"      0.002   0.109   0.009   0.000 c.m/sec"
" 40      HYDROGRAPH   Combine   10"
"      6   Combine "
" 10      Node #"
"      FLOW TO WETLAND"
"      Maximum flow      0.188   c.m/sec"
"      Hydrograph volume  360.756 c.m"
"      0.002   0.109   0.009   0.188"
" 40      HYDROGRAPH Start - New Tributary"

```



"	2	Start - New Tributary"				
"		0.002	0.000	0.009	0.188"	
" 33		CATCHMENT 2002"				
"	1	Triangular SCS"				
"	1	Equal length"				
"	2	Horton equation"				
"	2002	SITE REAR"				
"	10.000	% Impervious"				
"	0.090	Total Area"				
"	40.000	Flow length"				
"	2.000	Overland Slope"				
"	0.081	Pervious Area"				
"	40.000	Pervious length"				
"	2.000	Pervious slope"				
"	0.009	Impervious Area"				
"	40.000	Impervious length"				
"	2.000	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	200.000	Pervious Max.infiltration"				
"	13.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.013	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.050	Impervious Lag constant (hours)"				
"	1.500	Impervious Depression storage"				
"		0.002	0.000	0.009	0.188 c.m/sec"	
"		Catchment 2002	Pervious	Impervious	Total Area	"
"		Surface Area	0.081	0.009	0.090	hectare"
"		Time of concentration	---	2.585	2.585	minutes"
"		Time to Centroid	0.000	111.248	111.248	minutes"
"		Rainfall depth	25.000	25.000	25.000	mm"
"		Rainfall volume	20.25	2.25	22.50	c.m"
"		Rainfall losses	25.000	1.978	22.698	mm"
"		Runoff depth	0.000	23.022	2.302	mm"
"		Runoff volume	0.00	2.07	2.07	c.m"
"		Runoff coefficient	0.000	0.921	0.092	"
"		Maximum flow	0.000	0.002	0.002	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.002	0.002	0.009	0.188"	
" 40		HYDROGRAPH Copy to Outflow"				
"	8	Copy to Outflow"				
"		0.002	0.002	0.002	0.188"	
" 40		HYDROGRAPH Combine 10"				
"	6	Combine "				
"	10	Node #"				
"		FLOW TO WETLAND"				
"		Maximum flow		0.189	c.m/sec"	


```

"          Hydrograph volume          362.827    c.m"
"          0.002    0.002    0.002    0.189"
" 40      HYDROGRAPH Confluence    10"
"          7    Confluence "
"          10    Node #"
"          FLOW TO WETLAND"
"          Maximum flow          0.189    c.m/sec"
"          Hydrograph volume          362.827    c.m"
"          0.002    0.189    0.002    0.000"
" 33      CATCHMENT 3000"
"          1    Triangular SCS"
"          1    Equal length"
"          2    Horton equation"
"          3000    SITE WETLAND"
"          10.000    % Impervious"
"          0.110    Total Area"
"          25.000    Flow length"
"          2.000    Overland Slope"
"          0.099    Pervious Area"
"          25.000    Pervious length"
"          2.000    Pervious slope"
"          0.011    Impervious Area"
"          25.000    Impervious length"
"          2.000    Impervious slope"
"          0.250    Pervious Manning 'n'"
"          200.000    Pervious Max.infiltration"
"          13.000    Pervious Min.infiltration"
"          0.250    Pervious Lag constant (hours)"
"          5.000    Pervious Depression storage"
"          0.013    Impervious Manning 'n'"
"          0.000    Impervious Max.infiltration"
"          0.000    Impervious Min.infiltration"
"          0.050    Impervious Lag constant (hours)"
"          1.500    Impervious Depression storage"
"          0.002    0.189    0.002    0.000 c.m/sec"
"          Catchment 3000          Pervious    Impervious    Total Area "
"          Surface Area          0.099    0.011    0.110    hectare"
"          Time of concentration          ---    1.950    1.950    minutes"
"          Time to Centroid          0.000    110.316    110.316    minutes"
"          Rainfall depth          25.000    25.000    25.000    mm"
"          Rainfall volume          24.75    2.75    27.50    c.m"
"          Rainfall losses          25.000    1.809    22.681    mm"
"          Runoff depth          0.000    23.191    2.319    mm"
"          Runoff volume          0.00    2.55    2.55    c.m"
"          Runoff coefficient          0.000    0.928    0.093    "
"          Maximum flow          0.000    0.002    0.002    c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"          4    Add Runoff "
"          0.002    0.191    0.002    0.000"
" 47      FILEI_0 Write/Save Flow from Site Rear.001hyd"

```

```

"      2  1=read/open; 2=write/save"
"      2  1=rainfall; 2=hydrograph"
"      2  1=runoff; 2=inflow; 3=outflow; 4=junction"
"      Flow from Site Rear.001hyd"
"      Flow from site rear from catchment 3000 to external wetland"
"      Total volume          365.378      c.m"
"      Maximum flow          0.191      c.m/sec"
"      0.002      0.191      0.002      0.000 c.m/sec"
" 40      HYDROGRAPH Copy to Outflow"
"      8  Copy to Outflow"
"      0.002      0.191      0.191      0.000"
" 40      HYDROGRAPH Combine 30"
"      6  Combine "
"      30  Node #"
"      FLOW FROM SITE"
"      Maximum flow          0.191      c.m/sec"
"      Hydrograph volume      365.378      c.m"
"      0.002      0.191      0.191      0.191"
" 40      HYDROGRAPH Start - New Tributary"
"      2  Start - New Tributary"
"      0.002      0.000      0.191      0.191"
" 33      CATCHMENT 4000"
"      1  Triangular SCS"
"      1  Equal length"
"      2  Horton equation"
"      4000 SITE REMAIN"
"      60.000 % Impervious"
"      0.050 Total Area"
"      10.000 Flow length"
"      2.000 Overland Slope"
"      0.020 Pervious Area"
"      10.000 Pervious length"
"      2.000 Pervious slope"
"      0.030 Impervious Area"
"      10.000 Impervious length"
"      2.000 Impervious slope"
"      0.250 Pervious Manning 'n'"
"      200.000 Pervious Max.infiltration"
"      13.000 Pervious Min.infiltration"
"      0.250 Pervious Lag constant (hours)"
"      5.000 Pervious Depression storage"
"      0.013 Impervious Manning 'n'"
"      0.000 Impervious Max.infiltration"
"      0.000 Impervious Min.infiltration"
"      0.050 Impervious Lag constant (hours)"
"      1.500 Impervious Depression storage"
"      0.006      0.000      0.191      0.191 c.m/sec"
"      Catchment 4000      Pervious      Impervious Total Area "
"      Surface Area      0.020      0.030      0.050      hectare"
"      Time of concentration      ---      1.125      1.125      minutes"

```

"	Time to Centroid	0.000	109.234	109.234	minutes"
"	Rainfall depth	25.000	25.000	25.000	mm"
"	Rainfall volume	5.00	7.50	12.50	c.m"
"	Rainfall losses	25.000	2.121	11.272	mm"
"	Runoff depth	0.000	22.879	13.728	mm"
"	Runoff volume	0.00	6.86	6.86	c.m"
"	Runoff coefficient	0.000	0.915	0.549	"
"	Maximum flow	0.000	0.006	0.006	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.006 0.006 0.191 0.191"				
" 33	CATCHMENT 4001"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	2 Horton equation"				
"	4001 SITE SINGLE"				
"	30.000 % Impervious"				
"	0.030 Total Area"				
"	10.000 Flow length"				
"	2.000 Overland Slope"				
"	0.021 Pervious Area"				
"	10.000 Pervious length"				
"	2.000 Pervious slope"				
"	0.009 Impervious Area"				
"	10.000 Impervious length"				
"	2.000 Impervious slope"				
"	0.250 Pervious Manning 'n'"				
"	200.000 Pervious Max.infiltration"				
"	13.000 Pervious Min.infiltration"				
"	0.250 Pervious Lag constant (hours)"				
"	5.000 Pervious Depression storage"				
"	0.013 Impervious Manning 'n'"				
"	0.000 Impervious Max.infiltration"				
"	0.000 Impervious Min.infiltration"				
"	0.050 Impervious Lag constant (hours)"				
"	1.500 Impervious Depression storage"				
"	0.002 0.006 0.191 0.191 c.m/sec"				
"	Catchment 4001 Pervious Impervious Total Area "				
"	Surface Area 0.021 0.009 0.030 hectare"				
"	Time of concentration --- 1.125 1.125 minutes"				
"	Time to Centroid 0.000 109.234 109.234 minutes"				
"	Rainfall depth 25.000 25.000 25.000 mm"				
"	Rainfall volume 5.25 2.25 7.50 c.m"				
"	Rainfall losses 25.000 2.121 18.136 mm"				
"	Runoff depth 0.000 22.879 6.864 mm"				
"	Runoff volume 0.00 2.06 2.06 c.m"				
"	Runoff coefficient 0.000 0.915 0.275 "				
"	Maximum flow 0.000 0.002 0.002 c.m/sec"				
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				

"		0.002	0.008	0.191	0.191"	
" 40	HYDROGRAPH Copy to Outflow"					
"	8	Copy to Outflow"				
"		0.002	0.008	0.008	0.191"	
" 40	HYDROGRAPH Combine 30"					
"	6	Combine "				
"	30	Node #"				
"	FLOW FROM SITE"					
"				0.195	c.m/sec"	
"				374.301	c.m"	
"		0.002	0.008	0.008	0.195"	
" 40	HYDROGRAPH Confluence 30"					
"	7	Confluence "				
"	30	Node #"				
"	FLOW FROM SITE"					
"				0.195	c.m/sec"	
"				374.301	c.m"	
"		0.002	0.195	0.008	0.000"	
" 38	START/RE-START TOTALS 30"					
"	3	Runoff Totals on EXIT"				
"					4.520	hectare"
"					1.607	hectare"
"					35.553"	
" 19	EXIT"					

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                        B:\Working\WRIGHTHAVEN HOMES\"
"          2401073 - 122025 079 Sideroad 19 Fergus\5 Work in Progress\Design
Calcs\2026-01-22 SWM Calcs"
"          Output filename:                    122025 Post 2yr.out"
"          Licensee name:                      "
"          Company                            "
"          Date & Time last used:              1/23/2026 at 10:23:15 AM"
" 31          TIME PARAMETERS"
"          5.000  Time Step"
"          240.000  Max. Storm length"
"          1500.000  Max. Hydrograph"
" 32          STORM Chicago storm"
"          1  Chicago storm"
"          695.047  Coefficient A"
"          6.387  Constant B"
"          0.793  Exponent C"
"          0.375  Fraction R"
"          180.000  Duration"
"          1.000  Time step multiplier"
"          Maximum intensity                    99.625  mm/hr"
"          Total depth                        33.014  mm"
"          6  002hyd  Hydrograph extension used in this file"
" 33          CATCHMENT 1000"
"          1  Triangular SCS"
"          1  Equal length"
"          2  Horton equation"
"          1000  EXTERNAL"
"          30.000  % Impervious"
"          3.400  Total Area"
"          150.000  Flow length"
"          2.000  Overland Slope"
"          2.380  Pervious Area"
"          150.000  Pervious length"
"          2.000  Pervious slope"
"          1.020  Impervious Area"
"          150.000  Impervious length"
"          2.000  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          200.000  Pervious Max.infiltration"
"          13.000  Pervious Min.infiltration"
"          0.250  Pervious Lag constant (hours)"
"          5.000  Pervious Depression storage"
"          0.013  Impervious Manning 'n'"
"          0.000  Impervious Max.infiltration"
"          0.000  Impervious Min.infiltration"
"          0.050  Impervious Lag constant (hours)"

```

"	1.500	Impervious Depression storage"			
"		0.214	0.000	0.000	0.000 c.m/sec"
"		Catchment 1000	Pervious	Impervious	Total Area "
"		Surface Area	2.380	1.020	3.400 hectare"
"		Time of concentration	---	5.355	5.355 minutes"
"		Time to Centroid	0.000	91.059	91.059 minutes"
"		Rainfall depth	33.014	33.014	33.014 mm"
"		Rainfall volume	785.73	336.74	1122.47 c.m"
"		Rainfall losses	33.014	1.644	23.603 mm"
"		Runoff depth	0.000	31.369	9.411 mm"
"		Runoff volume	0.00	319.97	319.97 c.m"
"		Runoff coefficient	0.000	0.950	0.285 "
"		Maximum flow	0.000	0.214	0.214 c.m/sec"
" 40		HYDROGRAPH Add Runoff "			
"	4	Add Runoff "			
"		0.214	0.214	0.000	0.000"
" 56		DIVERSION"			
"	1000	Node number"			
"	0.180	Overflow threshold"			
"	1.000	Required diverted fraction"			
"	0	Conduit type; 1=Pipe;2=Channel"			
"		Peak of diverted flow	0.034	c.m/sec"	
"		Volume of diverted flow	10.197	c.m"	
"		DIV01000.002hyd"			
"		Major flow to pond"			
"		0.214	0.214	0.180	0.000 c.m/sec"
" 40		HYDROGRAPH	Combine	10"	
"	6	Combine "			
"	10	Node #"			
"		FLOW TO WETLAND"			
"		Maximum flow	0.180	c.m/sec"	
"		Hydrograph volume	309.771	c.m"	
"		0.214	0.214	0.180	0.180"
" 40		HYDROGRAPH Start - New Tributary"			
"	2	Start - New Tributary"			
"		0.214	0.000	0.180	0.180"
" 33		CATCHMENT 2000"			
"	1	Triangular SCS"			
"	1	Equal length"			
"	2	Horton equation"			
"	2000	SITE"			
"	70.000	% Impervious"			
"	0.740	Total Area"			
"	20.000	Flow length"			
"	2.000	Overland Slope"			
"	0.222	Pervious Area"			
"	20.000	Pervious length"			
"	2.000	Pervious slope"			
"	0.518	Impervious Area"			
"	20.000	Impervious length"			

"	2.000	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	200.000	Pervious Max.infiltration"				
"	13.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.013	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.050	Impervious Lag constant (hours)"				
"	1.500	Impervious Depression storage"				
"		0.116	0.000	0.180	0.180 c.m/sec"	
"		Catchment 2000	Pervious	Impervious	Total Area	"
"		Surface Area	0.222	0.518	0.740	hectare"
"		Time of concentration	---	1.599	1.599	minutes"
"		Time to Centroid	0.000	85.401	85.401	minutes"
"		Rainfall depth	33.014	33.014	33.014	mm"
"		Rainfall volume	73.29	171.01	244.30	c.m"
"		Rainfall losses	33.014	1.976	11.288	mm"
"		Runoff depth	0.000	31.037	21.726	mm"
"		Runoff volume	0.00	160.77	160.77	c.m"
"		Runoff coefficient	0.000	0.940	0.658	"
"		Maximum flow	0.000	0.116	0.116	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.116	0.116	0.180	0.180"	
" 33		CATCHMENT 2001"				
"	1	Triangular SCS"				
"	1	Equal length"				
"	2	Horton equation"				
"	2001	SITE SWM"				
"	10.000	% Impervious"				
"	0.100	Total Area"				
"	20.000	Flow length"				
"	2.000	Overland Slope"				
"	0.090	Pervious Area"				
"	20.000	Pervious length"				
"	2.000	Pervious slope"				
"	0.010	Impervious Area"				
"	20.000	Impervious length"				
"	2.000	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	200.000	Pervious Max.infiltration"				
"	13.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.013	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.050	Impervious Lag constant (hours)"				

```

"      1.500  Impervious Depression storage"
"      0.002      0.116      0.180      0.180 c.m/sec"
"      Catchment 2001      Pervious      Impervious      Total Area  "
"      Surface Area      0.090      0.010      0.100      hectare"
"      Time of concentration      ---      1.599      1.599      minutes"
"      Time to Centroid      0.000      85.401      85.401      minutes"
"      Rainfall depth      33.014      33.014      33.014      mm"
"      Rainfall volume      29.71      3.30      33.01      c.m"
"      Rainfall losses      33.014      1.976      29.910      mm"
"      Runoff depth      0.000      31.037      3.104      mm"
"      Runoff volume      0.00      3.10      3.10      c.m"
"      Runoff coefficient      0.000      0.940      0.094      "
"      Maximum flow      0.000      0.002      0.002      c.m/sec"
" 40      HYDROGRAPH Add Runoff  "
"      4      Add Runoff  "
"      0.002      0.118      0.180      0.180"
" 40      HYDROGRAPH Copy to Outflow"
"      8      Copy to Outflow"
"      0.002      0.118      0.118      0.180"
" 40      HYDROGRAPH Combine      20"
"      6      Combine  "
" 20      Node #"
"      FLOW TO POND"
"      Maximum flow      0.118      c.m/sec"
"      Hydrograph volume      163.878      c.m"
"      0.002      0.118      0.118      0.118"
" 40      HYDROGRAPH Start - New Tributary"
"      2      Start - New Tributary"
"      0.002      0.000      0.118      0.118"
" 47      FILEI_0 Read/Open DIV01000.002hyd"
"      1      1=read/open; 2=write/save"
"      2      1=rainfall; 2=hydrograph"
"      2      1=runoff; 2=inflow; 3=outflow; 4=junction"
"      DIV01000.002hyd"
"      Major flow to pond"
"      Total volume      10.197      c.m"
"      Maximum flow      0.034      c.m/sec"
"      0.002      0.034      0.118      0.118 c.m/sec"
" 40      HYDROGRAPH Copy to Outflow"
"      8      Copy to Outflow"
"      0.002      0.034      0.034      0.118"
" 40      HYDROGRAPH Combine      20"
"      6      Combine  "
" 20      Node #"
"      FLOW TO POND"
"      Maximum flow      0.124      c.m/sec"
"      Hydrograph volume      174.075      c.m"
"      0.002      0.034      0.034      0.124"
" 40      HYDROGRAPH Confluence      20"
"      7      Confluence  "

```



```

"      20   Node #"
"      FLOW TO POND"
"      Maximum flow           0.124   c.m/sec"
"      Hydrograph volume      174.075   c.m"
"      0.002   0.124   0.034   0.000"
" 54      POND DESIGN"
"      0.124   Current peak flow   c.m/sec"
"      0.001   Target outflow      c.m/sec"
"      174.1   Hydrograph volume    c.m"
"      22.     Number of stages"
"      0.000   Minimum water level  metre"
"      3.000   Maximum water level  metre"
"      0.000   Starting water level metre"
"      0       Keep Design Data: 1 = True; 0 = False"
"      Level Discharge   Volume"
"      415.600   0.000   0.000"
"      415.650   0.00200  16.920"
"      415.700   0.00500  35.260"
"      415.750   0.00700  54.600"
"      415.800   0.00800  74.980"
"      415.850   0.00900  96.410"
"      415.900   0.01000  118.910"
"      415.950   0.06200  142.510"
"      416.000   0.06800  167.220"
"      416.050   0.07400  193.080"
"      416.100   0.08000  220.090"
"      416.150   0.08500  248.280"
"      416.200   0.09000  277.680"
"      416.250   0.09500  308.310"
"      416.300   0.09900  340.170"
"      416.350   0.1030   373.310"
"      416.400   0.1840   407.730"
"      416.450   0.3320   443.470"
"      416.500   0.5260   480.530"
"      416.550   0.7600   518.950"
"      416.600   1.028    558.740"
"      416.650   2.329    599.930"
"      Peak outflow           0.012   c.m/sec"
"      Maximum level          415.902   metre"
"      Maximum storage        119.894   c.m"
"      Centroidal lag         4.084   hours"
"      0.002   0.124   0.012   0.000 c.m/sec"
" 40      HYDROGRAPH   Combine   10"
"      6       Combine "
" 10      Node #"
"      FLOW TO WETLAND"
"      Maximum flow           0.188   c.m/sec"
"      Hydrograph volume      483.749   c.m"
"      0.002   0.124   0.012   0.188"
" 40      HYDROGRAPH Start - New Tributary"

```

"	2	Start - New Tributary"				
"		0.002	0.000	0.012	0.188"	
" 33		CATCHMENT 2002"				
"	1	Triangular SCS"				
"	1	Equal length"				
"	2	Horton equation"				
"	2002	SITE REAR"				
"	10.000	% Impervious"				
"	0.090	Total Area"				
"	40.000	Flow length"				
"	2.000	Overland Slope"				
"	0.081	Pervious Area"				
"	40.000	Pervious length"				
"	2.000	Pervious slope"				
"	0.009	Impervious Area"				
"	40.000	Impervious length"				
"	2.000	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	200.000	Pervious Max.infiltration"				
"	13.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.013	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.050	Impervious Lag constant (hours)"				
"	1.500	Impervious Depression storage"				
"		0.002	0.000	0.012	0.188 c.m/sec"	
"		Catchment 2002	Pervious	Impervious	Total Area	"
"		Surface Area	0.081	0.009	0.090	hectare"
"		Time of concentration	---	2.423	2.423	minutes"
"		Time to Centroid	0.000	86.729	86.729	minutes"
"		Rainfall depth	33.014	33.014	33.014	mm"
"		Rainfall volume	26.74	2.97	29.71	c.m"
"		Rainfall losses	33.014	2.007	29.913	mm"
"		Runoff depth	0.000	31.007	3.101	mm"
"		Runoff volume	0.00	2.79	2.79	c.m"
"		Runoff coefficient	0.000	0.939	0.094	"
"		Maximum flow	0.000	0.002	0.002	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.002	0.002	0.012	0.188"	
" 40		HYDROGRAPH Copy to Outflow"				
"	8	Copy to Outflow"				
"		0.002	0.002	0.002	0.188"	
" 40		HYDROGRAPH Combine 10"				
"	6	Combine "				
"	10	Node #"				
"		FLOW TO WETLAND"				
"		Maximum flow		0.190	c.m/sec"	

"		Hydrograph volume	486.539	c.m"
"		0.002 0.002 0.002	0.190"	
" 40		HYDROGRAPH Confluence	10"	
"	7	Confluence "		
"	10	Node #"		
"		FLOW TO WETLAND"		
"		Maximum flow	0.190 c.m/sec"	
"		Hydrograph volume	486.539 c.m"	
"		0.002 0.190 0.002	0.000"	
" 33		CATCHMENT 3000"		
"	1	Triangular SCS"		
"	1	Equal length"		
"	2	Horton equation"		
"	3000	SITE WETLAND"		
"	10.000	% Impervious"		
"	0.110	Total Area"		
"	25.000	Flow length"		
"	2.000	Overland Slope"		
"	0.099	Pervious Area"		
"	25.000	Pervious length"		
"	2.000	Pervious slope"		
"	0.011	Impervious Area"		
"	25.000	Impervious length"		
"	2.000	Impervious slope"		
"	0.250	Pervious Manning 'n'"		
"	200.000	Pervious Max.infiltration"		
"	13.000	Pervious Min.infiltration"		
"	0.250	Pervious Lag constant (hours)"		
"	5.000	Pervious Depression storage"		
"	0.013	Impervious Manning 'n'"		
"	0.000	Impervious Max.infiltration"		
"	0.000	Impervious Min.infiltration"		
"	0.050	Impervious Lag constant (hours)"		
"	1.500	Impervious Depression storage"		
"		0.002 0.190 0.002	0.000 c.m/sec"	
"		Catchment 3000	Pervious	Impervious Total Area "
"		Surface Area	0.099	0.011 0.110 hectare"
"		Time of concentration	---	1.828 1.828 minutes"
"		Time to Centroid	0.000	85.761 85.761 minutes"
"		Rainfall depth	33.014	33.014 mm"
"		Rainfall volume	32.68	3.63 36.32 c.m"
"		Rainfall losses	33.014	1.949 29.907 mm"
"		Runoff depth	0.000	31.065 3.106 mm"
"		Runoff volume	0.00	3.42 3.42 c.m"
"		Runoff coefficient	0.000	0.941 0.094 "
"		Maximum flow	0.000	0.002 0.002 c.m/sec"
" 40		HYDROGRAPH Add Runoff "		
"	4	Add Runoff "		
"		0.002 0.192 0.002	0.000"	
" 47		FILEI_0 Write/Save Flow from Site Rear.002hyd"		

```

"      2  1=read/open; 2=write/save"
"      2  1=rainfall; 2=hydrograph"
"      2  1=runoff; 2=inflow; 3=outflow; 4=junction"
"      Flow from Site Rear.002hyd"
"      Flow from site rear from catchment 3000 to external wetland"
"      Total volume          489.956      c.m"
"      Maximum flow          0.192      c.m/sec"
"      0.002      0.192      0.002      0.000 c.m/sec"
" 40      HYDROGRAPH Copy to Outflow"
"      8  Copy to Outflow"
"      0.002      0.192      0.192      0.000"
" 40      HYDROGRAPH Combine 30"
"      6  Combine "
"      30  Node #"
"      FLOW FROM SITE"
"      Maximum flow          0.192      c.m/sec"
"      Hydrograph volume     489.956      c.m"
"      0.002      0.192      0.192      0.192"
" 40      HYDROGRAPH Start - New Tributary"
"      2  Start - New Tributary"
"      0.002      0.000      0.192      0.192"
" 33      CATCHMENT 4000"
"      1  Triangular SCS"
"      1  Equal length"
"      2  Horton equation"
"      4000 SITE REMAIN"
"      60.000 % Impervious"
"      0.050 Total Area"
"      10.000 Flow length"
"      2.000 Overland Slope"
"      0.020 Pervious Area"
"      10.000 Pervious length"
"      2.000 Pervious slope"
"      0.030 Impervious Area"
"      10.000 Impervious length"
"      2.000 Impervious slope"
"      0.250 Pervious Manning 'n'"
"      200.000 Pervious Max.infiltration"
"      13.000 Pervious Min.infiltration"
"      0.250 Pervious Lag constant (hours)"
"      5.000 Pervious Depression storage"
"      0.013 Impervious Manning 'n'"
"      0.000 Impervious Max.infiltration"
"      0.000 Impervious Min.infiltration"
"      0.050 Impervious Lag constant (hours)"
"      1.500 Impervious Depression storage"
"      0.007      0.000      0.192      0.192 c.m/sec"
"      Catchment 4000      Pervious      Impervious Total Area "
"      Surface Area      0.020      0.030      0.050      hectare"
"      Time of concentration      ---      1.055      1.055      minutes"

