GEI Consultants

Stormwater Management Design Report

Proposed Residential Development 73/79 Sideroad 19

Township of Centre Wellington (Fergus), Ontario

Submitted to:
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August 5, 2025
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

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

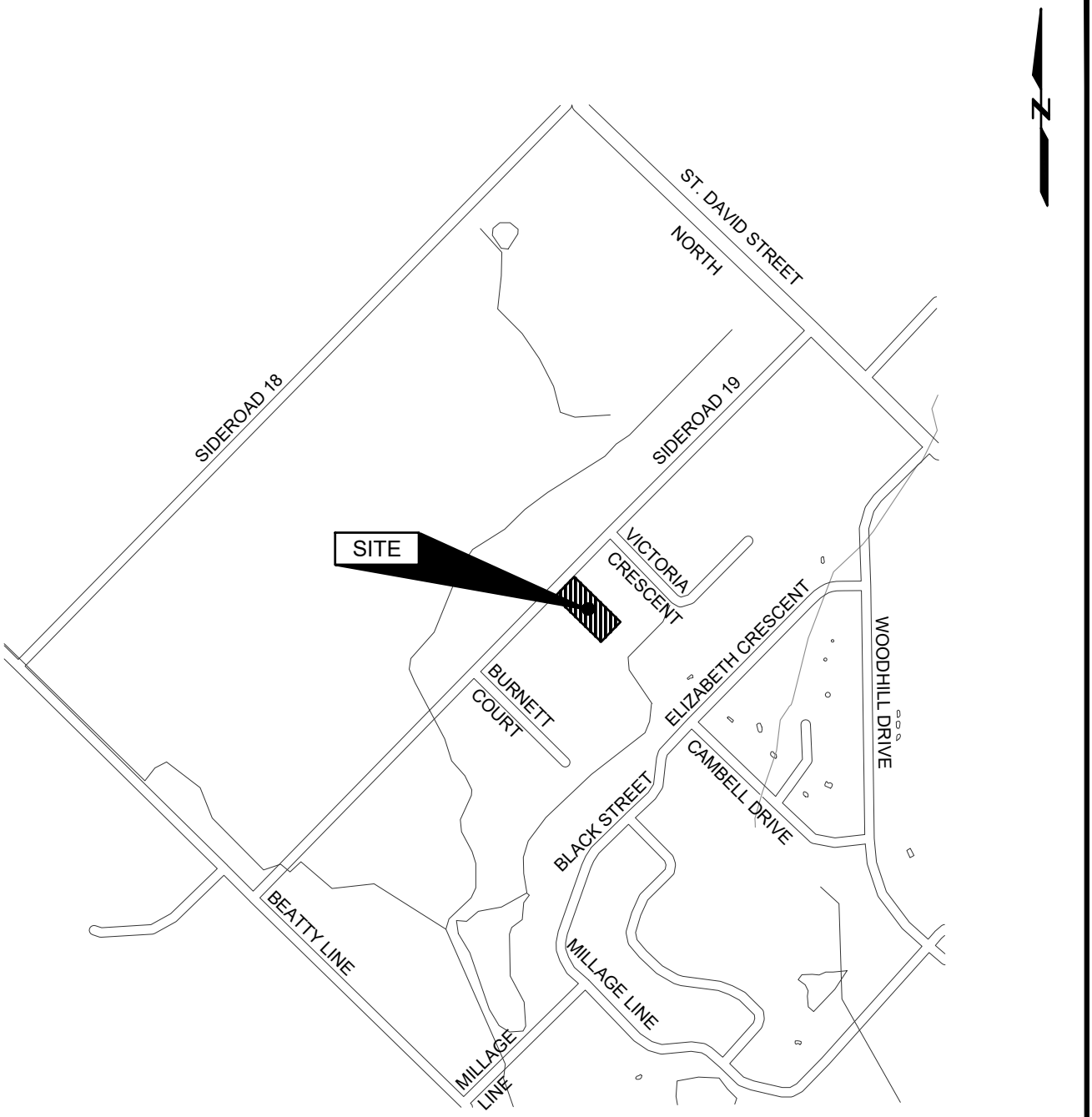
The 1.12-hectare (ha) site is located at 73 and 79 Sideroad 19 in the Town of Fergus in the Township of Centre Wellington. The property is rectangular in shape, with approximately 57m of frontage along Sideroad 19 and a depth of approximately 190m. For the purposes of this report, Sideroad 19 is considered 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	JUNE 2025 Figure No. 1

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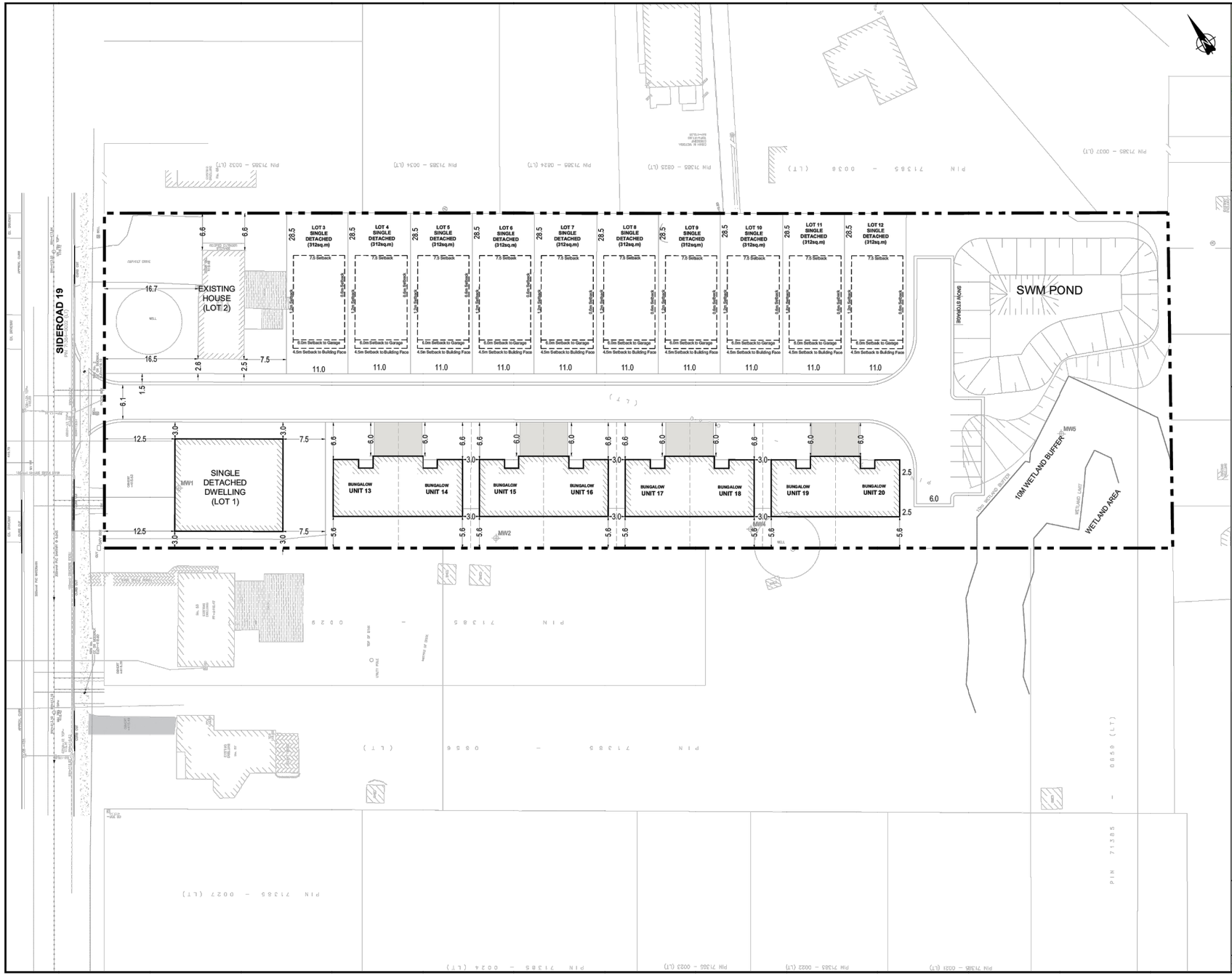
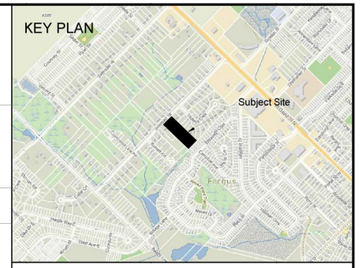


KEY PLAN



SITE PLAN

Part of Park Lot 10, Registered Plan 71
Township of Centre Wellington
Wellington County

73 & 79, Sideroad 19, Fergus

GSP group
PLANNING I URBAN DESIGN I LANDSCAPE ARCHITECTURE
gspgroup.ca

REVISIONS

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

WRIGHTHAVEN HOMES LTD.

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SITE PLAN

Project 2401073 | JULY 2025 | FIGURE No. 2

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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, April 2023, prepared by JLP Services Inc.
- **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**.**

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.

2.2. Soils

Soil Conditions

The soils for the Site are classified as follows:

- The predominant soil type on the Site is a combination of sandy silt, sand and silt (JLP Services, 2023).

Infiltration Rates

The infiltration rates for the soil are as follows:

- 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).

Refer to Appendix A for the Geotechnical Investigation report by JLP Services Inc.

Groundwater Levels

The groundwater levels observed on Site are as follows:

- 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 Figures 7a and 7b contained 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 the parameters 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	0.300
Maximum Infiltration (mm/hr)	0.0	125.0
Minimum Infiltration (mm/hr)	0.0	5.0
Lag Constant (hr)	0.00	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 m^3/ha of storage volume for a contributing drainage area that is 62% impervious. 40.00 m^3/ha of the required storage volume is extended detention storage, while the remaining 71.74 m^3/ha is permanent pool storage.
  - Based on the contributing drainage area of 0.84 hectares on the Site (Catchments 2000 and 2001), 60.26 m^3 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 m^3 of permanent pool storage and a sediment forebay which provides 34.94 m^3 of permanent pool storage, for a total permanent pool storage of 94.95 m^3.
  - Based on the contributing drainage area of 0.84 hectares on the Site (Catchments 2000 and 2001), 33.60 m^3 of extended detention storage is required. The stormwater management facility has been designed to provide approximately 599.93 m^3 of extended detention storage.
  - 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 OGS unit, and so the cleanout frequency is very conservative.
  - Stormwater management facility design calculations are included in Appendix C.

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 (3.45 hectares, 25% 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, 0% 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 wetland, which is found in Section 3.6.

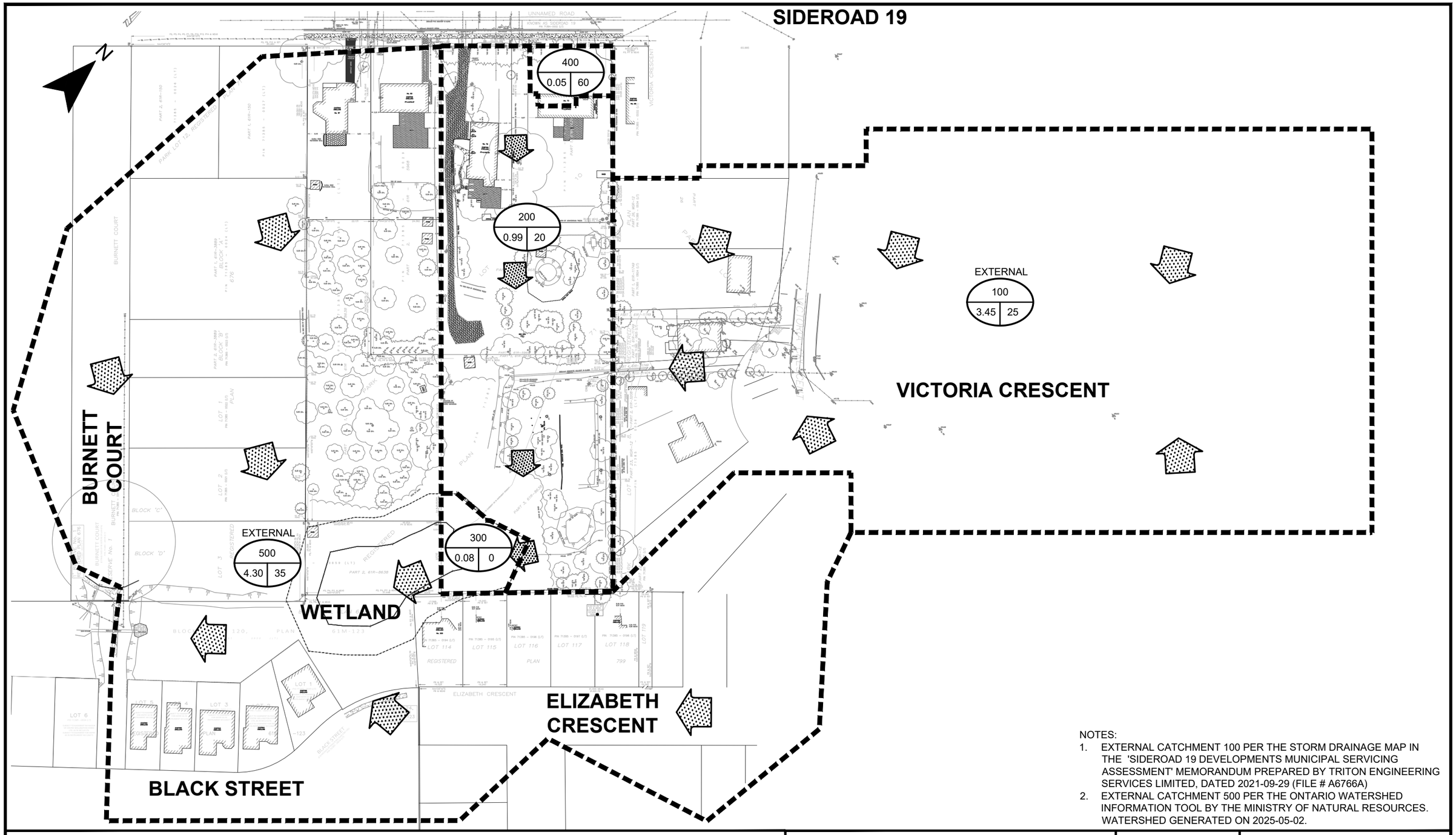
Table 3-4 summarizes the peak flow from each catchment and total peak flows under existing conditions.

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	0.168	0.180	0.252	0.308	0.394	0.497	0.624	0.293
200	0.040	0.042	0.078	0.130	0.197	0.247	0.296	0.087
Flow to Wetland	**0.197**	**0.217**	**0.323**	**0.420**	**0.574**	**0.706**	**0.867**	**0.374**
300	0.000	0.001	0.006	0.010	0.016	0.021	0.025	0.006
400	0.006	0.007	0.009	0.011	0.014	0.016	0.018	0.006
Flow to SDR 19	**0.006**	**0.007**	**0.009**	**0.011**	**0.014**	**0.016**	**0.018**	**0.006**
Total Flow from Site	**0.201**	**0.221**	**0.333**	**0.437**	**0.600**	**0.735**	**0.898**	**0.384**

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.



NOTES:

1. EXTERNAL CATCHMENT 100 PER THE STORM DRAINAGE MAP IN THE 'SIDEROAD 19 DEVELOPMENTS MUNICIPAL SERVICING ASSESSMENT' MEMORANDUM PREPARED BY TRITON ENGINEERING SERVICES LIMITED, DATED 2021-09-29 (FILE # A6766A)
2. EXTERNAL CATCHMENT 500 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)

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EXISTING CONDITIONS
DRAINAGE AREAS

Project 2401073 | JULY 2025 | FIGURE No. 3

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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	0.197	0.217	0.323	0.420	0.574	0.706	0.867	0.374
Allowable Flow to SDR 19	0.006	0.007	0.009	0.011	0.014	0.016	0.018	0.006
Allowable Flow from Site	0.201	0.221	0.333	0.437	0.600	0.735	0.898	0.384

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 (3.45 hectares, 25% impervious) represents external drainage that enters the Site from the north. Minor runoff generated from Catchment 1000 is captured by a storm sewer system and conveyed via a storm sewer easement through the Site to the existing wetland east of the property. 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, 0% 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 (0.08 hectares, 0% impervious) represents the rear yards of units fronting onto the south side of the proposed site access road. Runoff from Catchment 2002 contains no impervious area and is considered clean so it will be collected by a rear yard swale to discharge uncontrolled to the wetland.

Catchment 3000 (0.11 hectares, 0% 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.

Catchment 4002 (0.01 hectares, 90% impervious) represents a very small portion of the proposed road. Runoff from Catchment 4002 sheetflows overland to the Sideroad 19 right-of-way west of the property.

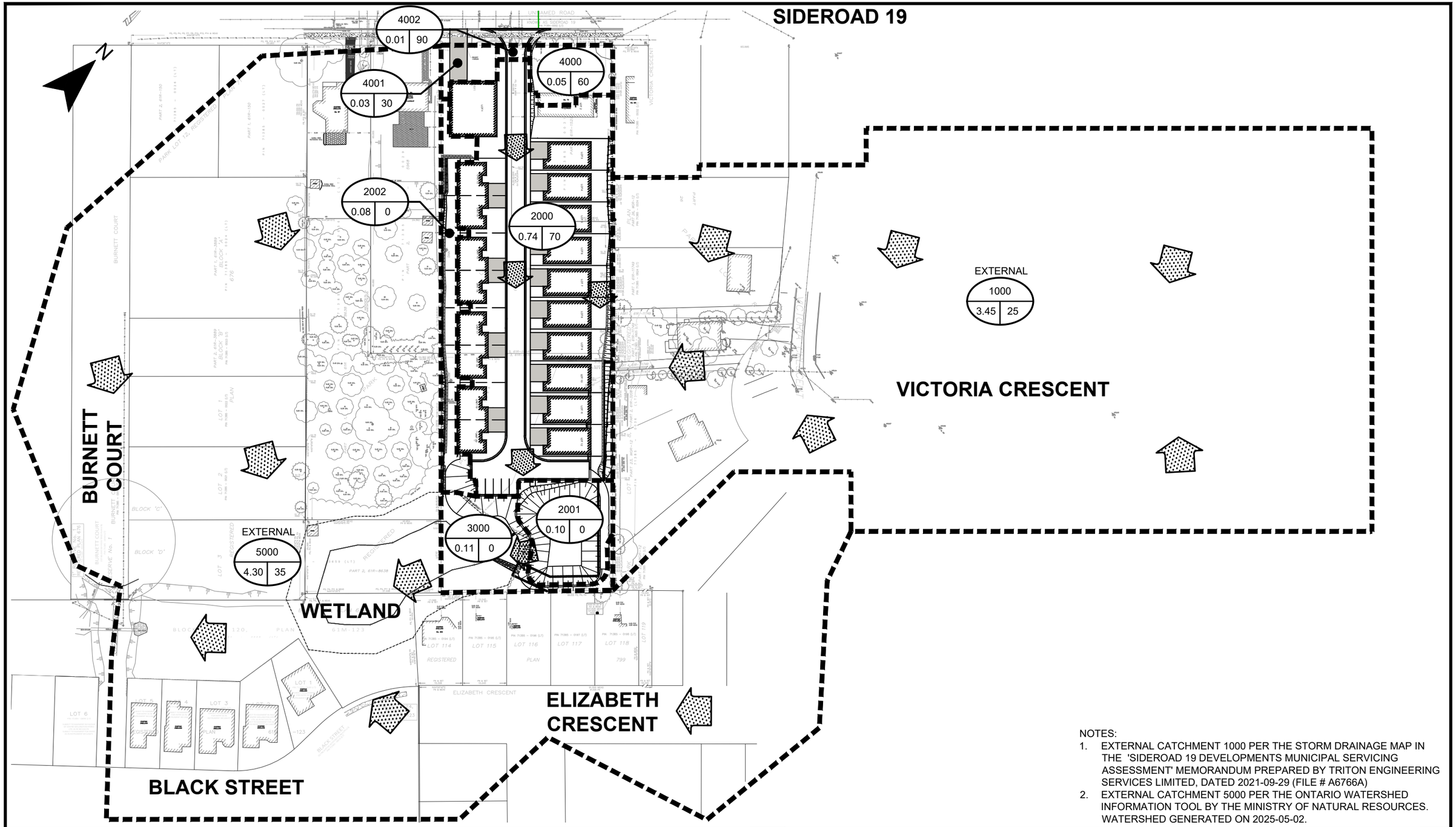
Note that Catchment 5000, which represents the downstream catchment areas that contribute to the downstream stormwater infrastructure, has not been included in the post-development conditions analysis. This catchment has been included in further analysis of the wetland, which is found in Section 3.6.

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	90.70	415.84	8.0
2-Year Storm	--	--	--	0.010	116.85	415.90	8.8
Outlet Catch Basin Lip	**0.010**	**118.91**	**415.90**	**--**	**--**	**--**	**--**
5-Year Storm	--	--	--	0.070	176.34	416.02	9.3
10-Year Storm	--	--	--	0.096	320.34	416.27	9.3
Overflow Weir	**0.103**	**373.31**	**416.35**	**--**	**--**	**--**	**--**
Regional Storm	--	--	--	0.197	410.99	416.41	55.3
25-Year Storm	--	--	--	0.302	437.42	416.44	9.4
50-Year Storm	--	--	--	0.457	467.32	416.48	9.5
100-Year Storm	--	--	--	0.611	495.45	416.52	9.5
Top of Pond	**2.329**	**599.93**	**416.65**	**--**	**--**	**--**	**--**



NOTES:

1. EXTERNAL CATCHMENT 1000 PER THE STORM DRAINAGE MAP IN THE 'SIDEROAD 19 DEVELOPMENTS MUNICIPAL SERVICING ASSESSMENT' MEMORANDUM PREPARED BY TRITON ENGINEERING SERVICES LIMITED, DATED 2021-09-29 (FILE # A6766A)
2. EXTERNAL CATCHMENT 5000 PER THE ONTARIO WATERSHED INFORMATION TOOL BY THE MINISTRY OF NATURAL RESOURCES. WATERSHED GENERATED ON 2025-05-02.

LEGEND

201 — CATCHMENT NUMBER
0.110 | 80 — % 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)

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POST-DEVELOPMENT DRAINAGE AREAS

Project 2401073 | JULY 2025 | FIGURE No. 4

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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)	0.164	0.164	0.164	0.164	0.164	0.164	0.164	0.164
1000 (Major), 2000 & 2001 (Controlled)	0.009	0.010	0.070	0.096	0.302	0.457	0.611	0.197
2002 (Controlled)	0.000	0.000	0.005	0.009	0.014	0.018	0.022	0.007
Flow to Wetland	**0.172**	**0.172**	**0.235**	**0.266**	**0.474**	**0.635**	**0.792**	**0.368**
3000	0.000	0.001	0.008	0.014	0.022	0.028	0.034	0.009
4000	0.006	0.007	0.009	0.011	0.014	0.016	0.018	0.006
4001	0.002	0.002	0.004	0.005	0.008	0.009	0.011	0.003
4002	0.002	0.002	0.003	0.003	0.003	0.004	0.004	0.001
Flow to SDR 19	**0.010**	**0.011**	**0.015**	**0.018**	**0.024**	**0.028**	**0.032**	**0.010**
Flow from Site	**0.177**	**0.179**	**0.253**	**0.286**	**0.495**	**0.663**	**0.833**	**0.383**

A summary of the allowable and post-development peak flow rates for all design storm events 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	0.197	0.217	0.323	0.420	0.574	0.706	0.867	0.374
Post-Development Flow to Wetland	**0.172**	**0.172**	**0.235**	**0.266**	**0.474**	**0.635**	**0.792**	**0.368**
Allowable Flow to SDR 19	0.006	0.007	0.009	0.011	0.014	0.016	0.018	0.006
Post-Development Flow to SDR 19	**0.010**	**0.011**	**0.015**	**0.018**	**0.024**	**0.028**	**0.032**	**0.010**
Allowable Flow from Site	0.201	0.221	0.333	0.437	0.600	0.735	0.898	0.384
Post-Development Flow from Site	**0.177**	**0.179**	**0.253**	**0.286**	**0.495**	**0.663**	**0.833**	**0.383**

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. Once this 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.

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.

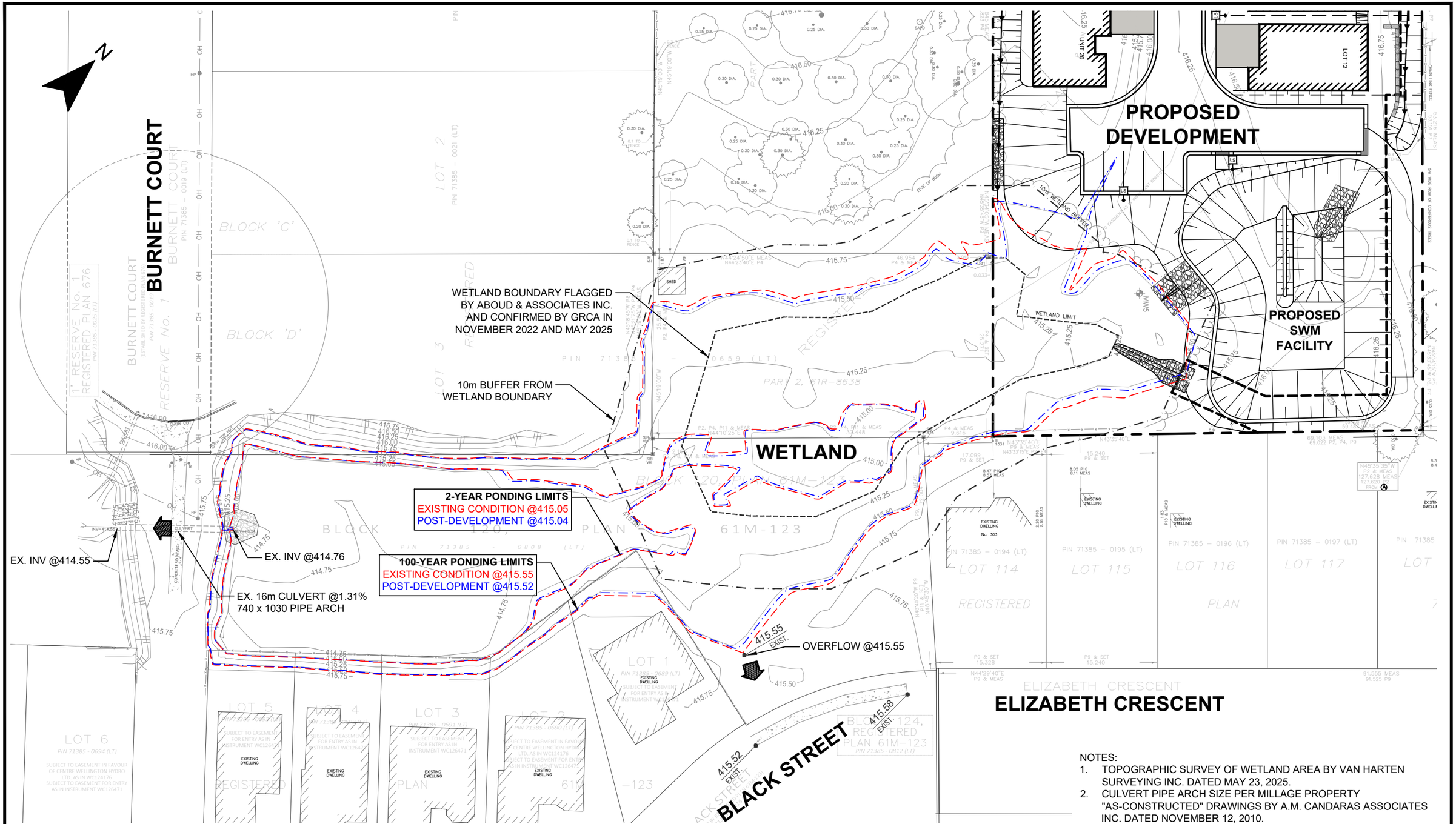
MIDUSS was used to calculate the peak flow rates to and from the wetland under existing conditions and post-development conditions. The existing conditions modeling is included in Appendix E and the post-development modeling is included in Appendix F.