```

"	Time to Centroid	0.000	84.596	84.596	minutes"
"	Rainfall depth	33.014	33.014	33.014	mm"
"	Rainfall volume	6.60	9.90	16.51	c.m"
"	Rainfall losses	33.014	2.461	14.682	mm"
"	Runoff depth	0.000	30.553	18.332	mm"
"	Runoff volume	0.00	9.17	9.17	c.m"
"	Runoff coefficient	0.000	0.925	0.555	"
"	Maximum flow	0.000	0.007	0.007	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.007 0.007 0.192 0.192"				
" 33	CATCHMENT 4001"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	2 Horton equation"				
"	4001 SITE SINGLE"				
"	30.000 % Impervious"				
"	0.030 Total Area"				
"	10.000 Flow length"				
"	2.000 Overland Slope"				
"	0.021 Pervious Area"				
"	10.000 Pervious length"				
"	2.000 Pervious slope"				
"	0.009 Impervious Area"				
"	10.000 Impervious length"				
"	2.000 Impervious slope"				
"	0.250 Pervious Manning 'n'"				
"	200.000 Pervious Max.infiltration"				
"	13.000 Pervious Min.infiltration"				
"	0.250 Pervious Lag constant (hours)"				
"	5.000 Pervious Depression storage"				
"	0.013 Impervious Manning 'n'"				
"	0.000 Impervious Max.infiltration"				
"	0.000 Impervious Min.infiltration"				
"	0.050 Impervious Lag constant (hours)"				
"	1.500 Impervious Depression storage"				
"	0.002 0.007 0.192 0.192 c.m/sec"				
"	Catchment 4001 Pervious Impervious Total Area "				
"	Surface Area 0.021 0.009 0.030 hectare"				
"	Time of concentration --- 1.055 1.055 minutes"				
"	Time to Centroid 0.000 84.596 84.596 minutes"				
"	Rainfall depth 33.014 33.014 33.014 mm"				
"	Rainfall volume 6.93 2.97 9.90 c.m"				
"	Rainfall losses 33.014 2.461 23.848 mm"				
"	Runoff depth 0.000 30.553 9.166 mm"				
"	Runoff volume 0.00 2.75 2.75 c.m"				
"	Runoff coefficient 0.000 0.925 0.278 "				
"	Maximum flow 0.000 0.002 0.002 c.m/sec"				
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				

"		0.002	0.009	0.192	0.192"
" 40	HYDROGRAPH Copy to Outflow"				
"	8	Copy to Outflow"			
"		0.002	0.009	0.009	0.192"
" 40	HYDROGRAPH Combine 30"				
"	6	Combine "			
"	30	Node #"			
"	FLOW FROM SITE"				
"				0.198	c.m/sec"
"				501.872	c.m"
"		0.002	0.009	0.009	0.198"
" 40	HYDROGRAPH Confluence 30"				
"	7	Confluence "			
"	30	Node #"			
"	FLOW FROM SITE"				
"				0.198	c.m/sec"
"				501.872	c.m"
"		0.002	0.198	0.009	0.000"

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                        B:\Working\WRIGHTHAVEN HOMES\"
"          2401073 - 122025 079 Sideroad 19 Fergus\5 Work in Progress\Design
Calcs\2026-01-22 SWM Calcs"
"          Output filename:                    122025 Post 5yr.out"
"          Licensee name:                      "
"          Company                            "
"          Date & Time last used:              1/23/2026 at 10:27:34 AM"
" 31          TIME PARAMETERS"
"          5.000  Time Step"
"          240.000 Max. Storm length"
"          5000.000 Max. Hydrograph"
" 32          STORM Chicago storm"
"          1  Chicago storm"
"          1459.072 Coefficient A"
"          13.690 Constant B"
"          0.850 Exponent C"
"          0.375 Fraction R"
"          180.000 Duration"
"          1.000 Time step multiplier"
"          Maximum intensity                    119.775  mm/hr"
"          Total depth                        49.792  mm"
"          6  005hyd Hydrograph extension used in this file"
" 33          CATCHMENT 1000"
"          1  Triangular SCS"
"          1  Equal length"
"          2  Horton equation"
"          1000 EXTERNAL"
"          30.000 % Impervious"
"          3.400 Total Area"
"          150.000 Flow length"
"          2.000 Overland Slope"
"          2.380 Pervious Area"
"          150.000 Pervious length"
"          2.000 Pervious slope"
"          1.020 Impervious Area"
"          150.000 Impervious length"
"          2.000 Impervious slope"
"          0.250 Pervious Manning 'n'"
"          200.000 Pervious Max.infiltration"
"          13.000 Pervious Min.infiltration"
"          0.250 Pervious Lag constant (hours)"
"          5.000 Pervious Depression storage"
"          0.013 Impervious Manning 'n'"
"          0.000 Impervious Max.infiltration"
"          0.000 Impervious Min.infiltration"
"          0.050 Impervious Lag constant (hours)"

```

"	1.500	Impervious Depression storage"				
"		0.282	0.000	0.000	0.000	c.m/sec"
"		Catchment 1000	Pervious	Impervious	Total Area	"
"		Surface Area	2.380	1.020	3.400	hectare"
"		Time of concentration	---	4.975	4.975	minutes"
"		Time to Centroid	0.000	89.324	89.324	minutes"
"		Rainfall depth	49.792	49.792	49.792	mm"
"		Rainfall volume	1185.04	507.88	1692.92	c.m"
"		Rainfall losses	49.792	1.847	35.408	mm"
"		Runoff depth	0.000	47.945	14.383	mm"
"		Runoff volume	0.00	489.04	489.04	c.m"
"		Runoff coefficient	0.000	0.963	0.289	"
"		Maximum flow	0.000	0.282	0.282	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.282	0.282	0.000	0.000"	
" 56		DIVERSION"				
"	1000	Node number"				
"	0.180	Overflow threshold"				
"	1.000	Required diverted fraction"				
"	0	Conduit type; 1=Pipe;2=Channel"				
"		Peak of diverted flow	0.102			c.m/sec"
"		Volume of diverted flow	44.843			c.m"
"		DIV01000.005hyd"				
"		Major flow to pond"				
"		0.282	0.282	0.180	0.000	c.m/sec"
" 40		HYDROGRAPH Combine 10"				
"	6	Combine "				
"	10	Node #"				
"		FLOW TO WETLAND"				
"		Maximum flow	0.180			c.m/sec"
"		Hydrograph volume	444.195			c.m"
"		0.282	0.282	0.180	0.180"	
" 40		HYDROGRAPH Start - New Tributary"				
"	2	Start - New Tributary"				
"		0.282	0.000	0.180	0.180"	
" 33		CATCHMENT 2000"				
"	1	Triangular SCS"				
"	1	Equal length"				
"	2	Horton equation"				
"	2000	SITE"				
"	70.000	% Impervious"				
"	0.740	Total Area"				
"	20.000	Flow length"				
"	2.000	Overland Slope"				
"	0.222	Pervious Area"				
"	20.000	Pervious length"				
"	2.000	Pervious slope"				
"	0.518	Impervious Area"				
"	20.000	Impervious length"				

"	2.000	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	200.000	Pervious Max.infiltration"				
"	13.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.013	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.050	Impervious Lag constant (hours)"				
"	1.500	Impervious Depression storage"				
"		0.148	0.000	0.180	0.180 c.m/sec"	
"		Catchment 2000	Pervious	Impervious	Total Area	"
"		Surface Area	0.222	0.518	0.740	hectare"
"		Time of concentration	---	1.485	1.485	minutes"
"		Time to Centroid	0.000	84.405	84.405	minutes"
"		Rainfall depth	49.792	49.792	49.792	mm"
"		Rainfall volume	110.54	257.92	368.46	c.m"
"		Rainfall losses	49.792	2.240	16.506	mm"
"		Runoff depth	0.000	47.552	33.286	mm"
"		Runoff volume	0.00	246.32	246.32	c.m"
"		Runoff coefficient	0.000	0.955	0.669	"
"		Maximum flow	0.000	0.148	0.148	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.148	0.148	0.180	0.180"	
" 33		CATCHMENT 2001"				
"	1	Triangular SCS"				
"	1	Equal length"				
"	2	Horton equation"				
"	2001	SITE SWM"				
"	10.000	% Impervious"				
"	0.100	Total Area"				
"	20.000	Flow length"				
"	2.000	Overland Slope"				
"	0.090	Pervious Area"				
"	20.000	Pervious length"				
"	2.000	Pervious slope"				
"	0.010	Impervious Area"				
"	20.000	Impervious length"				
"	2.000	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	200.000	Pervious Max.infiltration"				
"	13.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.013	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.050	Impervious Lag constant (hours)"				

```

"      1.500  Impervious Depression storage"
"      0.003      0.148      0.180      0.180 c.m/sec"
"      Catchment 2001      Pervious      Impervious      Total Area  "
"      Surface Area      0.090      0.010      0.100      hectare"
"      Time of concentration      ---      1.485      1.485      minutes"
"      Time to Centroid      0.000      84.405      84.405      minutes"
"      Rainfall depth      49.792      49.792      49.792      mm"
"      Rainfall volume      44.81      4.98      49.79      c.m"
"      Rainfall losses      49.792      2.240      45.037      mm"
"      Runoff depth      0.000      47.552      4.755      mm"
"      Runoff volume      0.00      4.76      4.76      c.m"
"      Runoff coefficient      0.000      0.955      0.096      "
"      Maximum flow      0.000      0.003      0.003      c.m/sec"
" 40      HYDROGRAPH Add Runoff  "
"      4      Add Runoff  "
"      0.003      0.151      0.180      0.180"
" 40      HYDROGRAPH Copy to Outflow"
"      8      Copy to Outflow"
"      0.003      0.151      0.151      0.180"
" 40      HYDROGRAPH Combine      20"
"      6      Combine  "
" 20      Node #"
"      FLOW TO POND"
"      Maximum flow      0.151      c.m/sec"
"      Hydrograph volume      251.072      c.m"
"      0.003      0.151      0.151      0.151"
" 40      HYDROGRAPH Start - New Tributary"
"      2      Start - New Tributary"
"      0.003      0.000      0.151      0.151"
" 47      FILEI_0 Read/Open DIV01000.005hyd"
"      1      1=read/open; 2=write/save"
"      2      1=rainfall; 2=hydrograph"
"      2      1=runoff; 2=inflow; 3=outflow; 4=junction"
"      DIV01000.005hyd"
"      Major flow to pond"
"      Total volume      44.843      c.m"
"      Maximum flow      0.102      c.m/sec"
"      0.003      0.102      0.151      0.151 c.m/sec"
" 40      HYDROGRAPH Copy to Outflow"
"      8      Copy to Outflow"
"      0.003      0.102      0.102      0.151"
" 40      HYDROGRAPH Combine      20"
"      6      Combine  "
" 20      Node #"
"      FLOW TO POND"
"      Maximum flow      0.226      c.m/sec"
"      Hydrograph volume      295.915      c.m"
"      0.003      0.102      0.102      0.226"
" 40      HYDROGRAPH Confluence      20"
"      7      Confluence  "

```

```

"          20   Node #"
"          FLOW TO POND"
"          Maximum flow          0.226   c.m/sec"
"          Hydrograph volume      295.915   c.m"
"          0.003   0.226   0.102   0.000"
" 54   POND DESIGN"
"          0.226   Current peak flow   c.m/sec"
"          0.001   Target outflow   c.m/sec"
"          295.9   Hydrograph volume   c.m"
"          22.   Number of stages"
"          0.000   Minimum water level   metre"
"          3.000   Maximum water level   metre"
"          0.000   Starting water level   metre"
"          0   Keep Design Data: 1 = True; 0 = False"
"          Level Discharge   Volume"
"          415.600   0.000   0.000"
"          415.650   0.00200   16.920"
"          415.700   0.00500   35.260"
"          415.750   0.00700   54.600"
"          415.800   0.00800   74.980"
"          415.850   0.00900   96.410"
"          415.900   0.01000   118.910"
"          415.950   0.06200   142.510"
"          416.000   0.06800   167.220"
"          416.050   0.07400   193.080"
"          416.100   0.08000   220.090"
"          416.150   0.08500   248.280"
"          416.200   0.09000   277.680"
"          416.250   0.09500   308.310"
"          416.300   0.09900   340.170"
"          416.350   0.1030   373.310"
"          416.400   0.1840   407.730"
"          416.450   0.3320   443.470"
"          416.500   0.5260   480.530"
"          416.550   0.7600   518.950"
"          416.600   1.028   558.740"
"          416.650   2.329   599.930"
"          Peak outflow          0.067   c.m/sec"
"          Maximum level          415.995   metre"
"          Maximum storage          164.853   c.m"
"          Centroidal lag          3.157   hours"
"          0.003   0.226   0.067   0.000 c.m/sec"
" 40   HYDROGRAPH   Combine   10"
"          6   Combine "
" 10   Node #"
"          FLOW TO WETLAND"
"          Maximum flow          0.247   c.m/sec"
"          Hydrograph volume      741.698   c.m"
"          0.003   0.226   0.067   0.247"
" 40   HYDROGRAPH Start - New Tributary"

```

"	2	Start - New Tributary"				
"		0.003	0.000	0.067	0.247"	
" 33		CATCHMENT 2002"				
"	1	Triangular SCS"				
"	1	Equal length"				
"	2	Horton equation"				
"	2002	SITE REAR"				
"	10.000	% Impervious"				
"	0.090	Total Area"				
"	40.000	Flow length"				
"	2.000	Overland Slope"				
"	0.081	Pervious Area"				
"	40.000	Pervious length"				
"	2.000	Pervious slope"				
"	0.009	Impervious Area"				
"	40.000	Impervious length"				
"	2.000	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	200.000	Pervious Max.infiltration"				
"	13.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.013	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.050	Impervious Lag constant (hours)"				
"	1.500	Impervious Depression storage"				
"		0.002	0.000	0.067	0.247 c.m/sec"	
"		Catchment 2002	Pervious	Impervious	Total Area	"
"		Surface Area	0.081	0.009	0.090	hectare"
"		Time of concentration	---	2.251	2.251	minutes"
"		Time to Centroid	0.000	85.512	85.512	minutes"
"		Rainfall depth	49.792	49.792	49.792	mm"
"		Rainfall volume	40.33	4.48	44.81	c.m"
"		Rainfall losses	49.792	2.268	45.039	mm"
"		Runoff depth	0.000	47.524	4.752	mm"
"		Runoff volume	0.00	4.28	4.28	c.m"
"		Runoff coefficient	0.000	0.954	0.095	"
"		Maximum flow	0.000	0.002	0.002	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.002	0.002	0.067	0.247"	
" 40		HYDROGRAPH Copy to Outflow"				
"	8	Copy to Outflow"				
"		0.002	0.002	0.002	0.247"	
" 40		HYDROGRAPH Combine 10"				
"	6	Combine "				
"	10	Node #"				
"		FLOW TO WETLAND"				
"		Maximum flow		0.248	c.m/sec"	

```

"          Hydrograph volume          745.975    c.m"
"          0.002      0.002      0.002      0.248"
" 40      HYDROGRAPH Confluence      10"
"          7 Confluence "
"          10 Node #"
"          FLOW TO WETLAND"
"          Maximum flow          0.248    c.m/sec"
"          Hydrograph volume      745.975    c.m"
"          0.002      0.248      0.002      0.000"
" 33      CATCHMENT 3000"
"          1 Triangular SCS"
"          1 Equal length"
"          2 Horton equation"
"          3000 SITE WETLAND"
"          10.000 % Impervious"
"          0.110 Total Area"
"          25.000 Flow length"
"          2.000 Overland Slope"
"          0.099 Pervious Area"
"          25.000 Pervious length"
"          2.000 Pervious slope"
"          0.011 Impervious Area"
"          25.000 Impervious length"
"          2.000 Impervious slope"
"          0.250 Pervious Manning 'n'"
"          200.000 Pervious Max.infiltration"
"          13.000 Pervious Min.infiltration"
"          0.250 Pervious Lag constant (hours)"
"          5.000 Pervious Depression storage"
"          0.013 Impervious Manning 'n'"
"          0.000 Impervious Max.infiltration"
"          0.000 Impervious Min.infiltration"
"          0.050 Impervious Lag constant (hours)"
"          1.500 Impervious Depression storage"
"          0.003      0.248      0.002      0.000 c.m/sec"
"          Catchment 3000      Pervious      Impervious Total Area "
"          Surface Area      0.099      0.011      0.110      hectare"
"          Time of concentration      ---      1.698      1.698      minutes"
"          Time to Centroid      0.000      84.637      84.637      minutes"
"          Rainfall depth      49.792      49.792      49.792      mm"
"          Rainfall volume      49.29      5.48      54.77      c.m"
"          Rainfall losses      49.792      2.199      45.032      mm"
"          Runoff depth      0.000      47.593      4.759      mm"
"          Runoff volume      0.00      5.24      5.24      c.m"
"          Runoff coefficient      0.000      0.956      0.096      "
"          Maximum flow      0.000      0.003      0.003      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"          4 Add Runoff "
"          0.003      0.250      0.002      0.000"
" 47      FILEI_0 Write/Save Flow from Site Rear.005hyd"

```

```

"      2  1=read/open; 2=write/save"
"      2  1=rainfall; 2=hydrograph"
"      2  1=runoff; 2=inflow; 3=outflow; 4=junction"
"      Flow from Site Rear.005hyd"
"      Flow from site rear from catchment 3000 to external wetland"
"      Total volume          751.210      c.m"
"      Maximum flow          0.250      c.m/sec"
"      0.003      0.250      0.002      0.000 c.m/sec"
" 40      HYDROGRAPH Copy to Outflow"
"      8  Copy to Outflow"
"      0.003      0.250      0.250      0.000"
" 40      HYDROGRAPH Combine 30"
"      6  Combine "
"      30  Node #"
"      FLOW FROM SITE"
"      Maximum flow          0.250      c.m/sec"
"      Hydrograph volume     751.210      c.m"
"      0.003      0.250      0.250      0.250"
" 40      HYDROGRAPH Start - New Tributary"
"      2  Start - New Tributary"
"      0.003      0.000      0.250      0.250"
" 33      CATCHMENT 4000"
"      1  Triangular SCS"
"      1  Equal length"
"      2  Horton equation"
"      4000 SITE REMAIN"
"      60.000 % Impervious"
"      0.050 Total Area"
"      10.000 Flow length"
"      2.000 Overland Slope"
"      0.020 Pervious Area"
"      10.000 Pervious length"
"      2.000 Pervious slope"
"      0.030 Impervious Area"
"      10.000 Impervious length"
"      2.000 Impervious slope"
"      0.250 Pervious Manning 'n'"
"      200.000 Pervious Max.infiltration"
"      13.000 Pervious Min.infiltration"
"      0.250 Pervious Lag constant (hours)"
"      5.000 Pervious Depression storage"
"      0.013 Impervious Manning 'n'"
"      0.000 Impervious Max.infiltration"
"      0.000 Impervious Min.infiltration"
"      0.050 Impervious Lag constant (hours)"
"      1.500 Impervious Depression storage"
"      0.009      0.000      0.250      0.250 c.m/sec"
"      Catchment 4000      Pervious      Impervious Total Area "
"      Surface Area      0.020      0.030      0.050      hectare"
"      Time of concentration      ---      0.980      0.980      minutes"

```

"	Time to Centroid	0.000	83.649	83.649	minutes"
"	Rainfall depth	49.792	49.792	49.792	mm"
"	Rainfall volume	9.96	14.94	24.90	c.m"
"	Rainfall losses	49.792	3.090	21.770	mm"
"	Runoff depth	0.000	46.702	28.021	mm"
"	Runoff volume	0.00	14.01	14.01	c.m"
"	Runoff coefficient	0.000	0.938	0.563	"
"	Maximum flow	0.000	0.009	0.009	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.009 0.009 0.250 0.250"				
" 33	CATCHMENT 4001"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	2 Horton equation"				
"	4001 SITE SINGLE"				
"	30.000 % Impervious"				
"	0.030 Total Area"				
"	10.000 Flow length"				
"	2.000 Overland Slope"				
"	0.021 Pervious Area"				
"	10.000 Pervious length"				
"	2.000 Pervious slope"				
"	0.009 Impervious Area"				
"	10.000 Impervious length"				
"	2.000 Impervious slope"				
"	0.250 Pervious Manning 'n' "				
"	200.000 Pervious Max.infiltration"				
"	13.000 Pervious Min.infiltration"				
"	0.250 Pervious Lag constant (hours)"				
"	5.000 Pervious Depression storage"				
"	0.013 Impervious Manning 'n' "				
"	0.000 Impervious Max.infiltration"				
"	0.000 Impervious Min.infiltration"				
"	0.050 Impervious Lag constant (hours)"				
"	1.500 Impervious Depression storage"				
"	0.003 0.009 0.250 0.250 c.m/sec"				
"	Catchment 4001 Pervious Impervious Total Area "				
"	Surface Area 0.021 0.009 0.030 hectare"				
"	Time of concentration --- 0.980 0.980 minutes"				
"	Time to Centroid 0.000 83.649 83.649 minutes"				
"	Rainfall depth 49.792 49.792 49.792 mm"				
"	Rainfall volume 10.46 4.48 14.94 c.m"				
"	Rainfall losses 49.792 3.090 35.781 mm"				
"	Runoff depth 0.000 46.702 14.011 mm"				
"	Runoff volume 0.00 4.20 4.20 c.m"				
"	Runoff coefficient 0.000 0.938 0.281 "				
"	Maximum flow 0.000 0.003 0.003 c.m/sec"				
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				

"		0.003	0.011	0.250	0.250"	
" 40	HYDROGRAPH Copy to Outflow"					
"	8	Copy to Outflow"				
"		0.003	0.011	0.011	0.250"	
" 40	HYDROGRAPH Combine 30"					
"	6	Combine "				
"	30	Node #"				
"	FLOW FROM SITE"					
"				0.255	c.m/sec"	
"				769.424	c.m"	
"		0.003	0.011	0.011	0.255"	
" 40	HYDROGRAPH Confluence 30"					
"	7	Confluence "				
"	30	Node #"				
"	FLOW FROM SITE"					
"				0.255	c.m/sec"	
"				769.424	c.m"	
"		0.003	0.255	0.011	0.000"	
" 38	START/RE-START TOTALS 30"					
"	3	Runoff Totals on EXIT"				
"					4.520	hectare"
"					1.607	hectare"
"					35.553"	
" 19	EXIT"					


```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                        B:\Working\WRIGHTHAVEN HOMES\"
"          2401073 - 122025 079 Sideroad 19 Fergus\5 Work in Progress\Design
Calcs\2026-01-22 SWM Calcs"
"          Output filename:                    122025 Post 10yr.out"
"          Licensee name:                      "
"          Company                            "
"          Date & Time last used:              1/23/2026 at 10:29:51 AM"
" 31          TIME PARAMETERS"
"          5.000  Time Step"
"          240.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 32          STORM Chicago storm"
"          1  Chicago storm"
"          2327.596 Coefficient A"
"          19.500  Constant B"
"          0.894  Exponent C"
"          0.375  Fraction R"
"          180.000 Duration"
"          1.000  Time step multiplier"
"          Maximum intensity          132.071  mm/hr"
"          Total depth                61.359  mm"
"          6  010hyd  Hydrograph extension used in this file"
" 33          CATCHMENT 1000"
"          1  Triangular SCS"
"          1  Equal length"
"          2  Horton equation"
"          1000  EXTERNAL"
"          30.000 % Impervious"
"          3.400  Total Area"
"          150.000 Flow length"
"          2.000  Overland Slope"
"          2.380  Pervious Area"
"          150.000 Pervious length"
"          2.000  Pervious slope"
"          1.020  Impervious Area"
"          150.000 Impervious length"
"          2.000  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          200.000 Pervious Max.infiltration"
"          13.000  Pervious Min.infiltration"
"          0.250  Pervious Lag constant (hours)"
"          5.000  Pervious Depression storage"
"          0.013  Impervious Manning 'n'"
"          0.000  Impervious Max.infiltration"
"          0.000  Impervious Min.infiltration"
"          0.050  Impervious Lag constant (hours)"

```

"	1.500	Impervious Depression storage"				
"		0.321	0.000	0.000	0.000	c.m/sec"
"		Catchment 1000	Pervious	Impervious	Total Area	"
"		Surface Area	2.380	1.020	3.400	hectare"
"		Time of concentration	---	4.784	4.784	minutes"
"		Time to Centroid	0.000	88.560	88.560	minutes"
"		Rainfall depth	61.359	61.359	61.359	mm"
"		Rainfall volume	1460.35	625.86	2086.21	c.m"
"		Rainfall losses	61.359	1.930	43.531	mm"
"		Runoff depth	0.000	59.429	17.829	mm"
"		Runoff volume	0.00	606.17	606.17	c.m"
"		Runoff coefficient	0.000	0.969	0.291	"
"		Maximum flow	0.000	0.321	0.321	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.321	0.321	0.000	0.000"	
" 56		DIVERSION"				
"	1000	Node number"				
"	0.180	Overflow threshold"				
"	1.000	Required diverted fraction"				
"	0	Conduit type; 1=Pipe;2=Channel"				
"		Peak of diverted flow	0.141		c.m/sec"	
"		Volume of diverted flow	79.903		c.m"	
"		DIV01000.010hyd"				
"		Major flow to pond"				
"		0.321	0.321	0.180	0.000	c.m/sec"
" 40		HYDROGRAPH Combine 10"				
"	6	Combine "				
"	10	Node #"				
"		FLOW TO WETLAND"				
"		Maximum flow	0.180		c.m/sec"	
"		Hydrograph volume	526.270		c.m"	
"		0.321	0.321	0.180	0.180"	
" 40		HYDROGRAPH Start - New Tributary"				
"	2	Start - New Tributary"				
"		0.321	0.000	0.180	0.180"	
" 33		CATCHMENT 2000"				
"	1	Triangular SCS"				
"	1	Equal length"				
"	2	Horton equation"				
"	2000	SITE"				
"	70.000	% Impervious"				
"	0.740	Total Area"				
"	20.000	Flow length"				
"	2.000	Overland Slope"				
"	0.222	Pervious Area"				
"	20.000	Pervious length"				
"	2.000	Pervious slope"				
"	0.518	Impervious Area"				
"	20.000	Impervious length"				

"	2.000	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	200.000	Pervious Max.infiltration"				
"	13.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.013	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.050	Impervious Lag constant (hours)"				
"	1.500	Impervious Depression storage"				
"		0.167	0.000	0.180	0.180 c.m/sec"	
"		Catchment 2000	Pervious	Impervious	Total Area	"
"		Surface Area	0.222	0.518	0.740	hectare"
"		Time of concentration	---	1.428	1.428	minutes"
"		Time to Centroid	0.000	83.965	83.965	minutes"
"		Rainfall depth	61.359	61.359	61.359	mm"
"		Rainfall volume	136.22	317.84	454.06	c.m"
"		Rainfall losses	61.359	2.432	20.110	mm"
"		Runoff depth	0.000	58.927	41.249	mm"
"		Runoff volume	0.00	305.24	305.24	c.m"
"		Runoff coefficient	0.000	0.960	0.672	"
"		Maximum flow	0.000	0.167	0.167	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.167	0.167	0.180	0.180"	
" 33		CATCHMENT 2001"				
"	1	Triangular SCS"				
"	1	Equal length"				
"	2	Horton equation"				
"	2001	SITE SWM"				
"	10.000	% Impervious"				
"	0.100	Total Area"				
"	20.000	Flow length"				
"	2.000	Overland Slope"				
"	0.090	Pervious Area"				
"	20.000	Pervious length"				
"	2.000	Pervious slope"				
"	0.010	Impervious Area"				
"	20.000	Impervious length"				
"	2.000	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	200.000	Pervious Max.infiltration"				
"	13.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.013	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.050	Impervious Lag constant (hours)"				

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"      1.500  Impervious Depression storage"
"      0.003      0.167      0.180      0.180 c.m/sec"
"      Catchment 2001      Pervious      Impervious      Total Area  "
"      Surface Area      0.090      0.010      0.100      hectare"
"      Time of concentration      ---      1.428      1.428      minutes"
"      Time to Centroid      0.000      83.965      83.965      minutes"
"      Rainfall depth      61.359      61.359      61.359      mm"
"      Rainfall volume      55.22      6.14      61.36      c.m"
"      Rainfall losses      61.359      2.432      55.466      mm"
"      Runoff depth      0.000      58.927      5.893      mm"
"      Runoff volume      0.00      5.89      5.89      c.m"
"      Runoff coefficient      0.000      0.960      0.096      "
"      Maximum flow      0.000      0.003      0.003      c.m/sec"
" 40      HYDROGRAPH Add Runoff  "
"      4      Add Runoff  "
"      0.003      0.170      0.180      0.180"
" 40      HYDROGRAPH Copy to Outflow"
"      8      Copy to Outflow"
"      0.003      0.170      0.170      0.180"
" 40      HYDROGRAPH Combine      20"
"      6      Combine  "
" 20      Node #"
"      FLOW TO POND"
"      Maximum flow      0.170      c.m/sec"
"      Hydrograph volume      311.136      c.m"
"      0.003      0.170      0.170      0.170"
" 40      HYDROGRAPH Start - New Tributary"
"      2      Start - New Tributary"
"      0.003      0.000      0.170      0.170"
" 47      FILEI_0 Read/Open DIV01000.010hyd"
"      1      1=read/open; 2=write/save"
"      2      1=rainfall; 2=hydrograph"
"      2      1=runoff; 2=inflow; 3=outflow; 4=junction"
"      DIV01000.010hyd"
"      Major flow to pond"
"      Total volume      79.903      c.m"
"      Maximum flow      0.141      c.m/sec"
"      0.003      0.141      0.170      0.170 c.m/sec"
" 40      HYDROGRAPH Copy to Outflow"
"      8      Copy to Outflow"
"      0.003      0.141      0.141      0.170"
" 40      HYDROGRAPH Combine      20"
"      6      Combine  "
" 20      Node #"
"      FLOW TO POND"
"      Maximum flow      0.284      c.m/sec"
"      Hydrograph volume      391.039      c.m"
"      0.003      0.141      0.141      0.284"
" 40      HYDROGRAPH Confluence      20"
"      7      Confluence  "

```

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"      20   Node #"
"      FLOW TO POND"
"      Maximum flow           0.284   c.m/sec"
"      Hydrograph volume      391.039   c.m"
"      0.003   0.284   0.141   0.000"
" 54      POND DESIGN"
"      0.284   Current peak flow   c.m/sec"
"      0.001   Target outflow   c.m/sec"
"      391.0   Hydrograph volume   c.m"
"      22.   Number of stages"
"      0.000   Minimum water level   metre"
"      3.000   Maximum water level   metre"
"      0.000   Starting water level   metre"
"      0   Keep Design Data: 1 = True; 0 = False"
"      Level Discharge   Volume"
"      415.600   0.000   0.000"
"      415.650   0.00200   16.920"
"      415.700   0.00500   35.260"
"      415.750   0.00700   54.600"
"      415.800   0.00800   74.980"
"      415.850   0.00900   96.410"
"      415.900   0.01000   118.910"
"      415.950   0.06200   142.510"
"      416.000   0.06800   167.220"
"      416.050   0.07400   193.080"
"      416.100   0.08000   220.090"
"      416.150   0.08500   248.280"
"      416.200   0.09000   277.680"
"      416.250   0.09500   308.310"
"      416.300   0.09900   340.170"
"      416.350   0.1030   373.310"
"      416.400   0.1840   407.730"
"      416.450   0.3320   443.470"
"      416.500   0.5260   480.530"
"      416.550   0.7600   518.950"
"      416.600   1.028   558.740"
"      416.650   2.329   599.930"
"      Peak outflow           0.080   c.m/sec"
"      Maximum level           416.099   metre"
"      Maximum storage         219.612   c.m"
"      Centroidal lag          2.868   hours"
"      0.003   0.284   0.080   0.000 c.m/sec"
" 40      HYDROGRAPH   Combine   10"
"      6   Combine "
" 10      Node #"
"      FLOW TO WETLAND"
"      Maximum flow           0.258   c.m/sec"
"      Hydrograph volume      915.317   c.m"
"      0.003   0.284   0.080   0.258"
" 40      HYDROGRAPH Start - New Tributary"

```

"	2	Start - New Tributary"				
"		0.003	0.000	0.080	0.258"	
" 33		CATCHMENT 2002"				
"	1	Triangular SCS"				
"	1	Equal length"				
"	2	Horton equation"				
"	2002	SITE REAR"				
"	10.000	% Impervious"				
"	0.090	Total Area"				
"	40.000	Flow length"				
"	2.000	Overland Slope"				
"	0.081	Pervious Area"				
"	40.000	Pervious length"				
"	2.000	Pervious slope"				
"	0.009	Impervious Area"				
"	40.000	Impervious length"				
"	2.000	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	200.000	Pervious Max.infiltration"				
"	13.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.013	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.050	Impervious Lag constant (hours)"				
"	1.500	Impervious Depression storage"				
"		0.003	0.000	0.080	0.258 c.m/sec"	
"		Catchment 2002	Pervious	Impervious	Total Area	"
"		Surface Area	0.081	0.009	0.090	hectare"
"		Time of concentration	---	2.165	2.165	minutes"
"		Time to Centroid	0.000	84.991	84.991	minutes"
"		Rainfall depth	61.359	61.359	61.359	mm"
"		Rainfall volume	49.70	5.52	55.22	c.m"
"		Rainfall losses	61.359	2.499	55.473	mm"
"		Runoff depth	0.000	58.861	5.886	mm"
"		Runoff volume	0.00	5.30	5.30	c.m"
"		Runoff coefficient	0.000	0.959	0.096	"
"		Maximum flow	0.000	0.003	0.003	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.003	0.003	0.080	0.258"	
" 40		HYDROGRAPH Copy to Outflow"				
"	8	Copy to Outflow"				
"		0.003	0.003	0.003	0.258"	
" 40		HYDROGRAPH Combine 10"				
"	6	Combine "				
"	10	Node #"				
"		FLOW TO WETLAND"				
"		Maximum flow		0.260	c.m/sec"	

```

"          Hydrograph volume          920.615    c.m"
"          0.003      0.003      0.003      0.260"
" 40      HYDROGRAPH Confluence      10"
"          7 Confluence "
"          10 Node #"
"          FLOW TO WETLAND"
"          Maximum flow          0.260    c.m/sec"
"          Hydrograph volume      920.615    c.m"
"          0.003      0.260      0.003      0.000"
" 33      CATCHMENT 3000"
"          1 Triangular SCS"
"          1 Equal length"
"          2 Horton equation"
"          3000 SITE WETLAND"
"          10.000 % Impervious"
"          0.110 Total Area"
"          25.000 Flow length"
"          2.000 Overland Slope"
"          0.099 Pervious Area"
"          25.000 Pervious length"
"          2.000 Pervious slope"
"          0.011 Impervious Area"
"          25.000 Impervious length"
"          2.000 Impervious slope"
"          0.250 Pervious Manning 'n'"
"          200.000 Pervious Max.infiltration"
"          13.000 Pervious Min.infiltration"
"          0.250 Pervious Lag constant (hours)"
"          5.000 Pervious Depression storage"
"          0.013 Impervious Manning 'n'"
"          0.000 Impervious Max.infiltration"
"          0.000 Impervious Min.infiltration"
"          0.050 Impervious Lag constant (hours)"
"          1.500 Impervious Depression storage"
"          0.004      0.260      0.003      0.000 c.m/sec"
"          Catchment 3000      Pervious      Impervious Total Area "
"          Surface Area      0.099      0.011      0.110      hectare"
"          Time of concentration      ---      1.633      1.633      minutes"
"          Time to Centroid      0.000      84.203      84.203      minutes"
"          Rainfall depth      61.359      61.359      61.359      mm"
"          Rainfall volume      60.75      6.75      67.50      c.m"
"          Rainfall losses      61.359      2.329      55.456      mm"
"          Runoff depth      0.000      59.030      5.903      mm"
"          Runoff volume      0.00      6.49      6.49      c.m"
"          Runoff coefficient      0.000      0.962      0.096      "
"          Maximum flow      0.000      0.004      0.004      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"          4 Add Runoff "
"          0.004      0.262      0.003      0.000"
" 47      FILEI_0 Write/Save Flow from Site Rear.010hyd"

```

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"      2  1=read/open; 2=write/save"
"      2  1=rainfall; 2=hydrograph"
"      2  1=runoff; 2=inflow; 3=outflow; 4=junction"
"      Flow from Site Rear.010hyd"
"      Flow from site rear from catchment 3000 to external wetland"
"      Total volume          927.108      c.m"
"      Maximum flow          0.262      c.m/sec"
"      0.004      0.262      0.003      0.000 c.m/sec"
" 40      HYDROGRAPH Copy to Outflow"
"      8  Copy to Outflow"
"      0.004      0.262      0.262      0.000"
" 40      HYDROGRAPH Combine 30"
"      6  Combine "
"      30  Node #"
"      FLOW FROM SITE"
"      Maximum flow          0.262      c.m/sec"
"      Hydrograph volume     927.108      c.m"
"      0.004      0.262      0.262      0.262"
" 40      HYDROGRAPH Start - New Tributary"
"      2  Start - New Tributary"
"      0.004      0.000      0.262      0.262"
" 33      CATCHMENT 4000"
"      1  Triangular SCS"
"      1  Equal length"
"      2  Horton equation"
"      4000 SITE REMAIN"
"      60.000 % Impervious"
"      0.050 Total Area"
"      10.000 Flow length"
"      2.000 Overland Slope"
"      0.020 Pervious Area"
"      10.000 Pervious length"
"      2.000 Pervious slope"
"      0.030 Impervious Area"
"      10.000 Impervious length"
"      2.000 Impervious slope"
"      0.250 Pervious Manning 'n'"
"      200.000 Pervious Max.infiltration"
"      13.000 Pervious Min.infiltration"
"      0.250 Pervious Lag constant (hours)"
"      5.000 Pervious Depression storage"
"      0.013 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      0.000      0.262      0.262 c.m/sec"
"      Catchment 4000      Pervious      Impervious Total Area "
"      Surface Area      0.020      0.030      0.050      hectare"
"      Time of concentration      ---      0.942      0.942      minutes"

```


"	Time to Centroid	0.000	83.325	83.325	minutes"
"	Rainfall depth	61.359	61.359	61.359	mm"
"	Rainfall volume	12.27	18.41	30.68	c.m"
"	Rainfall losses	61.359	3.596	26.701	mm"
"	Runoff depth	0.000	57.763	34.658	mm"
"	Runoff volume	0.00	17.33	17.33	c.m"
"	Runoff coefficient	0.000	0.941	0.565	"
"	Maximum flow	0.000	0.010	0.010	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.010 0.010 0.262 0.262"				
" 33	CATCHMENT 4001"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	2 Horton equation"				
"	4001 SITE SINGLE"				
"	30.000 % Impervious"				
"	0.030 Total Area"				
"	10.000 Flow length"				
"	2.000 Overland Slope"				
"	0.021 Pervious Area"				
"	10.000 Pervious length"				
"	2.000 Pervious slope"				
"	0.009 Impervious Area"				
"	10.000 Impervious length"				
"	2.000 Impervious slope"				
"	0.250 Pervious Manning 'n'"				
"	200.000 Pervious Max.infiltration"				
"	13.000 Pervious Min.infiltration"				
"	0.250 Pervious Lag constant (hours)"				
"	5.000 Pervious Depression storage"				
"	0.013 Impervious Manning 'n'"				
"	0.000 Impervious Max.infiltration"				
"	0.000 Impervious Min.infiltration"				
"	0.050 Impervious Lag constant (hours)"				
"	1.500 Impervious Depression storage"				
"	0.003 0.010 0.262 0.262 c.m/sec"				
"	Catchment 4001 Pervious Impervious Total Area "				
"	Surface Area 0.021 0.009 0.030 hectare"				
"	Time of concentration --- 0.942 0.942 minutes"				
"	Time to Centroid 0.000 83.325 83.325 minutes"				
"	Rainfall depth 61.359 61.359 61.359 mm"				
"	Rainfall volume 12.89 5.52 18.41 c.m"				
"	Rainfall losses 61.359 3.596 44.030 mm"				
"	Runoff depth 0.000 57.763 17.329 mm"				
"	Runoff volume 0.00 5.20 5.20 c.m"				
"	Runoff coefficient 0.000 0.941 0.282 "				
"	Maximum flow 0.000 0.003 0.003 c.m/sec"				
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				

"		0.003	0.013	0.262	0.262"	
" 40	HYDROGRAPH Copy to Outflow"					
"	8	Copy to Outflow"				
"		0.003	0.013	0.013	0.262"	
" 40	HYDROGRAPH Combine 30"					
"	6	Combine "				
"	30	Node #"				
"	FLOW FROM SITE"					
"				0.269	c.m/sec"	
"				949.636	c.m"	
"		0.003	0.013	0.013	0.269"	
" 40	HYDROGRAPH Confluence 30"					
"	7	Confluence "				
"	30	Node #"				
"	FLOW FROM SITE"					
"				0.269	c.m/sec"	
"				949.636	c.m"	
"		0.003	0.269	0.013	0.000"	
" 38	START/RE-START TOTALS 30"					
"	3	Runoff Totals on EXIT"				
"					4.520	hectare"
"					1.607	hectare"
"					35.553"	
" 19	EXIT"					

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                        B:\Working\WRIGHTHAVEN HOMES\"
"          2401073 - 122025 079 Sideroad 19 Fergus\5 Work in Progress\Design
Calcs\2026-01-22 SWM Calcs"
"          Output filename:                    122025 Post 25yr.out"
"          Licensee name:                      "
"          Company                            "
"          Date & Time last used:              1/23/2026 at 10:33:47 AM"
" 31          TIME PARAMETERS"
"          5.000  Time Step"
"          240.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 32          STORM Chicago storm"
"          1  Chicago storm"
"          3701.648 Coefficient A"
"          25.500  Constant B"
"          0.937  Exponent C"
"          0.375  Fraction R"
"          180.000 Duration"
"          1.000  Time step multiplier"
"          Maximum intensity          149.252  mm/hr"
"          Total depth                75.581  mm"
"          6  025hyd  Hydrograph extension used in this file"
" 33          CATCHMENT 1000"
"          1  Triangular SCS"
"          1  Equal length"
"          2  Horton equation"
"          1000  EXTERNAL"
"          30.000  % Impervious"
"          3.400  Total Area"
"          150.000 Flow length"
"          2.000  Overland Slope"
"          2.380  Pervious Area"
"          150.000 Pervious length"
"          2.000  Pervious slope"
"          1.020  Impervious Area"
"          150.000 Impervious length"
"          2.000  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          200.000 Pervious Max.infiltration"
"          13.000  Pervious Min.infiltration"
"          0.250  Pervious Lag constant (hours)"
"          5.000  Pervious Depression storage"
"          0.013  Impervious Manning 'n'"
"          0.000  Impervious Max.infiltration"
"          0.000  Impervious Min.infiltration"
"          0.050  Impervious Lag constant (hours)"

```

"	1.500	Impervious Depression storage"			
"		0.369	0.000	0.000	0.000 c.m/sec"
"		Catchment 1000	Pervious	Impervious	Total Area "
"		Surface Area	2.380	1.020	3.400 hectare"
"		Time of concentration	62.069	4.556	10.609 minutes"
"		Time to Centroid	139.388	87.864	93.287 minutes"
"		Rainfall depth	75.581	75.581	75.581 mm"
"		Rainfall volume	1798.82	770.92	2569.75 c.m"
"		Rainfall losses	71.874	2.048	50.926 mm"
"		Runoff depth	3.707	73.533	24.655 mm"
"		Runoff volume	88.22	750.04	838.26 c.m"
"		Runoff coefficient	0.049	0.973	0.326 "
"		Maximum flow	0.020	0.369	0.369 c.m/sec"
" 40		HYDROGRAPH Add Runoff "			
"	4	Add Runoff "			
"		0.369	0.369	0.000	0.000"
" 56		DIVERSION"			
"	1000	Node number"			
"	0.180	Overflow threshold"			
"	1.000	Required diverted fraction"			
"	0	Conduit type; 1=Pipe;2=Channel"			
"		Peak of diverted flow	0.189	c.m/sec"	
"		Volume of diverted flow	127.202	c.m"	
"		DIV01000.025hyd"			
"		Major flow to pond"			
"		0.369	0.369	0.180	0.000 c.m/sec"
" 40		HYDROGRAPH	Combine	10"	
"	6	Combine "			
"	10	Node #"			
"		FLOW TO WETLAND"			
"		Maximum flow	0.180	c.m/sec"	
"		Hydrograph volume	711.059	c.m"	
"		0.369	0.369	0.180	0.180"
" 40		HYDROGRAPH Start - New Tributary"			
"	2	Start - New Tributary"			
"		0.369	0.000	0.180	0.180"
" 33		CATCHMENT 2000"			
"	1	Triangular SCS"			
"	1	Equal length"			
"	2	Horton equation"			
"	2000	SITE"			
"	70.000	% Impervious"			
"	0.740	Total Area"			
"	20.000	Flow length"			
"	2.000	Overland Slope"			
"	0.222	Pervious Area"			
"	20.000	Pervious length"			
"	2.000	Pervious slope"			
"	0.518	Impervious Area"			
"	20.000	Impervious length"			

"	2.000	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	200.000	Pervious Max.infiltration"				
"	13.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.013	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.050	Impervious Lag constant (hours)"				
"	1.500	Impervious Depression storage"				
"		0.191	0.000	0.180	0.180 c.m/sec"	
"		Catchment 2000	Pervious	Impervious	Total Area	"
"		Surface Area	0.222	0.518	0.740	hectare"
"		Time of concentration	18.528	1.360	1.726	minutes"
"		Time to Centroid	98.301	83.598	83.911	minutes"
"		Rainfall depth	75.581	75.581	75.581	mm"
"		Rainfall volume	167.79	391.51	559.30	c.m"
"		Rainfall losses	71.877	2.714	23.463	mm"
"		Runoff depth	3.704	72.866	52.118	mm"
"		Runoff volume	8.22	377.45	385.67	c.m"
"		Runoff coefficient	0.049	0.964	0.690	"
"		Maximum flow	0.005	0.191	0.191	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.191	0.191	0.180	0.180"	
" 33		CATCHMENT 2001"				
"	1	Triangular SCS"				
"	1	Equal length"				
"	2	Horton equation"				
"	2001	SITE SWM"				
"	10.000	% Impervious"				
"	0.100	Total Area"				
"	20.000	Flow length"				
"	2.000	Overland Slope"				
"	0.090	Pervious Area"				
"	20.000	Pervious length"				
"	2.000	Pervious slope"				
"	0.010	Impervious Area"				
"	20.000	Impervious length"				
"	2.000	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	200.000	Pervious Max.infiltration"				
"	13.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.013	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.050	Impervious Lag constant (hours)"				

```

"      1.500  Impervious Depression storage"
"      0.004      0.191      0.180      0.180 c.m/sec"
"      Catchment 2001      Pervious      Impervious      Total Area  "
"      Surface Area      0.090      0.010      0.100      hectare"
"      Time of concentration 18.528      1.360      6.749      minutes"
"      Time to Centroid 98.301      83.598      88.213      minutes"
"      Rainfall depth 75.581      75.581      75.581      mm"
"      Rainfall volume 68.02      7.56      75.58      c.m"
"      Rainfall losses 71.877      2.714      64.961      mm"
"      Runoff depth 3.704      72.866      10.620      mm"
"      Runoff volume 3.33      7.29      10.62      c.m"
"      Runoff coefficient 0.049      0.964      0.141      "
"      Maximum flow 0.002      0.004      0.004      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"      4      Add Runoff "
"      0.004      0.195      0.180      0.180"
" 40      HYDROGRAPH Copy to Outflow"
"      8      Copy to Outflow"
"      0.004      0.195      0.195      0.180"
" 40      HYDROGRAPH Combine 20"
"      6      Combine "
" 20      Node #"
"      FLOW TO POND"
"      Maximum flow      0.195      c.m/sec"
"      Hydrograph volume 396.291      c.m"
"      0.004      0.195      0.195      0.195"
" 40      HYDROGRAPH Start - New Tributary"
"      2      Start - New Tributary"
"      0.004      0.000      0.195      0.195"
" 47      FILEI_0 Read/Open DIV01000.025hyd"
"      1      1=read/open; 2=write/save"
"      2      1=rainfall; 2=hydrograph"
"      2      1=runoff; 2=inflow; 3=outflow; 4=junction"
"      DIV01000.025hyd"
"      Major flow to pond"
"      Total volume      127.202      c.m"
"      Maximum flow      0.189      c.m/sec"
"      0.004      0.189      0.195      0.195 c.m/sec"
" 40      HYDROGRAPH Copy to Outflow"
"      8      Copy to Outflow"
"      0.004      0.189      0.189      0.195"
" 40      HYDROGRAPH Combine 20"
"      6      Combine "
" 20      Node #"
"      FLOW TO POND"
"      Maximum flow      0.357      c.m/sec"
"      Hydrograph volume 523.492      c.m"
"      0.004      0.189      0.189      0.357"
" 40      HYDROGRAPH Confluence 20"
"      7      Confluence "

```