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	0.245	323.51	415.05	0.226	305.59	415.04
5-Year Storm	0.356	588.95	415.19	0.346	582.22	415.19
10-Year Storm	0.577	750.65	415.26	0.513	695.22	415.24
25-Year Storm	0.787	1068.31	415.37	0.735	974.88	415.34
50-Year Storm	0.924	1366.75	415.46	0.878	1264.99	415.43
100-Year Storm	1.051	1737.40	415.55	1.014	1628.43	415.52
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 less than existing conditions. Therefore, there is no negative impact from this development on the downstream ponding.



NOTES:

1. TOPOGRAPHIC SURVEY OF WETLAND AREA BY VAN HARTEN SURVEYING INC. DATED MAY 23, 2025.
2. CULVERT PIPE ARCH SIZE PER MILLAGE PROPERTY "AS-CONSTRUCTED" DRAWINGS BY A.M. CANDARAS ASSOCIATES INC. DATED NOVEMBER 12, 2010.

LEGEND

EXISTING PONDING LIMITS

POST-DEVELOPMENT PONDING LIMITS

5 0 5 10 20

1:500 (m)

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

WRIGHTHAVEN HOMES LTD.

GEI Consultants

WETLAND PONDING LIMITS

Project 2401073 | JULY 2025 | FIGURE No. 5

4. Water Budget

4.1. Existing Conditions

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.

Under existing conditions, the Site is approximately 20% impervious overall. The existing annual average runoff volume towards the wetland is 2,278 m^3 and the existing annual average runoff volume towards the Sideroad 19 right-of-way is 261 m^3. The existing annual recharge volume for the site is 2,787 m^3. Tables 4-1, 4-2 and 4-3 illustrate the monthly water balance under existing conditions.

4.2. Post-Development Conditions

Under post-development conditions, the Site is approximately 51% 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 1,418 m^3, the average annual runoff volume towards the wetland will be 4,683 m^3, and the average annual runoff volume towards the Sideroad 19 right-of-way will be 426 m^3. Tables 4-4, 4-5 and 4-6 illustrate the monthly water balance 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 Figures 7a and 7b contained 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
To Wetland	1.07	19	Fine sand	Shallow-rooted crops	0.50	50	0.45	0.34
To Right-of-Way	0.05	60	Fine sand	Shallow-rooted crops	0.50	50	0.85	0.34

Table 4-2. Existing Conditions Monthly Water Balance (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 Evapotrans-piration (mm)	Moisture Surplus (mm)	Water Runoff (mm)	Snow Melt Runoff (mm)	Total Recharge & Runoff (mm)	Actual Runoff (mm)	Runoff Volume (m^3)	Recharge Volume (m^3)
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	5.7	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	6.3	0.0	6.3	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	1.4	15	18
Apr	5.7	1.22	0.9	33.6	30.2	74.1	43.9		50.0	0.0	26.5	47.6	23.8	25.2	49.0	22.2	238	286
May	12.2	3.86	2.0	37.8	75.6	86.9	11.3		50.0	0.0	66.4	20.5	22.2	226.8	249.0	113.0	1,209	1455
Jun	17.5	6.66	2.9	38.4	111.4	83.8	-27.6	-27.6	28.0	-22.0	92.9	12.9	17.6	0.0	17.6	8.0	85	103
Jul	20.0	8.16	3.4	38.7	131.6	89.2	-42.4	-69.9	11.0	-17.0	93.2	13.0	15.3	0.0	15.3	6.9	74	89
Aug	19	7.55	3.2	36.0	115.2	96.6	-18.6	-88.5	8.0	-3.0	87.4	12.2	13.7	0.0	13.7	6.2	67	80
Sep	14.9	5.22	2.5	31.2	78.0	93.1	15.1		23.1	15.1	68.5	9.5	11.6	0.0	11.6	5.3	57	68
Oct	8.3	2.15	1.3	28.5	37.1	77.2	40.2		50.0	26.9	32.5	17.8	14.7	0.0	14.7	6.7	71	86
Nov	2.1	0.27	0.3	24.3	7.3	93.0	85.7		50.0	0.0	6.4	86.6	50.7	0.0	50.7	23.0	246	296
Dec	-3.9	0.00	0.0	23.1	0.0	68.6	68.6		118.6	0.0	0.0	0.0	25.3	0.0	25.3	11.5	123	148
Total		**35.09**			**586.3**	**945.9**	**359.6**				**473.8**	**220.1**	**217.0**	**252.0**	**469.0**	**212.9**	**2,278.1**	**2,739.9**

Table 4-3. Existing Conditions Monthly Water Balance (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 Evapotrans-piration (mm)	Moisture Surplus (mm)	Water Runoff (mm)	Snow Melt Runoff (mm)	Total Recharge & Runoff (mm)	Actual Runoff (mm)	Runoff Volume (m^3)	Recharge Volume (m^3)
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
To Wetland	1.03	50	Fine sand	Shallow-rooted crops	0.50	50	0.79	0.34
To Right-of-Way	0.09	53	Fine sand	Shallow-rooted crops	0.50	50	0.80	0.34

Table 4-5. Post-Development Conditions Monthly Water Balance (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 Evapotrans-piration (mm)	Moisture Surplus (mm)	Water Runoff (mm)	Snow Melt Runoff (mm)	Total Recharge & Runoff (mm)	Actual Runoff (mm)	Runoff Volume (m^3)	Recharge Volume (m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		186.5	0.0	0.0	0.0	14.5	0.0	14.5	11.3	117	33
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	5.7	58	16
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		302.0	0.0	0.0	0.0	3.6	0.0	3.6	2.8	29	8
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		50.0	0.0	20.2	53.9	27.0	25.2	52.2	40.7	420	117
May	12.2	3.9	2.0	37.8	75.6	86.9	11.3		50.0	0.0	50.5	36.4	31.7	226.8	258.5	202.0	2,080	582
Jun	17.5	6.7	2.9	38.4	111.4	83.8	-27.6	-27.6	28.0	-22.0	70.6	35.2	33.4	0.0	33.4	26.1	269	75
Jul	20.0	8.2	3.4	38.7	131.6	89.2	-42.4	-69.9	11.0	-17.0	70.9	35.3	34.4	0.0	34.4	26.9	277	77
Aug	19	7.6	3.2	36.0	115.2	96.6	-18.6	-88.5	8.0	-3.0	66.5	33.1	33.7	0.0	33.7	26.4	271	76
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		23.1	15.1	52.1	25.9	29.8	0.0	29.8	23.3	240	67
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		50.0	26.9	24.7	25.6	27.7	0.0	27.7	21.6	223	62
Nov	2.1	0.3	0.3	24.3	7.3	93.0	85.7		50.0	0.0	4.9	88.1	57.9	0.0	57.9	45.2	466	130
Dec	-3.9	0.0	0.0	23.1	0.0	68.6	68.6		118.6	0.0	0.0	0.0	29.0	0.0	29.0	22.6	233	65
Total		**35.1**			**586.3**	**945.9**	**359.6**				**360.4**	**333.5**	**329.9**	**252.0**	**581.9**	**454.7**	**4,682.9**	**1,311.0**

Table 4-6. Post-Development Conditions Monthly Water Balance (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 Evapotrans-piration (mm)	Moisture Surplus (mm)	Water Runoff (mm)	Snow Melt Runoff (mm)	Total Recharge & Runoff (mm)	Actual Runoff (mm)	Runoff Volume (m^3)	Recharge Volume (m^3)
Jan	-7.4	0.0	0.0	24.3	0.0	67.9	67.9		186.5	0.0	0.0	0.0	14.7	0.0	14.7	11.7	11	3
Feb	-6.3	0.0	0.0	24.6	0.0	55.9	55.9		242.4	0.0	0.0	0.0	7.3	0.0	7.3	5.9	5	1
Mar	-1.9	0.0	0.0	30.6	0.0	59.6	59.6		302.0	0.0	0.0	0.0	3.7	0.0	3.7	2.9	3	1
Apr	5.7	1.2	0.9	33.6	30.2	74.1	43.9		50.0	0.0	19.6	54.5	27.3	25.2	52.5	41.9	38	9
May	12.2	3.9	2.0	37.8	75.6	86.9	11.3		50.0	0.0	48.9	38.0	32.6	226.8	259.4	207.4	187	47
Jun	17.5	6.7	2.9	38.4	111.4	83.8	-27.6	-27.6	28.0	-22.0	68.5	37.3	35.0	0.0	35.0	27.9	25	6
Jul	20.0	8.2	3.4	38.7	131.6	89.2	-42.4	-69.9	11.0	-17.0	68.8	37.4	36.2	0.0	36.2	28.9	26	7
Aug	19	7.6	3.2	36.0	115.2	96.6	-18.6	-88.5	8.0	-3.0	64.5	35.1	35.7	0.0	35.7	28.5	26	6
Sep	14.9	5.2	2.5	31.2	78.0	93.1	15.1		23.1	15.1	50.5	27.5	31.6	0.0	31.6	25.2	23	6
Oct	8.3	2.2	1.3	28.5	37.1	77.2	40.2		50.0	26.9	24.0	26.3	28.9	0.0	28.9	23.1	21	5
Nov	2.1	0.3	0.3	24.3	7.3	93.0	85.7		50.0	0.0	4.7	88.3	58.6	0.0	58.6	46.8	42	11
Dec	-3.9	0.0	0.0	23.1	0.0	68.6	68.6		118.6	0.0	0.0	0.0	29.3	0.0	29.3	23.4	21	5
Total		**35.1**			**586.3**	**945.9**	**359.6**				**349.5**	**344.4**	**340.7**	**252.0**	**592.7**	**473.8**	**426.4**	**107.0**

5. Erosion and Sediment Control Plan

Silt fence will be installed along the property 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.

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

Once catch basins have been installed, the grates will be wrapped in filter cloth. This will be maintained until all building and landscaping has been completed.

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 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 minimum cleanout frequency of sediment in the forebay, required to maintain the stormwater management facility, is 6 years as per the information provided in Table 3-3.

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 and filter cloth over catch basin grates.

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

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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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Appendix A: Limitations and Use of Report

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/m^2

K	=	active earth pressure coefficient, K = Ka = 0.33, if retaining structure is permitted to move, otherwise, K = Ko = 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

Enclosures

Notes:
1. The soil types a
boreholes, they ar
in the report are us
2. The Ground Sur
Benchmark (TBM)
3. The soil samples
and then discarde

BORING NUMBER MW1

JLP
Geotechnical & Environmental Consultants

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

ELEV. (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY %	HEADSPACE VAPOUR	ANALYSIS	SPT N VALUE / PL MC LL / FINES CONTENT (%)	WELL CONSTRUCTION
419			**TOPSOIL** 250mm sandy silt, some organics; black, moist (organic odour, no staining)	0.3	SS 1	6-2-3-3 (5)	54		Metals, ORPs		
418	1		**SILT** some sand, scattered coarse sand inclusions, trace organics inclusions in upper portion; brown, moist, loose to dense (no odour, no staining)	1.8	SS 2	5-19-18-14 (37)	75				
417	2		**SAND** sand, trace to some silt; brown, moist to wet, compact to loose (no odour, no staining)		SS 3	4-13-14-15 (27)	71				
416	3				SS 4	7-9-12-8 (21)	71		PHC, BTEX		
415	4				SS 5	2-5-7-6 (12)	75				
414	5		occasional silty seams		SS 6	4-4-5-4 (9)	79				
413	6				SS 7	2-6-6-10 (12)	100				
412	7				SS 8	4-7-5-6 (12)	83				
411	8		**SANDY SILT TILL** sandy silt, trace clay, occasional gravel inclusions; grey, moist, very dense (no odour, no staining)	7.6 / 8.2	SS 9	20-40-44 (84)	100				

End of Borehole at 8.23 mbgs

Water Level Readings:

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

BORING NUMBER MW2

JLP
Geotechnical & Environmental Consultants

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 417.1 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 0.12 m / Elev 416.98 m

ELEV. (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY %	HEADSPACE VAPOUR	ANALYSIS	SPT N VALUE / PL MC LL / FINES CONTENT (%)	WELL CONSTRUCTION
417			**FILL** 125mm sand and gravel, some silt; brown, moist (no odour, no staining)	0.1	SS 1	8-4-4-6 (8)	75		Metals, ORPs		
416	1		**TOPSOIL** 650mm sandy silt, some organics; black, moist (organic odour, no staining)	0.8	SS 2	2-6-5-5 (11)	75				
415	2		**SILT** some sand, occasional coarse sand inclusions; brown, moist, compact (no odour, no staining)	1.5	SS 3	3-4-4-4 (8)	50		PHC, BTEX		
414	3		**SAND** sand, trace silt; brown, wet, loose to compact (no odour, no staining)		SS 4	2-10-19-14 (29)	71				
413	4				SS 5	5-11-15-9 (26)	67				
412	5			5.2	SS 6	3-4-4-12 (8)	58				

End of Borehole at 5.18 mbgs

Water Level Readings:

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

BORING NUMBER MW3

JLP
Geotechnical & Environmental Consultants

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

ELEV. (m)	DEPTH (m)	MATERIAL DESCRIPTION	DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY %	HEADSPACE VAPOUR	ANALYSIS
		TOPSOIL 250mm sandy silt, some organics; dark brown, moist (organic odour, no staining)	0.3	SS 1	3-3-3-4 (6)	79		Metals, ORPs
416	1	**SILT** some sand, occasional coarse sand inclusions; brown, wet, compact (no odour, no staining) becoming grey and saturated at 1.52 mbgs	1.7	SS 2	2-3-8-5 (11)	58		
415	2	**SAND** sand, trace silt; grey, wet, compact to loose (no odour, no staining)		SS 3	3-6-8-7 (14)	71		PHC, BTEX
				SS 4	6-6-6-7 (12)	67		
414	3			SS 5	4-6-4-5 (10)	75		
413	4			SS 6	3-2-4-5 (6)	63		
412	5	**SANDY SILT TILL** sandy silt, trace clay, occasional gravel inclusions; grey, wet, compact (no odour, no staining)	4.9 / 5.2	SS 7	2-3-9-18 (12)	71		

End of Borehole at 5.18 mbgs

▲SPT N VALUE▲ 20 40 60 80
PL MC LL 20 40 60 80
☐FINES CONTENT (%)☐ 20 40 60 80

WELL CONSTRUCTION

Water Level Readings:

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

BORING NUMBER MW4

JLP
Geotechnical & Environmental Consultants

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

ELEV. (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY %	HEADSPACE VAPOUR	ANALYSIS	SPT N VALUE / PL MC LL / FINES CONTENT (%)	WELL CONSTRUCTION
416			**FILL** 125mm sand and gravel, some silt; brown, moist (no odour, no staining)	0.1	SS 1	3-3-5-3 (8)	29				
	1		**TOPSOIL** 500mm sandy silt, some organics; black, moist (organic odour, no staining)	0.6 1.0	SS 2	1-3-5-5 (8)	46				
415			**SILT** some sand, scattered organic seams and wood fibres in upper portion; grey, wet, loose (no odour, no staining)		SS 3	2-2-3-3 (5)	71				
	2				SS 4	3-7-11-7 (18)	50				
414											
	3		**SAND** sand, trace silt; grey, wet, loose to compact (no odour, no staining)	3.5	SS 5	15-15-15-13 (30)	100				
413			**SANDY SILT TILL** sandy silt, occasional gravel inclusions; grey, wet, compact (no odour, no staining)	3.7							
			End of Borehole at 3.66 mbgs								

Water Level Readings:

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

BORING NUMBER MW5

JLP
Geotechnical & Environmental Consultants

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 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

ELEV. (m)	DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (m)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	RECOVERY %	HEADSPACE VAPOUR	ANALYSIS	WELL CONSTRUCTION
			TOPSOIL 100mm sandy silt, some organics; black (organic odour, no staining)	0.1	SS 1	3-3-4-4 (7)	42			
415	1		**SILT** some sand, scattered organic seams and plant fibres in upper portion; brown, wet, loose (no odour, no staining)		SS 2	2-2-3-5 (5)	63			
414	2		**SAND** sand, trace silt; brown, mottled grey, wet, loose to very loose (no odour, no staining) becoming grey at 2.3 mbgs	1.8	SS 3	4-6-4-5 (10)	67			
413	3				SS 4	5-6-3-3 (9)	58			
					SS 5	1-1-2-6 (3)	71			
412	4		**SANDY SILT TILL** sandy silt, trace clay, occasional gravel inclusions; grey, wet, very dense (no odour, no staining)	4.0 4.4	SS 6	11-17-36-37 (53)	67			

▲ SPT N VALUE ▲ 20 40 60 80
PL MC LL 20 40 60 80
☐ FINES CONTENT (%) ☐ 20 40 60 80

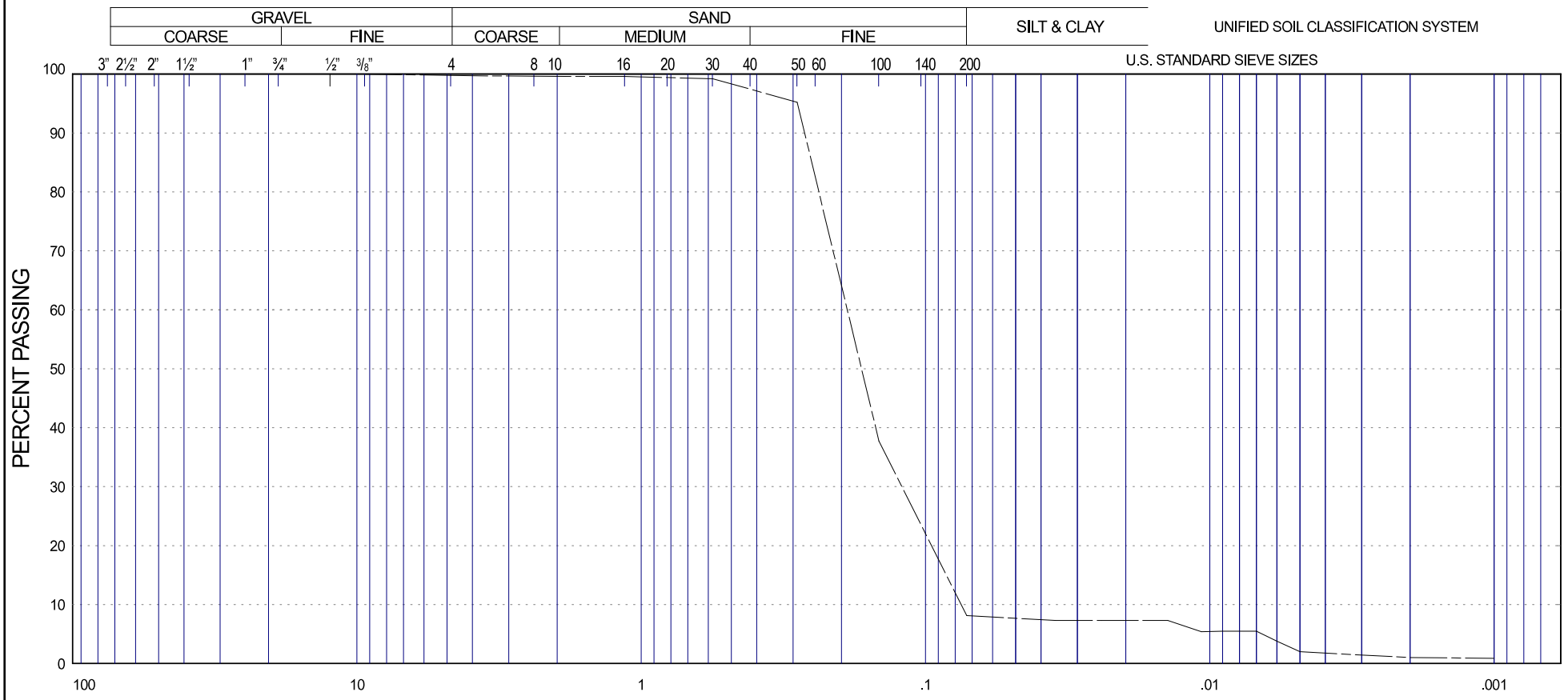
End of Borehole at 4.42 mbgs

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



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:

Classification of Sample and Group Symbol:

SAND, trace silt

PLASTIC PROPERTIES

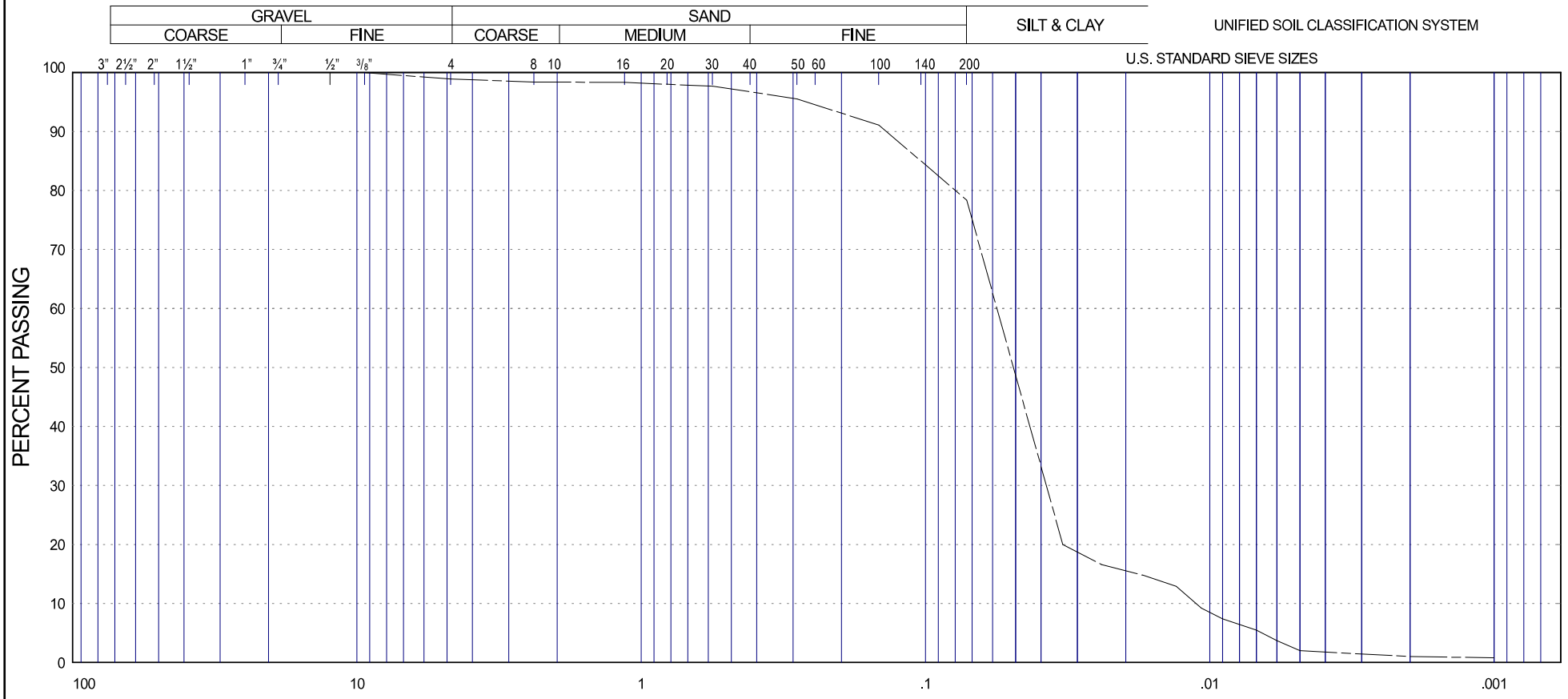
LIQUID LIMIT	% = -
PLASTIC LIMIT	% = -
PLASTICITY INDEX	% = -
MOISTURE CONTENT	% = 25.3

ENCLOSURE N° 7

JLP SERVICES INC.

GRAIN SIZE DISTRIBUTION

OUR REFERENCE N° G4670-22-12



PROJECT: Residential Subdivision

LOCATION: 79 - 87 Sideroad , (Fergus), ON

BOREHOLE N°: 3

SAMPLE N°: 2

DEPTH: 0.8 - 1.4 m±

ELEVATION: 416.4 - 415.8 m±

COEFFICIENT OF UNIFORMITY:

COEFFICIENT OF CURVATURE:

Classification of Sample and Group Symbol:

SANDY SILT (ML)

PLASTIC PROPERTIES

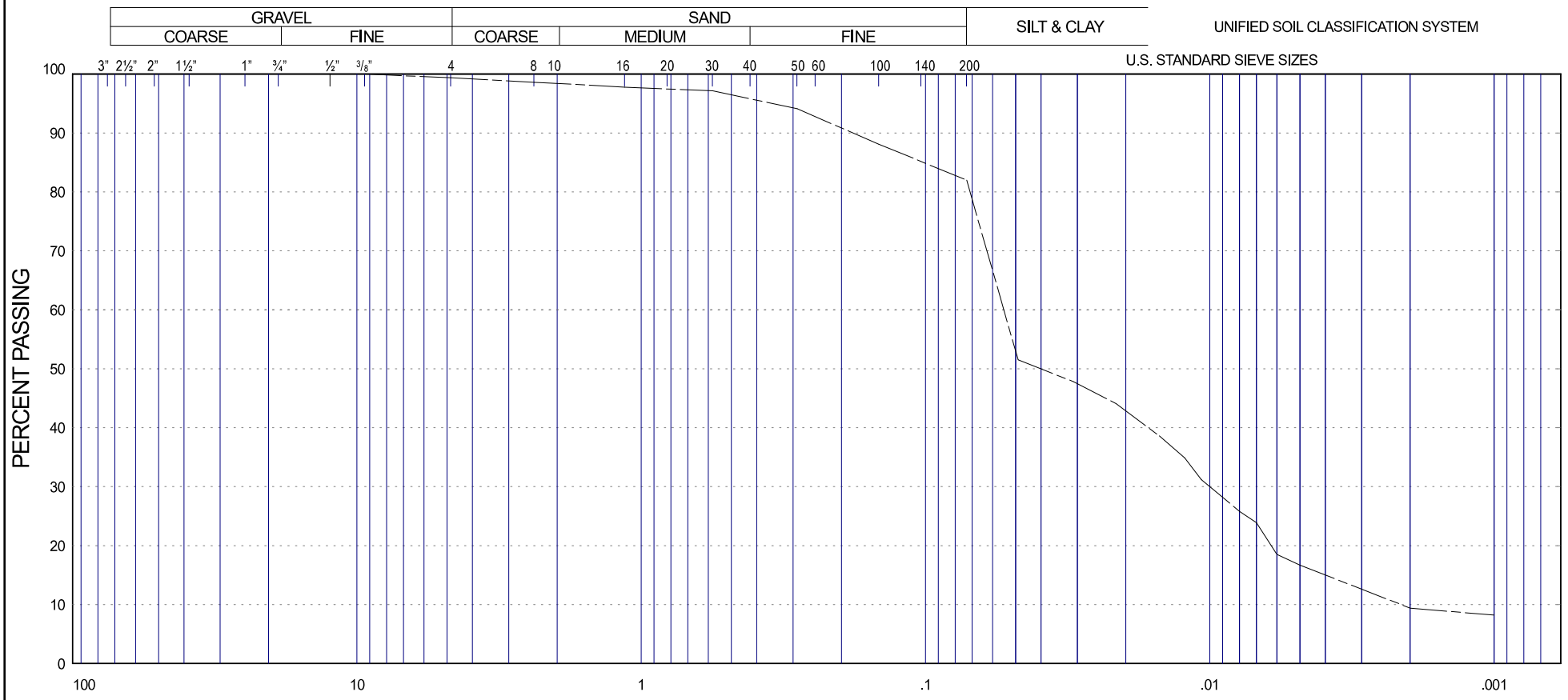
LIQUID LIMIT	% = 17.2
PLASTIC LIMIT	% = 13.7
PLASTICITY INDEX	% = 3.5
MOISTURE CONTENT	% = 17.5

ENCLOSURE N° 8

JLP SERVICES INC.

GRAIN SIZE DISTRIBUTION

OUR REFERENCE N° G4670-22-12



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:

Classification of Sample and Group Symbol:

SILT, some sand, trace clay (ML)

PLASTIC PROPERTIES

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

ENCLOSURE N° 9

JLP SERVICES INC.

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 THIE 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®

Rinker MATERIALS™

Stormceptor® EF Sizing Report

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

07/09/2025

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

Site Name:	No external drainage

Drainage Area (ha):	0.74
% Imperviousness:	70.00

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

Project Name:	079 Sideroad 19
Project Number:	122025
Designer Name:	Parth Lad
Designer Company:	GEI Consultants Canada Ltd.
Designer Email:	plad@geiconsultants.com
Designer Phone:	519-824-8150
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

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

imbrium

THIRD-PARTY TESTING AND VERIFICATION

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

PERFORMANCE

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

PARTICLE SIZE DISTRIBUTION (PSD)

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

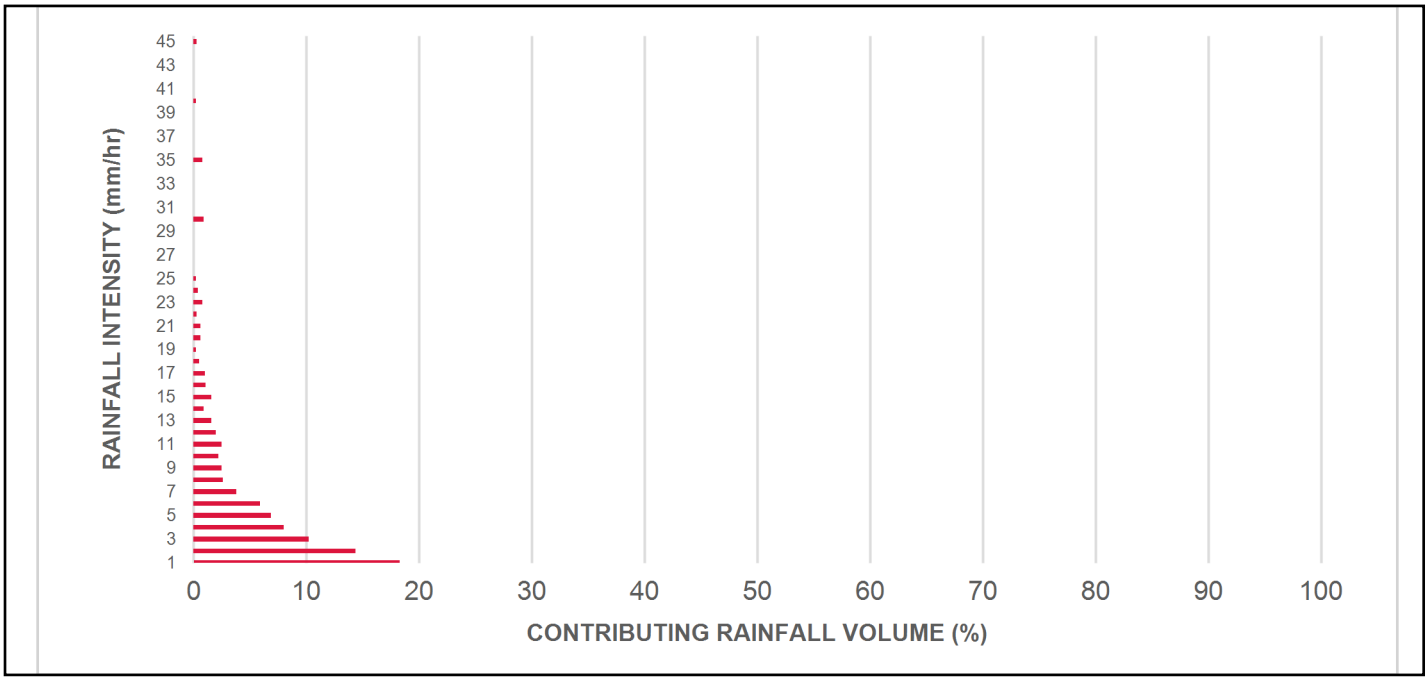
Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

Stormceptor® EF Sizing Report

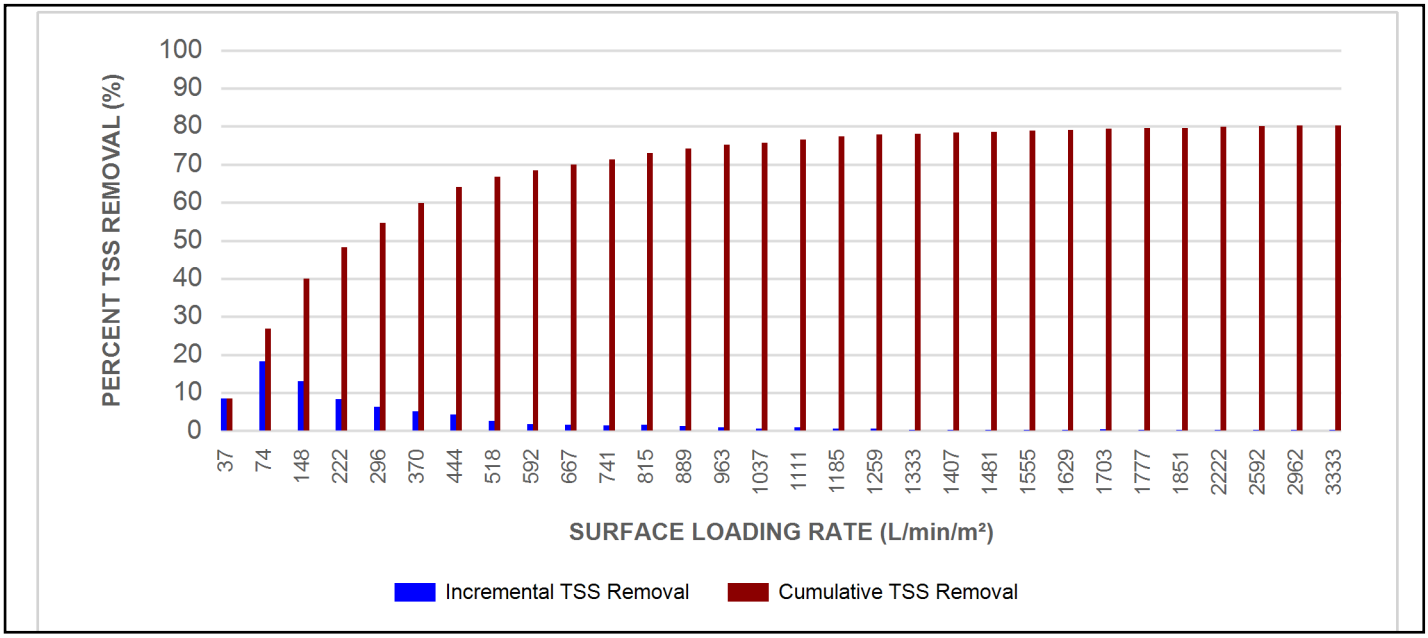
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	8.5	8.5	0.74	44.0	37.0	100	8.5	8.5
1.00	18.3	26.8	1.48	89.0	74.0	100	18.3	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

RAINFALL DATA FROM WATERLOO WELLINGTON AP RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF5 / EFO5	1.5	5	90	762	30	762	30	710	25
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

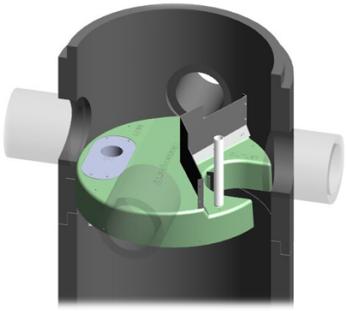
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test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

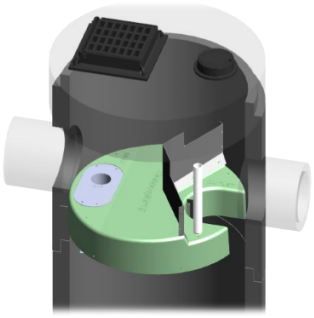
DESIGN FLEXIBILITY

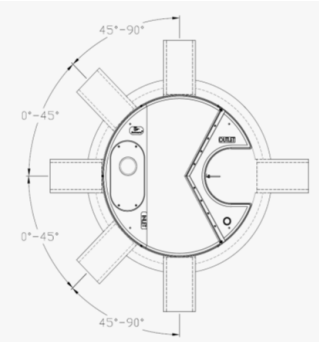
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend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

OIL CAPTURE AND RETENTION

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







INLET-TO-OUTLET DROP

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

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

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

HEAD LOSS

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

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF5 / EFO5	1.5	5	1.62	5.3	420	111	305	10	2124	75	2612	5758
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

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

** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

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

STANDARD STORMCEPTOR EF/EFO DRAWINGS

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

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

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

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

PART 1 – GENERAL

1.1 WORK INCLUDED

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

1.2 REFERENCE STANDARDS & PROCEDURES

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

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

1.3 SUBMITTALS

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

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

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

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

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

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	5 ft (1524 mm) Diameter OGS Units:	1.95 m^3 sediment / 420 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

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

3.2 SIZING METHODOLOGY

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

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

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

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

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

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

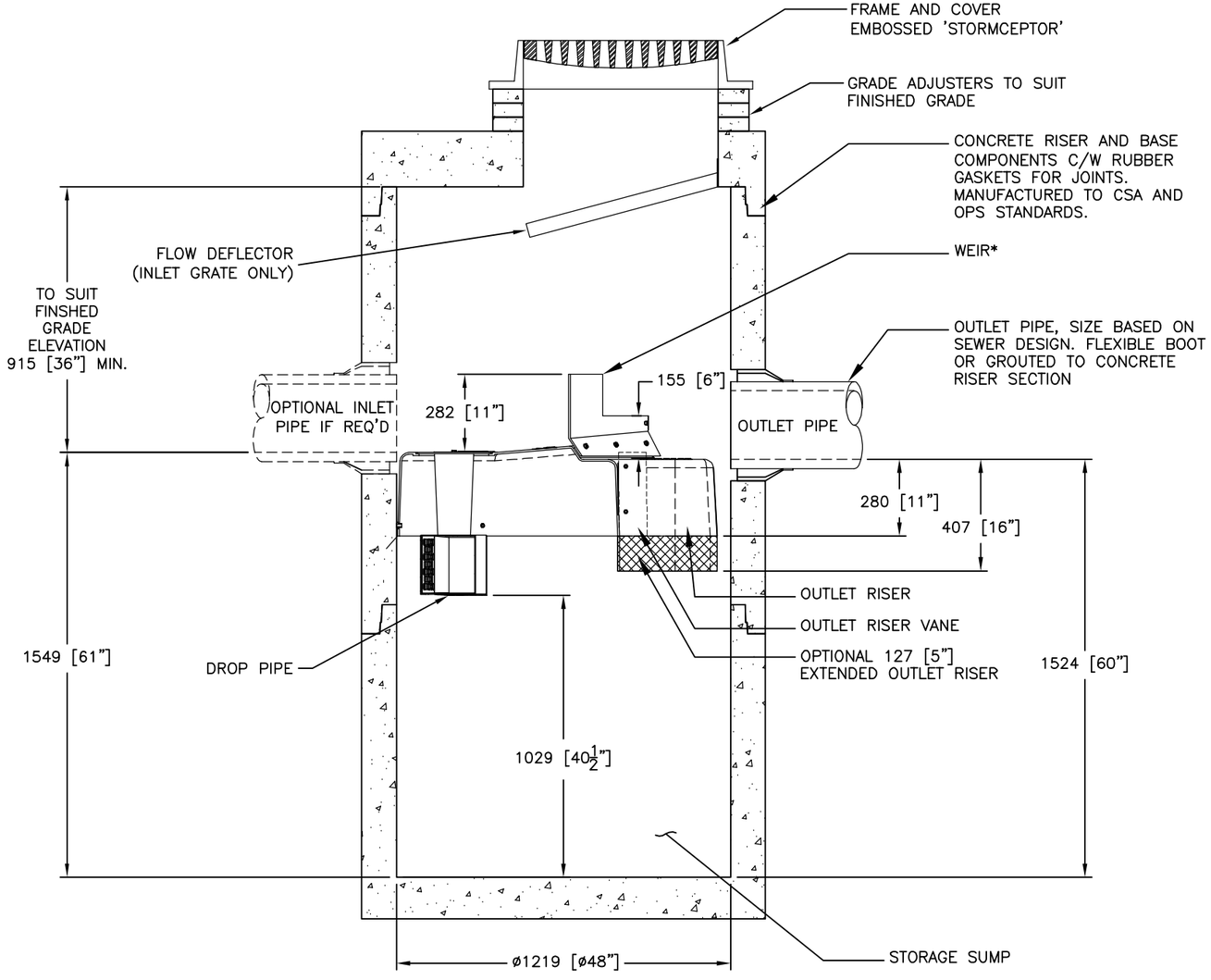
3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

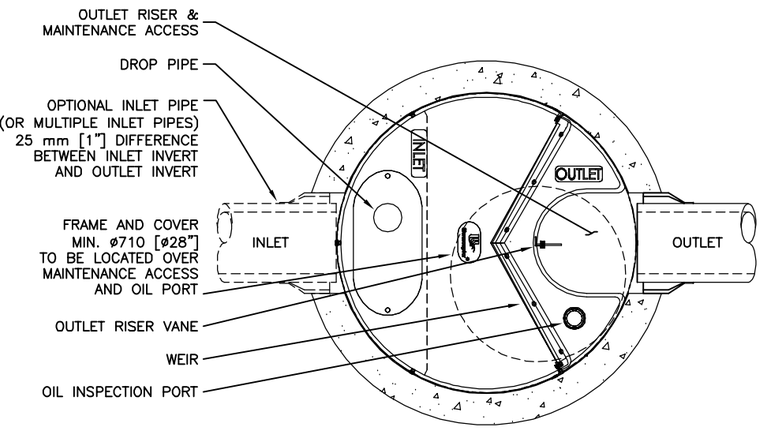
The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid

Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to assess whether light liquids captured after a spill are effectively retained at high flow rates.

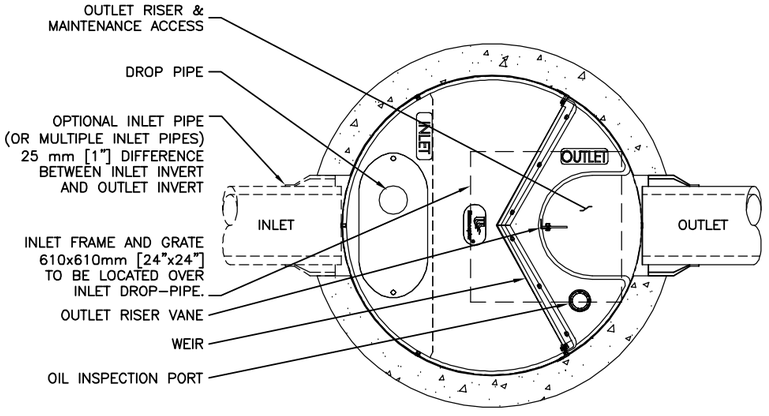
3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m^2 to 2600 L/min/m^2) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.** However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.



SECTION VIEW



PLAN VIEW (STANDARD)



PLAN VIEW (INLET TOP)

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

GENERAL NOTES:

* MAXIMUM SURFACE LOADING RATE (SLR) INTO LOWER CHAMBER THROUGH DROP PIPE IS 1135 L/min/m^2 (27.9 gpm/ft^2) FOR STORMCEPTOR EF4 AND 535 L/min/m^2 (13.1 gpm/ft^2) FOR STORMCEPTOR EFO4 (OIL CAPTURE CONFIGURATION). WEIR HEIGHT IS 150 mm (6 INCH) FOR EF04.

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

INSTALLATION NOTES

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

STANDARD DETAIL
NOT FOR CONSTRUCTION

SITE SPECIFIC DATA REQUIREMENTS

STORMCEPTOR MODEL	EFO4
STRUCTURE ID	*
HYDROCARBON STORAGE REQ'D (L)	*
WATER QUALITY FLOW RATE (L/s)	*
PEAK FLOW RATE (L/s)	*
RETURN PERIOD OF PEAK FLOW (yrs)	*
DRAINAGE AREA (HA)	*
DRAINAGE AREA IMPERVIOUSNESS (%)	*

PIPE DATA:	I.E.	MAT'L	DIA	SLOPE %	HGL
INLET #1	*	*	*	*	*
INLET #2	*	*	*	*	*
OUTLET	*	*	*	*	*

* PER ENGINEER OF RECORD

MARK	DATE	REVISION DESCRIPTION	BY
1	6/8/18	UPDATES	JSK
0	5/26/17	INITIAL RELEASE	JSK

Stormceptor® EF

SCALE = NTS

imbrium®
407 FAIRVIEW DRIVE, WHITBY, ON, L1N 9A9
TF 800-565-4501 CA 416-800-9000 INTL +1-416-800-9000

DATE: 10/13/2017

DESIGNED:	DRAWN:
JSK	JSK
CHECKED:	APPROVED:
BSF	SP
PROJECT No.:	SEQUENCE No.:
EFO4	*

SHEET: 1 OF 1

Appendix C Stormwater Management Facility Design Calculations

079 Sideroad 19
Township of Centre Wellington
File No.: 122025
7/9/2025
Water Quality Storage Calculations

Site Draining to Wetland

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

Storage Requirements for Wetland (MOE SWM Table 3.2)

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

Calculated Storage Requirements for Wetland

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

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Township of Centre Wellington (Fergus)
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7/9/2025
Stage / Storage Volume Calculations - On-Site SWM Facility

Elevation (m)	Depth (m)	Accum. Pond Volume (m^3)	Accum. Detention 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	
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	Top of Forebay
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	
415.60	1.25	94.95	0.00	Top of Perm. Pool
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	CB Lip Elevation
415.95	1.60	237.46	142.51	
416.00	1.65	262.17	167.22	
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	Overflow Weir
416.40	2.05	502.68	407.73	
416.45	2.10	538.42	443.47	
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

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Orifice No. 1			Orifice No. 2		
INV	415.60	m	INV	415.60	m
Q =	0.010	m^3/s	Q =	0.125	m^3/s
Cd =	0.600		Cd =	0.600	
H =	0.300	m	H =	1.050	m
h =	0.250	m	h =	0.925	m
2g =	19.620		2g =	19.620	
A =	0.008	m^2	A =	0.049	m^2
D =	0.100	m	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 (m)	Stage (m)	Storage (m^3)	Orifice #1 Discharge (m^3/s)	Orifice #2 Discharge (m^3/s)	Weir Discharge (m^3/s)	Total Discharge (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
7/9/2025
Sediment and Forebay Calculations

Site Draining to Wetland

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)
0.070	1.00	0.50	1.12

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

079 Sideroad 19
Township of Centre Wellington (Fergus)
Our File: 122025
July 2025

Riprap Outlet Protection Design Calculations (Storm Sewer Easement Outlet)

Assumptions:

- pipe discharges onto a relatively flat surface
- there is no well defined channel immediately downstream
- minimum tailwater conditions apply
- outlet pipe is flowing full

Given:

pipe diameter (D_o) =	0.450	m	
=	18	inches	
maximum flow =	0.164	m^3/s	(per diverted flow
=	5.79	ft^3/s	taken from MIDUSS model)

From Figure 7.45 (Erosion and Sediment Control Handbook, 1986)

Apron Length (L_a) =	10.00	ft
=	3.05	m
Median Stone Size (d_{50}) =	0.4	ft
=	0.12	m
=	122	mm
Upstream Apron Width (W_u) =	3 x D_o	
=	53.15	inches
=	1.35	m
Downstream Apron Width (W_d) =	D_o + L_a	
=	11.48	ft
=	3.50	m

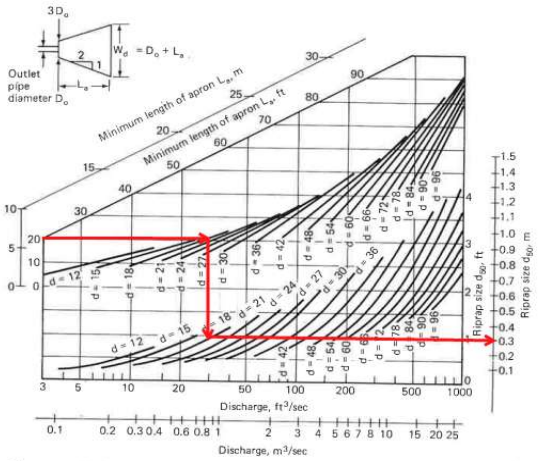

Fig. 7.45 Design of riprap outlet protection from a round pipe flowing full; minimum tailwater conditions. (6, 14)

Definition of Median Stone Size (d_{50}) :
50 percent by weight of a rock mixture is greater than or less than the d_{50} size.

Conclusions:

The median stone size required for the rip rap of 122 mm is equal to or less than the specified size of 300mm. Therefore the 300mm diameter rip rap specified will stay in place when the 450 mm diameter outlet pipe is flowing full.

The required Upstream and Downstream Apron Width (W_u and W_d) of 1.35 m and 3.50 m, respectively are less than the specified width of 3.50 m.

The required Apron Length (L_a) of 3.05 m, is less than the specified length of 3.50 m.

References:

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

079 Sideroad 19
Township of Centre Wellington (Fergus)
Our File: 122025
July 2025

Riprap Outlet Protection Design Calculations (SWM Facility Overflow Weir)

Assumptions:

- pipe discharges onto a relatively flat surface
- there is no well defined channel immediately downstream
- minimum tailwater conditions apply
- outlet pipe is flowing full

Given:

weir length	5	m	
=	197	inches	
maximum flow =	0.611	m^3/s	(per 100-year pond outflow
=	21.58	ft^3/s	taken from MIDUSS model)

From Figure 7.45 (Erosion and Sediment Control Handbook, 1986)

Apron Length (L_a) =	19.0	ft
=	5.79	m
Median Stone Size (d_{50}) =	1.0	ft
=	0.30	m
=	300	mm

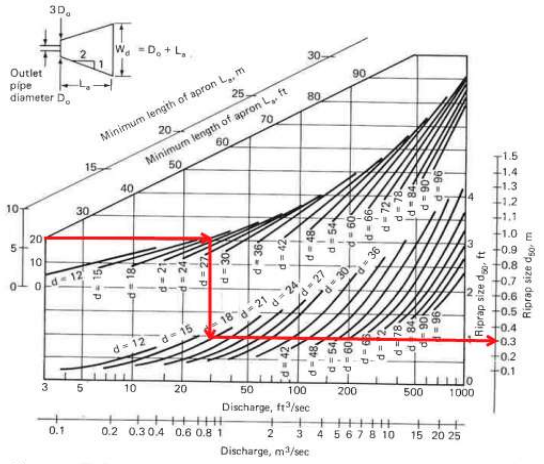

Fig. 7.45 Design of riprap outlet protection from a round pipe flowing full; minimum tailwater conditions. (6, 14)

Definition of Median Stone Size (d_{50}) :

50 percent by weight of a rock mixture is greater than or less than the d_{50} size.

Conclusions:

The median stone size required for the rip rap of 300 mm is equal to or less than the specified size of 300mm. Therefore the 300mm diameter rip rap specified will stay in place under the 100-year design storm event.

The required Apron Length (L_a) of 6.1 m, is less than the specified length of 6.5 m.

References:

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

079 Sideroad 19
Township of Centre Wellington (Fergus)
Our File: 122025
July 2025

Riprap Outlet Protection Design Calculations (SWM Facility Outlet Pipe)

Assumptions:

- pipe discharges onto a relatively flat surface
- there is no well defined channel immediately downstream
- minimum tailwater conditions apply
- outlet pipe is flowing full

Given:

pipe diameter (D_o) =	0.375	m	
=	15	inches	
maximum pipe flow =	0.125	m^3/s	(per outlet pipe capacity
=	4.41	ft^3/s	taken from MIDUSS model)

From Figure 7.45 (Erosion and Sediment Control Handbook, 1986)

Apron Length (L_a) =	9.0	ft	
=	2.74	m	
Median Stone Size (d_{50}) =	0.3	ft	
=	0.09	m	
=	91	mm	
Upstream Apron Width (W_u) =	3 x D_o		
=	44.29	inches	
=	1.13	m	
Downstream Apron Width (W_d) =	D_o + L_a		
=	10.23	ft	
=	3.12	m	

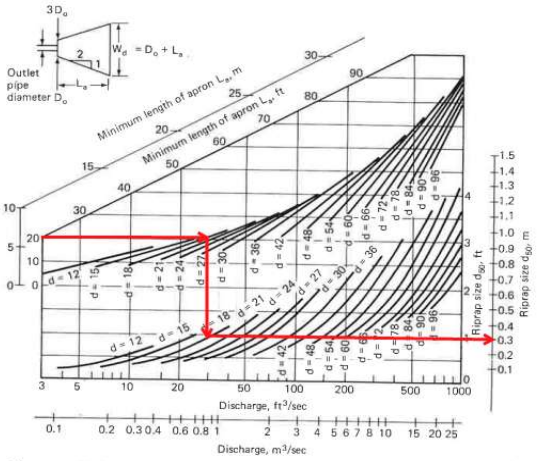

Fig. 7.45 Design of riprap outlet protection from a round pipe flowing full; minimum tailwater conditions. (6, 14)

Definition of Median Stone Size (d_{50}) :
50 percent by weight of a rock mixture is greater than or less than the d_{50} size.

Conclusions:

The median stone size required for the rip rap of 100 mm is equal to or less than the specified size of 300mm. Therefore the 300mm diameter rip rap specified will stay in place under when the outlet pipe is flowing full.

The required Upstream and Downstream Apron Width (W_u and W_d) of 1.13 m and 3.12 m, respectively are less than the specified width of 3.2 m.

The required Apron Length (L_a) of 2.74 m, is less than the specified length of 2.8 m.