```

"          20   Node #"
"          FLOW TO POND"
"          Maximum flow          0.357   c.m/sec"
"          Hydrograph volume      523.492   c.m"
"          0.004   0.357   0.189   0.000"
" 54   POND DESIGN"
"          0.357   Current peak flow   c.m/sec"
"          0.001   Target outflow   c.m/sec"
"          523.5   Hydrograph volume   c.m"
"          22.   Number of stages"
"          0.000   Minimum water level   metre"
"          3.000   Maximum water level   metre"
"          0.000   Starting water level   metre"
"          0   Keep Design Data: 1 = True; 0 = False"
"          Level Discharge   Volume"
"          415.600   0.000   0.000"
"          415.650   0.00200   16.920"
"          415.700   0.00500   35.260"
"          415.750   0.00700   54.600"
"          415.800   0.00800   74.980"
"          415.850   0.00900   96.410"
"          415.900   0.01000   118.910"
"          415.950   0.06200   142.510"
"          416.000   0.06800   167.220"
"          416.050   0.07400   193.080"
"          416.100   0.08000   220.090"
"          416.150   0.08500   248.280"
"          416.200   0.09000   277.680"
"          416.250   0.09500   308.310"
"          416.300   0.09900   340.170"
"          416.350   0.1030   373.310"
"          416.400   0.1840   407.730"
"          416.450   0.3320   443.470"
"          416.500   0.5260   480.530"
"          416.550   0.7600   518.950"
"          416.600   1.028   558.740"
"          416.650   2.329   599.930"
"          Peak outflow          0.093   c.m/sec"
"          Maximum level          416.229   metre"
"          Maximum storage          295.524   c.m"
"          Centroidal lag          2.658   hours"
"          0.004   0.357   0.093   0.000 c.m/sec"
" 40   HYDROGRAPH   Combine   10"
"          6   Combine "
" 10   Node #"
"          FLOW TO WETLAND"
"          Maximum flow          0.273   c.m/sec"
"          Hydrograph volume          1236.573   c.m"
"          0.004   0.357   0.093   0.273"
" 40   HYDROGRAPH Start - New Tributary"

```

"	2	Start - New Tributary"				
"		0.004	0.000	0.093	0.273"	
" 33		CATCHMENT 2002"				
"	1	Triangular SCS"				
"	1	Equal length"				
"	2	Horton equation"				
"	2002	SITE REAR"				
"	10.000	% Impervious"				
"	0.090	Total Area"				
"	40.000	Flow length"				
"	2.000	Overland Slope"				
"	0.081	Pervious Area"				
"	40.000	Pervious length"				
"	2.000	Pervious slope"				
"	0.009	Impervious Area"				
"	40.000	Impervious length"				
"	2.000	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	200.000	Pervious Max.infiltration"				
"	13.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.013	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.050	Impervious Lag constant (hours)"				
"	1.500	Impervious Depression storage"				
"		0.003	0.000	0.093	0.273 c.m/sec"	
"		Catchment 2002	Pervious	Impervious	Total Area	"
"		Surface Area	0.081	0.009	0.090	hectare"
"		Time of concentration	28.084	2.061	10.223	minutes"
"		Time to Centroid	107.309	84.507	91.658	minutes"
"		Rainfall depth	75.581	75.581	75.581	mm"
"		Rainfall volume	61.22	6.80	68.02	c.m"
"		Rainfall losses	71.878	2.650	64.955	mm"
"		Runoff depth	3.703	72.931	10.626	mm"
"		Runoff volume	3.00	6.56	9.56	c.m"
"		Runoff coefficient	0.049	0.965	0.141	"
"		Maximum flow	0.001	0.003	0.003	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.003	0.003	0.093	0.273"	
" 40		HYDROGRAPH Copy to Outflow"				
"	8	Copy to Outflow"				
"		0.003	0.003	0.003	0.273"	
" 40		HYDROGRAPH Combine 10"				
"	6	Combine "				
"	10	Node #"				
"		FLOW TO WETLAND"				
"		Maximum flow		0.275	c.m/sec"	

"	Hydrograph volume	1246.136	c.m"
"	0.003 0.003 0.003	0.275"	
" 40	HYDROGRAPH Confluence	10"	
"	7 Confluence "		
"	10 Node #"		
"	FLOW TO WETLAND"		
"	Maximum flow	0.275	c.m/sec"
"	Hydrograph volume	1246.136	c.m"
"	0.003 0.275 0.003	0.000"	
" 33	CATCHMENT 3000"		
"	1 Triangular SCS"		
"	1 Equal length"		
"	2 Horton equation"		
"	3000 SITE WETLAND"		
"	10.000 % Impervious"		
"	0.110 Total Area"		
"	25.000 Flow length"		
"	2.000 Overland Slope"		
"	0.099 Pervious Area"		
"	25.000 Pervious length"		
"	2.000 Pervious slope"		
"	0.011 Impervious Area"		
"	25.000 Impervious length"		
"	2.000 Impervious slope"		
"	0.250 Pervious Manning 'n'"		
"	200.000 Pervious Max.infiltration"		
"	13.000 Pervious Min.infiltration"		
"	0.250 Pervious Lag constant (hours)"		
"	5.000 Pervious Depression storage"		
"	0.013 Impervious Manning 'n'"		
"	0.000 Impervious Max.infiltration"		
"	0.000 Impervious Min.infiltration"		
"	0.050 Impervious Lag constant (hours)"		
"	1.500 Impervious Depression storage"		
"	0.004 0.275 0.003 0.000	c.m/sec"	
"	Catchment 3000	Pervious	Impervious Total Area "
"	Surface Area	0.099	0.110 hectare"
"	Time of concentration	21.183	1.555 7.706 minutes"
"	Time to Centroid	100.821	83.836 89.159 minutes"
"	Rainfall depth	75.581	75.581 mm"
"	Rainfall volume	74.83	8.31 83.14 c.m"
"	Rainfall losses	71.875	2.523 64.940 mm"
"	Runoff depth	3.705	73.058 10.641 mm"
"	Runoff volume	3.67	8.04 11.70 c.m"
"	Runoff coefficient	0.049	0.967 0.141 "
"	Maximum flow	0.002	0.004 0.004 c.m/sec"
" 40	HYDROGRAPH Add Runoff "		
"	4 Add Runoff "		
"	0.004 0.278 0.003 0.000"		
" 47	FILEI_0 Write/Save Flow from Site Rear.025hyd"		

```

"      2  1=read/open; 2=write/save"
"      2  1=rainfall; 2=hydrograph"
"      2  1=runoff; 2=inflow; 3=outflow; 4=junction"
"      Flow from Site Rear.025hyd"
"      Flow from site rear from catchment 3000 to external wetland"
"      Total volume          1257.841      c.m"
"      Maximum flow          0.278      c.m/sec"
"      0.004      0.278      0.003      0.000 c.m/sec"
" 40      HYDROGRAPH Copy to Outflow"
"      8  Copy to Outflow"
"      0.004      0.278      0.278      0.000"
" 40      HYDROGRAPH Combine 30"
"      6  Combine "
"      30  Node #"
"      FLOW FROM SITE"
"      Maximum flow          0.278      c.m/sec"
"      Hydrograph volume     1257.841      c.m"
"      0.004      0.278      0.278      0.278"
" 40      HYDROGRAPH Start - New Tributary"
"      2  Start - New Tributary"
"      0.004      0.000      0.278      0.278"
" 33      CATCHMENT 4000"
"      1  Triangular SCS"
"      1  Equal length"
"      2  Horton equation"
"      4000 SITE REMAIN"
"      60.000 % Impervious"
"      0.050 Total Area"
"      10.000 Flow length"
"      2.000 Overland Slope"
"      0.020 Pervious Area"
"      10.000 Pervious length"
"      2.000 Pervious slope"
"      0.030 Impervious Area"
"      10.000 Impervious length"
"      2.000 Impervious slope"
"      0.250 Pervious Manning 'n'"
"      200.000 Pervious Max.infiltration"
"      13.000 Pervious Min.infiltration"
"      0.250 Pervious Lag constant (hours)"
"      5.000 Pervious Depression storage"
"      0.013 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      0.000      0.278      0.278 c.m/sec"
"      Catchment 4000      Pervious      Impervious Total Area "
"      Surface Area      0.020      0.030      0.050      hectare"
"      Time of concentration 12.224      0.897      1.276      minutes"

```

"	Time to Centroid	92.344	83.119	83.428	minutes"
"	Rainfall depth	75.581	75.581	75.581	mm"
"	Rainfall volume	15.12	22.67	37.79	c.m"
"	Rainfall losses	71.884	4.393	31.389	mm"
"	Runoff depth	3.697	71.188	44.191	mm"
"	Runoff volume	0.74	21.36	22.10	c.m"
"	Runoff coefficient	0.049	0.942	0.585	"
"	Maximum flow	0.001	0.011	0.011	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.011 0.011 0.278 0.278"				
" 33	CATCHMENT 4001"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	2 Horton equation"				
"	4001 SITE SINGLE"				
"	30.000 % Impervious"				
"	0.030 Total Area"				
"	10.000 Flow length"				
"	2.000 Overland Slope"				
"	0.021 Pervious Area"				
"	10.000 Pervious length"				
"	2.000 Pervious slope"				
"	0.009 Impervious Area"				
"	10.000 Impervious length"				
"	2.000 Impervious slope"				
"	0.250 Pervious Manning 'n'"				
"	200.000 Pervious Max.infiltration"				
"	13.000 Pervious Min.infiltration"				
"	0.250 Pervious Lag constant (hours)"				
"	5.000 Pervious Depression storage"				
"	0.013 Impervious Manning 'n'"				
"	0.000 Impervious Max.infiltration"				
"	0.000 Impervious Min.infiltration"				
"	0.050 Impervious Lag constant (hours)"				
"	1.500 Impervious Depression storage"				
"	0.003 0.011 0.278 0.278 c.m/sec"				
"	Catchment 4001 Pervious Impervious Total Area "				
"	Surface Area 0.021 0.009 0.030 hectare"				
"	Time of concentration 12.224 0.897 2.121 minutes"				
"	Time to Centroid 92.344 83.119 84.116 minutes"				
"	Rainfall depth 75.581 75.581 75.581 mm"				
"	Rainfall volume 15.87 6.80 22.67 c.m"				
"	Rainfall losses 71.884 4.393 51.637 mm"				
"	Runoff depth 3.697 71.188 23.944 mm"				
"	Runoff volume 0.78 6.41 7.18 c.m"				
"	Runoff coefficient 0.049 0.942 0.317 "				
"	Maximum flow 0.001 0.003 0.003 c.m/sec"				
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				

"		0.003	0.014	0.278	0.278"	
" 40	HYDROGRAPH Copy to Outflow"					
"	8	Copy to Outflow"				
"		0.003	0.014	0.014	0.278"	
" 40	HYDROGRAPH Combine 30"					
"	6	Combine "				
"	30	Node #"				
"	FLOW FROM SITE"					
"				0.285	c.m/sec"	
"				1287.120	c.m"	
"		0.003	0.014	0.014	0.285"	
" 40	HYDROGRAPH Confluence 30"					
"	7	Confluence "				
"	30	Node #"				
"	FLOW FROM SITE"					
"				0.285	c.m/sec"	
"				1287.120	c.m"	
"		0.003	0.285	0.014	0.000"	
" 38	START/RE-START TOTALS 30"					
"	3	Runoff Totals on EXIT"				
"					4.520	hectare"
"					1.607	hectare"
"					35.553"	
" 19	EXIT"					

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                        B:\Working\WRIGHTHAVEN HOMES\"
"          2401073 - 122025 079 Sideroad 19 Fergus\5 Work in Progress\Design
Calcs\2026-01-22 SWM Calcs"
"          Output filename:                    122025 Post 50yr.out"
"          Licensee name:                      "
"          Company                            "
"          Date & Time last used:              1/23/2026 at 10:35:41 AM"
" 31          TIME PARAMETERS"
"          5.000  Time Step"
"          240.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 32          STORM Chicago storm"
"          1  Chicago storm"
"          5089.418 Coefficient A"
"          30.000  Constant B"
"          0.967  Exponent C"
"          0.375  Fraction R"
"          180.000 Duration"
"          1.000  Time step multiplier"
"          Maximum intensity          162.242  mm/hr"
"          Total depth                86.737  mm"
"          6  050hyd  Hydrograph extension used in this file"
" 33          CATCHMENT 1000"
"          1  Triangular SCS"
"          1  Equal length"
"          2  Horton equation"
"          1000  EXTERNAL"
"          30.000  % Impervious"
"          3.400  Total Area"
"          150.000 Flow length"
"          2.000  Overland Slope"
"          2.380  Pervious Area"
"          150.000 Pervious length"
"          2.000  Pervious slope"
"          1.020  Impervious Area"
"          150.000 Impervious length"
"          2.000  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          200.000 Pervious Max.infiltration"
"          13.000  Pervious Min.infiltration"
"          0.250  Pervious Lag constant (hours)"
"          5.000  Pervious Depression storage"
"          0.013  Impervious Manning 'n'"
"          0.000  Impervious Max.infiltration"
"          0.000  Impervious Min.infiltration"
"          0.050  Impervious Lag constant (hours)"

```

"	1.500	Impervious Depression storage"			
"		0.408	0.000	0.000	0.000 c.m/sec"
"		Catchment 1000	Pervious	Impervious	Total Area "
"		Surface Area	2.380	1.020	3.400 hectare"
"		Time of concentration	40.814	4.406	13.919 minutes"
"		Time to Centroid	127.829	87.508	98.043 minutes"
"		Rainfall depth	86.737	86.737	86.737 mm"
"		Rainfall volume	2064.34	884.72	2949.05 c.m"
"		Rainfall losses	73.927	2.228	52.417 mm"
"		Runoff depth	12.810	84.509	34.320 mm"
"		Runoff volume	304.88	861.99	1166.88 c.m"
"		Runoff coefficient	0.148	0.974	0.396 "
"		Maximum flow	0.080	0.402	0.408 c.m/sec"
" 40		HYDROGRAPH Add Runoff "			
"	4	Add Runoff "			
"		0.408	0.408	0.000	0.000"
" 56		DIVERSION"			
"	1000	Node number"			
"	0.180	Overflow threshold"			
"	1.000	Required diverted fraction"			
"	0	Conduit type; 1=Pipe;2=Channel"			
"		Peak of diverted flow	0.228	c.m/sec"	
"		Volume of diverted flow	195.747	c.m"	
"		DIV01000.050hyd"			
"		Major flow to pond"			
"		0.408	0.408	0.180	0.000 c.m/sec"
" 40		HYDROGRAPH	Combine	10"	
"	6	Combine "			
"	10	Node #"			
"		FLOW TO WETLAND"			
"		Maximum flow	0.180	c.m/sec"	
"		Hydrograph volume	971.129	c.m"	
"		0.408	0.408	0.180	0.180"
" 40		HYDROGRAPH Start - New Tributary"			
"	2	Start - New Tributary"			
"		0.408	0.000	0.180	0.180"
" 33		CATCHMENT 2000"			
"	1	Triangular SCS"			
"	1	Equal length"			
"	2	Horton equation"			
"	2000	SITE"			
"	70.000	% Impervious"			
"	0.740	Total Area"			
"	20.000	Flow length"			
"	2.000	Overland Slope"			
"	0.222	Pervious Area"			
"	20.000	Pervious length"			
"	2.000	Pervious slope"			
"	0.518	Impervious Area"			
"	20.000	Impervious length"			

"	2.000	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	200.000	Pervious Max.infiltration"				
"	13.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.013	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.050	Impervious Lag constant (hours)"				
"	1.500	Impervious Depression storage"				
"		0.210	0.000	0.180	0.180 c.m/sec"	
"		Catchment 2000	Pervious	Impervious	Total Area	"
"		Surface Area	0.222	0.518	0.740	hectare"
"		Time of concentration	12.184	1.315	1.983	minutes"
"		Time to Centroid	96.622	83.427	84.238	minutes"
"		Rainfall depth	86.737	86.737	86.737	mm"
"		Rainfall volume	192.56	449.30	641.85	c.m"
"		Rainfall losses	73.938	2.974	24.263	mm"
"		Runoff depth	12.799	83.762	62.473	mm"
"		Runoff volume	28.41	433.89	462.30	c.m"
"		Runoff coefficient	0.148	0.966	0.720	"
"		Maximum flow	0.016	0.210	0.210	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.210	0.210	0.180	0.180"	
" 33		CATCHMENT 2001"				
"	1	Triangular SCS"				
"	1	Equal length"				
"	2	Horton equation"				
"	2001	SITE SWM"				
"	10.000	% Impervious"				
"	0.100	Total Area"				
"	20.000	Flow length"				
"	2.000	Overland Slope"				
"	0.090	Pervious Area"				
"	20.000	Pervious length"				
"	2.000	Pervious slope"				
"	0.010	Impervious Area"				
"	20.000	Impervious length"				
"	2.000	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	200.000	Pervious Max.infiltration"				
"	13.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.013	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.050	Impervious Lag constant (hours)"				

```

"      1.500  Impervious Depression storage"
"      0.008      0.210      0.180      0.180 c.m/sec"
"      Catchment 2001      Pervious      Impervious      Total Area  "
"      Surface Area      0.090      0.010      0.100      hectare"
"      Time of concentration 12.184      1.315      7.608      minutes"
"      Time to Centroid 96.622      83.427      91.067      minutes"
"      Rainfall depth 86.737      86.737      86.737      mm"
"      Rainfall volume 78.06      8.67      86.74      c.m"
"      Rainfall losses 73.938      2.974      66.841      mm"
"      Runoff depth 12.799      83.762      19.895      mm"
"      Runoff volume 11.52      8.38      19.90      c.m"
"      Runoff coefficient 0.148      0.966      0.229      "
"      Maximum flow 0.007      0.004      0.008      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"      4      Add Runoff "
"      0.008      0.214      0.180      0.180"
" 40      HYDROGRAPH Copy to Outflow"
"      8      Copy to Outflow"
"      0.008      0.214      0.214      0.180"
" 40      HYDROGRAPH Combine 20"
"      6      Combine "
" 20      Node #"
"      FLOW TO POND"
"      Maximum flow      0.214      c.m/sec"
"      Hydrograph volume 482.199      c.m"
"      0.008      0.214      0.214      0.214"
" 40      HYDROGRAPH Start - New Tributary"
"      2      Start - New Tributary"
"      0.008      0.000      0.214      0.214"
" 47      FILEI_0 Read/Open DIV01000.050hyd"
"      1      1=read/open; 2=write/save"
"      2      1=rainfall; 2=hydrograph"
"      2      1=runoff; 2=inflow; 3=outflow; 4=junction"
"      DIV01000.050hyd"
"      Major flow to pond"
"      Total volume      195.747      c.m"
"      Maximum flow      0.228      c.m/sec"
"      0.008      0.228      0.214      0.214 c.m/sec"
" 40      HYDROGRAPH Copy to Outflow"
"      8      Copy to Outflow"
"      0.008      0.228      0.228      0.214"
" 40      HYDROGRAPH Combine 20"
"      6      Combine "
" 20      Node #"
"      FLOW TO POND"
"      Maximum flow      0.417      c.m/sec"
"      Hydrograph volume 677.946      c.m"
"      0.008      0.228      0.228      0.417"
" 40      HYDROGRAPH Confluence 20"
"      7      Confluence "

```



```

"          20   Node #"
"          FLOW TO POND"
"          Maximum flow          0.417   c.m/sec"
"          Hydrograph volume     677.946   c.m"
"          0.008   0.417   0.228   0.000"
" 54   POND DESIGN"
"          0.417   Current peak flow   c.m/sec"
"          0.001   Target outflow   c.m/sec"
"          677.9   Hydrograph volume   c.m"
"          22.   Number of stages"
"          0.000   Minimum water level   metre"
"          3.000   Maximum water level   metre"
"          0.000   Starting water level   metre"
"          0   Keep Design Data: 1 = True; 0 = False"
"          Level Discharge   Volume"
"          415.600   0.000   0.000"
"          415.650   0.00200   16.920"
"          415.700   0.00500   35.260"
"          415.750   0.00700   54.600"
"          415.800   0.00800   74.980"
"          415.850   0.00900   96.410"
"          415.900   0.01000   118.910"
"          415.950   0.06200   142.510"
"          416.000   0.06800   167.220"
"          416.050   0.07400   193.080"
"          416.100   0.08000   220.090"
"          416.150   0.08500   248.280"
"          416.200   0.09000   277.680"
"          416.250   0.09500   308.310"
"          416.300   0.09900   340.170"
"          416.350   0.1030   373.310"
"          416.400   0.1840   407.730"
"          416.450   0.3320   443.470"
"          416.500   0.5260   480.530"
"          416.550   0.7600   518.950"
"          416.600   1.028   558.740"
"          416.650   2.329   599.930"
"          Peak outflow          0.130   c.m/sec"
"          Maximum level         416.367   metre"
"          Maximum storage        384.704   c.m"
"          Centroidal lag         2.564   hours"
"          0.008   0.417   0.130   0.000 c.m/sec"
" 40   HYDROGRAPH   Combine   10"
"          6   Combine "
" 10   Node #"
"          FLOW TO WETLAND"
"          Maximum flow          0.310   c.m/sec"
"          Hydrograph volume     1649.907   c.m"
"          0.008   0.417   0.130   0.310"
" 40   HYDROGRAPH Start - New Tributary"

```

"	2	Start - New Tributary"				
"		0.008	0.000	0.130	0.310"	
" 33		CATCHMENT 2002"				
"	1	Triangular SCS"				
"	1	Equal length"				
"	2	Horton equation"				
"	2002	SITE REAR"				
"	10.000	% Impervious"				
"	0.090	Total Area"				
"	40.000	Flow length"				
"	2.000	Overland Slope"				
"	0.081	Pervious Area"				
"	40.000	Pervious length"				
"	2.000	Pervious slope"				
"	0.009	Impervious Area"				
"	40.000	Impervious length"				
"	2.000	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	200.000	Pervious Max.infiltration"				
"	13.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.013	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.050	Impervious Lag constant (hours)"				
"	1.500	Impervious Depression storage"				
"		0.006	0.000	0.130	0.310 c.m/sec"	
"		Catchment 2002	Pervious	Impervious	Total Area	"
"		Surface Area	0.081	0.009	0.090	hectare"
"		Time of concentration	18.467	1.994	11.524	minutes"
"		Time to Centroid	103.450	84.269	95.366	minutes"
"		Rainfall depth	86.737	86.737	86.737	mm"
"		Rainfall volume	70.26	7.81	78.06	c.m"
"		Rainfall losses	73.937	2.813	66.825	mm"
"		Runoff depth	12.800	83.924	19.912	mm"
"		Runoff volume	10.37	7.55	17.92	c.m"
"		Runoff coefficient	0.148	0.968	0.230	"
"		Maximum flow	0.005	0.004	0.006	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.006	0.006	0.130	0.310"	
" 40		HYDROGRAPH Copy to Outflow"				
"	8	Copy to Outflow"				
"		0.006	0.006	0.006	0.310"	
" 40		HYDROGRAPH Combine 10"				
"	6	Combine "				
"	10	Node #"				
"		FLOW TO WETLAND"				
"		Maximum flow		0.316	c.m/sec"	

"		Hydrograph volume	1667.828	c.m"
"		0.006 0.006 0.006	0.316"	
" 40		HYDROGRAPH Confluence	10"	
"	7	Confluence "		
"	10	Node #"		
"		FLOW TO WETLAND"		
"		Maximum flow	0.316	c.m/sec"
"		Hydrograph volume	1667.828	c.m"
"		0.006 0.316 0.006	0.000"	
" 33		CATCHMENT 3000"		
"	1	Triangular SCS"		
"	1	Equal length"		
"	2	Horton equation"		
"	3000	SITE WETLAND"		
"	10.000	% Impervious"		
"	0.110	Total Area"		
"	25.000	Flow length"		
"	2.000	Overland Slope"		
"	0.099	Pervious Area"		
"	25.000	Pervious length"		
"	2.000	Pervious slope"		
"	0.011	Impervious Area"		
"	25.000	Impervious length"		
"	2.000	Impervious slope"		
"	0.250	Pervious Manning 'n'"		
"	200.000	Pervious Max.infiltration"		
"	13.000	Pervious Min.infiltration"		
"	0.250	Pervious Lag constant (hours)"		
"	5.000	Pervious Depression storage"		
"	0.013	Impervious Manning 'n'"		
"	0.000	Impervious Max.infiltration"		
"	0.000	Impervious Min.infiltration"		
"	0.050	Impervious Lag constant (hours)"		
"	1.500	Impervious Depression storage"		
"		0.009 0.316 0.006	0.000 c.m/sec"	
"		Catchment 3000	Pervious	Impervious Total Area "
"		Surface Area	0.099	0.011 0.110 hectare"
"		Time of concentration	13.929	1.504 8.689 minutes"
"		Time to Centroid	98.536	83.651 92.258 minutes"
"		Rainfall depth	86.737	86.737 mm"
"		Rainfall volume	85.87	9.54 95.41 c.m"
"		Rainfall losses	73.930	2.676 66.805 mm"
"		Runoff depth	12.806	84.061 19.932 mm"
"		Runoff volume	12.68	9.25 21.92 c.m"
"		Runoff coefficient	0.148	0.969 0.230 "
"		Maximum flow	0.007	0.004 0.009 c.m/sec"
" 40		HYDROGRAPH Add Runoff "		
"	4	Add Runoff "		
"		0.009 0.324 0.006	0.000"	
" 47		FILEI_0 Write/Save Flow from Site Rear.050hyd"		

```

"      2  1=read/open; 2=write/save"
"      2  1=rainfall; 2=hydrograph"
"      2  1=runoff; 2=inflow; 3=outflow; 4=junction"
"      Flow from Site Rear.050hyd"
"      Flow from site rear from catchment 3000 to external wetland"
"      Total volume          1689.754      c.m"
"      Maximum flow          0.324      c.m/sec"
"      0.009      0.324      0.006      0.000 c.m/sec"
" 40      HYDROGRAPH Copy to Outflow"
"      8  Copy to Outflow"
"      0.009      0.324      0.324      0.000"
" 40      HYDROGRAPH Combine 30"
"      6  Combine "
"      30  Node #"
"      FLOW FROM SITE"
"      Maximum flow          0.324      c.m/sec"
"      Hydrograph volume     1689.754      c.m"
"      0.009      0.324      0.324      0.324"
" 40      HYDROGRAPH Start - New Tributary"
"      2  Start - New Tributary"
"      0.009      0.000      0.324      0.324"
" 33      CATCHMENT 4000"
"      1  Triangular SCS"
"      1  Equal length"
"      2  Horton equation"
"      4000 SITE REMAIN"
"      60.000 % Impervious"
"      0.050 Total Area"
"      10.000 Flow length"
"      2.000 Overland Slope"
"      0.020 Pervious Area"
"      10.000 Pervious length"
"      2.000 Pervious slope"
"      0.030 Impervious Area"
"      10.000 Impervious length"
"      2.000 Impervious slope"
"      0.250 Pervious Manning 'n'"
"      200.000 Pervious Max.infiltration"
"      13.000 Pervious Min.infiltration"
"      0.250 Pervious Lag constant (hours)"
"      5.000 Pervious Depression storage"
"      0.013 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      0.324      0.324 c.m/sec"
"      Catchment 4000      Pervious      Impervious Total Area "
"      Surface Area      0.020      0.030      0.050      hectare"
"      Time of concentration 8.038      0.868      1.544      minutes"

```

"	Time to Centroid	92.171	83.030	83.892	minutes"
"	Rainfall depth	86.737	86.737	86.737	mm"
"	Rainfall volume	17.35	26.02	43.37	c.m"
"	Rainfall losses	73.979	5.087	32.644	mm"
"	Runoff depth	12.758	81.650	54.093	mm"
"	Runoff volume	2.55	24.49	27.05	c.m"
"	Runoff coefficient	0.147	0.941	0.624	"
"	Maximum flow	0.002	0.012	0.012	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.012 0.012 0.324 0.324"				
" 33	CATCHMENT 4001"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	2 Horton equation"				
"	4001 SITE SINGLE"				
"	30.000 % Impervious"				
"	0.030 Total Area"				
"	10.000 Flow length"				
"	2.000 Overland Slope"				
"	0.021 Pervious Area"				
"	10.000 Pervious length"				
"	2.000 Pervious slope"				
"	0.009 Impervious Area"				
"	10.000 Impervious length"				
"	2.000 Impervious slope"				
"	0.250 Pervious Manning 'n'"				
"	200.000 Pervious Max.infiltration"				
"	13.000 Pervious Min.infiltration"				
"	0.250 Pervious Lag constant (hours)"				
"	5.000 Pervious Depression storage"				
"	0.013 Impervious Manning 'n'"				
"	0.000 Impervious Max.infiltration"				
"	0.000 Impervious Min.infiltration"				
"	0.050 Impervious Lag constant (hours)"				
"	1.500 Impervious Depression storage"				
"	0.004 0.012 0.324 0.324 c.m/sec"				
"	Catchment 4001 Pervious Impervious Total Area "				
"	Surface Area 0.021 0.009 0.030 hectare"				
"	Time of concentration 8.038 0.868 2.784 minutes"				
"	Time to Centroid 92.171 83.030 85.472 minutes"				
"	Rainfall depth 86.737 86.737 86.737 mm"				
"	Rainfall volume 18.21 7.81 26.02 c.m"				
"	Rainfall losses 73.979 5.087 53.311 mm"				
"	Runoff depth 12.758 81.650 33.426 mm"				
"	Runoff volume 2.68 7.35 10.03 c.m"				
"	Runoff coefficient 0.147 0.941 0.385 "				
"	Maximum flow 0.002 0.004 0.004 c.m/sec"				
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				

"		0.004	0.016	0.324	0.324"	
" 40	HYDROGRAPH Copy to Outflow"					
"	8	Copy to Outflow"				
"		0.004	0.016	0.016	0.324"	
" 40	HYDROGRAPH Combine 30"					
"	6	Combine "				
"	30	Node #"				
"	FLOW FROM SITE"					
"				0.332	c.m/sec"	
"				1726.828	c.m"	
"		0.004	0.016	0.016	0.332"	
" 40	HYDROGRAPH Confluence 30"					
"	7	Confluence "				
"	30	Node #"				
"	FLOW FROM SITE"					
"				0.332	c.m/sec"	
"				1726.828	c.m"	
"		0.004	0.332	0.016	0.000"	
" 38	START/RE-START TOTALS 30"					
"	3	Runoff Totals on EXIT"				
"					4.520	hectare"
"					1.607	hectare"
"					35.553"	
" 19	EXIT"					

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                        B:\Working\WRIGHTHAVEN HOMES\"
"          2401073 - 122025 079 Sideroad 19 Fergus\5 Work in Progress\Design
Calcs\2026-01-22 SWM Calcs"
"          Output filename:                    122025 Post 100yr.out"
"          Licensee name:                      "
"          Company                            "
"          Date & Time last used:              1/22/2026 at 10:13:49 PM"
" 31          TIME PARAMETERS"
"          5.000  Time Step"
"          240.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 32          STORM Chicago storm"
"          1  Chicago storm"
"          6933.019 Coefficient A"
"          34.699 Constant B"
"          0.998 Exponent C"
"          0.375 Fraction R"
"          180.000 Duration"
"          1.000 Time step multiplier"
"          Maximum intensity          174.661  mm/hr"
"          Total depth                97.921  mm"
"          6  100hyd Hydrograph extension used in this file"
" 33          CATCHMENT 1000"
"          1  Triangular SCS"
"          1  Equal length"
"          2  Horton equation"
"          1000 EXTERNAL"
"          30.000 % Impervious"
"          3.400 Total Area"
"          150.000 Flow length"
"          2.000 Overland Slope"
"          2.380 Pervious Area"
"          150.000 Pervious length"
"          2.000 Pervious slope"
"          1.020 Impervious Area"
"          150.000 Impervious length"
"          2.000 Impervious slope"
"          0.250 Pervious Manning 'n'"
"          200.000 Pervious Max.infiltration"
"          13.000 Pervious Min.infiltration"
"          0.250 Pervious Lag constant (hours)"
"          5.000 Pervious Depression storage"
"          0.013 Impervious Manning 'n'"
"          0.000 Impervious Max.infiltration"
"          0.000 Impervious Min.infiltration"
"          0.050 Impervious Lag constant (hours)"

```

"	1.500	Impervious Depression storage"				
"		0.452	0.000	0.000	0.000	c.m/sec"
"		Catchment 1000	Pervious	Impervious	Total Area	"
"		Surface Area	2.380	1.020	3.400	hectare"
"		Time of concentration	35.783	4.278	15.451	minutes"
"		Time to Centroid	122.544	87.206	99.738	minutes"
"		Rainfall depth	97.921	97.921	97.921	mm"
"		Rainfall volume	2330.53	998.80	3329.33	c.m"
"		Rainfall losses	75.419	2.378	53.507	mm"
"		Runoff depth	22.502	95.544	44.415	mm"
"		Runoff volume	535.55	974.55	1510.10	c.m"
"		Runoff coefficient	0.230	0.976	0.454	"
"		Maximum flow	0.154	0.438	0.452	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.452	0.452	0.000	0.000"	
" 56		DIVERSION"				
"	1000	Node number"				
"	0.180	Overflow threshold"				
"	1.000	Required diverted fraction"				
"	0	Conduit type; 1=Pipe;2=Channel"				
"		Peak of diverted flow	0.272			c.m/sec"
"		Volume of diverted flow	390.591			c.m"
"		DIV01000.100hyd"				
"		Major flow to pond"				
"		0.452	0.452	0.180	0.000	c.m/sec"
" 40		HYDROGRAPH Combine 10"				
"	6	Combine "				
"	10	Node #"				
"		FLOW TO WETLAND"				
"		Maximum flow	0.180			c.m/sec"
"		Hydrograph volume	1119.505			c.m"
"		0.452	0.452	0.180	0.180"	
" 40		HYDROGRAPH Start - New Tributary"				
"	2	Start - New Tributary"				
"		0.452	0.000	0.180	0.180"	
" 33		CATCHMENT 2000"				
"	1	Triangular SCS"				
"	1	Equal length"				
"	2	Horton equation"				
"	2000	SITE"				
"	70.000	% Impervious"				
"	0.740	Total Area"				
"	20.000	Flow length"				
"	2.000	Overland Slope"				
"	0.222	Pervious Area"				
"	20.000	Pervious length"				
"	2.000	Pervious slope"				
"	0.518	Impervious Area"				
"	20.000	Impervious length"				

"	2.000	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	200.000	Pervious Max.infiltration"				
"	13.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.013	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.050	Impervious Lag constant (hours)"				
"	1.500	Impervious Depression storage"				
"		0.229	0.000	0.180	0.180 c.m/sec"	
"		Catchment 2000	Pervious	Impervious	Total Area	"
"		Surface Area	0.222	0.518	0.740	hectare"
"		Time of concentration	10.682	1.277	2.144	minutes"
"		Time to Centroid	95.910	83.299	84.462	minutes"
"		Rainfall depth	97.921	97.921	97.921	mm"
"		Rainfall volume	217.39	507.23	724.62	c.m"
"		Rainfall losses	75.489	3.248	24.920	mm"
"		Runoff depth	22.433	94.674	73.001	mm"
"		Runoff volume	49.80	490.41	540.21	c.m"
"		Runoff coefficient	0.229	0.967	0.746	"
"		Maximum flow	0.029	0.227	0.229	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.229	0.229	0.180	0.180"	
" 33		CATCHMENT 2001"				
"	1	Triangular SCS"				
"	1	Equal length"				
"	2	Horton equation"				
"	2001	SITE SWM"				
"	10.000	% Impervious"				
"	0.100	Total Area"				
"	20.000	Flow length"				
"	2.000	Overland Slope"				
"	0.090	Pervious Area"				
"	20.000	Pervious length"				
"	2.000	Pervious slope"				
"	0.010	Impervious Area"				
"	20.000	Impervious length"				
"	2.000	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	200.000	Pervious Max.infiltration"				
"	13.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.013	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.050	Impervious Lag constant (hours)"				

```

"      1.500  Impervious Depression storage"
"      0.014      0.229      0.180      0.180 c.m/sec"
"      Catchment 2001      Pervious      Impervious      Total Area  "
"      Surface Area      0.090      0.010      0.100      hectare"
"      Time of concentration 10.682      1.277      7.679      minutes"
"      Time to Centroid 95.910      83.299      91.884      minutes"
"      Rainfall depth 97.921      97.921      97.921      mm"
"      Rainfall volume 88.13      9.79      97.92      c.m"
"      Rainfall losses 75.489      3.248      68.265      mm"
"      Runoff depth 22.433      94.674      29.657      mm"
"      Runoff volume 20.19      9.47      29.66      c.m"
"      Runoff coefficient 0.229      0.967      0.303      "
"      Maximum flow 0.012      0.004      0.014      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"      4      Add Runoff "
"      0.014      0.234      0.180      0.180"
" 40      HYDROGRAPH Copy to Outflow"
"      8      Copy to Outflow"
"      0.014      0.234      0.234      0.180"
" 40      HYDROGRAPH Combine 20"
"      6      Combine "
" 20      Node #"
"      FLOW TO POND"
"      Maximum flow      0.234      c.m/sec"
"      Hydrograph volume 569.867      c.m"
"      0.014      0.234      0.234      0.234"
" 40      HYDROGRAPH Start - New Tributary"
"      2      Start - New Tributary"
"      0.014      0.000      0.234      0.234"
" 47      FILEI_0 Read/Open DIV01000.100hyd"
"      1      1=read/open; 2=write/save"
"      2      1=rainfall; 2=hydrograph"
"      2      1=runoff; 2=inflow; 3=outflow; 4=junction"
"      DIV01000.100hyd"
"      Major flow to pond"
"      Total volume      390.591      c.m"
"      Maximum flow      0.272      c.m/sec"
"      0.014      0.272      0.234      0.234 c.m/sec"
" 40      HYDROGRAPH Copy to Outflow"
"      8      Copy to Outflow"
"      0.014      0.272      0.272      0.234"
" 40      HYDROGRAPH Combine 20"
"      6      Combine "
" 20      Node #"
"      FLOW TO POND"
"      Maximum flow      0.487      c.m/sec"
"      Hydrograph volume 960.458      c.m"
"      0.014      0.272      0.272      0.487"
" 40      HYDROGRAPH Confluence 20"
"      7      Confluence "

```

```

"      20   Node #"
"      FLOW TO POND"
"      Maximum flow           0.487   c.m/sec"
"      Hydrograph volume      960.458   c.m"
"      0.014   0.487   0.272   0.000"
" 54      POND DESIGN"
"      0.487   Current peak flow   c.m/sec"
"      0.001   Target outflow      c.m/sec"
"      960.5   Hydrograph volume    c.m"
"      22.   Number of stages"
"      0.000   Minimum water level  metre"
"      3.000   Maximum water level  metre"
"      0.000   Starting water level metre"
"      0   Keep Design Data: 1 = True; 0 = False"
"      Level Discharge   Volume"
"      415.600   0.000   0.000"
"      415.650   0.00200   16.920"
"      415.700   0.00500   35.260"
"      415.750   0.00700   54.600"
"      415.800   0.00800   74.980"
"      415.850   0.00900   96.410"
"      415.900   0.01000   118.910"
"      415.950   0.06200   142.510"
"      416.000   0.06800   167.220"
"      416.050   0.07400   193.080"
"      416.100   0.08000   220.090"
"      416.150   0.08500   248.280"
"      416.200   0.09000   277.680"
"      416.250   0.09500   308.310"
"      416.300   0.09900   340.170"
"      416.350   0.1030   373.310"
"      416.400   0.1840   407.730"
"      416.450   0.3320   443.470"
"      416.500   0.5260   480.530"
"      416.550   0.7600   518.950"
"      416.600   1.028   558.740"
"      416.650   2.329   599.930"
"      Peak outflow           0.265   c.m/sec"
"      Maximum level          416.428   metre"
"      Maximum storage        427.775   c.m"
"      Centroidal lag         2.370   hours"
"      0.014   0.487   0.265   0.000 c.m/sec"
" 40      HYDROGRAPH   Combine   10"
"      6   Combine "
" 10      Node #"
"      FLOW TO WETLAND"
"      Maximum flow           0.445   c.m/sec"
"      Hydrograph volume      2079.475   c.m"
"      0.014   0.487   0.265   0.445"
" 40      HYDROGRAPH Start - New Tributary"

```

"	2	Start - New Tributary"				
"		0.014	0.000	0.265	0.445"	
" 33		CATCHMENT 2002"				
"	1	Triangular SCS"				
"	1	Equal length"				
"	2	Horton equation"				
"	2002	SITE REAR"				
"	10.000	% Impervious"				
"	0.090	Total Area"				
"	40.000	Flow length"				
"	2.000	Overland Slope"				
"	0.081	Pervious Area"				
"	40.000	Pervious length"				
"	2.000	Pervious slope"				
"	0.009	Impervious Area"				
"	40.000	Impervious length"				
"	2.000	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	200.000	Pervious Max.infiltration"				
"	13.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.013	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	0.000	0.265	0.445 c.m/sec"	
"		Catchment 2002	Pervious	Impervious	Total Area	"
"		Surface Area	0.081	0.009	0.090	hectare"
"		Time of concentration	16.190	1.936	11.623	minutes"
"		Time to Centroid	101.727	84.074	96.071	minutes"
"		Rainfall depth	97.921	97.921	97.921	mm"
"		Rainfall volume	79.32	8.81	88.13	c.m"
"		Rainfall losses	75.529	2.913	68.268	mm"
"		Runoff depth	22.392	95.009	29.654	mm"
"		Runoff volume	18.14	8.55	26.69	c.m"
"		Runoff coefficient	0.229	0.970	0.303	"
"		Maximum flow	0.009	0.004	0.010	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.010	0.010	0.265	0.445"	
" 40		HYDROGRAPH Copy to Outflow"				
"	8	Copy to Outflow"				
"		0.010	0.010	0.010	0.445"	
" 40		HYDROGRAPH Combine 10"				
"	6	Combine "				
"	10	Node #"				
"		FLOW TO WETLAND"				
"		Maximum flow		0.455	c.m/sec"	

"		Hydrograph volume	2106.162	c.m"
"		0.010 0.010 0.010	0.455"	
" 40		HYDROGRAPH Confluence	10"	
"	7	Confluence "		
"	10	Node #"		
"		FLOW TO WETLAND"		
"		Maximum flow	0.455	c.m/sec"
"		Hydrograph volume	2106.162	c.m"
"		0.010 0.455 0.010	0.000"	
" 33		CATCHMENT 3000"		
"	1	Triangular SCS"		
"	1	Equal length"		
"	2	Horton equation"		
"	3000	SITE WETLAND"		
"	10.000	% Impervious"		
"	0.110	Total Area"		
"	25.000	Flow length"		
"	2.000	Overland Slope"		
"	0.099	Pervious Area"		
"	25.000	Pervious length"		
"	2.000	Pervious slope"		
"	0.011	Impervious Area"		
"	25.000	Impervious length"		
"	2.000	Impervious slope"		
"	0.250	Pervious Manning 'n'"		
"	200.000	Pervious Max.infiltration"		
"	13.000	Pervious Min.infiltration"		
"	0.250	Pervious Lag constant (hours)"		
"	5.000	Pervious Depression storage"		
"	0.013	Impervious Manning 'n'"		
"	0.000	Impervious Max.infiltration"		
"	0.000	Impervious Min.infiltration"		
"	0.050	Impervious Lag constant (hours)"		
"	1.500	Impervious Depression storage"		
"		0.014 0.455 0.010	0.000 c.m/sec"	
"		Catchment 3000	Pervious	Impervious Total Area "
"		Surface Area	0.099	0.011 0.110 hectare"
"		Time of concentration	12.212	1.460 8.772 minutes"
"		Time to Centroid	97.540	83.516 93.053 minutes"
"		Rainfall depth	97.921	97.921 mm"
"		Rainfall volume	96.94	107.71 c.m"
"		Rainfall losses	75.471	2.861 68.210 mm"
"		Runoff depth	22.451	95.061 29.712 mm"
"		Runoff volume	22.23	10.46 32.68 c.m"
"		Runoff coefficient	0.229	0.971 0.303 "
"		Maximum flow	0.012	0.005 0.014 c.m/sec"
" 40		HYDROGRAPH Add Runoff "		
"	4	Add Runoff "		
"		0.014 0.469 0.010	0.000"	
" 47		FILEI_0 Write/Save Flow from Site Rear.100hyd"		

```

"      2  1=read/open; 2=write/save"
"      2  1=rainfall; 2=hydrograph"
"      2  1=runoff; 2=inflow; 3=outflow; 4=junction"
"      Flow from Site Rear.100hyd"
"      Flow from site rear from catchment 3000 to external wetland"
"      Total volume                2138.845      c.m"
"      Maximum flow                0.469      c.m/sec"
"      0.014      0.469      0.010      0.000 c.m/sec"
" 40      HYDROGRAPH Copy to Outflow"
"      8  Copy to Outflow"
"      0.014      0.469      0.469      0.000"
" 40      HYDROGRAPH Combine 30"
"      6  Combine "
"      30  Node #"
"      FLOW FROM SITE"
"      Maximum flow                0.469      c.m/sec"
"      Hydrograph volume          2138.845      c.m"
"      0.014      0.469      0.469      0.469"
" 40      HYDROGRAPH Start - New Tributary"
"      2  Start - New Tributary"
"      0.014      0.000      0.469      0.469"
" 33      CATCHMENT 4000"
"      1  Triangular SCS"
"      1  Equal length"
"      2  Horton equation"
"      4000 SITE REMAIN"
"      60.000 % Impervious"
"      0.050 Total Area"
"      10.000 Flow length"
"      2.000 Overland Slope"
"      0.020 Pervious Area"
"      10.000 Pervious length"
"      2.000 Pervious slope"
"      0.030 Impervious Area"
"      10.000 Impervious length"
"      2.000 Impervious slope"
"      0.250 Pervious Manning 'n'"
"      200.000 Pervious Max.infiltration"
"      13.000 Pervious Min.infiltration"
"      0.250 Pervious Lag constant (hours)"
"      5.000 Pervious Depression storage"
"      0.013 Impervious Manning 'n'"
"      0.000 Impervious Max.infiltration"
"      0.000 Impervious Min.infiltration"
"      0.050 Impervious Lag constant (hours)"
"      1.500 Impervious Depression storage"
"      0.013      0.000      0.469      0.469 c.m/sec"
"      Catchment 4000      Pervious      Impervious Total Area "
"      Surface Area      0.020      0.030      0.050      hectare"
"      Time of concentration 7.047      0.843      1.705      minutes"

```

"	Time to Centroid	92.094	82.965	84.233	minutes"
"	Rainfall depth	97.921	97.921	97.921	mm"
"	Rainfall volume	19.58	29.38	48.96	c.m"
"	Rainfall losses	75.635	5.873	33.778	mm"
"	Runoff depth	22.286	92.048	64.143	mm"
"	Runoff volume	4.46	27.61	32.07	c.m"
"	Runoff coefficient	0.228	0.940	0.655	"
"	Maximum flow	0.003	0.013	0.013	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.013 0.013 0.469 0.469"				
" 33	CATCHMENT 4001"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	2 Horton equation"				
"	4001 SITE SINGLE"				
"	30.000 % Impervious"				
"	0.030 Total Area"				
"	10.000 Flow length"				
"	2.000 Overland Slope"				
"	0.021 Pervious Area"				
"	10.000 Pervious length"				
"	2.000 Pervious slope"				
"	0.009 Impervious Area"				
"	10.000 Impervious length"				
"	2.000 Impervious slope"				
"	0.250 Pervious Manning 'n'"				
"	200.000 Pervious Max.infiltration"				
"	13.000 Pervious Min.infiltration"				
"	0.250 Pervious Lag constant (hours)"				
"	5.000 Pervious Depression storage"				
"	0.013 Impervious Manning 'n'"				
"	0.000 Impervious Max.infiltration"				
"	0.000 Impervious Min.infiltration"				
"	0.050 Impervious Lag constant (hours)"				
"	1.500 Impervious Depression storage"				
"	0.006 0.013 0.469 0.469 c.m/sec"				
"	Catchment 4001 Pervious Impervious Total Area "				
"	Surface Area 0.021 0.009 0.030 hectare"				
"	Time of concentration 7.047 0.843 3.082 minutes"				
"	Time to Centroid 92.094 82.965 86.260 minutes"				
"	Rainfall depth 97.921 97.921 97.921 mm"				
"	Rainfall volume 20.56 8.81 29.38 c.m"				
"	Rainfall losses 75.635 5.873 54.707 mm"				
"	Runoff depth 22.286 92.048 43.215 mm"				
"	Runoff volume 4.68 8.28 12.96 c.m"				
"	Runoff coefficient 0.228 0.940 0.441 "				
"	Maximum flow 0.003 0.004 0.006 c.m/sec"				
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				

"		0.006	0.017	0.469	0.469"	
" 40	HYDROGRAPH Copy to Outflow"					
"	8	Copy to Outflow"				
"		0.006	0.017	0.017	0.469"	
" 40	HYDROGRAPH Combine 30"					
"	6	Combine "				
"	30	Node #"				
"	FLOW FROM SITE"					
"				0.483	c.m/sec"	
"				2183.881	c.m"	
"		0.006	0.017	0.017	0.483"	
" 40	HYDROGRAPH Confluence 30"					
"	7	Confluence "				
"	30	Node #"				
"	FLOW FROM SITE"					
"				0.483	c.m/sec"	
"				2183.880	c.m"	
"		0.006	0.483	0.017	0.000"	
" 38	START/RE-START TOTALS 30"					
"	3	Runoff Totals on EXIT"				
"					4.520	hectare"
"					1.607	hectare"
"					35.553"	
" 19	EXIT"					


```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                        B:\Working\WRIGHTHAVEN HOMES\"
"          2401073 - 122025 079 Sideroad 19 Fergus\5 Work in Progress\Design
Calcs\2026-01-22 SWM Calcs"
"          Output filename:                    122025 Post REG.out"
"          Licensee name:                      "
"          Company                            "
"          Date & Time last used:              1/23/2026 at 10:38:13 AM"
" 31          TIME PARAMETERS"
"          60.000  Time Step"
"          2880.000  Max. Storm length"
"          5760.000  Max. Hydrograph"
" 32          STORM Historic"
"          5  Historic"
"          2880.000  Duration"
"          48.000  Rainfall intensity values"
"                  2.028      2.028      2.028      2.028      2.028"
"                  2.028      2.028      2.028      2.028      2.028"
"                  2.028      2.028      2.028      2.028      2.028"
"                  2.028      2.028      2.028      2.028      2.028"
"                  2.028      2.028      2.028      2.028      2.028"
"                  2.028      2.026      2.026      2.026      2.028"
"                  2.026      6.000      4.000      6.000      13.000"
"                  17.000      13.000      23.000      13.000      13.000"
"                  53.000      38.000      13.000"
"          Maximum intensity                    53.000  mm/hr"
"          Total depth                          285.000  mm"
"          6  200hyd  Hydrograph extension used in this file"
" 33          CATCHMENT 1000"
"          1  Triangular SCS"
"          1  Equal length"
"          2  Horton equation"
"          1000  EXTERNAL"
"          30.000  % Impervious"
"          3.400  Total Area"
"          150.000  Flow length"
"          2.000  Overland Slope"
"          2.380  Pervious Area"
"          150.000  Pervious length"
"          2.000  Pervious slope"
"          1.020  Impervious Area"
"          150.000  Impervious length"
"          2.000  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          200.000  Pervious Max.infiltration"
"          13.000  Pervious Min.infiltration"

```

"	0.250	Pervious Lag constant (hours)"			
"	5.000	Pervious Depression storage"			
"	0.013	Impervious Manning 'n'"			
"	0.000	Impervious Max.infiltration"			
"	0.000	Impervious Min.infiltration"			
"	0.050	Impervious Lag constant (hours)"			
"	1.500	Impervious Depression storage"			
"		0.283	0.000	0.000	0.000 c.m/sec"
"		Catchment 1000	Pervious	Impervious	Total Area "
"		Surface Area	2.380	1.020	3.400 hectare"
"		Time of concentration	45.467	6.893	21.943 minutes"
"		Time to Centroid	2801.985	2242.481	2460.773 minutes"
"		Rainfall depth	285.000	285.000	285.000 mm"
"		Rainfall volume	6783.00	2907.00	9690.00 c.m"
"		Rainfall losses	213.498	24.215	156.713 mm"
"		Runoff depth	71.502	260.785	128.287 mm"
"		Runoff volume	1701.75	2660.01	4361.76 c.m"
"		Runoff coefficient	0.251	0.915	0.450 "
"		Maximum flow	0.193	0.129	0.283 c.m/sec"
" 40		HYDROGRAPH Add Runoff "			
"	4	Add Runoff "			
"		0.283	0.283	0.000	0.000"
" 56		DIVERSION"			
"	1000	Node number"			
"	0.180	Overflow threshold"			
"	1.000	Required diverted fraction"			
"	0	Conduit type; 1=Pipe;2=Channel"			
"		Peak of diverted flow	0.103		c.m/sec"
"		Volume of diverted flow	577.870		c.m"
"		DIV01000.200hyd"			
"		Major flow to pond"			
"		0.283	0.283	0.180	0.000 c.m/sec"
" 40		HYDROGRAPH Combine 10"			
"	6	Combine "			
"	10	Node #"			
"		FLOW TO WETLAND"			
"		Maximum flow	0.180		c.m/sec"
"		Hydrograph volume	3783.890		c.m"
"		0.283	0.283	0.180	0.180"
" 40		HYDROGRAPH Start - New Tributary"			
"	2	Start - New Tributary"			
"		0.283	0.000	0.180	0.180"
" 33		CATCHMENT 2000"			
"	1	Triangular SCS"			
"	1	Equal length"			
"	2	Horton equation"			
"	2000	SITE"			
"	70.000	% Impervious"			
"	0.740	Total Area"			
"	20.000	Flow length"			

"	2.000	Overland Slope"				
"	0.222	Pervious Area"				
"	20.000	Pervious length"				
"	2.000	Pervious slope"				
"	0.518	Impervious Area"				
"	20.000	Impervious length"				
"	2.000	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	200.000	Pervious Max.infiltration"				
"	13.000	Pervious Min.infiltration"				
"	0.250	Pervious Lag constant (hours)"				
"	5.000	Pervious Depression storage"				
"	0.013	Impervious Manning 'n'"				
"	0.000	Impervious Max.infiltration"				
"	0.000	Impervious Min.infiltration"				
"	0.050	Impervious Lag constant (hours)"				
"	1.500	Impervious Depression storage"				
"		0.085	0.000	0.180	0.180 c.m/sec"	
"		Catchment 2000	Pervious	Impervious	Total Area	"
"		Surface Area	0.222	0.518	0.740	hectare"
"		Time of concentration	13.573	2.058	3.338	minutes"
"		Time to Centroid	2773.882	2272.256	2328.042	minutes"
"		Rainfall depth	285.000	285.000	285.000	mm"
"		Rainfall volume	632.70	1476.30	2109.00	c.m"
"		Rainfall losses	213.743	40.931	92.775	mm"
"		Runoff depth	71.257	244.069	192.225	mm"
"		Runoff volume	158.19	1264.28	1422.47	c.m"
"		Runoff coefficient	0.250	0.856	0.674	"
"		Maximum flow	0.018	0.067	0.085	c.m/sec"
" 40		HYDROGRAPH Add Runoff "				
"	4	Add Runoff "				
"		0.085	0.085	0.180	0.180"	
" 33		CATCHMENT 2001"				
"	1	Triangular SCS"				
"	1	Equal length"				
"	2	Horton equation"				
"	2001	SITE SWM"				
"	10.000	% Impervious"				
"	0.100	Total Area"				
"	20.000	Flow length"				
"	2.000	Overland Slope"				
"	0.090	Pervious Area"				
"	20.000	Pervious length"				
"	2.000	Pervious slope"				
"	0.010	Impervious Area"				
"	20.000	Impervious length"				
"	2.000	Impervious slope"				
"	0.250	Pervious Manning 'n'"				
"	200.000	Pervious Max.infiltration"				
"	13.000	Pervious Min.infiltration"				