References:

Goldman, Steven J., Jackson, Katharine, and Bursztynsky, Taras A., 1986. Erosion andSediment 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 (m)	Depth (m)	Pond Surface Area (m^2)	Pond Volume (m^3)	Accum. Volume (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	m2	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 m	h m	θ rad.	A m2	P m	Rh m	Q 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 m	Cd	A m2	2g	H m	h m	Q 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

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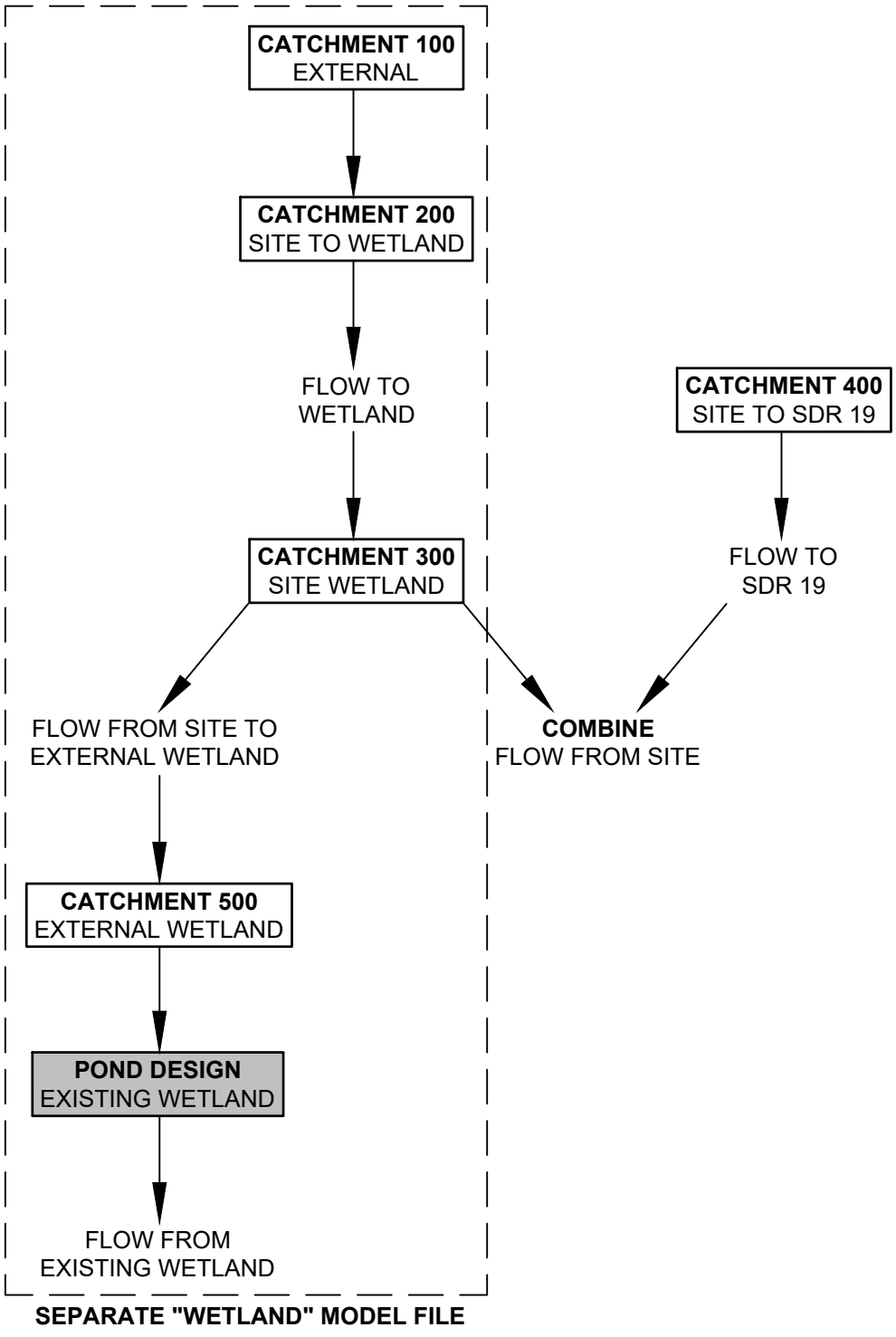
Overflow (Weir Flow)

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 (m)	Stage (m)	Storage (m^3)	Culvert Discharge (m^3/s)	Overflow Discharge (m^3/s)	Total Discharge (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)	GEI Consultants	EXISTING CONDITIONS MIDUSS HYDROLOGIC MODEL SCHEMATIC
WRIGHTHAVEN HOMES LTD.	Project 2401073	JUNE 2025

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"            1   Equal length"
"            2   Horton equation"
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"        3.450   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
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"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.863   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.168     0.000     0.000     0.000 c.m/sec"
"             Catchment 100          Pervious   Impervious Total Area "
"             Surface Area           2.588      0.863      3.450      hectare"
"             Time of concentration      ---    6.226      6.226      minutes"
"             Time to Centroid       0.000      116.340    116.340    minutes"
"             Rainfall depth         25.000     25.000     25.000     mm"
"             Rainfall volume        646.88     215.62     862.50     c.m"
"             Rainfall losses        25.000     1.639      19.160     mm"
"             Runoff depth           0.000      23.361     5.840      mm"
"             Runoff volume          0.00       201.49     201.49     c.m"
"             Runoff coefficient     0.000      0.934      0.234      "
"             Maximum flow           0.000      0.168      0.168      c.m/sec"
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"            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"
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"       30.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.040     0.168     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      ---    2.370      2.370      minutes"
"             Time to Centroid       0.000      110.927    110.927    minutes"
"             Rainfall depth         25.000     25.000     25.000     mm"
"             Rainfall volume        198.00     49.50      247.50     c.m"
"             Rainfall losses        25.000     1.866      20.373     mm"
"             Runoff depth           0.000      23.134     4.627      mm"
```

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"             Runoff volume          0.00       45.81      45.81      c.m"
"             Runoff coefficient     0.000      0.925      0.185      "
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"            2   Horton equation"
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"        0.080   Total Area"
"       25.000   Flow length"
"        2.000   Overland Slope"
"        0.080   Pervious Area"
"       25.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       25.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.000     0.197     0.000     0.000 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           0.080      0.000      0.080      hectare"
"             Time of concentration      ---    2.125      2.125      minutes"
"             Time to Centroid       0.000      110.556    110.556    minutes"
"             Rainfall depth         25.000     25.000     25.000     mm"
"             Rainfall volume        20.00      0.00       20.00      c.m"
"             Rainfall losses        25.000     1.816      25.000     mm"
"             Runoff depth           0.000      23.184     0.000      mm"
"             Runoff volume          0.00       0.00       0.00       c.m"
"             Runoff coefficient     0.000      0.000      0.000      "
"             Maximum flow           0.000      0.000      0.000      c.m/sec"
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"            4   Add Runoff "
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"            6   Combine "
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"             Maximum flow                  0.197    c.m/sec"
"             Hydrograph volume           247.294    c.m"
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"            1   Equal length"
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"        0.050   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
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"        2.000   Pervious slope"
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"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
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"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
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"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
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"             Catchment 400          Pervious   Impervious Total Area "
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"             Runoff volume          0.00       6.90       6.90       c.m"
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"             Maximum flow           0.000      0.006      0.006      c.m/sec"
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" 40          HYDROGRAPH Copy to Outflow"
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"            8   Copy to Outflow"
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"        2.000   Overland Slope"
"        2.588   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.863   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.180     0.000     0.000     0.000 c.m/sec"
"             Catchment 100          Pervious   Impervious Total Area "
"             Surface Area           2.588      0.863      3.450      hectare"
"             Time of concentration  72.495     5.835      11.857     minutes"
"             Time to Centroid       128.682    91.788     95.121     minutes"
"             Rainfall depth         33.014     33.014     33.014     mm"
"             Rainfall volume        854.23     284.74     1138.98    c.m"
"             Rainfall losses        31.976     1.664      24.398     mm"
"             Runoff depth           1.038      31.350     8.616      mm"
"             Runoff volume          26.85      270.39     297.25     c.m"
"             Runoff coefficient     0.031      0.950      0.261      "
"             Maximum flow           0.007      0.179      0.180      c.m/sec"
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"            4   Add Runoff "
"                     0.180     0.180     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"
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"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.042     0.180     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  27.601     2.222      5.217      minutes"
"             Time to Centroid       95.779     86.449     87.550     minutes"
"             Rainfall depth         33.014     33.014     33.014     mm"
"             Rainfall volume        261.47     65.37      326.84     c.m"
"             Rainfall losses        31.976     1.987      25.978     mm"
"             Runoff depth           1.038      31.027     7.036      mm"
```

```
"             Runoff volume          8.22       61.43      69.65      c.m"
"             Runoff coefficient     0.031      0.940      0.213      "
"             Maximum flow           0.005      0.042      0.042      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.042     0.217     0.000     0.000"
" 33          CATCHMENT 300"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          300   SITE WETLAND"
"        0.000   % Impervious"
"        0.080   Total Area"
"       25.000   Flow length"
"        2.000   Overland Slope"
"        0.080   Pervious Area"
"       25.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       25.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.001     0.217     0.000     0.000 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           0.080      0.000      0.080      hectare"
"             Time of concentration  24.741     1.991      24.740     minutes"
"             Time to Centroid       93.722     86.074     93.722     minutes"
"             Rainfall depth         33.014     33.014     33.014     mm"
"             Rainfall volume        26.41      0.00       26.41      c.m"
"             Rainfall losses        31.977     1.935      31.977     mm"
"             Runoff depth           1.037      31.079     1.037      mm"
"             Runoff volume          0.83       0.00       0.83       c.m"
"             Runoff coefficient     0.031      0.000      0.031      "
"             Maximum flow           0.001      0.000      0.001      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.001     0.217     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.001     0.217     0.217     0.000"
" 40          HYDROGRAPH   Combine    1"
```

```
"            6   Combine "
"            1   Node #"
"                EX FLOW FROM SITE"
"             Maximum flow                  0.217    c.m/sec"
"             Hydrograph volume           367.730    c.m"
"                    0.001     0.217     0.217     0.217"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.001     0.000     0.217     0.217"
" 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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.007     0.000     0.217     0.217 c.m/sec"
"             Catchment 400          Pervious   Impervious Total Area "
"             Surface Area           0.020      0.030      0.050      hectare"
"             Time of concentration  14.278     1.149      1.439      minutes"
"             Time to Centroid       86.060     84.800     84.828     minutes"
"             Rainfall depth         33.014     33.014     33.014     mm"
"             Rainfall volume        6.60       9.90       16.51      c.m"
"             Rainfall losses        31.976     2.325      14.185     mm"
"             Runoff depth           1.038      30.689     18.829     mm"
"             Runoff volume          0.21       9.21       9.41       c.m"
"             Runoff coefficient     0.031      0.930      0.570      "
"             Maximum flow           0.000      0.007      0.007      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.007     0.007     0.217     0.217"
" 40          HYDROGRAPH Copy to Outflow"
```

```
"            8   Copy to Outflow"
"                     0.007     0.007     0.007     0.217"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                EX FLOW FROM SITE"
"             Maximum flow                  0.221    c.m/sec"
"             Hydrograph volume           377.145    c.m"
"                     0.007     0.007     0.007     0.221"
" 38          START/RE-START TOTALS 400"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      4.570    hectare"
"             Total Impervious area                     1.091    hectare"
"             Total % impervious                       23.862"
" 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\2025-05-21 Wetland"
"                Output filename:                     122025 Pre 2yr-wetland.out"
"                Licensee name:                                                 "
"                Company                                                        "
"                Date & Time last used:                5/21/2025 at 12:28:57 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      695.050   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"
"       25.000   % Impervious"
"        3.450   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
"        2.588   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.863   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.180     0.000     0.000     0.000 c.m/sec"
"             Catchment 100          Pervious   Impervious Total Area "
"             Surface Area           2.588      0.863      3.450      hectare"
"             Time of concentration  72.493     5.835      11.857     minutes"
"             Time to Centroid       128.681    91.788     95.121     minutes"
"             Rainfall depth         33.014     33.014     33.014     mm"
"             Rainfall volume        854.24     284.75     1138.98    c.m"
"             Rainfall losses        31.976     1.664      24.398     mm"
"             Runoff depth           1.038      31.350     8.616      mm"
"             Runoff volume          26.85      270.39     297.25     c.m"
"             Runoff coefficient     0.031      0.950      0.261      "
"             Maximum flow           0.007      0.179      0.180      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.180     0.180     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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.042     0.180     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  27.600     2.222      5.217      minutes"
"             Time to Centroid       95.779     86.449     87.550     minutes"
"             Rainfall depth         33.014     33.014     33.014     mm"
"             Rainfall volume        261.47     65.37      326.84     c.m"
"             Rainfall losses        31.976     1.987      25.978     mm"
"             Runoff depth           1.038      31.027     7.036      mm"
```

```
"             Runoff volume          8.22       61.43      69.66      c.m"
"             Runoff coefficient     0.031      0.940      0.213      "
"             Maximum flow           0.005      0.042      0.042      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.042     0.217     0.000     0.000"
" 33          CATCHMENT 300"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          300   SITE WETLAND"
"        0.000   % Impervious"
"        0.080   Total Area"
"       25.000   Flow length"
"        2.000   Overland Slope"
"        0.080   Pervious Area"
"       25.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       25.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.001     0.217     0.000     0.000 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           0.080      0.000      0.080      hectare"
"             Time of concentration  24.740     1.991      24.740     minutes"
"             Time to Centroid       93.722     86.074     93.722     minutes"
"             Rainfall depth         33.014     33.014     33.014     mm"
"             Rainfall volume        26.41      0.00       26.41      c.m"
"             Rainfall losses        31.977     1.935      31.977     mm"
"             Runoff depth           1.037      31.079     1.037      mm"
"             Runoff volume          0.83       0.00       0.83       c.m"
"             Runoff coefficient     0.031      0.000      0.031      "
"             Maximum flow           0.001      0.000      0.001      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.001     0.217     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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.318     0.217     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  89.250     7.184      11.948     minutes"
"             Time to Centroid       141.005    93.788     96.529     minutes"
"             Rainfall depth         33.014     33.014     33.014     mm"
"             Rainfall volume        922.74     496.86     1419.60    c.m"
"             Rainfall losses        31.976     1.722      21.387     mm"
"             Runoff depth           1.038      31.292     11.627     mm"
"             Runoff volume          29.02      470.95     499.97     c.m"
"             Runoff coefficient     0.031      0.948      0.352      "
"             Maximum flow           0.006      0.318      0.318      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.318     0.535     0.000     0.000"
" 54          POND DESIGN"
"        0.535   Current peak flow    c.m/sec"
"        0.001   Target outflow    c.m/sec"
"        867.7   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  1.00E-07     1.280"
"                414.750  1.00E-07    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                  0.245    c.m/sec"
"              Maximum level               415.048    metre"
"              Maximum storage             323.507    c.m"
"              Centroidal lag                2.059   hours"
"                   0.318     0.535     0.245     0.000 c.m/sec"
```

```
"                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\2025-06-11 SWM Pond"
"                Output filename:                              122025 Pre 5yr.out"
"                Licensee name:                                                  "
"                Company                                                         "
"                Date & Time last used:                  6/11/2025 at 1:34:32 PM"
" 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"
"       25.000   % Impervious"
"        3.450   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
"        2.588   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.863   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.252     0.000     0.000     0.000 c.m/sec"
"             Catchment 100          Pervious   Impervious Total Area "
"             Surface Area           2.588      0.863      3.450      hectare"
"             Time of concentration  42.120     5.421      20.225     minutes"
"             Time to Centroid       115.206    89.951     100.139    minutes"
"             Rainfall depth         49.792     49.792     49.792     mm"
"             Rainfall volume        1288.36    429.45     1717.81    c.m"
"             Rainfall losses        38.982     1.829      29.694     mm"
"             Runoff depth           10.810     47.963     20.098     mm"
"             Runoff volume          279.70     413.68     693.38     c.m"
"             Runoff coefficient     0.217      0.963      0.404      "
"             Maximum flow           0.093      0.238      0.252      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.252     0.252     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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.078     0.252     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  16.036     2.064      8.706      minutes"
"             Time to Centroid       91.266     85.228     88.098     minutes"
"             Rainfall depth         49.792     49.792     49.792     mm"
"             Rainfall volume        394.35     98.59      492.94     c.m"
"             Rainfall losses        39.023     2.256      31.670     mm"
"             Runoff depth           10.768     47.536     18.122     mm"
```

```
"             Runoff volume          85.29      94.12      179.41     c.m"
"             Runoff coefficient     0.216      0.955      0.364      "
"             Maximum flow           0.059      0.054      0.078      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.078     0.323     0.000     0.000"
" 33          CATCHMENT 300"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          300   SITE WETLAND"
"        0.000   % Impervious"
"        0.080   Total Area"
"       25.000   Flow length"
"        2.000   Overland Slope"
"        0.080   Pervious Area"
"       25.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       25.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.006     0.323     0.000     0.000 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           0.080      0.000      0.080      hectare"
"             Time of concentration  14.375     1.850      14.375     minutes"
"             Time to Centroid       89.770     84.851     89.770     minutes"
"             Rainfall depth         49.792     49.792     49.792     mm"
"             Rainfall volume        39.83      0.00       39.83      c.m"
"             Rainfall losses        38.999     2.189      38.999     mm"
"             Runoff depth           10.793     47.602     10.793     mm"
"             Runoff volume          8.63       0.00       8.63       c.m"
"             Runoff coefficient     0.217      0.000      0.217      "
"             Maximum flow           0.006      0.000      0.006      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.006     0.326     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.006     0.326     0.326     0.000"
" 40          HYDROGRAPH   Combine    1"
```

```
"            6   Combine "
"            1   Node #"
"                EX FLOW FROM SITE"
"             Maximum flow                  0.326    c.m/sec"
"             Hydrograph volume           881.422    c.m"
"                    0.006     0.326     0.326     0.326"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.006     0.000     0.326     0.326"
" 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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.009     0.000     0.326     0.326 c.m/sec"
"             Catchment 400          Pervious   Impervious Total Area "
"             Surface Area           0.020      0.030      0.050      hectare"
"             Time of concentration  8.295      1.068      2.029      minutes"
"             Time to Centroid       84.311     83.761     83.834     minutes"
"             Rainfall depth         49.792     49.792     49.792     mm"
"             Rainfall volume        9.96       14.94      24.90      c.m"
"             Rainfall losses        38.990     2.855      17.309     mm"
"             Runoff depth           10.802     46.936     32.483     mm"
"             Runoff volume          2.16       14.08      16.24      c.m"
"             Runoff coefficient     0.217      0.943      0.652      "
"             Maximum flow           0.002      0.009      0.009      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.009     0.009     0.326     0.326"
" 40          HYDROGRAPH Copy to Outflow"
```

```
"            8   Copy to Outflow"
"                     0.009     0.009     0.009     0.326"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                EX FLOW FROM SITE"
"             Maximum flow                  0.333    c.m/sec"
"             Hydrograph volume           897.663    c.m"
"                     0.009     0.009     0.009     0.333"
" 38          START/RE-START TOTALS 400"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      4.570    hectare"
"             Total Impervious area                     1.091    hectare"
"             Total % impervious                       23.862"
" 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\2025-06-16 SWM Pond"
"                Output filename:                     122025 Pre 5yr-wetland.out"
"                Licensee name:                                                 "
"                Company                                                        "
"                Date & Time last used:                 6/24/2025 at 1:52:37 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      240.000   Max. Storm length"
"     1500.000   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"
"       25.000   % Impervious"
"        3.450   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
"        2.588   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.863   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.252     0.000     0.000     0.000 c.m/sec"
"             Catchment 100          Pervious   Impervious Total Area "
"             Surface Area           2.588      0.863      3.450      hectare"
"             Time of concentration  42.120     5.421      20.225     minutes"
"             Time to Centroid       115.206    89.951     100.139    minutes"
"             Rainfall depth         49.792     49.792     49.792     mm"
"             Rainfall volume        1288.36    429.45     1717.81    c.m"
"             Rainfall losses        38.982     1.829      29.694     mm"
"             Runoff depth           10.810     47.963     20.098     mm"
"             Runoff volume          279.70     413.68     693.38     c.m"
"             Runoff coefficient     0.217      0.963      0.404      "
"             Maximum flow           0.093      0.238      0.252      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.252     0.252     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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.078     0.252     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  16.036     2.064      8.706      minutes"
"             Time to Centroid       91.266     85.228     88.098     minutes"
"             Rainfall depth         49.792     49.792     49.792     mm"
"             Rainfall volume        394.35     98.59      492.94     c.m"
"             Rainfall losses        39.023     2.256      31.670     mm"
"             Runoff depth           10.768     47.536     18.122     mm"
```

```
"             Runoff volume          85.29      94.12      179.41     c.m"
"             Runoff coefficient     0.216      0.955      0.364      "
"             Maximum flow           0.059      0.054      0.078      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.078     0.323     0.000     0.000"
" 33          CATCHMENT 300"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          300   SITE WETLAND"
"        0.000   % Impervious"
"        0.080   Total Area"
"       25.000   Flow length"
"        2.000   Overland Slope"
"        0.080   Pervious Area"
"       25.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       25.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.006     0.323     0.000     0.000 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           0.080      0.000      0.080      hectare"
"             Time of concentration  14.375     1.850      14.375     minutes"
"             Time to Centroid       89.770     84.851     89.770     minutes"
"             Rainfall depth         49.792     49.792     49.792     mm"
"             Rainfall volume        39.83      0.00       39.83      c.m"
"             Rainfall losses        38.999     2.189      38.999     mm"
"             Runoff depth           10.793     47.602     10.793     mm"
"             Runoff volume          8.63       0.00       8.63       c.m"
"             Runoff coefficient     0.217      0.000      0.217      "
"             Maximum flow           0.006      0.000      0.006      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.006     0.326     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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.417     0.326     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  51.856     6.674      20.035     minutes"
"             Time to Centroid       124.140    91.682     101.280    minutes"
"             Rainfall depth         49.792     49.792     49.792     mm"
"             Rainfall volume        1391.68    749.36     2141.04    c.m"
"             Rainfall losses        38.979     1.969      26.026     mm"
"             Runoff depth           10.812     47.823     23.766     mm"
"             Runoff volume          302.21     719.73     1021.94    c.m"
"             Runoff coefficient     0.217      0.960      0.477      "
"             Maximum flow           0.084      0.407      0.417      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.417     0.742     0.000     0.000"
" 54          POND DESIGN"
"        0.742   Current peak flow    c.m/sec"
"        0.001   Target outflow    c.m/sec"
"       1903.4   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                  0.356    c.m/sec"
"             Maximum level               415.188    metre"
"             Maximum storage             588.949    c.m"
"             Centroidal lag                2.154   hours"
"                  0.417     0.742     0.356     0.000 c.m/sec"
" 38          START/RE-START TOTALS 500"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      8.820    hectare"
"             Total Impervious area                     2.566    hectare"
"             Total % impervious                       29.087"
" 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\2025-06-16 SWM Pond"
"                Output filename:                            122025 Pre 10yr.out"
"                Licensee name:                                                  "
"                Company                                                         "
"                Date & Time last used:                6/24/2025 at 12:14:43 PM"
" 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"
"       25.000   % Impervious"
"        3.450   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
"        2.588   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.863   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.308     0.000     0.000     0.000 c.m/sec"
"             Catchment 100          Pervious   Impervious Total Area "
"             Surface Area           2.588      0.863      3.450      hectare"
"             Time of concentration  34.842     5.213      19.957     minutes"
"             Time to Centroid       112.196    89.134     100.610    minutes"
"             Rainfall depth         61.359     61.359     61.359     mm"
"             Rainfall volume        1587.67    529.22     2116.89    c.m"
"             Rainfall losses        41.746     1.955      31.799     mm"
"             Runoff depth           19.613     59.404     29.561     mm"
"             Runoff volume          507.48     512.36     1019.84    c.m"
"             Runoff coefficient     0.320      0.968      0.482      "
"             Maximum flow           0.173      0.272      0.308      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.308     0.308     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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.130     0.308     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  13.265     1.985      8.417      minutes"
"             Time to Centroid       91.150     84.687     88.373     minutes"
"             Rainfall depth         61.359     61.359     61.359     mm"
"             Rainfall volume        485.97     121.49     607.46     c.m"
"             Rainfall losses        41.800     2.394      33.918     mm"
"             Runoff depth           19.560     58.966     27.441     mm"
```

```
"             Runoff volume          154.91     116.75     271.66     c.m"
"             Runoff coefficient     0.319      0.961      0.447      "
"             Maximum flow           0.098      0.061      0.130      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.130     0.420     0.000     0.000"
" 33          CATCHMENT 300"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          300   SITE WETLAND"
"        0.000   % Impervious"
"        0.080   Total Area"
"       25.000   Flow length"
"        2.000   Overland Slope"
"        0.080   Pervious Area"
"       25.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       25.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.010     0.420     0.000     0.000 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           0.080      0.000      0.080      hectare"
"             Time of concentration  11.891     1.779      11.891     minutes"
"             Time to Centroid       89.763     84.366     89.763     minutes"
"             Rainfall depth         61.359     61.359     61.359     mm"
"             Rainfall volume        49.09      0.00       49.09      c.m"
"             Rainfall losses        41.812     2.333      41.812     mm"
"             Runoff depth           19.547     59.026     19.547     mm"
"             Runoff volume          15.64      0.00       15.64      c.m"
"             Runoff coefficient     0.319      0.000      0.319      "
"             Maximum flow           0.010      0.000      0.010      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.010     0.427     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.010     0.427     0.427     0.000"
" 40          HYDROGRAPH   Combine    1"
```

```
"            6   Combine "
"            1   Node #"
"                EX FLOW FROM SITE"
"             Maximum flow                  0.427    c.m/sec"
"             Hydrograph volume          1307.145    c.m"
"                    0.010     0.427     0.427     0.427"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.010     0.000     0.427     0.427"
" 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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.011     0.000     0.427     0.427 c.m/sec"
"             Catchment 400          Pervious   Impervious Total Area "
"             Surface Area           0.020      0.030      0.050      hectare"
"             Time of concentration  6.862      1.027      2.087      minutes"
"             Time to Centroid       85.000     83.391     83.683     minutes"
"             Rainfall depth         61.359     61.359     61.359     mm"
"             Rainfall volume        12.27      18.41      30.68      c.m"
"             Rainfall losses        42.018     3.280      18.775     mm"
"             Runoff depth           19.341     58.079     42.584     mm"
"             Runoff volume          3.87       17.42      21.29      c.m"
"             Runoff coefficient     0.315      0.947      0.694      "
"             Maximum flow           0.003      0.010      0.011      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.011     0.011     0.427     0.427"
" 40          HYDROGRAPH Copy to Outflow"
```

```
"            8   Copy to Outflow"
"                     0.011     0.011     0.011     0.427"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                EX FLOW FROM SITE"
"             Maximum flow                  0.437    c.m/sec"
"             Hydrograph volume          1328.437    c.m"
"                     0.011     0.011     0.011     0.437"
" 38          START/RE-START TOTALS 400"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      4.570    hectare"
"             Total Impervious area                     1.091    hectare"
"             Total % impervious                       23.862"
" 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\2025-06-16 SWM Pond"
"                Output filename:                   122025 Pre 10yr-wetland.out"
"                Licensee name:                                                 "
"                Company                                                        "
"                Date & Time last used:                6/24/2025 at 1:54:21 PM"
" 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"
"       25.000   % Impervious"
"        3.450   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
"        2.588   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.863   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.308     0.000     0.000     0.000 c.m/sec"
"             Catchment 100          Pervious   Impervious Total Area "
"             Surface Area           2.588      0.863      3.450      hectare"
"             Time of concentration  34.842     5.213      19.957     minutes"
"             Time to Centroid       112.196    89.134     100.610    minutes"
"             Rainfall depth         61.359     61.359     61.359     mm"
"             Rainfall volume        1587.67    529.22     2116.89    c.m"
"             Rainfall losses        41.746     1.955      31.799     mm"
"             Runoff depth           19.613     59.404     29.561     mm"
"             Runoff volume          507.48     512.36     1019.84    c.m"
"             Runoff coefficient     0.320      0.968      0.482      "
"             Maximum flow           0.173      0.272      0.308      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.308     0.308     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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.130     0.308     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  13.265     1.985      8.417      minutes"
"             Time to Centroid       91.150     84.687     88.373     minutes"
"             Rainfall depth         61.359     61.359     61.359     mm"
"             Rainfall volume        485.97     121.49     607.46     c.m"
"             Rainfall losses        41.800     2.394      33.918     mm"
"             Runoff depth           19.560     58.966     27.441     mm"
```

```
"             Runoff volume          154.91     116.75     271.66     c.m"
"             Runoff coefficient     0.319      0.961      0.447      "
"             Maximum flow           0.098      0.061      0.130      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.130     0.420     0.000     0.000"
" 33          CATCHMENT 300"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          300   SITE WETLAND"
"        0.000   % Impervious"
"        0.080   Total Area"
"       25.000   Flow length"
"        2.000   Overland Slope"
"        0.080   Pervious Area"
"       25.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       25.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.010     0.420     0.000     0.000 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           0.080      0.000      0.080      hectare"
"             Time of concentration  11.891     1.779      11.891     minutes"
"             Time to Centroid       89.763     84.366     89.763     minutes"
"             Rainfall depth         61.359     61.359     61.359     mm"
"             Rainfall volume        49.09      0.00       49.09      c.m"
"             Rainfall losses        41.812     2.333      41.812     mm"
"             Runoff depth           19.547     59.026     19.547     mm"
"             Runoff volume          15.64      0.00       15.64      c.m"
"             Runoff coefficient     0.319      0.000      0.319      "
"             Maximum flow           0.010      0.000      0.010      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.010     0.427     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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.498     0.427     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  42.895     6.418      20.289     minutes"
"             Time to Centroid       120.078    90.727     101.888    minutes"
"             Rainfall depth         61.359     61.359     61.359     mm"
"             Rainfall volume        1714.99    923.46     2638.45    c.m"
"             Rainfall losses        41.728     1.941      27.803     mm"
"             Runoff depth           19.631     59.418     33.557     mm"
"             Runoff volume          548.69     894.24     1442.93    c.m"
"             Runoff coefficient     0.320      0.968      0.547      "
"             Maximum flow           0.159      0.471      0.498      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.498     0.924     0.000     0.000"
" 54          POND DESIGN"
"        0.924   Current peak flow    c.m/sec"
"        0.001   Target outflow    c.m/sec"
"       2750.1   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                  0.577    c.m/sec"
"             Maximum level               415.258    metre"
"             Maximum storage             750.649    c.m"
"             Centroidal lag                2.097   hours"
"                  0.498     0.924     0.577     0.000 c.m/sec"
" 38          START/RE-START TOTALS 500"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      8.820    hectare"
"             Total Impervious area                     2.566    hectare"
"             Total % impervious                       29.087"
" 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\2025-06-11 SWM Pond"
"                Output filename:                            122025 Pre 25yr.out"
"                Licensee name:                                                 "
"                Company                                                        "
"                Date & Time last used:                 6/11/2025 at 1:43:18 PM"
" 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"
"       25.000   % Impervious"
"        3.450   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
"        2.588   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.863   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.394     0.000     0.000     0.000 c.m/sec"
"             Catchment 100          Pervious   Impervious Total Area "
"             Surface Area           2.588      0.863      3.450      hectare"
"             Time of concentration  28.839     4.964      18.371     minutes"
"             Time to Centroid       110.529    88.395     100.824    minutes"
"             Rainfall depth         75.581     75.581     75.581     mm"
"             Rainfall volume        1955.65    651.88     2607.54    c.m"
"             Rainfall losses        44.179     2.022      33.640     mm"
"             Runoff depth           31.402     73.559     41.941     mm"
"             Runoff volume          812.53     634.45     1446.97    c.m"
"             Runoff coefficient     0.415      0.973      0.555      "
"             Maximum flow           0.290      0.314      0.394      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.394     0.394     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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.197     0.394     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  10.980     1.890      7.634      minutes"
"             Time to Centroid       91.241     84.237     88.663     minutes"
"             Rainfall depth         75.581     75.581     75.581     mm"
"             Rainfall volume        598.60     149.65     748.25     c.m"
"             Rainfall losses        44.239     2.560      35.903     mm"
"             Runoff depth           31.342     73.021     39.677     mm"
```

```
"             Runoff volume          248.22     144.58     392.81     c.m"
"             Runoff coefficient     0.415      0.966      0.525      "
"             Maximum flow           0.151      0.071      0.197      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.197     0.574     0.000     0.000"
" 33          CATCHMENT 300"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          300   SITE WETLAND"
"        0.000   % Impervious"
"        0.080   Total Area"
"       25.000   Flow length"
"        2.000   Overland Slope"
"        0.080   Pervious Area"
"       25.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       25.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.016     0.574     0.000     0.000 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           0.080      0.000      0.080      hectare"
"             Time of concentration  9.842      1.694      9.842      minutes"
"             Time to Centroid       89.993     83.984     89.993     minutes"
"             Rainfall depth         75.581     75.581     75.581     mm"
"             Rainfall volume        60.46      0.00       60.46      c.m"
"             Rainfall losses        44.396     2.515      44.396     mm"
"             Runoff depth           31.185     73.066     31.185     mm"
"             Runoff volume          24.95      0.00       24.95      c.m"
"             Runoff coefficient     0.413      0.000      0.413      "
"             Maximum flow           0.016      0.000      0.016      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.016     0.590     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.016     0.590     0.590     0.000"
" 40          HYDROGRAPH   Combine    1"
```

```
"            6   Combine "
"            1   Node #"
"                EX FLOW FROM SITE"
"             Maximum flow                  0.590    c.m/sec"
"             Hydrograph volume          1864.728    c.m"
"                    0.016     0.590     0.590     0.590"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.016     0.000     0.590     0.590"
" 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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.014     0.000     0.590     0.590 c.m/sec"
"             Catchment 400          Pervious   Impervious Total Area "
"             Surface Area           0.020      0.030      0.050      hectare"
"             Time of concentration  5.680      0.978      2.035      minutes"
"             Time to Centroid       85.598     83.128     83.683     minutes"
"             Rainfall depth         75.581     75.581     75.581     mm"
"             Rainfall volume        15.12      22.67      37.79      c.m"
"             Rainfall losses        44.418     3.930      20.125     mm"
"             Runoff depth           31.163     71.651     55.456     mm"
"             Runoff volume          6.23       21.50      27.73      c.m"
"             Runoff coefficient     0.412      0.948      0.734      "
"             Maximum flow           0.005      0.011      0.014      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.014     0.014     0.590     0.590"
" 40          HYDROGRAPH Copy to Outflow"
```

```
"            8   Copy to Outflow"
"                     0.014     0.014     0.014     0.590"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                EX FLOW FROM SITE"
"             Maximum flow                  0.600    c.m/sec"
"             Hydrograph volume          1892.456    c.m"
"                     0.014     0.014     0.014     0.600"
" 38          START/RE-START TOTALS 400"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      4.570    hectare"
"             Total Impervious area                     1.091    hectare"
"             Total % impervious                       23.862"
" 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\2025-06-16 SWM Pond"
"                Output filename:                    122025 Pre 25yr-wetland.out"
"                Licensee name:                                                 "
"                Company                                                        "
"                Date & Time last used:                 6/24/2025 at 1:59:02 PM"
" 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"
"       25.000   % Impervious"
"        3.450   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
"        2.588   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.863   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.394     0.000     0.000     0.000 c.m/sec"
"             Catchment 100          Pervious   Impervious Total Area "
"             Surface Area           2.588      0.863      3.450      hectare"
"             Time of concentration  28.839     4.964      18.371     minutes"
"             Time to Centroid       110.529    88.395     100.824    minutes"
"             Rainfall depth         75.581     75.581     75.581     mm"
"             Rainfall volume        1955.65    651.88     2607.54    c.m"
"             Rainfall losses        44.179     2.022      33.640     mm"
"             Runoff depth           31.402     73.559     41.941     mm"
"             Runoff volume          812.53     634.45     1446.97    c.m"
"             Runoff coefficient     0.415      0.973      0.555      "
"             Maximum flow           0.290      0.314      0.394      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.394     0.394     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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.197     0.394     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  10.980     1.890      7.634      minutes"
"             Time to Centroid       91.241     84.237     88.663     minutes"
"             Rainfall depth         75.581     75.581     75.581     mm"
"             Rainfall volume        598.60     149.65     748.25     c.m"
"             Rainfall losses        44.239     2.560      35.903     mm"
"             Runoff depth           31.342     73.021     39.677     mm"
```

```
"             Runoff volume          248.22     144.58     392.81     c.m"
"             Runoff coefficient     0.415      0.966      0.525      "
"             Maximum flow           0.151      0.071      0.197      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.197     0.574     0.000     0.000"
" 33          CATCHMENT 300"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          300   SITE WETLAND"
"        0.000   % Impervious"
"        0.080   Total Area"
"       25.000   Flow length"
"        2.000   Overland Slope"
"        0.080   Pervious Area"
"       25.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       25.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.016     0.574     0.000     0.000 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           0.080      0.000      0.080      hectare"
"             Time of concentration  9.842      1.694      9.842      minutes"
"             Time to Centroid       89.993     83.984     89.993     minutes"
"             Rainfall depth         75.581     75.581     75.581     mm"
"             Rainfall volume        60.46      0.00       60.46      c.m"
"             Rainfall losses        44.396     2.515      44.396     mm"
"             Runoff depth           31.185     73.066     31.185     mm"
"             Runoff volume          24.95      0.00       24.95      c.m"
"             Runoff coefficient     0.413      0.000      0.413      "
"             Maximum flow           0.016      0.000      0.016      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.016     0.590     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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.605     0.590     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  35.505     6.112      19.122     minutes"
"             Time to Centroid       117.717    89.914     102.221    minutes"
"             Rainfall depth         75.581     75.581     75.581     mm"
"             Rainfall volume        2112.48    1137.49    3249.98    c.m"
"             Rainfall losses        44.167     2.120      29.451     mm"
"             Runoff depth           31.414     73.461     46.130     mm"
"             Runoff volume          878.02     1105.58    1983.60    c.m"
"             Runoff coefficient     0.416      0.972      0.610      "
"             Maximum flow           0.267      0.548      0.605      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.605     1.185     0.000     0.000"
" 54          POND DESIGN"
"        1.185   Current peak flow    c.m/sec"
"        0.001   Target outflow    c.m/sec"
"       3848.3   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                  0.787    c.m/sec"
"             Maximum level               415.367    metre"
"             Maximum storage            1068.308    c.m"
"             Centroidal lag                2.078   hours"
"                  0.605     1.185     0.787     0.000 c.m/sec"
" 38          START/RE-START TOTALS 500"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      8.820    hectare"
"             Total Impervious area                     2.566    hectare"
"             Total % impervious                       29.087"
" 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\2025-06-11 SWM Pond"
"                Output filename:                             122025 Pre 50yr.out"
"                Licensee name:                                                  "
"                Company                                                         "
"                Date & Time last used:                  6/11/2025 at 1:46:27 PM"
" 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"
"       25.000   % Impervious"
"        3.450   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
"        2.588   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.863   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.497     0.000     0.000     0.000 c.m/sec"
"             Catchment 100          Pervious   Impervious Total Area "
"             Surface Area           2.588      0.863      3.450      hectare"
"             Time of concentration  27.541     4.801      18.264     minutes"
"             Time to Centroid       109.720    87.997     100.858    minutes"
"             Rainfall depth         86.737     86.737     86.737     mm"
"             Rainfall volume        2244.31    748.10     2992.42    c.m"
"             Rainfall losses        45.785     2.071      34.856     mm"
"             Runoff depth           40.952     84.666     51.881     mm"
"             Runoff volume          1059.64    730.24     1789.88    c.m"
"             Runoff coefficient     0.472      0.976      0.598      "
"             Maximum flow           0.377      0.344      0.497      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.497     0.497     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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.247     0.497     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  10.486     1.828      7.544      minutes"
"             Time to Centroid       91.303     84.020     88.829     minutes"
"             Rainfall depth         86.737     86.737     86.737     mm"
"             Rainfall volume        686.96     171.74     858.69     c.m"
"             Rainfall losses        45.904     2.683      37.259     mm"
"             Runoff depth           40.833     84.054     49.477     mm"
```

```
"             Runoff volume          323.40     166.43     489.83     c.m"
"             Runoff coefficient     0.471      0.969      0.570      "
"             Maximum flow           0.195      0.079      0.247      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.247     0.706     0.000     0.000"
" 33          CATCHMENT 300"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          300   SITE WETLAND"
"        0.000   % Impervious"
"        0.080   Total Area"
"       25.000   Flow length"
"        2.000   Overland Slope"
"        0.080   Pervious Area"
"       25.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       25.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.021     0.706     0.000     0.000 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           0.080      0.000      0.080      hectare"
"             Time of concentration  9.399      1.639      9.399      minutes"
"             Time to Centroid       90.106     83.796     90.106     minutes"
"             Rainfall depth         86.737     86.737     86.737     mm"
"             Rainfall volume        69.39      0.00       69.39      c.m"
"             Rainfall losses        46.010     2.624      46.010     mm"
"             Runoff depth           40.727     84.113     40.727     mm"
"             Runoff volume          32.58      0.00       32.58      c.m"
"             Runoff coefficient     0.470      0.000      0.470      "
"             Maximum flow           0.021      0.000      0.021      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.021     0.724     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.021     0.724     0.724     0.000"
" 40          HYDROGRAPH   Combine    1"
```

```
"            6   Combine "
"            1   Node #"
"                EX FLOW FROM SITE"
"             Maximum flow                  0.724    c.m/sec"
"             Hydrograph volume          2312.284    c.m"
"                    0.021     0.724     0.724     0.724"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.021     0.000     0.724     0.724"
" 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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.016     0.000     0.724     0.724 c.m/sec"
"             Catchment 400          Pervious   Impervious Total Area "
"             Surface Area           0.020      0.030      0.050      hectare"
"             Time of concentration  5.424      0.946      2.056      minutes"
"             Time to Centroid       85.872     83.025     83.732     minutes"
"             Rainfall depth         86.737     86.737     86.737     mm"
"             Rainfall volume        17.35      26.02      43.37      c.m"
"             Rainfall losses        46.052     4.507      21.125     mm"
"             Runoff depth           40.685     82.229     65.612     mm"
"             Runoff volume          8.14       24.67      32.81      c.m"
"             Runoff coefficient     0.469      0.948      0.756      "
"             Maximum flow           0.006      0.012      0.016      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.016     0.016     0.724     0.724"
" 40          HYDROGRAPH Copy to Outflow"
```

```
"            8   Copy to Outflow"
"                     0.016     0.016     0.016     0.724"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                EX FLOW FROM SITE"
"             Maximum flow                  0.735    c.m/sec"
"             Hydrograph volume          2345.091    c.m"
"                     0.016     0.016     0.016     0.735"
" 38          START/RE-START TOTALS 400"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      4.570    hectare"
"             Total Impervious area                     1.091    hectare"
"             Total % impervious                       23.862"
" 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\2025-06-16 SWM Pond"
"                Output filename:                   122025 Pre 50yr-wetland.out"
"                Licensee name:                                                 "
"                Company                                                        "
"                Date & Time last used:                 6/24/2025 at 1:56:49 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      240.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     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"
"       25.000   % Impervious"
"        3.450   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
"        2.588   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.863   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.497     0.000     0.000     0.000 c.m/sec"
"             Catchment 100          Pervious   Impervious Total Area "
"             Surface Area           2.588      0.863      3.450      hectare"
"             Time of concentration  27.541     4.801      18.264     minutes"
"             Time to Centroid       109.720    87.997     100.858    minutes"
"             Rainfall depth         86.737     86.737     86.737     mm"
"             Rainfall volume        2244.31    748.10     2992.42    c.m"
"             Rainfall losses        45.785     2.071      34.856     mm"
"             Runoff depth           40.952     84.666     51.881     mm"
"             Runoff volume          1059.64    730.24     1789.88    c.m"
"             Runoff coefficient     0.472      0.976      0.598      "
"             Maximum flow           0.377      0.344      0.497      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.497     0.497     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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.247     0.497     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  10.486     1.828      7.544      minutes"
"             Time to Centroid       91.303     84.020     88.829     minutes"
"             Rainfall depth         86.737     86.737     86.737     mm"
"             Rainfall volume        686.96     171.74     858.69     c.m"
"             Rainfall losses        45.904     2.683      37.259     mm"
"             Runoff depth           40.833     84.054     49.477     mm"
```

```
"             Runoff volume          323.40     166.43     489.83     c.m"
"             Runoff coefficient     0.471      0.969      0.570      "
"             Maximum flow           0.195      0.079      0.247      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.247     0.706     0.000     0.000"
" 33          CATCHMENT 300"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          300   SITE WETLAND"
"        0.000   % Impervious"
"        0.080   Total Area"
"       25.000   Flow length"
"        2.000   Overland Slope"
"        0.080   Pervious Area"
"       25.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       25.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.021     0.706     0.000     0.000 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           0.080      0.000      0.080      hectare"
"             Time of concentration  9.399      1.639      9.399      minutes"
"             Time to Centroid       90.106     83.796     90.106     minutes"
"             Rainfall depth         86.737     86.737     86.737     mm"
"             Rainfall volume        69.39      0.00       69.39      c.m"
"             Rainfall losses        46.010     2.624      46.010     mm"
"             Runoff depth           40.727     84.113     40.727     mm"
"             Runoff volume          32.58      0.00       32.58      c.m"
"             Runoff coefficient     0.470      0.000      0.470      "
"             Maximum flow           0.021      0.000      0.021      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.021     0.724     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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.683     0.724     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  33.908     5.911      19.173     minutes"
"             Time to Centroid       116.590    89.415     102.288    minutes"
"             Rainfall depth         86.737     86.737     86.737     mm"
"             Rainfall volume        2424.29    1305.39    3729.68    c.m"
"             Rainfall losses        45.780     2.225      30.536     mm"
"             Runoff depth           40.957     84.512     56.201     mm"
"             Runoff volume          1144.74    1271.90    2416.64    c.m"
"             Runoff coefficient     0.472      0.974      0.648      "
"             Maximum flow           0.349      0.604      0.683      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.683     1.373     0.000     0.000"
" 54          POND DESIGN"
"        1.373   Current peak flow    c.m/sec"
"        0.001   Target outflow    c.m/sec"
"       4728.9   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                  0.924    c.m/sec"
"             Maximum level               415.455    metre"
"             Maximum storage            1366.754    c.m"
"             Centroidal lag                2.083   hours"
"                  0.683     1.373     0.924     0.000 c.m/sec"
" 38          START/RE-START TOTALS 500"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      8.820    hectare"
"             Total Impervious area                     2.566    hectare"
"             Total % impervious                       29.087"
" 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\2025-06-11 SWM Pond"
"                Output filename:                          122025 Pre 100yr.out"
"                Licensee name:                                                 "
"                Company                                                        "
"                Date & Time last used:                 6/11/2025 at 1:58:04 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 100"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          100   EXTERNAL"
"       25.000   % Impervious"
"        3.450   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
"        2.588   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.863   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.624     0.000     0.000     0.000 c.m/sec"
"             Catchment 100          Pervious   Impervious Total Area "
"             Surface Area           2.588      0.863      3.450      hectare"
"             Time of concentration  26.527     4.662      18.105     minutes"
"             Time to Centroid       108.738    87.699     100.634    minutes"
"             Rainfall depth         97.921     97.921     97.921     mm"
"             Rainfall volume        2533.71    844.57     3378.29    c.m"
"             Rainfall losses        47.006     2.217      35.808     mm"
"             Runoff depth           50.916     95.704     62.113     mm"
"             Runoff volume          1317.44    825.45     2142.90    c.m"
"             Runoff coefficient     0.520      0.977      0.634      "
"             Maximum flow           0.468      0.371      0.624      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.624     0.624     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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.296     0.624     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  10.100     1.775      7.440      minutes"
"             Time to Centroid       91.223     83.855     88.869     minutes"
"             Rainfall depth         97.921     97.921     97.921     mm"
"             Rainfall volume        775.54     193.88     969.42     c.m"
"             Rainfall losses        47.272     2.793      38.376     mm"
"             Runoff depth           50.649     95.128     59.545     mm"
```

```
"             Runoff volume          401.14     188.35     589.50     c.m"
"             Runoff coefficient     0.517      0.971      0.608      "
"             Maximum flow           0.237      0.086      0.296      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.296     0.867     0.000     0.000"
" 33          CATCHMENT 300"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          300   SITE WETLAND"
"        0.000   % Impervious"
"        0.080   Total Area"
"       25.000   Flow length"
"        2.000   Overland Slope"
"        0.080   Pervious Area"
"       25.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       25.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.025     0.867     0.000     0.000 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           0.080      0.000      0.080      hectare"
"             Time of concentration  9.053      1.591      9.053      minutes"
"             Time to Centroid       90.088     83.657     90.088     minutes"
"             Rainfall depth         97.921     97.921     97.921     mm"
"             Rainfall volume        78.34      0.00       78.34      c.m"
"             Rainfall losses        47.263     2.758      47.263     mm"
"             Runoff depth           50.658     95.164     50.658     mm"
"             Runoff volume          40.53      0.00       40.53      c.m"
"             Runoff coefficient     0.517      0.000      0.517      "
"             Maximum flow           0.025      0.000      0.025      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.025     0.888     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.025     0.888     0.888     0.000"
" 40          HYDROGRAPH   Combine    1"
```

```
"            6   Combine "
"            1   Node #"
"                EX FLOW FROM SITE"
"             Maximum flow                  0.888    c.m/sec"
"             Hydrograph volume          2772.918    c.m"
"                    0.025     0.888     0.888     0.888"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.025     0.000     0.888     0.888"
" 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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.018     0.000     0.888     0.888 c.m/sec"
"             Catchment 400          Pervious   Impervious Total Area "
"             Surface Area           0.020      0.030      0.050      hectare"
"             Time of concentration  5.224      0.918      2.065      minutes"
"             Time to Centroid       86.102     82.959     83.796     minutes"
"             Rainfall depth         97.921     97.921     97.921     mm"
"             Rainfall volume        19.58      29.38      48.96      c.m"
"             Rainfall losses        47.399     5.148      22.048     mm"
"             Runoff depth           50.522     92.773     75.873     mm"
"             Runoff volume          10.10      27.83      37.94      c.m"
"             Runoff coefficient     0.516      0.947      0.775      "
"             Maximum flow           0.007      0.013      0.018      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.018     0.018     0.888     0.888"
" 40          HYDROGRAPH Copy to Outflow"
```

```
"            8   Copy to Outflow"
"                     0.018     0.018     0.018     0.888"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                EX FLOW FROM SITE"
"             Maximum flow                  0.898    c.m/sec"
"             Hydrograph volume          2810.855    c.m"
"                     0.018     0.018     0.018     0.898"
" 38          START/RE-START TOTALS 400"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      4.570    hectare"
"             Total Impervious area                     1.091    hectare"
"             Total % impervious                       23.862"
" 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\2025-05-21 Wetland"
"                Output filename:                   122025 Pre 100yr-wetland.out"
"                Licensee name:                                                 "
"                Company                                                        "
"                Date & Time last used:                5/21/2025 at 12:25:38 PM"
" 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"
"       25.000   % Impervious"
"        3.450   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
"        2.588   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.863   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.624     0.000     0.000     0.000 c.m/sec"
"             Catchment 100          Pervious   Impervious Total Area "
"             Surface Area           2.588      0.863      3.450      hectare"
"             Time of concentration  26.519     4.660      18.100     minutes"
"             Time to Centroid       108.723    87.693     100.623    minutes"
"             Rainfall depth         97.935     97.935     97.935     mm"
"             Rainfall volume        2534.07    844.69     3378.76    c.m"
"             Rainfall losses        47.001     2.217      35.805     mm"
"             Runoff depth           50.934     95.718     62.130     mm"
"             Runoff volume          1317.91    825.57     2143.47    c.m"
"             Runoff coefficient     0.520      0.977      0.634      "
"             Maximum flow           0.468      0.372      0.624      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.624     0.624     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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.296     0.624     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  10.096     1.774      7.438      minutes"
"             Time to Centroid       91.213     83.851     88.861     minutes"
"             Rainfall depth         97.935     97.935     97.935     mm"
"             Rainfall volume        775.65     193.91     969.56     c.m"
"             Rainfall losses        47.269     2.793      38.374     mm"
"             Runoff depth           50.666     95.142     59.561     mm"
```

```
"             Runoff volume          401.27     188.38     589.65     c.m"
"             Runoff coefficient     0.517      0.971      0.608      "
"             Maximum flow           0.237      0.086      0.296      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.296     0.868     0.000     0.000"
" 33          CATCHMENT 300"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          300   SITE WETLAND"
"        0.000   % Impervious"
"        0.080   Total Area"
"       25.000   Flow length"
"        2.000   Overland Slope"
"        0.080   Pervious Area"
"       25.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       25.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.025     0.868     0.000     0.000 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           0.080      0.000      0.080      hectare"
"             Time of concentration  9.050      1.590      9.050      minutes"
"             Time to Centroid       90.079     83.653     90.079     minutes"
"             Rainfall depth         97.935     97.935     97.935     mm"
"             Rainfall volume        78.35      0.00       78.35      c.m"
"             Rainfall losses        47.259     2.758      47.259     mm"
"             Runoff depth           50.676     95.177     50.676     mm"
"             Runoff volume          40.54      0.00       40.54      c.m"
"             Runoff coefficient     0.517      0.000      0.517      "
"             Maximum flow           0.025      0.000      0.025      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.025     0.888     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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.767     0.888     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  32.648     5.737      19.124     minutes"
"             Time to Centroid       115.264    89.055     102.093    minutes"
"             Rainfall depth         97.935     97.935     97.935     mm"
"             Rainfall volume        2737.28    1473.92    4211.20    c.m"
"             Rainfall losses        46.987     2.350      31.364     mm"
"             Runoff depth           50.948     95.585     66.571     mm"
"             Runoff volume          1424.00    1438.56    2862.55    c.m"
"             Runoff coefficient     0.520      0.976      0.680      "
"             Maximum flow           0.441      0.656      0.767      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.767     1.597     0.000     0.000"
" 54          POND DESIGN"
"        1.597   Current peak flow    c.m/sec"
"        0.001   Target outflow    c.m/sec"
"       5636.2   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  1.00E-07     1.280"
"                414.750  1.00E-07    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                  1.051    c.m/sec"
"             Maximum level               415.551    metre"
"             Maximum storage            1737.401    c.m"
"             Centroidal lag                2.095   hours"
"                  0.767     1.597     1.051     0.000 c.m/sec"
" 38          START/RE-START TOTALS 500"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      8.820    hectare"
"             Total Impervious area                     2.566    hectare"
"             Total % impervious                       29.087"
" 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\2025-06-11 SWM Pond"
"                Output filename:                             122025 Pre REG.out"
"                Licensee name:                                                 "
"                Company                                                        "
"                Date & Time last used:                 6/11/2025 at 2:08:38 PM"
" 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     2.028     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"
"       25.000   % Impervious"
"        3.450   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
"        2.588   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.863   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
```