```

"      0.250   Pervious Lag constant (hours)"
"      5.000   Pervious Depression storage"
"      0.013   Impervious Manning 'n'"
"      0.000   Impervious Max.infiltration"
"      0.000   Impervious Min.infiltration"
"      0.050   Impervious Lag constant (hours)"
"      1.500   Impervious Depression storage"
"              0.009      0.085      0.180      0.180 c.m/sec"
"      Catchment 2001      Pervious      Impervious Total Area "
"      Surface Area      0.090      0.010      0.100      hectare"
"      Time of concentration 13.573      2.058      10.398      minutes"
"      Time to Centroid      2773.882      2272.256      2635.601      minutes"
"      Rainfall depth      285.000      285.000      285.000      mm"
"      Rainfall volume      256.50      28.50      285.00      c.m"
"      Rainfall losses      213.743      40.931      196.462      mm"
"      Runoff depth      71.257      244.069      88.538      mm"
"      Runoff volume      64.13      24.41      88.54      c.m"
"      Runoff coefficient      0.250      0.856      0.311      "
"      Maximum flow      0.007      0.001      0.009      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"      4      Add Runoff "
"              0.009      0.093      0.180      0.180"
" 40      HYDROGRAPH Copy to Outflow"
"      8      Copy to Outflow"
"              0.009      0.093      0.093      0.180"
" 40      HYDROGRAPH Combine      20"
"      6      Combine "
" 20      Node #"
"      FLOW TO POND"
"      Maximum flow      0.093      c.m/sec"
"      Hydrograph volume      1511.006      c.m"
"              0.009      0.093      0.093      0.093"
" 40      HYDROGRAPH Start - New Tributary"
"      2      Start - New Tributary"
"              0.009      0.000      0.093      0.093"
" 47      FILEI_0 Read/Open DIV01000.200hyd"
"      1      1=read/open; 2=write/save"
"      2      1=rainfall; 2=hydrograph"
"      2      1=runoff; 2=inflow; 3=outflow; 4=junction"
"      DIV01000.200hyd"
"      Major flow to pond"
"      Total volume      577.870      c.m"
"      Maximum flow      0.103      c.m/sec"
"              0.009      0.103      0.093      0.093 c.m/sec"
" 40      HYDROGRAPH Copy to Outflow"
"      8      Copy to Outflow"
"              0.009      0.103      0.103      0.093"
" 40      HYDROGRAPH Combine      20"
"      6      Combine "
" 20      Node #"

```

```

"          FLOW TO POND"
"          Maximum flow          0.174      c.m/sec"
"          Hydrograph volume      2088.876    c.m"
"              0.009      0.103      0.103      0.174"
" 40      HYDROGRAPH Confluence  20"
"          7 Confluence "
"          20 Node #"
"          FLOW TO POND"
"          Maximum flow          0.174      c.m/sec"
"          Hydrograph volume      2088.876    c.m"
"              0.009      0.174      0.103      0.000"
" 54      POND DESIGN"
"          0.174 Current peak flow  c.m/sec"
"          0.001 Target outflow  c.m/sec"
"          2088.9 Hydrograph volume  c.m"
"          22. Number of stages"
"          0.000 Minimum water level  metre"
"          3.000 Maximum water level  metre"
"          0.000 Starting water level  metre"
"          0 Keep Design Data: 1 = True; 0 = False"
"              Level Discharge  Volume"
"          415.600      0.000      0.000"
"          415.650      0.00200      16.920"
"          415.700      0.00500      35.260"
"          415.750      0.00700      54.600"
"          415.800      0.00800      74.980"
"          415.850      0.00900      96.410"
"          415.900      0.01000     118.910"
"          415.950      0.06200     142.510"
"          416.000      0.06800     167.220"
"          416.050      0.07400     193.080"
"          416.100      0.08000     220.090"
"          416.150      0.08500     248.280"
"          416.200      0.09000     277.680"
"          416.250      0.09500     308.310"
"          416.300      0.09900     340.170"
"          416.350      0.1030      373.310"
"          416.400      0.1840     407.730"
"          416.450      0.3320     443.470"
"          416.500      0.5260     480.530"
"          416.550      0.7600     518.950"
"          416.600      1.028      558.740"
"          416.650      2.329      599.930"
"          Peak outflow          0.169      c.m/sec"
"          Maximum level          416.391    metre"
"          Maximum storage          401.516    c.m"
"          Centroidal lag          42.480    hours"
"              0.009      0.174      0.169      0.000 c.m/sec"
" 40      HYDROGRAPH Combine  10"
"          6 Combine "

```

```

"      10 Node #"
"      FLOW TO WETLAND"
"      Maximum flow          0.349    c.m/sec"
"      Hydrograph volume     5882.455  c.m"
"      0.009    0.174    0.169    0.349"
" 40 HYDROGRAPH Start - New Tributary"
"      2 Start - New Tributary"
"      0.009    0.000    0.169    0.349"
" 33 CATCHMENT 2002"
"      1 Triangular SCS"
"      1 Equal length"
"      2 Horton equation"
"      2002 SITE REAR"
"      10.000 % Impervious"
"      0.090 Total Area"
"      40.000 Flow length"
"      2.000 Overland Slope"
"      0.081 Pervious Area"
"      40.000 Pervious length"
"      2.000 Pervious slope"
"      0.009 Impervious Area"
"      40.000 Impervious length"
"      2.000 Impervious slope"
"      0.250 Pervious Manning 'n'"
"      200.000 Pervious Max.infiltration"
"      13.000 Pervious Min.infiltration"
"      0.250 Pervious Lag constant (hours)"
"      5.000 Pervious Depression storage"
"      0.013 Impervious Manning 'n'"
"      0.000 Impervious Max.infiltration"
"      0.000 Impervious Min.infiltration"
"      0.050 Impervious Lag constant (hours)"
"      1.500 Impervious Depression storage"
"      0.007    0.000    0.169    0.349 c.m/sec"
"      Catchment 2002 Pervious Impervious Total Area "
"      Surface Area    0.081    0.009    0.090    hectare"
"      Time of concentration 20.572    3.119    15.843    minutes"
"      Time to Centroid 2782.073    2246.001    2636.802    minutes"
"      Rainfall depth    285.000    285.000    285.000    mm"
"      Rainfall volume    230.85    25.65    256.50    c.m"
"      Rainfall losses    211.540    39.240    194.310    mm"
"      Runoff depth    73.460    245.760    90.690    mm"
"      Runoff volume    59.50    22.12    81.62    c.m"
"      Runoff coefficient    0.258    0.862    0.318    "
"      Maximum flow    0.006    0.001    0.007    c.m/sec"
" 40 HYDROGRAPH Add Runoff "
"      4 Add Runoff "
"      0.007    0.007    0.169    0.349"
" 40 HYDROGRAPH Copy to Outflow"
"      8 Copy to Outflow"

```

"		0.007	0.007	0.007	0.349"
" 40	HYDROGRAPH	Combine	10"		
"	6	Combine "			
"	10	Node #"			
"		FLOW TO WETLAND"			
"		Maximum flow	0.356	c.m/sec"	
"		Hydrograph volume	5964.076	c.m"	
"		0.007	0.007	0.007	0.356"
" 40	HYDROGRAPH	Confluence	10"		
"	7	Confluence "			
"	10	Node #"			
"		FLOW TO WETLAND"			
"		Maximum flow	0.356	c.m/sec"	
"		Hydrograph volume	5964.076	c.m"	
"		0.007	0.356	0.007	0.000"
" 33	CATCHMENT	3000"			
"	1	Triangular SCS"			
"	1	Equal length"			
"	2	Horton equation"			
"	3000	SITE WETLAND"			
"	10.000	% Impervious"			
"	0.110	Total Area"			
"	25.000	Flow length"			
"	2.000	Overland Slope"			
"	0.099	Pervious Area"			
"	25.000	Pervious length"			
"	2.000	Pervious slope"			
"	0.011	Impervious Area"			
"	25.000	Impervious length"			
"	2.000	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	200.000	Pervious Max.infiltration"			
"	13.000	Pervious Min.infiltration"			
"	0.250	Pervious Lag constant (hours)"			
"	5.000	Pervious Depression storage"			
"	0.013	Impervious Manning 'n'"			
"	0.000	Impervious Max.infiltration"			
"	0.000	Impervious Min.infiltration"			
"	0.050	Impervious Lag constant (hours)"			
"	1.500	Impervious Depression storage"			
"		0.009	0.356	0.007	0.000 c.m/sec"
"	Catchment 3000	Pervious	Impervious	Total Area	"
"	Surface Area	0.099	0.011	0.110	hectare"
"	Time of concentration	15.517	2.352	11.921	minutes"
"	Time to Centroid	2776.514	2263.863	2636.466	minutes"
"	Rainfall depth	285.000	285.000	285.000	mm"
"	Rainfall volume	282.15	31.35	313.50	c.m"
"	Rainfall losses	212.698	40.417	195.470	mm"
"	Runoff depth	72.302	244.583	89.530	mm"
"	Runoff volume	71.58	26.90	98.48	c.m"

```

"          Runoff coefficient      0.254      0.858      0.314      "
"          Maximum flow            0.008      0.001      0.009      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"          4      Add Runoff "
"                  0.009      0.365      0.007      0.000"
" 47      FILEI_0 Write/Save Flow from Site Rear.200hyd"
"          2      1=read/open; 2=write/save"
"          2      1=rainfall; 2=hydrograph"
"          2      1=runoff; 2=inflow; 3=outflow; 4=junction"
"          Flow from Site Rear.200hyd"
"          Flow from site rear from catchment 3000 to external wetland"
"          Total volume            6062.559      c.m"
"          Maximum flow            0.365      c.m/sec"
"                  0.009      0.365      0.007      0.000 c.m/sec"
" 40      HYDROGRAPH Copy to Outflow"
"          8      Copy to Outflow"
"                  0.009      0.365      0.365      0.000"
" 40      HYDROGRAPH Combine 30"
"          6      Combine "
"          30     Node #"
"          FLOW FROM SITE"
"          Maximum flow            0.365      c.m/sec"
"          Hydrograph volume       6062.559      c.m"
"                  0.009      0.365      0.365      0.365"
" 40      HYDROGRAPH Start - New Tributary"
"          2      Start - New Tributary"
"                  0.009      0.000      0.365      0.365"
" 33      CATCHMENT 4000"
"          1      Triangular SCS"
"          1      Equal length"
"          2      Horton equation"
"          4000   SITE REMAIN"
"          60.000 % Impervious"
"          0.050   Total Area"
"          10.000 Flow length"
"          2.000   Overland Slope"
"          0.020   Pervious Area"
"          10.000 Pervious length"
"          2.000   Pervious slope"
"          0.030   Impervious Area"
"          10.000 Impervious length"
"          2.000   Impervious slope"
"          0.250   Pervious Manning 'n'"
"          200.000 Pervious Max.infiltration"
"          13.000 Pervious Min.infiltration"
"          0.250   Pervious Lag constant (hours)"
"          5.000   Pervious Depression storage"
"          0.013   Impervious Manning 'n'"
"          0.000   Impervious Max.infiltration"
"          0.000   Impervious Min.infiltration"

```


"	0.050	Impervious Lag constant (hours)"			
"	1.500	Impervious Depression storage"			
"		0.006	0.000	0.365	0.365 c.m/sec"
"		Catchment 4000	Pervious	Impervious	Total Area "
"		Surface Area	0.020	0.030	0.050 hectare"
"		Time of concentration	8.955	1.358	2.524 minutes"
"		Time to Centroid	2765.806	2280.645	2355.141 minutes"
"		Rainfall depth	285.000	285.000	285.000 mm"
"		Rainfall volume	57.00	85.50	142.50 c.m"
"		Rainfall losses	218.170	39.398	110.907 mm"
"		Runoff depth	66.830	245.602	174.093 mm"
"		Runoff volume	13.37	73.68	87.05 c.m"
"		Runoff coefficient	0.234	0.862	0.611 "
"		Maximum flow	0.002	0.004	0.006 c.m/sec"
" 40		HYDROGRAPH Add Runoff "			
"	4	Add Runoff "			
"		0.006	0.006	0.365	0.365"
" 33		CATCHMENT 4001"			
"	1	Triangular SCS"			
"	1	Equal length"			
"	2	Horton equation"			
"	4001	SITE SINGLE"			
"	30.000	% Impervious"			
"	0.030	Total Area"			
"	10.000	Flow length"			
"	2.000	Overland Slope"			
"	0.021	Pervious Area"			
"	10.000	Pervious length"			
"	2.000	Pervious slope"			
"	0.009	Impervious Area"			
"	10.000	Impervious length"			
"	2.000	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	200.000	Pervious Max.infiltration"			
"	13.000	Pervious Min.infiltration"			
"	0.250	Pervious Lag constant (hours)"			
"	5.000	Pervious Depression storage"			
"	0.013	Impervious Manning 'n'"			
"	0.000	Impervious Max.infiltration"			
"	0.000	Impervious Min.infiltration"			
"	0.050	Impervious Lag constant (hours)"			
"	1.500	Impervious Depression storage"			
"		0.003	0.006	0.365	0.365 c.m/sec"
"		Catchment 4001	Pervious	Impervious	Total Area "
"		Surface Area	0.021	0.009	0.030 hectare"
"		Time of concentration	8.955	1.358	4.308 minutes"
"		Time to Centroid	2765.806	2280.644	2469.055 minutes"
"		Rainfall depth	285.000	285.000	285.000 mm"
"		Rainfall volume	59.85	25.65	85.50 c.m"
"		Rainfall losses	218.170	39.398	164.539 mm"

"	Runoff depth	66.830	245.602	120.461	mm"
"	Runoff volume	14.03	22.10	36.14	c.m"
"	Runoff coefficient	0.234	0.862	0.423	"
"	Maximum flow	0.002	0.001	0.003	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.003 0.009 0.365 0.365"				
" 40	HYDROGRAPH Copy to Outflow"				
"	8 Copy to Outflow"				
"	0.003 0.009 0.009 0.365"				
" 40	HYDROGRAPH Combine 30"				
"	6 Combine "				
"	30 Node #"				
"	FLOW FROM SITE"				
"	Maximum flow	0.371		c.m/sec"	
"	Hydrograph volume	6185.744		c.m"	
"	0.003 0.009 0.009 0.371"				
" 40	HYDROGRAPH Confluence 30"				
"	7 Confluence "				
"	30 Node #"				
"	FLOW FROM SITE"				
"	Maximum flow	0.371		c.m/sec"	
"	Hydrograph volume	6185.744		c.m"	
"	0.003 0.371 0.009 0.000"				
" 38	START/RE-START TOTALS 30"				
"	3 Runoff Totals on EXIT"				
"	Total Catchment area		4.520	hectare"	
"	Total Impervious area		1.607	hectare"	
"	Total % impervious		35.553"		
" 19	EXIT"				

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                        B:\Working\WRIGHTHAVEN HOMES\"
"          2401073 - 122025 079 Sideroad 19 Fergus\5 Work in Progress\Design
Calcs\2026-01-22 SWM Calcs"
"          Output filename:                    122025 Post 2yr-wetland.out"
"          Licensee name:                      "
"          Company                            "
"          Date & Time last used:              1/23/2026 at 10:59:15 AM"
" 31      TIME PARAMETERS"
"          5.000  Time Step"
"          240.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 32      STORM Chicago storm"
"          1  Chicago storm"
"          695.047 Coefficient A"
"          6.387  Constant B"
"          0.793  Exponent C"
"          0.375  Fraction R"
"          180.000 Duration"
"          1.000  Time step multiplier"
"          Maximum intensity          99.625  mm/hr"
"          Total depth                33.014  mm"
"          6  002hyd  Hydrograph extension used in this file"
" 47      FILEI_0 Read/Open Flow from Site Rear.002hyd"
"          1  1=read/open; 2=write/save"
"          2  1=rainfall; 2=hydrograph"
"          2  1=runoff; 2=inflow; 3=outflow; 4=junction"
"          Flow from Site Rear.002hyd"
"          Flow from site rear from catchment 3000 to external wetland"
"          Total volume                489.956  c.m"
"          Maximum flow                0.192  c.m/sec"
"          0.000  0.192  0.000  0.000 c.m/sec"
" 40      HYDROGRAPH Copy to Outflow"
"          8  Copy to Outflow"
"          0.000  0.192  0.192  0.000"
" 40      HYDROGRAPH Combine 40"
"          6  Combine "
"          40  Node #"
"          FLOW TO WETLAND EXT."
"          Maximum flow                0.192  c.m/sec"
"          Hydrograph volume          489.956  c.m"
"          0.000  0.192  0.192  0.192"
" 40      HYDROGRAPH Start - New Tributary"
"          2  Start - New Tributary"
"          0.000  0.000  0.192  0.192"
" 33      CATCHMENT 5000"
"          1  Triangular SCS"

```

"	1	Equal length"			
"	2	Horton equation"			
"	5000	EXTERNAL WETLAND"			
"	35.000	% Impervious"			
"	4.300	Total Area"			
"	150.000	Flow length"			
"	1.000	Overland Slope"			
"	2.795	Pervious Area"			
"	150.000	Pervious length"			
"	1.000	Pervious slope"			
"	1.505	Impervious Area"			
"	150.000	Impervious length"			
"	1.000	Impervious slope"			
"	0.250	Pervious Manning 'n' "			
"	200.000	Pervious Max.infiltration"			
"	13.000	Pervious Min.infiltration"			
"	0.250	Pervious Lag constant (hours)"			
"	5.000	Pervious Depression storage"			
"	0.013	Impervious Manning 'n' "			
"	0.000	Impervious Max.infiltration"			
"	0.000	Impervious Min.infiltration"			
"	0.050	Impervious Lag constant (hours)"			
"	1.500	Impervious Depression storage"			
"		0.321 0.000 0.192 0.192 c.m/sec"			
"		Catchment 5000 Pervious Impervious Total Area "			
"		Surface Area 2.795 1.505 4.300 hectare"			
"		Time of concentration --- 6.593 6.593 minutes"			
"		Time to Centroid 0.000 92.935 92.935 minutes"			
"		Rainfall depth 33.014 33.014 33.014 mm"			
"		Rainfall volume 922.74 496.86 1419.59 c.m"			
"		Rainfall losses 33.014 1.804 22.090 mm"			
"		Runoff depth 0.000 31.210 10.924 mm"			
"		Runoff volume 0.00 469.71 469.71 c.m"			
"		Runoff coefficient 0.000 0.945 0.331 "			
"		Maximum flow 0.000 0.321 0.321 c.m/sec"			
" 40		HYDROGRAPH Add Runoff "			
"	4	Add Runoff "			
"		0.321 0.321 0.192 0.192"			
" 40		HYDROGRAPH Copy to Outflow"			
"	8	Copy to Outflow"			
"		0.321 0.321 0.321 0.192"			
" 40		HYDROGRAPH Combine 40"			
"	6	Combine "			
"	40	Node #"			
"		FLOW TO WETLAND EXT."			
"		Maximum flow 0.513 c.m/sec"			
"		Hydrograph volume 959.669 c.m"			
"		0.321 0.321 0.321 0.513"			
" 40		HYDROGRAPH Confluence 40"			
"	7	Confluence "			

```

"      40 Node #"
"      FLOW TO WETLAND EXT."
"      Maximum flow          0.513    c.m/sec"
"      Hydrograph volume     959.669  c.m"
"      0.321    0.513    0.321    0.000"
" 54      POND DESIGN"
"      0.513 Current peak flow    c.m/sec"
"      0.001 Target outflow    c.m/sec"
"      959.7 Hydrograph volume    c.m"
"      13. Number of stages"
"      0.000 Minimum water level  metre"
"      3.000 Maximum water level  metre"
"      0.000 Starting water level  metre"
"      0 Keep Design Data: 1 = True; 0 = False"
"      Level Discharge    Volume"
"      414.550    0.000    0.000"
"      414.650  1.01E-05    1.280"
"      414.750  2.01E-05   25.890"
"      414.850    0.02300   87.570"
"      414.950    0.1080  189.890"
"      415.050    0.2480  326.630"
"      415.150    0.2290  503.070"
"      415.250    0.5620  728.330"
"      415.350    0.7600 1010.010"
"      415.450    0.9170 1347.990"
"      415.550    1.051  1734.110"
"      415.650    1.476  2120.230"
"      415.750    3.050  2506.350"
"      Peak outflow          0.241    c.m/sec"
"      Maximum level         415.045  metre"
"      Maximum storage       320.223  c.m"
"      Centroidal lag        2.518   hours"
"      0.321    0.513    0.241    0.000 c.m/sec"
" 38      START/RE-START TOTALS 40"
"      3 Runoff Totals on EXIT"
"      Total Catchment area          4.300  hectare"
"      Total Impervious area         1.505  hectare"
"      Total % impervious          35.000"
" 19      EXIT"

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"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                        B:\Working\WRIGHTHAVEN HOMES\"
"          2401073 - 122025 079 Sideroad 19 Fergus\5 Work in Progress\Design
Calcs\2026-01-22 SWM Calcs"
"          Output filename:                    122025 Post 5yr-wetland.out"
"          Licensee name:                      "
"          Company                            "
"          Date & Time last used:              1/23/2026 at 11:17:52 AM"
" 31          TIME PARAMETERS"
"          5.000  Time Step"
"          240.000  Max. Storm length"
"          5000.000  Max. Hydrograph"
" 32          STORM Chicago storm"
"          1  Chicago storm"
"          1459.072  Coefficient A"
"          13.690  Constant B"
"          0.850  Exponent C"
"          0.375  Fraction R"
"          180.000  Duration"
"          1.000  Time step multiplier"
"          Maximum intensity          119.775  mm/hr"
"          Total depth                49.792  mm"
"          6  005hyd  Hydrograph extension used in this file"
" 47          FILEI_0 Read/Open Flow from Site Rear.005hyd"
"          1  1=read/open; 2=write/save"
"          2  1=rainfall; 2=hydrograph"
"          2  1=runoff; 2=inflow; 3=outflow; 4=junction"
"          Flow from Site Rear.005hyd"
"          Flow from site rear from catchment 3000 to external wetland"
"          Total volume                751.210  c.m"
"          Maximum flow                0.250  c.m/sec"
"          0.000  0.250  0.000  0.000 c.m/sec"
" 40          HYDROGRAPH Copy to Outflow"
"          8  Copy to Outflow"
"          0.000  0.250  0.250  0.000"
" 40          HYDROGRAPH Combine 40"
"          6  Combine "
"          40  Node #"
"          FLOW TO WETLAND EXT."
"          Maximum flow                0.250  c.m/sec"
"          Hydrograph volume            751.210  c.m"
"          0.000  0.250  0.250  0.250"
" 40          HYDROGRAPH Start - New Tributary"
"          2  Start - New Tributary"
"          0.000  0.000  0.250  0.250"
" 33          CATCHMENT 5000"
"          1  Triangular SCS"

```

"	1	Equal length"			
"	2	Horton equation"			
"	5000	EXTERNAL WETLAND"			
"	35.000	% Impervious"			
"	4.300	Total Area"			
"	150.000	Flow length"			
"	1.000	Overland Slope"			
"	2.795	Pervious Area"			
"	150.000	Pervious length"			
"	1.000	Pervious slope"			
"	1.505	Impervious Area"			
"	150.000	Impervious length"			
"	1.000	Impervious slope"			
"	0.250	Pervious Manning 'n' "			
"	200.000	Pervious Max.infiltration"			
"	13.000	Pervious Min.infiltration"			
"	0.250	Pervious Lag constant (hours)"			
"	5.000	Pervious Depression storage"			
"	0.013	Impervious Manning 'n' "			
"	0.000	Impervious Max.infiltration"			
"	0.000	Impervious Min.infiltration"			
"	0.050	Impervious Lag constant (hours)"			
"	1.500	Impervious Depression storage"			
"		0.412 0.000 0.250 0.250 c.m/sec"			
"		Catchment 5000 Pervious Impervious Total Area "			
"		Surface Area 2.795 1.505 4.300 hectare"			
"		Time of concentration --- 6.125 6.125 minutes"			
"		Time to Centroid 0.000 90.892 90.892 minutes"			
"		Rainfall depth 49.792 49.792 49.792 mm"			
"		Rainfall volume 1391.68 749.36 2141.04 c.m"			
"		Rainfall losses 49.792 1.809 32.998 mm"			
"		Runoff depth 0.000 47.983 16.794 mm"			
"		Runoff volume 0.00 722.14 722.14 c.m"			
"		Runoff coefficient 0.000 0.964 0.337 "			
"		Maximum flow 0.000 0.412 0.412 c.m/sec"			
" 40		HYDROGRAPH Add Runoff "			
"	4	Add Runoff "			
"		0.412 0.412 0.250 0.250"			
" 40		HYDROGRAPH Copy to Outflow"			
"	8	Copy to Outflow"			
"		0.412 0.412 0.412 0.250"			
" 40		HYDROGRAPH Combine 40"			
"	6	Combine "			
"	40	Node #"			
"		FLOW TO WETLAND EXT."			
"		Maximum flow 0.644 c.m/sec"			
"		Hydrograph volume 1473.348 c.m"			
"		0.412 0.412 0.412 0.644"			
" 40		HYDROGRAPH Confluence 40"			
"	7	Confluence "			

```

"      40      Node #"
"      FLOW TO WETLAND EXT."
"      Maximum flow          0.644      c.m/sec"
"      Hydrograph volume      1473.348    c.m"
"      0.412      0.644      0.412      0.000"
" 54      POND DESIGN"
"      0.644      Current peak flow      c.m/sec"
"      0.001      Target outflow      c.m/sec"
"      1473.3      Hydrograph volume      c.m"
"      13.      Number of stages"
"      0.000      Minimum water level      metre"
"      3.000      Maximum water level      metre"
"      0.000      Starting water level      metre"
"      0      Keep Design Data: 1 = True; 0 = False"
"      Level Discharge      Volume"
"      414.550      0.000      0.000"
"      414.650      1.01E-05      1.280"
"      414.750      2.01E-05      25.890"
"      414.850      0.02300      87.570"
"      414.950      0.1080      189.890"
"      415.050      0.2480      326.630"
"      415.150      0.2290      503.070"
"      415.250      0.5620      728.330"
"      415.350      0.7600      1010.010"
"      415.450      0.9170      1347.990"
"      415.550      1.051      1734.110"
"      415.650      1.476      2120.230"
"      415.750      3.050      2506.350"
"      Peak outflow          0.265      c.m/sec"
"      Maximum level          415.161      metre"
"      Maximum storage          527.414      c.m"
"      Centroidal lag          2.512      hours"
"      0.412      0.644      0.265      0.000 c.m/sec"
" 38      START/RE-START TOTALS 40"
"      3      Runoff Totals on EXIT"
"      Total Catchment area          4.300      hectare"
"      Total Impervious area          1.505      hectare"
"      Total % impervious          35.000"
" 19      EXIT"

```



```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                        B:\Working\WRIGHTHAVEN HOMES\"
"          2401073 - 122025 079 Sideroad 19 Fergus\5 Work in Progress\Design
Calcs\2026-01-22 SWM Calcs"
"          Output filename:                    122025 Post 10yr-wetland.out"
"          Licensee name:                      "
"          Company                            "
"          Date & Time last used:              1/23/2026 at 11:39:29 AM"
" 31          TIME PARAMETERS"
"          5.000  Time Step"
"          240.000  Max. Storm length"
"          1500.000  Max. Hydrograph"
" 32          STORM Chicago storm"
"          1  Chicago storm"
"          2327.596  Coefficient A"
"          19.500  Constant B"
"          0.894  Exponent C"
"          0.375  Fraction R"
"          180.000  Duration"
"          1.000  Time step multiplier"
"          Maximum intensity          132.071  mm/hr"
"          Total depth                61.359  mm"
"          6  010hyd  Hydrograph extension used in this file"
" 47          FILEI_0 Read/Open Flow from Site Rear.010hyd"
"          1  1=read/open; 2=write/save"
"          2  1=rainfall; 2=hydrograph"
"          2  1=runoff; 2=inflow; 3=outflow; 4=junction"
"          Flow from Site Rear.010hyd"
"          Flow from site rear from catchment 3000 to external wetland"
"          Total volume                927.108  c.m"
"          Maximum flow                0.262  c.m/sec"
"          0.000  0.262  0.000  0.000 c.m/sec"
" 40          HYDROGRAPH Copy to Outflow"
"          8  Copy to Outflow"
"          0.000  0.262  0.262  0.000"
" 40          HYDROGRAPH Combine 40"
"          6  Combine "
"          40  Node #"
"          FLOW TO WETLAND EXT."
"          Maximum flow                0.262  c.m/sec"
"          Hydrograph volume          927.108  c.m"
"          0.000  0.262  0.262  0.262"
" 40          HYDROGRAPH Start - New Tributary"
"          2  Start - New Tributary"
"          0.000  0.000  0.262  0.262"
" 33          CATCHMENT 5000"
"          1  Triangular SCS"

```

"	1	Equal length"			
"	2	Horton equation"			
"	5000	EXTERNAL WETLAND"			
"	35.000	% Impervious"			
"	4.300	Total Area"			
"	150.000	Flow length"			
"	1.000	Overland Slope"			
"	2.795	Pervious Area"			
"	150.000	Pervious length"			
"	1.000	Pervious slope"			
"	1.505	Impervious Area"			
"	150.000	Impervious length"			
"	1.000	Impervious slope"			
"	0.250	Pervious Manning 'n' "			
"	200.000	Pervious Max.infiltration"			
"	13.000	Pervious Min.infiltration"			
"	0.250	Pervious Lag constant (hours)"			
"	5.000	Pervious Depression storage"			
"	0.013	Impervious Manning 'n' "			
"	0.000	Impervious Max.infiltration"			
"	0.000	Impervious Min.infiltration"			
"	0.050	Impervious Lag constant (hours)"			
"	1.500	Impervious Depression storage"			
"		0.474 0.000 0.262 0.262 c.m/sec"			
"		Catchment 5000 Pervious Impervious Total Area "			
"		Surface Area 2.795 1.505 4.300 hectare"			
"		Time of concentration --- 5.890 5.890 minutes"			
"		Time to Centroid 0.000 90.058 90.058 minutes"			
"		Rainfall depth 61.359 61.359 61.359 mm"			
"		Rainfall volume 1714.99 923.46 2638.45 c.m"			
"		Rainfall losses 61.359 1.999 40.583 mm"			
"		Runoff depth 0.000 59.360 20.776 mm"			
"		Runoff volume 0.00 893.37 893.37 c.m"			
"		Runoff coefficient 0.000 0.967 0.339 "			
"		Maximum flow 0.000 0.474 0.474 c.m/sec"			
" 40		HYDROGRAPH Add Runoff "			
"	4	Add Runoff "			
"		0.474 0.474 0.262 0.262"			
" 40		HYDROGRAPH Copy to Outflow"			
"	8	Copy to Outflow"			
"		0.474 0.474 0.474 0.262"			
" 40		HYDROGRAPH Combine 40"			
"	6	Combine "			
"	40	Node #"			
"		FLOW TO WETLAND EXT."			
"		Maximum flow 0.729 c.m/sec"			
"		Hydrograph volume 1820.475 c.m"			
"		0.474 0.474 0.474 0.729"			
" 40		HYDROGRAPH Confluence 40"			
"	7	Confluence "			

```

"      40 Node #"
"      FLOW TO WETLAND EXT."
"      Maximum flow          0.729 c.m/sec"
"      Hydrograph volume     1820.475 c.m"
"      0.474 0.729 0.474 0.000"
" 54 POND DESIGN"
"      0.729 Current peak flow c.m/sec"
"      0.001 Target outflow c.m/sec"
" 1820.5 Hydrograph volume c.m"
"      13. Number of stages"
"      0.000 Minimum water level metre"
"      3.000 Maximum water level metre"
"      0.000 Starting water level metre"
"      0 Keep Design Data: 1 = True; 0 = False"
"      Level Discharge Volume"
"      414.550 0.000 0.000"
"      414.650 1.01E-05 1.280"
"      414.750 2.01E-05 25.890"
"      414.850 0.02300 87.570"
"      414.950 0.1080 189.890"
"      415.050 0.2480 326.630"
"      415.150 0.2290 503.070"
"      415.250 0.5620 728.330"
"      415.350 0.7600 1010.010"
"      415.450 0.9170 1347.990"
"      415.550 1.051 1734.110"
"      415.650 1.476 2120.230"
"      415.750 3.050 2506.350"
"      Peak outflow          0.375 c.m/sec"
"      Maximum level         415.194 metre"
"      Maximum storage       601.901 c.m"
"      Centroidal lag        2.302 hours"
"      0.474 0.729 0.375 0.000 c.m/sec"
" 38 START/RE-START TOTALS 40"
" 3 Runoff Totals on EXIT"
"      Total Catchment area 4.300 hectare"
"      Total Impervious area 1.505 hectare"
"      Total % impervious 35.000"
" 19 EXIT"

```

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                        B:\Working\WRIGHTHAVEN HOMES\"
"          2401073 - 122025 079 Sideroad 19 Fergus\5 Work in Progress\Design
Calcs\2026-01-22 SWM Calcs"
"          Output filename:                    122025 Post 25yr-wetland.out"
"          Licensee name:                      "
"          Company                            "
"          Date & Time last used:              1/23/2026 at 11:42:22 AM"
" 31          TIME PARAMETERS"
"          5.000  Time Step"
"          240.000  Max. Storm length"
"          1500.000  Max. Hydrograph"
" 32          STORM Chicago storm"
"          1  Chicago storm"
"          3701.648  Coefficient A"
"          25.500  Constant B"
"          0.937  Exponent C"
"          0.375  Fraction R"
"          180.000  Duration"
"          1.000  Time step multiplier"
"          Maximum intensity          149.252  mm/hr"
"          Total depth          75.581  mm"
"          6  025hyd  Hydrograph extension used in this file"
" 47          FILEI_0 Read/Open Flow from Site Rear.025hyd"
"          1  1=read/open; 2=write/save"
"          2  1=rainfall; 2=hydrograph"
"          2  1=runoff; 2=inflow; 3=outflow; 4=junction"
"          Flow from Site Rear.025hyd"
"          Flow from site rear from catchment 3000 to external wetland"
"          Total volume          1257.841  c.m"
"          Maximum flow          0.278  c.m/sec"
"          0.000  0.278  0.000  0.000 c.m/sec"
" 40          HYDROGRAPH Copy to Outflow"
"          8  Copy to Outflow"
"          0.000  0.278  0.278  0.000"
" 40          HYDROGRAPH Combine 40"
"          6  Combine "
"          40  Node #"
"          FLOW TO WETLAND EXT."
"          Maximum flow          0.278  c.m/sec"
"          Hydrograph volume          1257.841  c.m"
"          0.000  0.278  0.278  0.278"
" 40          HYDROGRAPH Start - New Tributary"
"          2  Start - New Tributary"
"          0.000  0.000  0.278  0.278"
" 33          CATCHMENT 5000"
"          1  Triangular SCS"

```

"	1	Equal length"			
"	2	Horton equation"			
"	5000	EXTERNAL WETLAND"			
"	35.000	% Impervious"			
"	4.300	Total Area"			
"	150.000	Flow length"			
"	1.000	Overland Slope"			
"	2.795	Pervious Area"			
"	150.000	Pervious length"			
"	1.000	Pervious slope"			
"	1.505	Impervious Area"			
"	150.000	Impervious length"			
"	1.000	Impervious slope"			
"	0.250	Pervious Manning 'n' "			
"	200.000	Pervious Max.infiltration"			
"	13.000	Pervious Min.infiltration"			
"	0.250	Pervious Lag constant (hours)"			
"	5.000	Pervious Depression storage"			
"	0.013	Impervious Manning 'n' "			
"	0.000	Impervious Max.infiltration"			
"	0.000	Impervious Min.infiltration"			
"	0.050	Impervious Lag constant (hours)"			
"	1.500	Impervious Depression storage"			
"		0.550	0.000	0.278	0.278 c.m/sec"
"		Catchment 5000	Pervious	Impervious	Total Area "
"		Surface Area	2.795	1.505	4.300 hectare"
"		Time of concentration	76.416	5.609	11.673 minutes"
"		Time to Centroid	152.931	89.232	94.687 minutes"
"		Rainfall depth	75.581	75.581	75.581 mm"
"		Rainfall volume	2112.48	1137.49	3249.98 c.m"
"		Rainfall losses	71.873	2.070	47.442 mm"
"		Runoff depth	3.707	73.511	28.139 mm"
"		Runoff volume	103.62	1106.34	1209.96 c.m"
"		Runoff coefficient	0.049	0.973	0.372 "
"		Maximum flow	0.019	0.549	0.550 c.m/sec"
" 40		HYDROGRAPH Add Runoff "			
"	4	Add Runoff "			
"		0.550	0.550	0.278	0.278"
" 40		HYDROGRAPH Copy to Outflow"			
"	8	Copy to Outflow"			
"		0.550	0.550	0.550	0.278"
" 40		HYDROGRAPH Combine 40"			
"	6	Combine "			
"	40	Node #"			
"		FLOW TO WETLAND EXT."			
"		Maximum flow	0.816		c.m/sec"
"		Hydrograph volume	2467.798		c.m"
"		0.550	0.550	0.550	0.816"
" 40		HYDROGRAPH Confluence 40"			
"	7	Confluence "			

```

"      40      Node #"
"      FLOW TO WETLAND EXT."
"      Maximum flow      0.816      c.m/sec"
"      Hydrograph volume      2467.798      c.m"
"      0.550      0.816      0.550      0.000"
" 54      POND DESIGN"
"      0.816      Current peak flow      c.m/sec"
"      0.001      Target outflow      c.m/sec"
"      2467.8      Hydrograph volume      c.m"
"      13.      Number of stages"
"      0.000      Minimum water level      metre"
"      3.000      Maximum water level      metre"
"      0.000      Starting water level      metre"
"      0      Keep Design Data: 1 = True; 0 = False"
"      Level Discharge      Volume"
"      414.550      0.000      0.000"
"      414.650      1.01E-05      1.280"
"      414.750      2.01E-05      25.890"
"      414.850      0.02300      87.570"
"      414.950      0.1080      189.890"
"      415.050      0.2480      326.630"
"      415.150      0.2290      503.070"
"      415.250      0.5620      728.330"
"      415.350      0.7600      1010.010"
"      415.450      0.9170      1347.990"
"      415.550      1.051      1734.110"
"      415.650      1.476      2120.230"
"      415.750      3.050      2506.350"
"      Peak outflow      0.490      c.m/sec"
"      Maximum level      415.229      metre"
"      Maximum storage      680.239      c.m"
"      Centroidal lag      2.291      hours"
"      0.550      0.816      0.490      0.000 c.m/sec"
" 38      START/RE-START TOTALS 40"
"      3      Runoff Totals on EXIT"
"      Total Catchment area      4.300      hectare"
"      Total Impervious area      1.505      hectare"
"      Total % impervious      35.000"
" 19      EXIT"

```

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                        B:\Working\WRIGHTHAVEN HOMES\"
"          2401073 - 122025 079 Sideroad 19 Fergus\5 Work in Progress\Design
Calcs\2026-01-22 SWM Calcs"
"          Output filename:                    122025 Post 50yr-wetland.out"
"          Licensee name:                      "
"          Company                            "
"          Date & Time last used:              1/23/2026 at 11:47:53 AM"
" 31          TIME PARAMETERS"
"          5.000  Time Step"
"          240.000  Max. Storm length"
"          1500.000  Max. Hydrograph"
" 32          STORM Chicago storm"
"          1  Chicago storm"
"          5089.418  Coefficient A"
"          30.000  Constant B"
"          0.967  Exponent C"
"          0.375  Fraction R"
"          180.000  Duration"
"          1.000  Time step multiplier"
"          Maximum intensity                    162.242  mm/hr"
"          Total depth                        86.737  mm"
"          6  050hyd  Hydrograph extension used in this file"
" 47          FILEI_0 Read/Open Flow from Site Rear.050hyd"
"          1  1=read/open; 2=write/save"
"          2  1=rainfall; 2=hydrograph"
"          2  1=runoff; 2=inflow; 3=outflow; 4=junction"
"          Flow from Site Rear.050hyd"
"          Flow from site rear from catchment 3000 to external wetland"
"          Total volume                    1689.753  c.m"
"          Maximum flow                    0.324  c.m/sec"
"          0.000  0.324  0.000  0.000 c.m/sec"
" 40          HYDROGRAPH Copy to Outflow"
"          8  Copy to Outflow"
"          0.000  0.324  0.324  0.000"
" 40          HYDROGRAPH Combine 40"
"          6  Combine "
"          40  Node #"
"          FLOW TO WETLAND EXT."
"          Maximum flow                    0.324  c.m/sec"
"          Hydrograph volume                1689.753  c.m"
"          0.000  0.324  0.324  0.324"
" 40          HYDROGRAPH Start - New Tributary"
"          2  Start - New Tributary"
"          0.000  0.000  0.324  0.324"
" 33          CATCHMENT 5000"
"          1  Triangular SCS"

```

"	1	Equal length"			
"	2	Horton equation"			
"	5000	EXTERNAL WETLAND"			
"	35.000	% Impervious"			
"	4.300	Total Area"			
"	150.000	Flow length"			
"	1.000	Overland Slope"			
"	2.795	Pervious Area"			
"	150.000	Pervious length"			
"	1.000	Pervious slope"			
"	1.505	Impervious Area"			
"	150.000	Impervious length"			
"	1.000	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	200.000	Pervious Max.infiltration"			
"	13.000	Pervious Min.infiltration"			
"	0.250	Pervious Lag constant (hours)"			
"	5.000	Pervious Depression storage"			
"	0.013	Impervious Manning 'n'"			
"	0.000	Impervious Max.infiltration"			
"	0.000	Impervious Min.infiltration"			
"	0.050	Impervious Lag constant (hours)"			
"	1.500	Impervious Depression storage"			
"		0.607	0.000	0.324	0.324 c.m/sec"
"		Catchment 5000	Pervious	Impervious	Total Area "
"		Surface Area	2.795	1.505	4.300 hectare"
"		Time of concentration	50.248	5.425	15.274 minutes"
"		Time to Centroid	138.122	88.818	99.652 minutes"
"		Rainfall depth	86.737	86.737	86.737 mm"
"		Rainfall volume	2424.29	1305.39	3729.68 c.m"
"		Rainfall losses	73.922	2.225	48.828 mm"
"		Runoff depth	12.815	84.512	37.909 mm"
"		Runoff volume	358.18	1271.91	1630.09 c.m"
"		Runoff coefficient	0.148	0.974	0.437 "
"		Maximum flow	0.079	0.603	0.607 c.m/sec"
" 40		HYDROGRAPH Add Runoff "			
"	4	Add Runoff "			
"		0.607	0.607	0.324	0.324"
" 40		HYDROGRAPH Copy to Outflow"			
"	8	Copy to Outflow"			
"		0.607	0.607	0.607	0.324"
" 40		HYDROGRAPH Combine 40"			
"	6	Combine "			
"	40	Node #"			
"		FLOW TO WETLAND EXT."			
"		Maximum flow	0.883		c.m/sec"
"		Hydrograph volume	3319.839		c.m"
"		0.607	0.607	0.607	0.883"
" 40		HYDROGRAPH Confluence 40"			
"	7	Confluence "			


```

"      40      Node #"
"      FLOW TO WETLAND EXT."
"      Maximum flow      0.883      c.m/sec"
"      Hydrograph volume      3319.839      c.m"
"      0.607      0.883      0.607      0.000"
" 54      POND DESIGN"
"      0.883      Current peak flow      c.m/sec"
"      0.001      Target outflow      c.m/sec"
"      3319.8      Hydrograph volume      c.m"
"      13.      Number of stages"
"      0.000      Minimum water level      metre"
"      3.000      Maximum water level      metre"
"      0.000      Starting water level      metre"
"      0      Keep Design Data: 1 = True; 0 = False"
"      Level Discharge      Volume"
"      414.550      0.000      0.000"
"      414.650      1.01E-05      1.280"
"      414.750      2.01E-05      25.890"
"      414.850      0.02300      87.570"
"      414.950      0.1080      189.890"
"      415.050      0.2480      326.630"
"      415.150      0.2290      503.070"
"      415.250      0.5620      728.330"
"      415.350      0.7600      1010.010"
"      415.450      0.9170      1347.990"
"      415.550      1.051      1734.110"
"      415.650      1.476      2120.230"
"      415.750      3.050      2506.350"
"      Peak outflow      0.576      c.m/sec"
"      Maximum level      415.258      metre"
"      Maximum storage      750.050      c.m"
"      Centroidal lag      2.298      hours"
"      0.607      0.883      0.576      0.000 c.m/sec"
" 38      START/RE-START TOTALS 40"
"      3      Runoff Totals on EXIT"
"      Total Catchment area      4.300      hectare"
"      Total Impervious area      1.505      hectare"
"      Total % impervious      35.000"
" 19      EXIT"

```

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                          B:\Working\WRIGHTHAVEN HOMES\"
"          2401073 - 122025 079 Sideroad 19 Fergus\5 Work in Progress\Design
Calcs\2026-01-22 SWM Calcs"
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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"
"          6933.019  Coefficient A"
"          34.699  Constant B"
"          0.998  Exponent C"
"          0.375  Fraction R"
"          180.000  Duration"
"          1.000  Time step multiplier"
"          Maximum intensity          174.661  mm/hr"
"          Total depth                97.921  mm"
"          6  100hyd  Hydrograph extension used in this file"
" 47          FILEI_0 Read/Open Flow from Site Rear.100hyd"
"          1  1=read/open; 2=write/save"
"          2  1=rainfall; 2=hydrograph"
"          2  1=runoff; 2=inflow; 3=outflow; 4=junction"
"          Flow from Site Rear.100hyd"
"          Flow from site rear from catchment 3000 to external wetland"
"          Total volume                2138.845  c.m"
"          Maximum flow                0.469  c.m/sec"
"          0.000  0.469  0.000  0.000 c.m/sec"
" 40          HYDROGRAPH Copy to Outflow"
"          8  Copy to Outflow"
"          0.000  0.469  0.469  0.000"
" 40          HYDROGRAPH Combine 40"
"          6  Combine "
"          40  Node #"
"          FLOW TO WETLAND EXT."
"          Maximum flow                0.469  c.m/sec"
"          Hydrograph volume          2138.845  c.m"
"          0.000  0.469  0.469  0.469"
" 40          HYDROGRAPH Start - New Tributary"
"          2  Start - New Tributary"
"          0.000  0.000  0.469  0.469"
" 33          CATCHMENT 5000"
"          1  Triangular SCS"

```

"	1	Equal length"			
"	2	Horton equation"			
"	5000	EXTERNAL WETLAND"			
"	35.000	% Impervious"			
"	4.300	Total Area"			
"	150.000	Flow length"			
"	1.000	Overland Slope"			
"	2.795	Pervious Area"			
"	150.000	Pervious length"			
"	1.000	Pervious slope"			
"	1.505	Impervious Area"			
"	150.000	Impervious length"			
"	1.000	Impervious slope"			
"	0.250	Pervious Manning 'n'"			
"	200.000	Pervious Max.infiltration"			
"	13.000	Pervious Min.infiltration"			
"	0.250	Pervious Lag constant (hours)"			
"	5.000	Pervious Depression storage"			
"	0.013	Impervious Manning 'n'"			
"	0.000	Impervious Max.infiltration"			
"	0.000	Impervious Min.infiltration"			
"	0.050	Impervious Lag constant (hours)"			
"	1.500	Impervious Depression storage"			
"		0.667	0.000	0.469	0.469 c.m/sec"
"		Catchment 5000	Pervious	Impervious	Total Area "
"		Surface Area	2.795	1.505	4.300 hectare"
"		Time of concentration	44.054	5.267	17.058 minutes"
"		Time to Centroid	131.309	88.445	101.475 minutes"
"		Rainfall depth	97.921	97.921	97.921 mm"
"		Rainfall volume	2736.90	1473.72	4210.62 c.m"
"		Rainfall losses	75.426	2.267	49.820 mm"
"		Runoff depth	22.496	95.655	48.101 mm"
"		Runoff volume	628.76	1439.60	2068.36 c.m"
"		Runoff coefficient	0.230	0.977	0.491 "
"		Maximum flow	0.155	0.656	0.667 c.m/sec"
" 40		HYDROGRAPH Add Runoff "			
"	4	Add Runoff "			
"		0.667	0.667	0.469	0.469"
" 40		HYDROGRAPH Copy to Outflow"			
"	8	Copy to Outflow"			
"		0.667	0.667	0.667	0.469"
" 40		HYDROGRAPH Combine 40"			
"	6	Combine "			
"	40	Node #"			
"		FLOW TO WETLAND EXT."			
"		Maximum flow	0.955		c.m/sec"
"		Hydrograph volume	4207.204		c.m"
"		0.667	0.667	0.667	0.955"
" 40		HYDROGRAPH Confluence 40"			
"	7	Confluence "			