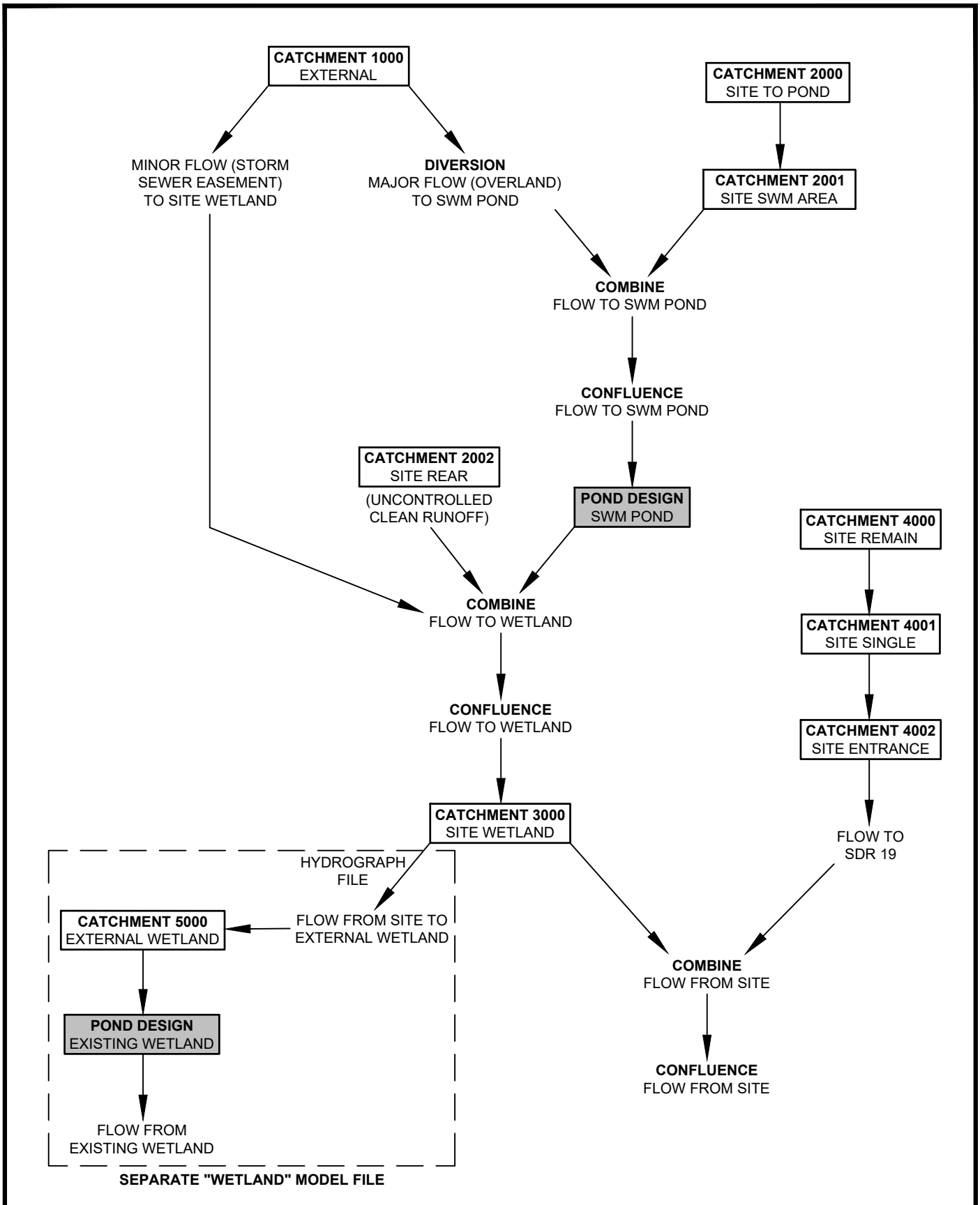
```
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.293     0.000     0.000     0.000 c.m/sec"
"             Catchment 100          Pervious   Impervious Total Area "
"             Surface Area           2.588      0.863      3.450      hectare"
"             Time of concentration  45.242     7.511      25.000     minutes"
"             Time to Centroid       2800.590   2249.031   2504.687   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        7374.38    2458.13    9832.50    c.m"
"             Rainfall losses        209.112    21.494     162.207    mm"
"             Runoff depth           75.888     263.506    122.793    mm"
"             Runoff volume          1963.60    2272.74    4236.34    c.m"
"             Runoff coefficient     0.266      0.925      0.431      "
"             Maximum flow           0.215      0.109      0.293      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.293     0.293     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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.087     0.293     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  17.225     2.860      10.875     minutes"
"             Time to Centroid       2775.197   2251.465   2543.669   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        2257.20    564.30     2821.50    c.m"
"             Rainfall losses        207.571    39.596     173.976    mm"
"             Runoff depth           77.429     245.404    111.024    mm"
"             Runoff volume          613.24     485.90     1099.14    c.m"
"             Runoff coefficient     0.272      0.861      0.390      "
"             Maximum flow           0.063      0.025      0.087      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.087     0.374     0.000     0.000"
" 33          CATCHMENT 300"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"          300   SITE WETLAND"
"        0.000   % Impervious"
"        0.080   Total Area"
"       25.000   Flow length"
"        2.000   Overland Slope"
"        0.080   Pervious Area"
"       25.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       25.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.006     0.374     0.000     0.000 c.m/sec"
"             Catchment 300          Pervious   Impervious Total Area "
"             Surface Area           0.080      0.000      0.080      hectare"
"             Time of concentration  15.440     2.563      15.440     minutes"
"             Time to Centroid       2772.868   2258.395   2772.866   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        228.00     0.00       228.00     c.m"
"             Rainfall losses        208.265    40.119     208.265    mm"
"             Runoff depth           76.735     244.881    76.735     mm"
"             Runoff volume          61.39      0.00       61.39      c.m"
"             Runoff coefficient     0.269      0.000      0.269      "
"             Maximum flow           0.006      0.000      0.006      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
```

```
"            4   Add Runoff "
"                     0.006     0.380     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.006     0.380     0.380     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                EX FLOW FROM SITE"
"             Maximum flow                  0.380    c.m/sec"
"             Hydrograph volume          5396.868    c.m"
"                     0.006     0.380     0.380     0.380"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.006     0.000     0.380     0.380"
" 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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.006     0.000     0.380     0.380 c.m/sec"
"             Catchment 400          Pervious   Impervious Total Area "
"             Surface Area           0.020      0.030      0.050      hectare"
"             Time of concentration  8.910      1.479      2.684      minutes"
"             Time to Centroid       2761.635   2281.822   2359.582   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        57.00      85.50      142.50     c.m"
"             Rainfall losses        213.998    40.260     109.755    mm"
"             Runoff depth           71.002     244.740    175.245    mm"
"             Runoff volume          14.20      73.42      87.62      c.m"
```

```
"             Runoff coefficient     0.249      0.859      0.615      "
"             Maximum flow           0.002      0.004      0.006      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.006     0.006     0.380     0.380"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.006     0.006     0.006     0.380"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                EX FLOW FROM SITE"
"             Maximum flow                  0.384    c.m/sec"
"             Hydrograph volume          5484.490    c.m"
"                    0.006     0.006     0.006     0.384"
" 38          START/RE-START TOTALS 400"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      4.570    hectare"
"             Total Impervious area                     1.091    hectare"
"             Total % impervious                       23.862"
" 19          EXIT"
```

Appendix F Post-Development Hydrologic Modelling



73/79 SIDEROAD 19 RESIDENTIAL DEVELOPMENT TOWNSHIP OF CENTRE WELLINGTON (FERGUS)	GEI Consultants	POST-DEVELOPMENT MIDUSS HYDROLOGIC MODEL SCHEMATIC
WRIGHTHAVEN HOMES LTD.	Project 2401073	JUNE 2025

---- B:\Working\WRIGHTHAVEN HOMES\2401073 - 122025 079 Sideroad 19 Fergus\5 Work in Progress\Drafting\Figures\122025_MIDUSS Schematics.dwg - 6/18/2025

```
"                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\2025-06-16 SWM Pond"
"                Output filename:                          122025 Post 25mm.out"
"                Licensee name:                                                 "
"                Company                                                        "
"                Date & Time last used:                6/24/2025 at 11:13:05 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"
"       25.000   % Impervious"
"        3.450   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
"        2.588   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.863   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.168     0.000     0.000     0.000 c.m/sec"
"             Catchment 1000         Pervious   Impervious Total Area "
"             Surface Area           2.588      0.863      3.450      hectare"
"             Time of concentration      ---    6.226      6.226      minutes"
"             Time to Centroid       0.000      116.340    116.340    minutes"
"             Rainfall depth         25.000     25.000     25.000     mm"
"             Rainfall volume        646.88     215.62     862.50     c.m"
"             Rainfall losses        25.000     1.639      19.160     mm"
"             Runoff depth           0.000      23.361     5.840      mm"
"             Runoff volume          0.00       201.49     201.49     c.m"
"             Runoff coefficient     0.000      0.934      0.234      "
"             Maximum flow           0.000      0.168      0.168      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.168     0.168     0.000     0.000"
" 56          DIVERSION"
"          1000   Node number"
"         0.164   Overflow threshold"
"         1.000   Required diverted fraction"
"            0   Conduit type; 1=Pipe;2=Channel"
"             Peak of diverted flow         0.004    c.m/sec"
"             Volume of diverted flow       1.092    c.m"
"             DIV01000.001hyd"
"             Major flow to pond"
"                     0.168     0.168     0.164     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    10"
"            6   Combine "
"           10   Node #"
"                FLOW TO WETLAND"
"             Maximum flow                  0.164    c.m/sec"
"             Hydrograph volume           200.395    c.m"
"                     0.168     0.168     0.164     0.164"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.168     0.000     0.164     0.164"
" 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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.106     0.000     0.164     0.164 c.m/sec"
"             Catchment 2000         Pervious   Impervious Total Area "
"             Surface Area           0.222      0.518      0.740      hectare"
"             Time of concentration      ---    1.859      1.859      minutes"
"             Time to Centroid       0.000      110.186    110.186    minutes"
"             Rainfall depth         25.000     25.000     25.000     mm"
"             Rainfall volume        55.50      129.50     185.00     c.m"
"             Rainfall losses        25.000     1.779      8.745      mm"
"             Runoff depth           0.000      23.221     16.255     mm"
"             Runoff volume          0.00       120.28     120.28     c.m"
"             Runoff coefficient     0.000      0.929      0.650      "
"             Maximum flow           0.000      0.106      0.106      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.106     0.106     0.164     0.164"
" 33          CATCHMENT 2001"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"         2001   SITE SWM"
"        0.000   % Impervious"
"        0.100   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.100   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.000     0.106     0.164     0.164 c.m/sec"
"             Catchment 2001          Pervious   Impervious Total Area "
"             Surface Area            0.100      0.000      0.100      hectare"
"             Time of concentration      ---     1.859      1.859      minutes"
"             Time to Centroid        0.000      110.186    110.186    minutes"
"             Rainfall depth          25.000     25.000     25.000     mm"
"             Rainfall volume         25.00      0.00       25.00      c.m"
"             Rainfall losses         25.000     1.779      25.000     mm"
"             Runoff depth            0.000      23.221     0.000      mm"
"             Runoff volume           0.00       0.00       0.00       c.m"
"             Runoff coefficient      0.000      0.000      0.000      "
"             Maximum flow            0.000      0.000      0.000      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.000     0.106     0.164     0.164"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.000     0.106     0.106     0.164"
" 40          HYDROGRAPH   Combine    20"
"            6   Combine "
"           20   Node #"
"                FLOW TO POND"
"             Maximum flow                  0.106    c.m/sec"
"             Hydrograph volume           120.285    c.m"
"                     0.000     0.106     0.106     0.106"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.000     0.000     0.106     0.106"
" 47          FILEI_O 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                  1.092    c.m"
"             Maximum flow                  0.004    c.m/sec"
"                  0.000     0.004     0.106     0.106 c.m/sec"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.000     0.004     0.004     0.106"
" 40          HYDROGRAPH   Combine    20"
"            6   Combine "
"           20   Node #"
"                FLOW TO POND"
"             Maximum flow                  0.106    c.m/sec"
"             Hydrograph volume           121.377    c.m"
"                     0.000     0.004     0.004     0.106"
" 40          HYDROGRAPH   Confluence    20"
"            7   Confluence "
```

```
"           20   Node #"
"                FLOW TO POND"
"             Maximum flow                  0.106    c.m/sec"
"             Hydrograph volume           121.377    c.m"
"                    0.000     0.106     0.004     0.000"
" 54          POND DESIGN"
"        0.106   Current peak flow    c.m/sec"
"        0.001   Target outflow    c.m/sec"
"        121.4   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               415.837    metre"
"             Maximum storage              90.704    c.m"
"             Centroidal lag                4.246   hours"
"                  0.000     0.106     0.009     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    10"
"            6   Combine "
"           10   Node #"
"                FLOW TO WETLAND"
"             Maximum flow                  0.172    c.m/sec"
"             Hydrograph volume           321.751    c.m"
"                    0.000     0.106     0.009     0.172"
" 40          HYDROGRAPH Start - New Tributary"
```

```
"            2   Start - New Tributary"
"                     0.000     0.000     0.009     0.172"
" 33          CATCHMENT 2002"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"         2002   SITE REAR"
"        0.000   % Impervious"
"        0.080   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.080   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.000     0.000     0.009     0.172 c.m/sec"
"             Catchment 2002         Pervious   Impervious Total Area "
"             Surface Area           0.080      0.000      0.080      hectare"
"             Time of concentration      ---    2.817      2.817      minutes"
"             Time to Centroid       0.000      111.623    111.623    minutes"
"             Rainfall depth         25.000     25.000     25.000     mm"
"             Rainfall volume        20.00      0.00       20.00      c.m"
"             Rainfall losses        25.000     2.050      25.000     mm"
"             Runoff depth           0.000      22.950     0.000      mm"
"             Runoff volume          0.00       0.00       0.00       c.m"
"             Runoff coefficient     0.000      0.000      0.000      "
"             Maximum flow           0.000      0.000      0.000      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.000     0.000     0.009     0.172"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.000     0.000     0.000     0.172"
" 40          HYDROGRAPH   Combine    10"
"            6   Combine "
"           10   Node #"
"                FLOW TO WETLAND"
"             Maximum flow                  0.172    c.m/sec"
```

```
"             Hydrograph volume           321.751    c.m"
"                     0.000     0.000     0.000     0.172"
" 40          HYDROGRAPH   Confluence    10"
"            7   Confluence "
"           10   Node #"
"                FLOW TO WETLAND"
"             Maximum flow                  0.172    c.m/sec"
"             Hydrograph volume           321.751    c.m"
"                     0.000     0.172     0.000     0.000"
" 33          CATCHMENT 3000"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"         3000   SITE WETLAND"
"        0.000   % Impervious"
"        0.110   Total Area"
"       25.000   Flow length"
"        2.000   Overland Slope"
"        0.110   Pervious Area"
"       25.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       25.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.000     0.172     0.000     0.000 c.m/sec"
"             Catchment 3000         Pervious   Impervious Total Area "
"             Surface Area           0.110      0.000      0.110      hectare"
"             Time of concentration      ---    2.125      2.125      minutes"
"             Time to Centroid       0.000      110.556    110.556    minutes"
"             Rainfall depth         25.000     25.000     25.000     mm"
"             Rainfall volume        27.50      0.00       27.50      c.m"
"             Rainfall losses        25.000     1.816      25.000     mm"
"             Runoff depth           0.000      23.184     0.000      mm"
"             Runoff volume          0.00       0.00       0.00       c.m"
"             Runoff coefficient     0.000      0.000      0.000      "
"             Maximum flow           0.000      0.000      0.000      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.000     0.172     0.000     0.000"
" 47          FILEI_O 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                321.751    c.m"
"             Maximum flow                  0.172    c.m/sec"
"                  0.000     0.172     0.000     0.000 c.m/sec"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.000     0.172     0.172     0.000"
" 40          HYDROGRAPH   Combine    30"
"            6   Combine "
"           30   Node #"
"                FLOW FROM SITE"
"             Maximum flow                  0.172    c.m/sec"
"             Hydrograph volume           321.751    c.m"
"                     0.000     0.172     0.172     0.172"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.000     0.000     0.172     0.172"
" 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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.006     0.000     0.172     0.172 c.m/sec"
"             Catchment 4000         Pervious   Impervious Total Area "
"             Surface Area           0.020      0.030      0.050      hectare"
"             Time of concentration      ---    1.226      1.226      minutes"
```

```
"             Time to Centroid       0.000      109.361    109.361    minutes"
"             Rainfall depth         25.000     25.000     25.000     mm"
"             Rainfall volume        5.00       7.50       12.50      c.m"
"             Rainfall losses        25.000     2.010      11.206     mm"
"             Runoff depth           0.000      22.990     13.794     mm"
"             Runoff volume          0.00       6.90       6.90       c.m"
"             Runoff coefficient     0.000      0.920      0.552      "
"             Maximum flow           0.000      0.006      0.006      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.006     0.006     0.172     0.172"
" 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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.002     0.006     0.172     0.172 c.m/sec"
"             Catchment 4001         Pervious   Impervious Total Area "
"             Surface Area           0.021      0.009      0.030      hectare"
"             Time of concentration      ---    1.226      1.226      minutes"
"             Time to Centroid       0.000      109.361    109.361    minutes"
"             Rainfall depth         25.000     25.000     25.000     mm"
"             Rainfall volume        5.25       2.25       7.50       c.m"
"             Rainfall losses        25.000     2.010      18.103     mm"
"             Runoff depth           0.000      22.990     6.897      mm"
"             Runoff volume          0.00       2.07       2.07       c.m"
"             Runoff coefficient     0.000      0.920      0.276      "
"             Maximum flow           0.000      0.002      0.002      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
```

```
"                    0.002     0.008     0.172     0.172"
" 33          CATCHMENT 4002"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"         4002   SITE ENTRANCE"
"       90.000   % Impervious"
"        0.010   Total Area"
"        5.000   Flow length"
"        2.000   Overland Slope"
"        0.001   Pervious Area"
"        5.000   Pervious length"
"        2.000   Pervious slope"
"        0.009   Impervious Area"
"        5.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.002     0.008     0.172     0.172 c.m/sec"
"             Catchment 4002         Pervious   Impervious Total Area "
"             Surface Area           0.001      0.009      0.010      hectare"
"             Time of concentration      ---    0.809      0.809      minutes"
"             Time to Centroid       0.000      108.903    108.903    minutes"
"             Rainfall depth         25.000     25.000     25.000     mm"
"             Rainfall volume        0.25       2.25       2.50       c.m"
"             Rainfall losses        25.000     2.798      5.018      mm"
"             Runoff depth           0.000      22.202     19.982     mm"
"             Runoff volume          0.00       2.00       2.00       c.m"
"             Runoff coefficient     0.000      0.888      0.799      "
"             Maximum flow           0.000      0.002      0.002      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.002     0.010     0.172     0.172"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.002     0.010     0.010     0.172"
" 40          HYDROGRAPH   Combine    30"
"            6   Combine "
"           30   Node #"
"                FLOW FROM SITE"
"             Maximum flow                 0.177    c.m/sec"
"             Hydrograph volume          332.715    c.m"
```

```
"                    0.002     0.010     0.010     0.177"
" 40          HYDROGRAPH   Confluence    30"
"            7   Confluence "
"           30   Node #"
"                FLOW FROM SITE"
"             Maximum flow                  0.177    c.m/sec"
"             Hydrograph volume           332.715    c.m"
"                    0.002     0.177     0.010     0.000"
" 38          START/RE-START TOTALS 30"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                     4.570    hectare"
"             Total Impervious area                    1.429    hectare"
"             Total % impervious                      31.258"
" 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\2025-06-16 SWM Pond"
"                Output filename:                            122025 Post 2yr.out"
"                Licensee name:                                                 "
"                Company                                                        "
"                Date & Time last used:                 6/16/2025 at 4:55:54 PM"
" 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"
"        25.000   % Impervious"
"        3.450   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
"        2.588   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.863   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.180     0.000     0.000     0.000 c.m/sec"
"             Catchment 1000         Pervious   Impervious Total Area "
"             Surface Area           2.588      0.863      3.450      hectare"
"             Time of concentration  72.495     5.835      11.857     minutes"
"             Time to Centroid       128.682    91.788     95.121     minutes"
"             Rainfall depth         33.014     33.014     33.014     mm"
"             Rainfall volume        854.23     284.74     1138.98    c.m"
"             Rainfall losses        31.976     1.664      24.398     mm"
"             Runoff depth           1.038      31.350     8.616      mm"
"             Runoff volume          26.85      270.39     297.25     c.m"
"             Runoff coefficient     0.031      0.950      0.261      "
"             Maximum flow           0.007      0.179      0.180      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.180     0.180     0.000     0.000"
" 56          DIVERSION"
"          1000   Node number"
"         0.164   Overflow threshold"
"         1.000   Required diverted fraction"
"            0   Conduit type; 1=Pipe;2=Channel"
"             Peak of diverted flow         0.016    c.m/sec"
"             Volume of diverted flow       4.701    c.m"
"             DIV01000.002hyd"
"             Major flow to pond"
"                     0.180     0.180     0.164     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    10"
"            6   Combine "
"           10   Node #"
"                FLOW TO WETLAND"
"             Maximum flow                  0.164    c.m/sec"
"             Hydrograph volume           292.545    c.m"
"                     0.180     0.180     0.164     0.164"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.180     0.000     0.164     0.164"
" 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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.114     0.000     0.164     0.164 c.m/sec"
"             Catchment 2000         Pervious   Impervious Total Area "
"             Surface Area           0.222      0.518      0.740      hectare"
"             Time of concentration  21.641     1.742      2.023      minutes"
"             Time to Centroid       91.393     85.614     85.695     minutes"
"             Rainfall depth         33.014     33.014     33.014     mm"
"             Rainfall volume        73.29      171.01     244.30     c.m"
"             Rainfall losses        31.977     1.962      10.966     mm"
"             Runoff depth           1.037      31.052     22.047     mm"
"             Runoff volume          2.30       160.85     163.15     c.m"
"             Runoff coefficient     0.031      0.941      0.668      "
"             Maximum flow           0.002      0.114      0.114      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.114     0.114     0.164     0.164"
" 33          CATCHMENT 2001"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"         2001   SITE SWM"
"        0.000   % Impervious"
"        0.100   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.100   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.001     0.114     0.164     0.164 c.m/sec"
"             Catchment 2001         Pervious   Impervious Total Area "
"             Surface Area           0.100      0.000      0.100      hectare"
"             Time of concentration  21.641     1.742      21.640     minutes"
"             Time to Centroid       91.393     85.614     91.393     minutes"
"             Rainfall depth         33.014     33.014     33.014     mm"
"             Rainfall volume        33.01      0.00       33.01      c.m"
"             Rainfall losses        31.977     1.962      31.977     mm"
"             Runoff depth           1.037      31.052     1.037      mm"
"             Runoff volume          1.04       0.00       1.04       c.m"
"             Runoff coefficient     0.031      0.000      0.031      "
"             Maximum flow           0.001      0.000      0.001      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.001     0.114     0.164     0.164"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.001     0.114     0.114     0.164"
" 40          HYDROGRAPH   Combine    20"
"            6   Combine "
"           20   Node #"
"                FLOW TO POND"
"             Maximum flow                  0.114    c.m/sec"
"             Hydrograph volume           164.187    c.m"
"                     0.001     0.114     0.114     0.114"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.001     0.000     0.114     0.114"
" 47          FILEI_O 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                  4.701    c.m"
"             Maximum flow                  0.016    c.m/sec"
"                  0.001     0.016     0.114     0.114 c.m/sec"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.001     0.016     0.016     0.114"
" 40          HYDROGRAPH   Combine    20"
"            6   Combine "
"           20   Node #"
"                FLOW TO POND"
"             Maximum flow                  0.114    c.m/sec"
"             Hydrograph volume           168.888    c.m"
"                     0.001     0.016     0.016     0.114"
" 40          HYDROGRAPH   Confluence    20"
"            7   Confluence "
```

```
"           20   Node #"
"                FLOW TO POND"
"             Maximum flow                  0.114    c.m/sec"
"             Hydrograph volume           168.888    c.m"
"                     0.001     0.114     0.016     0.000"
" 54          POND DESIGN"
"        0.114   Current peak flow    c.m/sec"
"        0.001   Target outflow    c.m/sec"
"        168.9   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                  0.010    c.m/sec"
"             Maximum level               415.895    metre"
"             Maximum storage             116.851    c.m"
"             Centroidal lag                4.097   hours"
"                  0.001     0.114     0.010     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    10"
"            6   Combine "
"           10   Node #"
"                FLOW TO WETLAND"
"             Maximum flow                  0.172    c.m/sec"
"             Hydrograph volume           461.416    c.m"
"                     0.001     0.114     0.010     0.172"
" 40          HYDROGRAPH Start - New Tributary"
```

```
"            2   Start - New Tributary"
"                     0.001     0.000     0.010     0.172"
" 33          CATCHMENT 2002"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"         2002   SITE REAR"
"        0.000   % Impervious"
"        0.080   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.080   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.000     0.000     0.010     0.172 c.m/sec"
"             Catchment 2002         Pervious   Impervious Total Area "
"             Surface Area           0.080      0.000      0.080      hectare"
"             Time of concentration  32.801     2.640      32.800     minutes"
"             Time to Centroid       99.630     87.071     99.630     minutes"
"             Rainfall depth         33.014     33.014     33.014     mm"
"             Rainfall volume        26.41      0.00       26.41      c.m"
"             Rainfall losses        31.976     2.026      31.976     mm"
"             Runoff depth           1.038      30.988     1.038      mm"
"             Runoff volume          0.83       0.00       0.83       c.m"
"             Runoff coefficient     0.031      0.000      0.031      "
"             Maximum flow           0.000      0.000      0.000      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.000     0.000     0.010     0.172"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.000     0.000     0.000     0.172"
" 40          HYDROGRAPH   Combine    10"
"            6   Combine "
"           10   Node #"
"                FLOW TO WETLAND"
"             Maximum flow                  0.172    c.m/sec"
```

```
"             Hydrograph volume           462.246    c.m"
"                     0.000     0.000     0.000     0.172"
" 40          HYDROGRAPH   Confluence    10"
"            7   Confluence "
"           10   Node #"
"                FLOW TO WETLAND"
"             Maximum flow                  0.172    c.m/sec"
"             Hydrograph volume           462.246    c.m"
"                     0.000     0.172     0.000     0.000"
" 33          CATCHMENT 3000"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"         3000   SITE WETLAND"
"        0.000   % Impervious"
"        0.110   Total Area"
"       25.000   Flow length"
"        2.000   Overland Slope"
"        0.110   Pervious Area"
"       25.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       25.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.001     0.172     0.000     0.000 c.m/sec"
"             Catchment 3000         Pervious   Impervious Total Area "
"             Surface Area           0.110      0.000      0.110      hectare"
"             Time of concentration  24.741     1.991      24.740     minutes"
"             Time to Centroid       93.722     86.074     93.722     minutes"
"             Rainfall depth         33.014     33.014     33.014     mm"
"             Rainfall volume        36.32      0.00       36.32      c.m"
"             Rainfall losses        31.977     1.935      31.977     mm"
"             Runoff depth           1.037      31.079     1.037      mm"
"             Runoff volume          1.14       0.00       1.14       c.m"
"             Runoff coefficient     0.031      0.000      0.031      "
"             Maximum flow           0.001      0.000      0.001      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.001     0.172     0.000     0.000"
" 47          FILEI_O 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                463.387    c.m"
"             Maximum flow                  0.172    c.m/sec"
"                  0.001     0.172     0.000     0.000 c.m/sec"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.001     0.172     0.172     0.000"
" 40          HYDROGRAPH   Combine    30"
"            6   Combine "
"           30   Node #"
"                FLOW FROM SITE"
"             Maximum flow                  0.172    c.m/sec"
"             Hydrograph volume           463.387    c.m"
"                     0.001     0.172     0.172     0.172"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.001     0.000     0.172     0.172"
" 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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.007     0.000     0.172     0.172 c.m/sec"
"             Catchment 4000         Pervious   Impervious Total Area "
"             Surface Area           0.020      0.030      0.050      hectare"
"             Time of concentration  14.278     1.149      1.439      minutes"
```

```
"             Time to Centroid       86.060     84.800     84.828     minutes"
"             Rainfall depth         33.014     33.014     33.014     mm"
"             Rainfall volume        6.60       9.90       16.51      c.m"
"             Rainfall losses        31.976     2.325      14.185     mm"
"             Runoff depth           1.038      30.689     18.829     mm"
"             Runoff volume          0.21       9.21       9.41       c.m"
"             Runoff coefficient     0.031      0.930      0.570      "
"             Maximum flow           0.000      0.007      0.007      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.007     0.007     0.172     0.172"
" 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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.002     0.007     0.172     0.172 c.m/sec"
"             Catchment 4001         Pervious   Impervious Total Area "
"             Surface Area           0.021      0.009      0.030      hectare"
"             Time of concentration  14.278     1.149      2.109      minutes"
"             Time to Centroid       86.060     84.800     84.892     minutes"
"             Rainfall depth         33.014     33.014     33.014     mm"
"             Rainfall volume        6.93       2.97       9.90       c.m"
"             Rainfall losses        31.976     2.325      23.081     mm"
"             Runoff depth           1.038      30.689     9.933      mm"
"             Runoff volume          0.22       2.76       2.98       c.m"
"             Runoff coefficient     0.031      0.930      0.301      "
"             Maximum flow           0.000      0.002      0.002      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
```

```
"                    0.002     0.009     0.172     0.172"
" 33          CATCHMENT 4002"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"         4002   SITE ENTRANCE"
"       90.000   % Impervious"
"        0.010   Total Area"
"        5.000   Flow length"
"        2.000   Overland Slope"
"        0.001   Pervious Area"
"        5.000   Pervious length"
"        2.000   Pervious slope"
"        0.009   Impervious Area"
"        5.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.002     0.009     0.172     0.172 c.m/sec"
"             Catchment 4002         Pervious   Impervious Total Area "
"             Surface Area           0.001      0.009      0.010      hectare"
"             Time of concentration  9.420      0.758      0.791      minutes"
"             Time to Centroid       82.317     84.479     84.471     minutes"
"             Rainfall depth         33.014     33.014     33.014     mm"
"             Rainfall volume        0.33       2.97       3.30       c.m"
"             Rainfall losses        31.986     3.083      5.974      mm"
"             Runoff depth           1.028      29.931     27.040     mm"
"             Runoff volume          0.01       2.69       2.70       c.m"
"             Runoff coefficient     0.031      0.907      0.819      "
"             Maximum flow           0.000      0.002      0.002      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.002     0.011     0.172     0.172"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.002     0.011     0.011     0.172"
" 40          HYDROGRAPH   Combine    30"
"            6   Combine "
"           30   Node #"
"                FLOW FROM SITE"
"             Maximum flow                 0.179    c.m/sec"
"             Hydrograph volume          478.485    c.m"
```

```
"                    0.002     0.011     0.011     0.179"
" 40          HYDROGRAPH   Confluence    30"
"            7   Confluence "
"           30   Node #"
"                FLOW FROM SITE"
"             Maximum flow                  0.179    c.m/sec"
"             Hydrograph volume           478.485    c.m"
"                    0.002     0.179     0.011     0.000"
" 38          START/RE-START TOTALS 30"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                     4.570    hectare"
"             Total Impervious area                    1.429    hectare"
"             Total % impervious                      31.258"
" 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\2025-06-16 SWM Pond"
"                Output filename:                  122025 Post 2yr-wetland.out"
"                Licensee name:                                               "
"                Company                                                      "
"                Date & Time last used:               6/16/2025 at 5:01:37 PM"
" 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_O 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                463.387    c.m"
"             Maximum flow                  0.172    c.m/sec"
"                  0.000     0.172     0.000     0.000 c.m/sec"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.000     0.172     0.172     0.000"
" 40          HYDROGRAPH   Combine    40"
"            6   Combine "
"           40   Node #"
"                FLOW TO WETLAND EXT."
"             Maximum flow                  0.172    c.m/sec"
"             Hydrograph volume           463.387    c.m"
"                     0.000     0.172     0.172     0.172"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.000     0.000     0.172     0.172"
" 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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.318     0.000     0.172     0.172 c.m/sec"
"             Catchment 5000         Pervious   Impervious Total Area "
"             Surface Area           2.795      1.505      4.300      hectare"
"             Time of concentration  89.252     7.184      11.948     minutes"
"             Time to Centroid       141.007    93.788     96.529     minutes"
"             Rainfall depth         33.014     33.014     33.014     mm"
"             Rainfall volume        922.74     496.86     1419.59    c.m"
"             Rainfall losses        31.975     1.722      21.387     mm"
"             Runoff depth           1.038      31.292     11.627     mm"
"             Runoff volume          29.02      470.95     499.97     c.m"
"             Runoff coefficient     0.031      0.948      0.352      "
"             Maximum flow           0.006      0.318      0.318      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.318     0.318     0.172     0.172"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.318     0.318     0.318     0.172"
" 40          HYDROGRAPH   Combine    40"
"            6   Combine "
"           40   Node #"
"                FLOW TO WETLAND EXT."
"             Maximum flow                  0.490    c.m/sec"
"             Hydrograph volume           963.355    c.m"
"                     0.318     0.318     0.318     0.490"
" 40          HYDROGRAPH   Confluence    40"
"            7   Confluence "
```

```
"           40   Node #"
"                FLOW TO WETLAND EXT."
"             Maximum flow                  0.490    c.m/sec"
"             Hydrograph volume           963.355    c.m"
"                    0.318     0.490     0.318     0.000"
" 54          POND DESIGN"
"        0.490   Current peak flow    c.m/sec"
"        0.001   Target outflow    c.m/sec"
"        963.4   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                  0.226    c.m/sec"
"             Maximum level               415.035    metre"
"             Maximum storage             305.593    c.m"
"             Centroidal lag                2.559   hours"
"                  0.318     0.490     0.226     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\2025-06-16 SWM Pond"
"                Output filename:                            122025 Post 5yr.out"
"                Licensee name:                                                 "
"                Company                                                        "
"                Date & Time last used:                6/24/2025 at 12:11:32 PM"
" 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"
"       25.000   % Impervious"
"        3.450   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
"        2.588   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.863   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.252     0.000     0.000     0.000 c.m/sec"
"             Catchment 1000         Pervious   Impervious Total Area "
"             Surface Area           2.588      0.863      3.450      hectare"
"             Time of concentration  42.120     5.421      20.225     minutes"
"             Time to Centroid       115.206    89.951     100.139    minutes"
"             Rainfall depth         49.792     49.792     49.792     mm"
"             Rainfall volume        1288.36    429.45     1717.81    c.m"
"             Rainfall losses        38.982     1.829      29.694     mm"
"             Runoff depth           10.810     47.963     20.098     mm"
"             Runoff volume          279.70     413.68     693.38     c.m"
"             Runoff coefficient     0.217      0.963      0.404      "
"             Maximum flow           0.093      0.238      0.252      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.252     0.252     0.000     0.000"
" 56          DIVERSION"
"          1000   Node number"
"         0.164   Overflow threshold"
"         1.000   Required diverted fraction"
"             0   Conduit type; 1=Pipe;2=Channel"
"             Peak of diverted flow         0.088    c.m/sec"
"             Volume of diverted flow      42.042    c.m"
"             DIV01000.005hyd"
"             Major flow to pond"
"                     0.252     0.252     0.164     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    10"
"            6   Combine "
"           10   Node #"
"                FLOW TO WETLAND"
"             Maximum flow                  0.164    c.m/sec"
"             Hydrograph volume           651.339    c.m"
"                     0.252     0.252     0.164     0.164"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.252     0.000     0.164     0.164"
" 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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.148     0.000     0.164     0.164 c.m/sec"
"             Catchment 2000         Pervious   Impervious Total Area "
"             Surface Area           0.222      0.518      0.740      hectare"
"             Time of concentration  12.573     1.618      2.585      minutes"
"             Time to Centroid       88.068     84.552     84.862     minutes"
"             Rainfall depth         49.792     49.792     49.792     mm"
"             Rainfall volume        110.54     257.92     368.46     c.m"
"             Rainfall losses        39.035     2.185      13.240     mm"
"             Runoff depth           10.757     47.607     36.552     mm"
"             Runoff volume          23.88      246.60     270.48     c.m"
"             Runoff coefficient     0.216      0.956      0.734      "
"             Maximum flow           0.018      0.146      0.148      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.148     0.148     0.164     0.164"
" 33          CATCHMENT 2001"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"         2001   SITE SWM"
"        0.000   % Impervious"
"        0.100   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.100   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.008     0.148     0.164     0.164 c.m/sec"
"             Catchment 2001         Pervious   Impervious Total Area "
"             Surface Area           0.100      0.000      0.100      hectare"
"             Time of concentration  12.573     1.618      12.573     minutes"
"             Time to Centroid       88.069     84.552     88.069     minutes"
"             Rainfall depth         49.792     49.792     49.792     mm"
"             Rainfall volume        49.79      0.00       49.79      c.m"
"             Rainfall losses        39.035     2.185      39.035     mm"
"             Runoff depth           10.757     47.607     10.757     mm"
"             Runoff volume          10.76      0.00       10.76      c.m"
"             Runoff coefficient     0.216      0.000      0.216      "
"             Maximum flow           0.008      0.000      0.008      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.008     0.149     0.164     0.164"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.008     0.149     0.149     0.164"
" 40          HYDROGRAPH   Combine    20"
"            6   Combine "
"           20   Node #"
"                FLOW TO POND"
"             Maximum flow                  0.149    c.m/sec"
"             Hydrograph volume           281.239    c.m"
"                     0.008     0.149     0.149     0.149"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.008     0.000     0.149     0.149"
" 47          FILEI_O 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                 42.042    c.m"
"             Maximum flow                  0.088    c.m/sec"
"                  0.008     0.088     0.149     0.149 c.m/sec"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.008     0.088     0.088     0.149"
" 40          HYDROGRAPH   Combine    20"
"            6   Combine "
"           20   Node #"
"                FLOW TO POND"
"             Maximum flow                  0.224    c.m/sec"
"             Hydrograph volume           323.281    c.m"
"                     0.008     0.088     0.088     0.224"
" 40          HYDROGRAPH   Confluence    20"
"            7   Confluence "
```

```
"           20   Node #"
"                FLOW TO POND"
"             Maximum flow                  0.224    c.m/sec"
"             Hydrograph volume           323.281    c.m"
"                    0.008     0.224     0.088     0.000"
" 54          POND DESIGN"
"        0.224   Current peak flow    c.m/sec"
"        0.001   Target outflow    c.m/sec"
"        323.3   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                  0.070    c.m/sec"
"             Maximum level               416.018    metre"
"             Maximum storage             176.344    c.m"
"             Centroidal lag                3.062   hours"
"                  0.008     0.224     0.070     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    10"
"            6   Combine "
"           10   Node #"
"                FLOW TO WETLAND"
"             Maximum flow                  0.231    c.m/sec"
"             Hydrograph volume           973.750    c.m"
"                    0.008     0.224     0.070     0.231"
" 40          HYDROGRAPH Start - New Tributary"
```

```
"            2   Start - New Tributary"
"                     0.008     0.000     0.070     0.231"
" 33          CATCHMENT 2002"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"         2002   SITE REAR"
"        0.000   % Impervious"
"        0.080   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.080   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.005     0.000     0.070     0.231 c.m/sec"
"             Catchment 2002         Pervious   Impervious Total Area "
"             Surface Area           0.080      0.000      0.080      hectare"
"             Time of concentration  19.058     2.453      19.058     minutes"
"             Time to Centroid       94.013     85.795     94.013     minutes"
"             Rainfall depth         49.792     49.792     49.792     mm"
"             Rainfall volume        39.83      0.00       39.83      c.m"
"             Rainfall losses        39.007     2.406      39.007     mm"
"             Runoff depth           10.785     47.386     10.785     mm"
"             Runoff volume          8.63       0.00       8.63       c.m"
"             Runoff coefficient     0.217      0.000      0.217      "
"             Maximum flow           0.005      0.000      0.005      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.005     0.005     0.070     0.231"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.005     0.005     0.005     0.231"
" 40          HYDROGRAPH   Combine    10"
"            6   Combine "
"           10   Node #"
"                FLOW TO WETLAND"
"             Maximum flow                  0.235    c.m/sec"
```

```
"             Hydrograph volume           982.378    c.m"
"                     0.005     0.005     0.005     0.235"
" 40          HYDROGRAPH   Confluence    10"
"            7   Confluence "
"           10   Node #"
"                FLOW TO WETLAND"
"             Maximum flow                  0.235    c.m/sec"
"             Hydrograph volume           982.378    c.m"
"                     0.005     0.235     0.005     0.000"
" 33          CATCHMENT 3000"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"         3000   SITE WETLAND"
"        0.000   % Impervious"
"        0.110   Total Area"
"       25.000   Flow length"
"        2.000   Overland Slope"
"        0.110   Pervious Area"
"       25.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       25.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.008     0.235     0.005     0.000 c.m/sec"
"             Catchment 3000         Pervious   Impervious Total Area "
"             Surface Area           0.110      0.000      0.110      hectare"
"             Time of concentration  14.375     1.850      14.375     minutes"
"             Time to Centroid       89.770     84.851     89.770     minutes"
"             Rainfall depth         49.792     49.792     49.792     mm"
"             Rainfall volume        54.77      0.00       54.77      c.m"
"             Rainfall losses        38.999     2.189      38.999     mm"
"             Runoff depth           10.793     47.602     10.793     mm"
"             Runoff volume          11.87      0.00       11.87      c.m"
"             Runoff coefficient     0.217      0.000      0.217      "
"             Maximum flow           0.008      0.000      0.008      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.008     0.242     0.005     0.000"
" 47          FILEI_O 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                994.250    c.m"
"             Maximum flow                  0.242    c.m/sec"
"                  0.008     0.242     0.005     0.000 c.m/sec"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.008     0.242     0.242     0.000"
" 40          HYDROGRAPH   Combine    30"
"            6   Combine "
"           30   Node #"
"                FLOW FROM SITE"
"             Maximum flow                  0.242    c.m/sec"
"             Hydrograph volume           994.250    c.m"
"                     0.008     0.242     0.242     0.242"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.008     0.000     0.242     0.242"
" 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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.009     0.000     0.242     0.242 c.m/sec"
"             Catchment 4000         Pervious   Impervious Total Area "
"             Surface Area           0.020      0.030      0.050      hectare"
"             Time of concentration  8.295      1.068      2.029      minutes"
```

```
"             Time to Centroid       84.311     83.761     83.834     minutes"
"             Rainfall depth         49.792     49.792     49.792     mm"
"             Rainfall volume        9.96       14.94      24.90      c.m"
"             Rainfall losses        38.990     2.855      17.309     mm"
"             Runoff depth           10.802     46.936     32.483     mm"
"             Runoff volume          2.16       14.08      16.24      c.m"
"             Runoff coefficient     0.217      0.943      0.652      "
"             Maximum flow           0.002      0.009      0.009      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.009     0.009     0.242     0.242"
" 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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.004     0.009     0.242     0.242 c.m/sec"
"             Catchment 4001         Pervious   Impervious Total Area "
"             Surface Area           0.021      0.009      0.030      hectare"
"             Time of concentration  8.295      1.068      3.593      minutes"
"             Time to Centroid       84.311     83.761     83.953     minutes"
"             Rainfall depth         49.792     49.792     49.792     mm"
"             Rainfall volume        10.46      4.48       14.94      c.m"
"             Rainfall losses        38.990     2.855      28.149     mm"
"             Runoff depth           10.802     46.936     21.642     mm"
"             Runoff volume          2.27       4.22       6.49       c.m"
"             Runoff coefficient     0.217      0.943      0.435      "
"             Maximum flow           0.002      0.003      0.004      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
```

```
"                    0.004     0.012     0.242     0.242"
" 33          CATCHMENT 4002"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"         4002   SITE ENTRANCE"
"       90.000   % Impervious"
"        0.010   Total Area"
"        5.000   Flow length"
"        2.000   Overland Slope"
"        0.001   Pervious Area"
"        5.000   Pervious length"
"        2.000   Pervious slope"
"        0.009   Impervious Area"
"        5.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.003     0.012     0.242     0.242 c.m/sec"
"             Catchment 4002         Pervious   Impervious Total Area "