```

"      40      Node #"
"      FLOW TO WETLAND EXT."
"      Maximum flow          0.955      c.m/sec"
"      Hydrograph volume      4207.204    c.m"
"      0.667      0.955      0.667      0.000"
" 54      POND DESIGN"
"      0.955      Current peak flow      c.m/sec"
"      0.001      Target outflow      c.m/sec"
"      4207.2      Hydrograph volume      c.m"
"      13.      Number of stages"
"      0.000      Minimum water level      metre"
"      3.000      Maximum water level      metre"
"      0.000      Starting water level      metre"
"      0      Keep Design Data: 1 = True; 0 = False"
"      Level Discharge      Volume"
"      414.550      0.000      0.000"
"      414.650      1.01E-05      1.280"
"      414.750      2.01E-05      25.890"
"      414.850      0.02300      87.570"
"      414.950      0.1080      189.890"
"      415.050      0.2480      326.630"
"      415.150      0.2290      503.070"
"      415.250      0.5620      728.330"
"      415.350      0.7600      1010.010"
"      415.450      0.9170      1347.990"
"      415.550      1.051      1734.110"
"      415.650      1.476      2120.230"
"      415.750      3.050      2506.350"
"      Peak outflow          0.699      c.m/sec"
"      Maximum level          415.319      metre"
"      Maximum storage          923.706      c.m"
"      Centroidal lag          2.276      hours"
"      0.667      0.955      0.699      0.000 c.m/sec"
" 38      START/RE-START TOTALS 40"
"      3      Runoff Totals on EXIT"
"      Total Catchment area          4.300      hectare"
"      Total Impervious area          1.505      hectare"
"      Total % impervious          35.000"
" 19      EXIT"

```

```

"          MIDUSS Output ----->"
"          MIDUSS version                      Version 2.25  rev. 473"
"          MIDUSS created                      Sunday, February 7, 2010"
"          10  Units used:                      ie METRIC"
"          Job folder:                        B:\Working\WRIGHTHAVEN HOMES\"
"          2401073 - 122025 079 Sideroad 19 Fergus\5 Work in Progress\Design
Calcs\2026-01-22 SWM Calcs"
"          Output filename:                    122025 Post 100yr-swaleNorth.out"
"          Licensee name:                      "
"          Company                            "
"          Date & Time last used:              1/23/2026 at 9:34:27 AM"
" 31          TIME PARAMETERS"
"          5.000  Time Step"
"          240.000 Max. Storm length"
"          1500.000 Max. Hydrograph"
" 32          STORM Chicago storm"
"          1  Chicago storm"
"          6933.019 Coefficient A"
"          34.699 Constant B"
"          0.998 Exponent C"
"          0.375 Fraction R"
"          180.000 Duration"
"          1.000 Time step multiplier"
"          Maximum intensity                    174.661  mm/hr"
"          Total depth                        97.921  mm"
"          6  100hyd Hydrograph extension used in this file"
" 33          CATCHMENT 1000"
"          1  Triangular SCS"
"          1  Equal length"
"          2  Horton equation"
"          1000 EXTERNAL"
"          30.000 % Impervious"
"          3.400 Total Area"
"          150.000 Flow length"
"          2.000 Overland Slope"
"          2.380 Pervious Area"
"          150.000 Pervious length"
"          2.000 Pervious slope"
"          1.020 Impervious Area"
"          150.000 Impervious length"
"          2.000 Impervious slope"
"          0.250 Pervious Manning 'n'"
"          200.000 Pervious Max.infiltration"
"          13.000 Pervious Min.infiltration"
"          0.250 Pervious Lag constant (hours)"
"          5.000 Pervious Depression storage"
"          0.013 Impervious Manning 'n'"
"          0.000 Impervious Max.infiltration"
"          0.000 Impervious Min.infiltration"
"          0.050 Impervious Lag constant (hours)"

```

```

"      1.500  Impervious Depression storage"
"      0.452      0.000      0.000      0.000 c.m/sec"
"      Catchment 1000      Pervious      Impervious      Total Area  "
"      Surface Area      2.380      1.020      3.400      hectare"
"      Time of concentration 35.783      4.278      15.451      minutes"
"      Time to Centroid 122.544      87.206      99.738      minutes"
"      Rainfall depth 97.921      97.921      97.921      mm"
"      Rainfall volume 2330.53      998.80      3329.33      c.m"
"      Rainfall losses 75.419      2.378      53.507      mm"
"      Runoff depth 22.502      95.544      44.415      mm"
"      Runoff volume 535.55      974.55      1510.10      c.m"
"      Runoff coefficient 0.230      0.976      0.454      "
"      Maximum flow 0.154      0.438      0.452      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"      4      Add Runoff "
"      0.452      0.452      0.000      0.000"
" 56      DIVERSION"
"      1000      Node number"
"      0.180      Overflow threshold"
"      1.000      Required diverted fraction"
"      0      Conduit type; 1=Pipe;2=Channel"
"      Peak of diverted flow 0.272      c.m/sec"
"      Volume of diverted flow 390.591      c.m"
"      DIV01000.100hyd"
"      Major flow to pond"
"      0.452      0.452      0.180      0.000 c.m/sec"
" 40      HYDROGRAPH Combine 10"
"      6      Combine "
"      10      Node #"
"      FLOW TO WETLAND"
"      Maximum flow 0.180      c.m/sec"
"      Hydrograph volume 1119.505      c.m"
"      0.452      0.452      0.180      0.180"
" 40      HYDROGRAPH Start - New Tributary"
"      2      Start - New Tributary"
"      0.452      0.000      0.180      0.180"
" 47      FILEI_0 Read/Open DIV01000.100hyd"
"      1      1=read/open; 2=write/save"
"      2      1=rainfall; 2=hydrograph"
"      2      1=runoff; 2=inflow; 3=outflow; 4=junction"
"      DIV01000.100hyd"
"      Major flow to pond"
"      Total volume 390.591      c.m"
"      Maximum flow 0.272      c.m/sec"
"      0.452      0.272      0.180      0.180 c.m/sec"
" 33      CATCHMENT 5"
"      1      Triangular SCS"
"      1      Equal length"
"      2      Horton equation"
"      6      REAR YARDS"

```

```

"      15.000  % Impervious"
"      0.127  Total Area"
"     10.000  Flow length"
"      3.000  Overland Slope"
"      0.108  Pervious Area"
"     10.000  Pervious length"
"      2.000  Pervious slope"
"      0.019  Impervious Area"
"     10.000  Impervious length"
"      2.000  Impervious slope"
"      0.250  Pervious Manning 'n'"
"    200.000  Pervious Max.infiltration"
"     13.000  Pervious Min.infiltration"
"      0.250  Pervious Lag constant (hours)"
"      5.000  Pervious Depression storage"
"      0.013  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      0.272      0.180      0.180 c.m/sec"
"      Catchment 6      Pervious      Impervious      Total Area  "
"      Surface Area      0.108      0.019      0.127      hectare"
"      Time of concentration  7.047      0.843      4.431      minutes"
"      Time to Centroid      92.094      82.965      88.245      minutes"
"      Rainfall depth      97.921      97.921      97.921      mm"
"      Rainfall volume      105.71      18.65      124.36      c.m"
"      Rainfall losses      75.635      5.873      65.171      mm"
"      Runoff depth      22.286      92.048      32.750      mm"
"      Runoff volume      24.06      17.54      41.59      c.m"
"      Runoff coefficient      0.228      0.940      0.334      "
"      Maximum flow      0.017      0.008      0.022      c.m/sec"
" 40      HYDROGRAPH Add Runoff  "
"      4      Add Runoff  "
"          0.022      0.286      0.180      0.180"
" 52      CHANNEL DESIGN"
"      0.286      Current peak flow      c.m/sec"
"      0.035      Manning 'n'"
"      1.      Cross-section type: 0=trapezoidal; 1=general"
"      4.      Define an arbitrary cross-section"
"          0.000      2.000      3.200      3.210"
"          0.390      0.000      0.400      1.000"
"      0.390      Channel depth      metre"
"      0.800      Gradient      %"
"      0.      Variable roughness: 0=False; 1=True"
"          0.0400      0.0400      0.0400      0.0400"
"      Depth of flow      0.312      metre"
"      Velocity      0.725      m/sec"
"      Channel capacity      0.520      c.m/sec"
"      Critical depth      0.252      metre"

```

" 38 START/RE-START TOTALS 6"
 " 3 Runoff Totals on EXIT"
 " Total Catchment area 3.527 hectare"
 " Total Impervious area 1.039 hectare"
 " Total % impervious 29.460"
 " 19 EXIT"

CHANNEL DESIGN

Current peak flow 0.286 c.m/sec
 Manning 'n' 0.035

Depth - Grade - Velocity Horizontal 4 Vertical 1

☒ Define arbitrary cross-section

Use the left mouse button to mark points and the right mouse button for the last point. Edit the table of coordinates to modify the cross-section. Press [OK] to accept coordinates.

Save Cross-section Load Cross-section

Channel depth 0.390 metre
 Invert elevation .000 metre
 Gradient 0.800 %

Design

Depth of flow 0.312 metre
 Channel capacity 0.520 c.m/sec
 Velocity 0.725 m/sec
 Critical depth 0.252 metre

Design Accept Cancel

☐ Variable roughness Insert Delete Undo Clear OK

	1	2	3	4	5	6	7	8	9	10
X	0.00	2.00	3.20	3.21						
Y	0.39	0.00	0.40	1.00						
dX		2.00	1.20	0.01						
dY		-0.39	0.40	0.60						
dX/dY		-5.13	3.00	0.02						


```

"          MIDUSS Output ----->"
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"          Job folder:                        B:\Working\WRIGHTHAVEN HOMES\"
"          2401073 - 122025 079 Sideroad 19 Fergus\5 Work in Progress\Design
Calcs\2025-12-17 SWM Pond"
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" 31          TIME PARAMETERS"
"          5.000  Time Step"
"          240.000  Max. Storm length"
"          1500.000  Max. Hydrograph"
" 32          STORM Chicago storm"
"          1  Chicago storm"
"          6933.019  Coefficient A"
"          34.699  Constant B"
"          0.998  Exponent C"
"          0.375  Fraction R"
"          180.000  Duration"
"          1.000  Time step multiplier"
"          Maximum intensity                    174.661  mm/hr"
"          Total depth                        97.921  mm"
"          6  100hyd  Hydrograph extension used in this file"
" 33          CATCHMENT 2002"
"          1  Triangular SCS"
"          1  Equal length"
"          2  Horton equation"
"          2002  SITE REAR"
"          10.000  % Impervious"
"          0.090  Total Area"
"          10.000  Flow length"
"          5.000  Overland Slope"
"          0.081  Pervious Area"
"          10.000  Pervious length"
"          5.000  Pervious slope"
"          0.009  Impervious Area"
"          10.000  Impervious length"
"          5.000  Impervious slope"
"          0.250  Pervious Manning 'n'"
"          200.000  Pervious Max.infiltration"
"          13.000  Pervious Min.infiltration"
"          0.250  Pervious Lag constant (hours)"
"          5.000  Pervious Depression storage"
"          0.013  Impervious Manning 'n'"
"          0.000  Impervious Max.infiltration"
"          0.000  Impervious Min.infiltration"
"          0.050  Impervious Lag constant (hours)"

```

```

"      1.500  Impervious Depression storage"
"      0.015      0.000      0.000      0.000 c.m/sec"
"      Catchment 2002      Pervious      Impervious      Total Area  "
"      Surface Area      0.081      0.009      0.090      hectare"
"      Time of concentration 5.354      0.640      3.907      minutes"
"      Time to Centroid 90.313      82.905      88.040      minutes"
"      Rainfall depth 97.921      97.921      97.921      mm"
"      Rainfall volume 79.32      8.81      88.13      c.m"
"      Rainfall losses 75.595      8.976      68.933      mm"
"      Runoff depth 22.326      88.946      28.988      mm"
"      Runoff volume 18.08      8.01      26.09      c.m"
"      Runoff coefficient 0.228      0.908      0.296      "
"      Maximum flow 0.013      0.004      0.015      c.m/sec"
" 40      HYDROGRAPH Add Runoff "
"      4  Add Runoff "
"      0.015      0.015      0.000      0.000"
" 52      CHANNEL DESIGN"
"      0.015  Current peak flow      c.m/sec"
"      0.035  Manning 'n'"
"      1.  Cross-section type: 0=trapezoidal; 1=general"
"      3.  Define an arbitrary cross-section"
"      0.000      0.450      1.530"
"      0.150      0.000      0.360"
"      0.150  Channel depth      metre"
"      1.000  Gradient      %"
"      0.  Variable roughness: 0=False; 1=True"
"      0.0400      0.0400      0.0400"
"      Depth of flow      0.111      metre"
"      Velocity      0.402      m/sec"
"      Channel capacity      0.033      c.m/sec"
"      Critical depth      0.087      metre"
" 38      START/RE-START TOTALS 2002"
"      3  Runoff Totals on EXIT"
"      Total Catchment area      0.090      hectare"
"      Total Impervious area      0.009      hectare"
"      Total % impervious      10.000"
" 19      EXIT"

```

CHANNEL DESIGN

Current peak flow: 0.015 c.m/sec
Manning 'n': 0.035

☒ Define arbitrary cross-section

Use the left mouse button to mark points and the right mouse button for the last point. Edit the table of coordinates to modify the cross-section. Press [OK] to accept coordinates.

Save Cross-section Load Cross-section

Channel depth: 0.150 metre
Invert elevation: .000 metre
Gradient: 1.000 %

Design

Depth of flow: 0.111 metre
Channel capacity: 0.033 c.m/sec
Velocity: 0.402 m/sec
Critical depth: 0.087 metre

Depth - Grade - Velocity

Horizontal: 2 Vertical: 0.5

Diagram showing a cross-section with TWL=0.111 and WLcr=0.087.

	1	2	3	4	5	6	7	8	9	10
X	0.00	0.45	1.53							
Y	0.15	0.00	0.36							
dX		0.45	1.08							
dY		-0.15	0.36							
dX/dY		-3.00	3.00							

Design Accept Cancel

☐ Variable roughness Insert Delete Undo Clear OK

Appendix G Stormwater Management Facility Liner Stability

Technical Memorandum

650 Woodlawn Road West, Block C, Unit 2 • Guelph, ON N1K 1B8 • 519.824.8150

To: Parth Lad - GEI Consultants Canada Ltd.
From: Matthew Long - GEI Consultants Canada Ltd.
cc: Brad Lambier, Sarah Primmer - GEI Consultants Canada Ltd.
Date: January 26, 2026
Re: SWM Pond Liner Stability
73/79 Sideroad 19
Township of Centre Wellington, Ontario
Project No. 2401073

GEI Consultants Canada Ltd. (GEI) have been retained by Wrighthaven Homes (the Owner) to provide engineering and hydrogeological consulting services regarding the preparation of reports and drawings as part of a site plan application for the proposed development of 79 and 73 Sideroad 19 (collectively referred to as the Site) in the settlement area of Fergus, Township of Centre Wellington, Ontario.

The proposed development will be for residential use. The stormwater management design will involve the construction of a Stormwater Management Pond (SWM Pond) in the southern portion of the Site. Due to the presence of permeable soil in the vicinity of the proposed SWM Pond location, an impervious liner is proposed to be installed in the SWM Pond to prevent untreated stormwater runoff from contaminating groundwater, prevent high groundwater from impacting detention storage, and maintain the permanent pool (i.e., to prevent leakage).

Due to the elevation of groundwater levels relative to the base of the SWM Pond, it is considered necessary to conduct an analysis of the stability of the proposed geosynthetic clay liner and determine the required cover over the liner to maintain its stability.

Objective

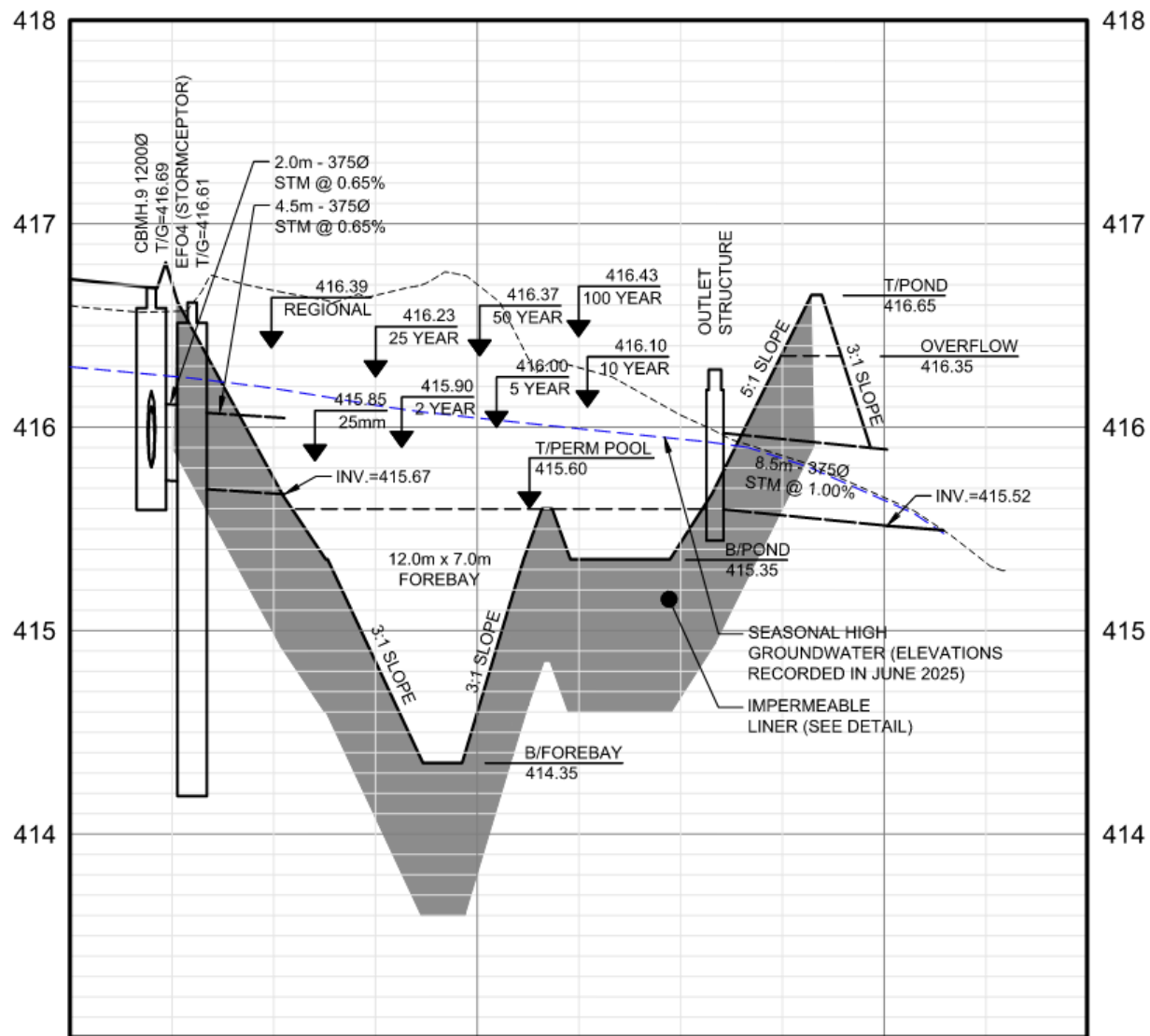
To provide supporting calculations to specify the required minimum cover over the impervious liner that will be installed in the Stormwater Management Pond (SWM Pond) to prevent failure of the liner.

Groundwater Conditions and Proposed Design

Drawing SWM-1 from the Revision 4 drawing set prepared for site plan approval (GEI, 2025), provides a profile of the SWM Pond showing the proposed pond bottom, the permanent pool elevation, and the seasonal high groundwater level. An excerpt of this drawing is provided in Figure 1.

Figure 1 shows that the maximum seasonal high groundwater level (SHGWL) at the proposed SWM Pond location is approximately 416.25 meters above sea level (masl), whereas the permanent pool elevation is 415.60 masl and the base of the SWM pond (forebay bottom) is as low as 414.35 masl.

Figure 1. Profile of Stormwater Management Pond.



Source: Drawing Set for Site Plan Approval (Rev. 4), 73/79 Sideroad 19, Township of Centre Wellington (Fergus), Residential Development, Wrighthaven Homes Limited. Prepared by GEI.

Analysis

As there is evidence of groundwater levels being higher than the proposed elevations of the permanent pool and pond bottom, there is potential for differential hydrostatic pressures to occur on the underside of the liner. To counteract the uplift caused by these hydrostatic pressures, the liner must be stabilized by ensuring that the cover placed over the liner is of sufficient thickness.

In determining liner stability and cover requirements, there are two scenarios to consider:

1. Uplift when the pond is empty (i.e., construction or maintenance conditions)
2. Uplift when the water level in the pond is at the permanent pool elevation (i.e., normal conditions)

It is noted that it is not strictly necessary to design for Scenario 1 (i.e., pond empty). A construction dewatering assessment has been prepared (hydrogeological study prepared by GEI, submitted under separate cover) regarding dewatering for the construction of the proposed SWM Pond and it is expected to be feasible to draw water levels down below the bottom of the pond to facilitate liner installation. In the future, when the pond undergoes maintenance (e.g., draining and dredging of sediment) dewatering can be implemented again to mitigate uplift pressures and ensure stability of the liner during the temporary maintenance activities. Therefore, through appropriate construction and maintenance planning, the conditions for Scenario 1 can be avoided.

Therefore, this analysis will focus on Scenario 2 (i.e., normal operation).

Two modes of failure will be considered: base heave (i.e., a total stress analysis) and internal erosion (i.e., an effective stress analysis).

Total Stress Analysis

For base heave, the liner is considered to be fully impervious, such that the seepage across the liner is considered negligible. The cover must be specified so that it will be sufficient to counteract the uplift pressure due to the difference in water level on either side of the liner (i.e., groundwater level below the liner and permanent pool level above the liner). The resistance provided by the cover is the total stress exerted by the materials placed on top of the liner.

The following equation must be satisfied to ensure stability of the liner in terms of total stress:

$$\sigma_T = P_{uplift}$$
$$(\gamma_b - \gamma_w)d = \gamma_w(H_{gw} - H_{pp})$$

Where:

- P_{uplift} is the net hydrostatic uplift pressure (kPa)
- σ_T is the stress exerted by the cover soil on the top of the liner (kPa)
- γ_b is the bulk unit weight of cover material placed over the liner (kN/m³)
- γ_w is the unit weight of water (9.81 kN/m³)
- d is the thickness of the material placed over the liner (m)
- H_{gw} is the elevation of groundwater (416.25 masl)
- H_{pp} is the elevation of the permanent pool (415.6 masl)

It is understood that the cover material will be native material, likely silty sand soil generated from excavations on Site. Based on this, γ_b is taken to be 20 kN/m³, which is based on an estimated dry density of 1,660 kg/m³ and a saturated moisture content of 23%.

The result of the calculation is a cover thickness d of 0.63 m.

Applying a factor of safety of 1.3 yields a result of 0.81 m.

Effective Stress Analysis

The internal erosion analysis applies in this case because the proposed liner is a geosynthetic clay liner, which is primarily composed of particulate matter (i.e., bentonite clay) for which internal tensile strength cannot be assumed.

The effective stress analysis assumes “drained” conditions in that the difference in hydrostatic pressure on either side of the liner is attributed to head loss of seepage across the liner. The weight of the cover material must be sufficient to stabilize the liner to prevent erosion of the liner due to the significant gradients that occur in this scenario.

Though some head loss may occur due to seepage through the cover soil, the hydraulic conductivity of the liner is orders of magnitude lower than the cover soil (approx. 10^{-11} m/s versus 10^{-6} or 10^{-7} m/s). Therefore, the amount of head loss occurring in the cover soil would be negligible, so to simplify the calculation it is assumed that hydrostatic conditions persist within the cover soil.

The following equation must be satisfied to ensure static equilibrium under the effective stress analysis:

$$\sigma' = \sigma_s$$
$$d(\gamma_b - \gamma_w) = \gamma_w \frac{(H_{gw} - H_{pp})t}{\Delta L}$$

Where:

- σ' is the effective stress exerted on the top of the liner (kPa)
- σ_s is the seepage force exerted across the liner (kPa)
- γ_b is the bulk unit weight of cover material placed over the liner (kN/m³)
- d is the thickness of the material placed over the liner (m)
- γ_w is the unit weight of water (9.81 kN/m³)
- H_{gw} is the elevation of groundwater (416.25 masl)
- H_{pp} is the elevation of the permanent pool (415.6 masl)
- ΔL is the length of the flow path over which the head loss ($H_{gw} - H_{pp}$) occurs (equivalent to t)
- t is the thickness of the liner (assumed 0.025 m)

The bulk unit weight γ_b is again taken to be 20 kN/m³. This is considered to be a conservative assumption because in effective stress analysis it is typical to assume the saturated unit weight rather than the dry unit weight.

Solving for d , the resulting cover thickness is 0.63 m, which is the same result as provided by the total stress analysis. Applying a factor of safety of 1.3 yields a result of 0.81 m.

Conclusions and Recommendations

Analyses have been completed regarding the stability of the geosynthetic clay liner that is proposed to be installed as part of the construction of the stormwater management pond (SWM Pond) for the proposed residential development at 73 and 79 Sideroad 19, Township of Centre Wellington.

The results of the analyses indicate that to provide sufficient stability to the liner, a layer of cover soil of minimum thickness of 0.81 m (32 inches) shall be placed and compacted over the liner.

Prior to construction, the Contractor shall arrange for a Standard Proctor compaction test to be completed on the selected cover material and the results of the compaction test shall be submitted for review and approval.

Sincerely,

GEI Consultants Canada Ltd.


Matthew Long, M.Eng., P.Eng.
Senior Project Engineer



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