"             Surface Area           0.001      0.009      0.010      hectare"
"             Time of concentration  5.473      0.704      0.826      minutes"
"             Time to Centroid       81.634     83.719     83.666     minutes"
"             Rainfall depth         49.792     49.792     49.792     mm"
"             Rainfall volume        0.50       4.48       4.98       c.m"
"             Rainfall losses        39.045     4.334      7.805      mm"
"             Runoff depth           10.747     45.457     41.986     mm"
"             Runoff volume          0.11       4.09       4.20       c.m"
"             Runoff coefficient     0.216      0.913      0.843      "
"             Maximum flow           0.000      0.003      0.003      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.003     0.015     0.242     0.242"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.003     0.015     0.015     0.242"
" 40          HYDROGRAPH   Combine    30"
"            6   Combine "
"           30   Node #"
"                FLOW FROM SITE"
"             Maximum flow                  0.253    c.m/sec"
"             Hydrograph volume          1021.183    c.m"
```

```
"                    0.003     0.015     0.015     0.253"
" 40          HYDROGRAPH   Confluence    30"
"            7   Confluence "
"           30   Node #"
"                FLOW FROM SITE"
"             Maximum flow                  0.253    c.m/sec"
"             Hydrograph volume          1021.183    c.m"
"                    0.003     0.253     0.015     0.000"
" 38          START/RE-START TOTALS 30"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                     4.570    hectare"
"             Total Impervious area                    1.429    hectare"
"             Total % impervious                      31.258"
" 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\2025-06-16 SWM Pond"
"                Output filename:                  122025 Post 5yr-wetland.out"
"                Licensee name:                                               "
"                Company                                                      "
"                Date & Time last used:               6/24/2025 at 1:40:48 PM"
" 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_O 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               994.250    c.m"
"             Maximum flow                 0.242    c.m/sec"
"                  0.000     0.242     0.000     0.000 c.m/sec"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.000     0.242     0.242     0.000"
" 40          HYDROGRAPH   Combine    40"
"            6   Combine "
"           40   Node #"
"                FLOW TO WETLAND EXT."
"             Maximum flow                 0.242    c.m/sec"
"             Hydrograph volume          994.250    c.m"
"                     0.000     0.242     0.242     0.242"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.000     0.000     0.242     0.242"
" 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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.417     0.000     0.242     0.242 c.m/sec"
"             Catchment 5000         Pervious   Impervious Total Area "
"             Surface Area           2.795      1.505      4.300      hectare"
"             Time of concentration  51.856     6.674      20.035     minutes"
"             Time to Centroid       124.140    91.682     101.280    minutes"
"             Rainfall depth         49.792     49.792     49.792     mm"
"             Rainfall volume        1391.68    749.36     2141.04    c.m"
"             Rainfall losses        38.979     1.969      26.026     mm"
"             Runoff depth           10.812     47.823     23.766     mm"
"             Runoff volume          302.21     719.73     1021.94    c.m"
"             Runoff coefficient     0.217      0.960      0.477      "
"             Maximum flow           0.084      0.407      0.417      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.417     0.417     0.242     0.242"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.417     0.417     0.417     0.242"
" 40          HYDROGRAPH   Combine    40"
"            6   Combine "
"           40   Node #"
"                FLOW TO WETLAND EXT."
"             Maximum flow                  0.619    c.m/sec"
"             Hydrograph volume          2016.189    c.m"
"                     0.417     0.417     0.417     0.619"
" 40          HYDROGRAPH   Confluence    40"
"            7   Confluence "
```

```
"           40   Node #"
"                FLOW TO WETLAND EXT."
"             Maximum flow                  0.619    c.m/sec"
"             Hydrograph volume          2016.189    c.m"
"                    0.417     0.619     0.417     0.000"
" 54          POND DESIGN"
"        0.619   Current peak flow    c.m/sec"
"        0.001   Target outflow    c.m/sec"
"       2016.2   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                  0.346    c.m/sec"
"             Maximum level               415.185    metre"
"             Maximum storage             582.220    c.m"
"             Centroidal lag                2.518   hours"
"                  0.417     0.619     0.346     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\2025-06-16 SWM Pond"
"                Output filename:                          122025 Post 10yr.out"
"                Licensee name:                                                 "
"                Company                                                        "
"                Date & Time last used:                6/24/2025 at 12:20:20 PM"
" 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"
"       25.000   % Impervious"
"        3.450   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
"        2.588   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.863   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.308     0.000     0.000     0.000 c.m/sec"
"             Catchment 1000         Pervious   Impervious Total Area "
"             Surface Area           2.588      0.863      3.450      hectare"
"             Time of concentration  34.842     5.213      19.957     minutes"
"             Time to Centroid       112.196    89.134     100.610    minutes"
"             Rainfall depth         61.359     61.359     61.359     mm"
"             Rainfall volume        1587.67    529.22     2116.89    c.m"
"             Rainfall losses        41.746     1.955      31.799     mm"
"             Runoff depth           19.613     59.404     29.561     mm"
"             Runoff volume          507.48     512.36     1019.84    c.m"
"             Runoff coefficient     0.320      0.968      0.482      "
"             Maximum flow           0.173      0.272      0.308      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.308     0.308     0.000     0.000"
" 56          DIVERSION"
"          1000   Node number"
"         0.164   Overflow threshold"
"         1.000   Required diverted fraction"
"            0   Conduit type; 1=Pipe;2=Channel"
"             Peak of diverted flow         0.144    c.m/sec"
"             Volume of diverted flow     206.889    c.m"
"             DIV01000.010hyd"
"             Major flow to pond"
"                     0.308     0.308     0.164     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    10"
"            6   Combine "
"           10   Node #"
"                FLOW TO WETLAND"
"             Maximum flow                  0.164    c.m/sec"
"             Hydrograph volume           812.954    c.m"
"                     0.308     0.308     0.164     0.164"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.308     0.000     0.164     0.164"
" 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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.172     0.000     0.164     0.164 c.m/sec"
"             Catchment 2000         Pervious   Impervious Total Area "
"             Surface Area           0.222      0.518      0.740      hectare"
"             Time of concentration  10.401     1.556      2.656      minutes"
"             Time to Centroid       88.349     84.117     84.643     minutes"
"             Rainfall depth         61.359     61.359     61.359     mm"
"             Rainfall volume        136.22     317.84     454.06     c.m"
"             Rainfall losses        41.798     2.339      14.177     mm"
"             Runoff depth           19.561     59.020     47.182     mm"
"             Runoff volume          43.43      305.72     349.15     c.m"
"             Runoff coefficient     0.319      0.962      0.769      "
"             Maximum flow           0.031      0.166      0.172      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.172     0.172     0.164     0.164"
" 33          CATCHMENT 2001"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"         2001   SITE SWM"
"        0.000   % Impervious"
"        0.100   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.100   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.014     0.172     0.164     0.164 c.m/sec"
"             Catchment 2001          Pervious   Impervious Total Area "
"             Surface Area            0.100      0.000      0.100      hectare"
"             Time of concentration   10.401     1.556      10.401     minutes"
"             Time to Centroid        88.349     84.117     88.349     minutes"
"             Rainfall depth          61.359     61.359     61.359     mm"
"             Rainfall volume         61.36      0.00       61.36      c.m"
"             Rainfall losses         41.798     2.339      41.798     mm"
"             Runoff depth            19.561     59.020     19.561     mm"
"             Runoff volume           19.56      0.00       19.56      c.m"
"             Runoff coefficient      0.319      0.000      0.319      "
"             Maximum flow            0.014      0.000      0.014      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.014     0.174     0.164     0.164"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.014     0.174     0.174     0.164"
" 40          HYDROGRAPH   Combine    20"
"            6   Combine "
"           20   Node #"
"                FLOW TO POND"
"             Maximum flow                  0.174    c.m/sec"
"             Hydrograph volume           368.709    c.m"
"                     0.014     0.174     0.174     0.174"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.014     0.000     0.174     0.174"
" 47          FILEI_O 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                206.889    c.m"
"             Maximum flow                  0.144    c.m/sec"
"                  0.014     0.144     0.174     0.174 c.m/sec"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.014     0.144     0.144     0.174"
" 40          HYDROGRAPH   Combine    20"
"            6   Combine "
"           20   Node #"
"                FLOW TO POND"
"             Maximum flow                  0.319    c.m/sec"
"             Hydrograph volume           575.598    c.m"
"                     0.014     0.144     0.144     0.319"
" 40          HYDROGRAPH   Confluence    20"
"            7   Confluence "
```

```
"           20   Node #"
"                FLOW TO POND"
"             Maximum flow                  0.319    c.m/sec"
"             Hydrograph volume           575.598    c.m"
"                    0.014     0.319     0.144     0.000"
" 54          POND DESIGN"
"        0.319   Current peak flow    c.m/sec"
"        0.001   Target outflow    c.m/sec"
"        575.6   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                  0.096    c.m/sec"
"             Maximum level               416.269    metre"
"             Maximum storage             320.336    c.m"
"             Centroidal lag                2.667   hours"
"                  0.014     0.319     0.096     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    10"
"            6   Combine "
"           10   Node #"
"                FLOW TO WETLAND"
"             Maximum flow                  0.260    c.m/sec"
"             Hydrograph volume          1387.503    c.m"
"                    0.014     0.319     0.096     0.260"
" 40          HYDROGRAPH Start - New Tributary"
```

```
"            2   Start - New Tributary"
"                     0.014     0.000     0.096     0.260"
" 33          CATCHMENT 2002"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"         2002   SITE REAR"
"        0.000   % Impervious"
"        0.080   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.080   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.009     0.000     0.096     0.260 c.m/sec"
"             Catchment 2002         Pervious   Impervious Total Area "
"             Surface Area           0.080      0.000      0.080      hectare"
"             Time of concentration  15.765     2.359      15.765     minutes"
"             Time to Centroid       93.590     85.262     93.590     minutes"
"             Rainfall depth         61.359     61.359     61.359     mm"
"             Rainfall volume        49.09      0.00       49.09      c.m"
"             Rainfall losses        41.791     2.555      41.791     mm"
"             Runoff depth           19.569     58.804     19.569     mm"
"             Runoff volume          15.65      0.00       15.65      c.m"
"             Runoff coefficient     0.319      0.000      0.319      "
"             Maximum flow           0.009      0.000      0.009      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.009     0.009     0.096     0.260"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.009     0.009     0.009     0.260"
" 40          HYDROGRAPH   Combine    10"
"            6   Combine "
"           10   Node #"
"                FLOW TO WETLAND"
"             Maximum flow                  0.266    c.m/sec"
```

```
"             Hydrograph volume          1403.157    c.m"
"                     0.009     0.009     0.009     0.266"
" 40          HYDROGRAPH   Confluence    10"
"            7   Confluence "
"           10   Node #"
"                FLOW TO WETLAND"
"             Maximum flow                  0.266    c.m/sec"
"             Hydrograph volume          1403.157    c.m"
"                     0.009     0.266     0.009     0.000"
" 33          CATCHMENT 3000"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"         3000   SITE WETLAND"
"        0.000   % Impervious"
"        0.110   Total Area"
"       25.000   Flow length"
"        2.000   Overland Slope"
"        0.110   Pervious Area"
"       25.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       25.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.014     0.266     0.009     0.000 c.m/sec"
"             Catchment 3000         Pervious   Impervious Total Area "
"             Surface Area           0.110      0.000      0.110      hectare"
"             Time of concentration  11.891     1.779      11.891     minutes"
"             Time to Centroid       89.763     84.366     89.763     minutes"
"             Rainfall depth         61.359     61.359     61.359     mm"
"             Rainfall volume        67.50      0.00       67.50      c.m"
"             Rainfall losses        41.812     2.333      41.812     mm"
"             Runoff depth           19.547     59.026     19.547     mm"
"             Runoff volume          21.50      0.00       21.50      c.m"
"             Runoff coefficient     0.319      0.000      0.319      "
"             Maximum flow           0.014      0.000      0.014      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.014     0.276     0.009     0.000"
" 47          FILEI_O Write/Save Flow from Site Rear.010hyd"
```

```
"            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               1424.659    c.m"
"             Maximum flow                  0.276    c.m/sec"
"                  0.014     0.276     0.009     0.000 c.m/sec"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.014     0.276     0.276     0.000"
" 40          HYDROGRAPH   Combine    30"
"            6   Combine "
"           30   Node #"
"                FLOW FROM SITE"
"             Maximum flow                  0.276    c.m/sec"
"             Hydrograph volume          1424.659    c.m"
"                     0.014     0.276     0.276     0.276"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.014     0.000     0.276     0.276"
" 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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.011     0.000     0.276     0.276 c.m/sec"
"             Catchment 4000         Pervious   Impervious Total Area "
"             Surface Area           0.020      0.030      0.050      hectare"
"             Time of concentration  6.862      1.027      2.087      minutes"
```

```
"             Time to Centroid       85.000     83.391     83.683     minutes"
"             Rainfall depth         61.359     61.359     61.359     mm"
"             Rainfall volume        12.27      18.41      30.68      c.m"
"             Rainfall losses        42.018     3.280      18.775     mm"
"             Runoff depth           19.341     58.079     42.584     mm"
"             Runoff volume          3.87       17.42      21.29      c.m"
"             Runoff coefficient     0.315      0.947      0.694      "
"             Maximum flow           0.003      0.010      0.011      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.011     0.011     0.276     0.276"
" 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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.005     0.011     0.276     0.276 c.m/sec"
"             Catchment 4001         Pervious   Impervious Total Area "
"             Surface Area           0.021      0.009      0.030      hectare"
"             Time of concentration  6.862      1.027      3.578      minutes"
"             Time to Centroid       85.000     83.391     84.095     minutes"
"             Rainfall depth         61.359     61.359     61.359     mm"
"             Rainfall volume        12.89      5.52       18.41      c.m"
"             Rainfall losses        42.018     3.280      30.396     mm"
"             Runoff depth           19.341     58.079     30.963     mm"
"             Runoff volume          4.06       5.23       9.29       c.m"
"             Runoff coefficient     0.315      0.947      0.505      "
"             Maximum flow           0.004      0.003      0.005      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
```

```
"                    0.005     0.016     0.276     0.276"
" 33          CATCHMENT 4002"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"         4002   SITE ENTRANCE"
"       90.000   % Impervious"
"        0.010   Total Area"
"        5.000   Flow length"
"        2.000   Overland Slope"
"        0.001   Pervious Area"
"        5.000   Pervious length"
"        2.000   Pervious slope"
"        0.009   Impervious Area"
"        5.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.003     0.016     0.276     0.276 c.m/sec"
"             Catchment 4002         Pervious   Impervious Total Area "
"             Surface Area           0.001      0.009      0.010      hectare"
"             Time of concentration  4.527      0.677      0.821      minutes"
"             Time to Centroid       82.662     83.388     83.361     minutes"
"             Rainfall depth         61.359     61.359     61.359     mm"
"             Rainfall volume        0.61       5.52       6.14       c.m"
"             Rainfall losses        41.871     5.415      9.060      mm"
"             Runoff depth           19.489     55.945     52.299     mm"
"             Runoff volume          0.19       5.04       5.23       c.m"
"             Runoff coefficient     0.318      0.912      0.852      "
"             Maximum flow           0.000      0.003      0.003      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.003     0.018     0.276     0.276"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.003     0.018     0.018     0.276"
" 40          HYDROGRAPH   Combine    30"
"            6   Combine "
"           30   Node #"
"                FLOW FROM SITE"
"             Maximum flow                  0.286    c.m/sec"
"             Hydrograph volume          1460.470    c.m"
```

```
"                    0.003     0.018     0.018     0.286"
" 40          HYDROGRAPH   Confluence    30"
"            7   Confluence "
"           30   Node #"
"                FLOW FROM SITE"
"             Maximum flow                  0.286    c.m/sec"
"             Hydrograph volume          1460.469    c.m"
"                    0.003     0.286     0.018     0.000"
" 38          START/RE-START TOTALS 30"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      4.570    hectare"
"             Total Impervious area                     1.429    hectare"
"             Total % impervious                       31.258"
" 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\2025-06-16 SWM Pond"
"                Output filename:                 122025 Post 10yr-wetland.out"
"                Licensee name:                                               "
"                Company                                                      "
"                Date & Time last used:               6/24/2025 at 1:43:20 PM"
" 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_O 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              1424.659    c.m"
"             Maximum flow                 0.276    c.m/sec"
"                  0.000     0.276     0.000     0.000 c.m/sec"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.000     0.276     0.276     0.000"
" 40          HYDROGRAPH   Combine    40"
"            6   Combine "
"           40   Node #"
"                FLOW TO WETLAND EXT."
"             Maximum flow                 0.276    c.m/sec"
"             Hydrograph volume          1424.659    c.m"
"                     0.000     0.276     0.276     0.276"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.000     0.000     0.276     0.276"
" 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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.498     0.000     0.276     0.276 c.m/sec"
"             Catchment 5000         Pervious   Impervious Total Area "
"             Surface Area           2.795      1.505      4.300      hectare"
"             Time of concentration  42.895     6.418      20.289     minutes"
"             Time to Centroid       120.078    90.727     101.888    minutes"
"             Rainfall depth         61.359     61.359     61.359     mm"
"             Rainfall volume        1714.99    923.46     2638.45    c.m"
"             Rainfall losses        41.728     1.941      27.803     mm"
"             Runoff depth           19.631     59.418     33.557     mm"
"             Runoff volume          548.69     894.24     1442.93    c.m"
"             Runoff coefficient     0.320      0.968      0.547      "
"             Maximum flow           0.159      0.471      0.498      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.498     0.498     0.276     0.276"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.498     0.498     0.498     0.276"
" 40          HYDROGRAPH   Combine    40"
"            6   Combine "
"           40   Node #"
"                FLOW TO WETLAND EXT."
"             Maximum flow                  0.743    c.m/sec"
"             Hydrograph volume          2867.593    c.m"
"                     0.498     0.498     0.498     0.743"
" 40          HYDROGRAPH   Confluence    40"
"            7   Confluence "
```

```
"           40   Node #"
"                FLOW TO WETLAND EXT."
"             Maximum flow                  0.743    c.m/sec"
"             Hydrograph volume          2867.593    c.m"
"                    0.498     0.743     0.498     0.000"
" 54          POND DESIGN"
"        0.743   Current peak flow    c.m/sec"
"        0.001   Target outflow    c.m/sec"
"       2867.6   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                  0.513    c.m/sec"
"             Maximum level               415.235    metre"
"             Maximum storage             695.217    c.m"
"             Centroidal lag                2.353   hours"
"                  0.498     0.743     0.513     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\2025-06-16 SWM Pond"
"                Output filename:                          122025 Post 25yr.out"
"                Licensee name:                                                 "
"                Company                                                        "
"                Date & Time last used:                6/24/2025 at 11:54:10 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"
"       25.000   % Impervious"
"        3.450   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
"        2.588   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.863   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.394     0.000     0.000     0.000 c.m/sec"
"             Catchment 1000         Pervious   Impervious Total Area "
"             Surface Area           2.588      0.863      3.450      hectare"
"             Time of concentration  28.839     4.964      18.371     minutes"
"             Time to Centroid       110.529    88.395     100.824    minutes"
"             Rainfall depth         75.581     75.581     75.581     mm"
"             Rainfall volume        1955.65    651.88     2607.54    c.m"
"             Rainfall losses        44.179     2.022      33.640     mm"
"             Runoff depth           31.402     73.559     41.941     mm"
"             Runoff volume          812.53     634.45     1446.97    c.m"
"             Runoff coefficient     0.415      0.973      0.555      "
"             Maximum flow           0.290      0.314      0.394      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.394     0.394     0.000     0.000"
" 56          DIVERSION"
"          1000   Node number"
"         0.164   Overflow threshold"
"         1.000   Required diverted fraction"
"            0   Conduit type; 1=Pipe;2=Channel"
"             Peak of diverted flow         0.230    c.m/sec"
"             Volume of diverted flow     512.600    c.m"
"             DIV01000.025hyd"
"             Major flow to pond"
"                     0.394     0.394     0.164     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    10"
"            6   Combine "
"           10   Node #"
"                FLOW TO WETLAND"
"             Maximum flow                  0.164    c.m/sec"
"             Hydrograph volume           934.374    c.m"
"                     0.394     0.394     0.164     0.164"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.394     0.000     0.164     0.164"
" 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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.207     0.000     0.164     0.164 c.m/sec"
"             Catchment 2000         Pervious   Impervious Total Area "
"             Surface Area           0.222      0.518      0.740      hectare"
"             Time of concentration  8.609      1.482      2.587      minutes"
"             Time to Centroid       88.642     83.748     84.507     minutes"
"             Rainfall depth         75.581     75.581     75.581     mm"
"             Rainfall volume        167.79     391.51     559.30     c.m"
"             Rainfall losses        44.326     2.566      15.094     mm"
"             Runoff depth           31.255     73.015     60.487     mm"
"             Runoff volume          69.39      378.22     447.60     c.m"
"             Runoff coefficient     0.414      0.966      0.800      "
"             Maximum flow           0.048      0.191      0.207      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.207     0.207     0.164     0.164"
" 33          CATCHMENT 2001"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"         2001   SITE SWM"
"        0.000   % Impervious"
"        0.100   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.100   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.021     0.207     0.164     0.164 c.m/sec"
"             Catchment 2001          Pervious   Impervious Total Area "
"             Surface Area            0.100      0.000      0.100      hectare"
"             Time of concentration   8.609      1.482      8.609      minutes"
"             Time to Centroid        88.642     83.748     88.642     minutes"
"             Rainfall depth          75.581     75.581     75.581     mm"
"             Rainfall volume         75.58      0.00       75.58      c.m"
"             Rainfall losses         44.326     2.566      44.326     mm"
"             Runoff depth            31.255     73.015     31.255     mm"
"             Runoff volume           31.25      0.00       31.25      c.m"
"             Runoff coefficient      0.414      0.000      0.414      "
"             Maximum flow            0.021      0.000      0.021      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.021     0.225     0.164     0.164"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.021     0.225     0.225     0.164"
" 40          HYDROGRAPH   Combine    20"
"            6   Combine "
"           20   Node #"
"                FLOW TO POND"
"             Maximum flow                  0.225    c.m/sec"
"             Hydrograph volume           478.858    c.m"
"                     0.021     0.225     0.225     0.225"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.021     0.000     0.225     0.225"
" 47          FILEI_O 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                512.600    c.m"
"             Maximum flow                  0.230    c.m/sec"
"                  0.021     0.230     0.225     0.225 c.m/sec"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.021     0.230     0.230     0.225"
" 40          HYDROGRAPH   Combine    20"
"            6   Combine "
"           20   Node #"
"                FLOW TO POND"
"             Maximum flow                  0.451    c.m/sec"
"             Hydrograph volume           991.458    c.m"
"                     0.021     0.230     0.230     0.451"
" 40          HYDROGRAPH   Confluence    20"
"            7   Confluence "
```

```
"           20   Node #"
"                FLOW TO POND"
"             Maximum flow                  0.451    c.m/sec"
"             Hydrograph volume           991.458    c.m"
"                    0.021     0.451     0.230     0.000"
" 54          POND DESIGN"
"        0.451   Current peak flow    c.m/sec"
"        0.001   Target outflow    c.m/sec"
"        991.5   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                  0.302    c.m/sec"
"             Maximum level               416.442    metre"
"             Maximum storage             437.416    c.m"
"             Centroidal lag                2.358   hours"
"                  0.021     0.451     0.302     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    10"
"            6   Combine "
"           10   Node #"
"                FLOW TO WETLAND"
"             Maximum flow                  0.466    c.m/sec"
"             Hydrograph volume          1925.857    c.m"
"                    0.021     0.451     0.302     0.466"
" 40          HYDROGRAPH Start - New Tributary"
```

```
"            2   Start - New Tributary"
"                     0.021     0.000     0.302     0.466"
" 33          CATCHMENT 2002"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"         2002   SITE REAR"
"        0.000   % Impervious"
"        0.080   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.080   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.014     0.000     0.302     0.466 c.m/sec"
"             Catchment 2002         Pervious   Impervious Total Area "
"             Surface Area           0.080      0.000      0.080      hectare"
"             Time of concentration  13.048     2.246      13.048     minutes"
"             Time to Centroid       93.486     84.792     93.486     minutes"
"             Rainfall depth         75.581     75.581     75.581     mm"
"             Rainfall volume        60.46      0.00       60.46      c.m"
"             Rainfall losses        44.300     2.796      44.300     mm"
"             Runoff depth           31.281     72.785     31.281     mm"
"             Runoff volume          25.02      0.00       25.02      c.m"
"             Runoff coefficient     0.414      0.000      0.414      "
"             Maximum flow           0.014      0.000      0.014      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.014     0.014     0.302     0.466"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.014     0.014     0.014     0.466"
" 40          HYDROGRAPH   Combine    10"
"            6   Combine "
"           10   Node #"
"                FLOW TO WETLAND"
"             Maximum flow                  0.474    c.m/sec"
```

```
"             Hydrograph volume          1950.881    c.m"
"                     0.014     0.014     0.014     0.474"
" 40          HYDROGRAPH   Confluence    10"
"            7   Confluence "
"           10   Node #"
"                FLOW TO WETLAND"
"             Maximum flow                  0.474    c.m/sec"
"             Hydrograph volume          1950.881    c.m"
"                     0.014     0.474     0.014     0.000"
" 33          CATCHMENT 3000"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"         3000   SITE WETLAND"
"        0.000   % Impervious"
"        0.110   Total Area"
"       25.000   Flow length"
"        2.000   Overland Slope"
"        0.110   Pervious Area"
"       25.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       25.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.022     0.474     0.014     0.000 c.m/sec"
"             Catchment 3000         Pervious   Impervious Total Area "
"             Surface Area           0.110      0.000      0.110      hectare"
"             Time of concentration  9.842      1.694      9.842      minutes"
"             Time to Centroid       89.994     83.984     89.993     minutes"
"             Rainfall depth         75.581     75.581     75.581     mm"
"             Rainfall volume        83.14      0.00       83.14      c.m"
"             Rainfall losses        44.396     2.515      44.396     mm"
"             Runoff depth           31.185     73.066     31.185     mm"
"             Runoff volume          34.30      0.00       34.30      c.m"
"             Runoff coefficient     0.413      0.000      0.413      "
"             Maximum flow           0.022      0.000      0.022      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.022     0.485     0.014     0.000"
" 47          FILEI_O 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               1985.185    c.m"
"             Maximum flow                  0.485    c.m/sec"
"                  0.022     0.485     0.014     0.000 c.m/sec"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.022     0.485     0.485     0.000"
" 40          HYDROGRAPH   Combine    30"
"            6   Combine "
"           30   Node #"
"                FLOW FROM SITE"
"             Maximum flow                  0.485    c.m/sec"
"             Hydrograph volume          1985.185    c.m"
"                     0.022     0.485     0.485     0.485"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.022     0.000     0.485     0.485"
" 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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.014     0.000     0.485     0.485 c.m/sec"
"             Catchment 4000         Pervious   Impervious Total Area "
"             Surface Area           0.020      0.030      0.050      hectare"
"             Time of concentration  5.680      0.978      2.035      minutes"
```

```
"             Time to Centroid       85.598     83.128     83.683     minutes"
"             Rainfall depth         75.581     75.581     75.581     mm"
"             Rainfall volume        15.12      22.67      37.79      c.m"
"             Rainfall losses        44.418     3.930      20.125     mm"
"             Runoff depth           31.163     71.651     55.456     mm"
"             Runoff volume          6.23       21.50      27.73      c.m"
"             Runoff coefficient     0.412      0.948      0.734      "
"             Maximum flow           0.005      0.011      0.014      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.014     0.014     0.485     0.485"
" 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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.008     0.014     0.485     0.485 c.m/sec"
"             Catchment 4001         Pervious   Impervious Total Area "
"             Surface Area           0.021      0.009      0.030      hectare"
"             Time of concentration  5.680      0.978      3.346      minutes"
"             Time to Centroid       85.598     83.128     84.372     minutes"
"             Rainfall depth         75.581     75.581     75.581     mm"
"             Rainfall volume        15.87      6.80       22.67      c.m"
"             Rainfall losses        44.418     3.930      32.271     mm"
"             Runoff depth           31.163     71.651     43.309     mm"
"             Runoff volume          6.54       6.45       12.99      c.m"
"             Runoff coefficient     0.412      0.948      0.573      "
"             Maximum flow           0.005      0.003      0.008      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
```

```
"                    0.008     0.021     0.485     0.485"
" 33          CATCHMENT 4002"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"         4002   SITE ENTRANCE"
"       90.000   % Impervious"
"        0.010   Total Area"
"        5.000   Flow length"
"        2.000   Overland Slope"
"        0.001   Pervious Area"
"        5.000   Pervious length"
"        2.000   Pervious slope"
"        0.009   Impervious Area"
"        5.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.003     0.021     0.485     0.485 c.m/sec"
"             Catchment 4002         Pervious   Impervious Total Area "
"             Surface Area           0.001      0.009      0.010      hectare"
"             Time of concentration  3.747      0.645      0.792      minutes"
"             Time to Centroid       83.491     83.110     83.128     minutes"
"             Rainfall depth         75.581     75.581     75.581     mm"
"             Rainfall volume        0.76       6.80       7.56       c.m"
"             Rainfall losses        44.930     6.955      10.753     mm"
"             Runoff depth           30.651     68.626     64.828     mm"
"             Runoff volume          0.31       6.18       6.48       c.m"
"             Runoff coefficient     0.406      0.908      0.858      "
"             Maximum flow           0.000      0.003      0.003      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.003     0.024     0.485     0.485"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.003     0.024     0.024     0.485"
" 40          HYDROGRAPH   Combine    30"
"            6   Combine "
"           30   Node #"
"                FLOW FROM SITE"
"             Maximum flow                 0.495    c.m/sec"
"             Hydrograph volume         2032.389    c.m"
```

```
"                    0.003     0.024     0.024     0.495"
" 40          HYDROGRAPH   Confluence    30"
"            7   Confluence "
"           30   Node #"
"                FLOW FROM SITE"
"             Maximum flow                  0.495    c.m/sec"
"             Hydrograph volume          2032.389    c.m"
"                    0.003     0.495     0.024     0.000"
" 38          START/RE-START TOTALS 30"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                     4.570    hectare"
"             Total Impervious area                    1.429    hectare"
"             Total % impervious                      31.258"
" 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\2025-06-16 SWM Pond"
"                Output filename:                 122025 Post 25yr-wetland.out"
"                Licensee name:                                               "
"                Company                                                      "
"                Date & Time last used:               6/24/2025 at 1:47:37 PM"
" 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_O 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              1985.185    c.m"
"             Maximum flow                 0.485    c.m/sec"
"                  0.000     0.485     0.000     0.000 c.m/sec"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.000     0.485     0.485     0.000"
" 40          HYDROGRAPH   Combine    40"
"            6   Combine "
"           40   Node #"
"                FLOW TO WETLAND EXT."
"             Maximum flow                 0.485    c.m/sec"
"             Hydrograph volume         1985.185    c.m"
"                     0.000     0.485     0.485     0.485"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.000     0.000     0.485     0.485"
" 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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.605     0.000     0.485     0.485 c.m/sec"
"             Catchment 5000         Pervious   Impervious Total Area "
"             Surface Area           2.795      1.505      4.300      hectare"
"             Time of concentration  35.505     6.112      19.122     minutes"
"             Time to Centroid       117.717    89.914     102.221    minutes"
"             Rainfall depth         75.581     75.581     75.581     mm"
"             Rainfall volume        2112.48    1137.49    3249.98    c.m"
"             Rainfall losses        44.167     2.120      29.451     mm"
"             Runoff depth           31.414     73.461     46.130     mm"
"             Runoff volume          878.02     1105.58    1983.60    c.m"
"             Runoff coefficient     0.416      0.972      0.610      "
"             Maximum flow           0.267      0.548      0.605      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.605     0.605     0.485     0.485"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.605     0.605     0.605     0.485"
" 40          HYDROGRAPH   Combine    40"
"            6   Combine "
"           40   Node #"
"                FLOW TO WETLAND EXT."
"             Maximum flow                  0.920    c.m/sec"
"             Hydrograph volume          3968.781    c.m"
"                     0.605     0.605     0.605     0.920"
" 40          HYDROGRAPH   Confluence    40"
"            7   Confluence "
```

```
"           40   Node #"
"                FLOW TO WETLAND EXT."
"             Maximum flow                  0.920    c.m/sec"
"             Hydrograph volume          3968.781    c.m"
"                    0.605     0.920     0.605     0.000"
" 54          POND DESIGN"
"        0.920   Current peak flow    c.m/sec"
"        0.001   Target outflow    c.m/sec"
"       3968.8   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                  0.735    c.m/sec"
"             Maximum level               415.338    metre"
"             Maximum storage             974.883    c.m"
"             Centroidal lag                2.301   hours"
"                  0.605     0.920     0.735     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\2025-06-16 SWM Pond"
"                Output filename:                           122025 Post 50yr.out"
"                Licensee name:                                                  "
"                Company                                                         "
"                Date & Time last used:                6/24/2025 at 11:49:10 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"
"       25.000   % Impervious"
"        3.450   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
"        2.588   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.863   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.497     0.000     0.000     0.000 c.m/sec"
"             Catchment 1000         Pervious   Impervious Total Area "
"             Surface Area           2.588      0.863      3.450      hectare"
"             Time of concentration  27.541     4.801      18.264     minutes"
"             Time to Centroid       109.720    87.997     100.858    minutes"
"             Rainfall depth         86.737     86.737     86.737     mm"
"             Rainfall volume        2244.31    748.10     2992.42    c.m"
"             Rainfall losses        45.785     2.071      34.856     mm"
"             Runoff depth           40.952     84.666     51.881     mm"
"             Runoff volume          1059.64    730.24     1789.88    c.m"
"             Runoff coefficient     0.472      0.976      0.598      "
"             Maximum flow           0.377      0.344      0.497      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.497     0.497     0.000     0.000"
" 56          DIVERSION"
"          1000   Node number"
"         0.164   Overflow threshold"
"         1.000   Required diverted fraction"
"            0   Conduit type; 1=Pipe;2=Channel"
"             Peak of diverted flow         0.333    c.m/sec"
"             Volume of diverted flow     774.092    c.m"
"             DIV01000.050hyd"
"             Major flow to pond"
"                     0.497     0.497     0.164     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    10"
"            6   Combine "
"           10   Node #"
"                FLOW TO WETLAND"
"             Maximum flow                  0.164    c.m/sec"
"             Hydrograph volume          1015.786    c.m"
"                     0.497     0.497     0.164     0.164"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.497     0.000     0.164     0.164"
" 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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.243     0.000     0.164     0.164 c.m/sec"
"             Catchment 2000         Pervious   Impervious Total Area "
"             Surface Area           0.222      0.518      0.740      hectare"
"             Time of concentration  8.221      1.433      2.604      minutes"
"             Time to Centroid       88.919     83.571     84.493     minutes"
"             Rainfall depth         86.737     86.737     86.737     mm"
"             Rainfall volume        192.56     449.30     641.85     c.m"
"             Rainfall losses        45.907     2.762      15.705     mm"
"             Runoff depth           40.830     83.975     71.032     mm"
"             Runoff volume          90.64      434.99     525.63     c.m"
"             Runoff coefficient     0.471      0.968      0.819      "
"             Maximum flow           0.060      0.209      0.243      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.243     0.243     0.164     0.164"
" 33          CATCHMENT 2001"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"         2001   SITE SWM"
"        0.000   % Impervious"
"        0.100   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.100   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.027     0.243     0.164     0.164 c.m/sec"
"             Catchment 2001         Pervious   Impervious Total Area "
"             Surface Area           0.100      0.000      0.100      hectare"
"             Time of concentration  8.221      1.433      8.221      minutes"
"             Time to Centroid       88.919     83.570     88.919     minutes"
"             Rainfall depth         86.737     86.737     86.737     mm"
"             Rainfall volume        86.74      0.00       86.74      c.m"
"             Rainfall losses        45.907     2.762      45.907     mm"
"             Runoff depth           40.830     83.975     40.830     mm"
"             Runoff volume          40.83      0.00       40.83      c.m"
"             Runoff coefficient     0.471      0.000      0.471      "
"             Maximum flow           0.027      0.000      0.027      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.027     0.270     0.164     0.164"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.027     0.270     0.270     0.164"
" 40          HYDROGRAPH   Combine    20"
"            6   Combine "
"           20   Node #"
"                FLOW TO POND"
"             Maximum flow                  0.270    c.m/sec"
"             Hydrograph volume           566.463    c.m"
"                     0.027     0.270     0.270     0.270"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.027     0.000     0.270     0.270"
" 47          FILEI_O 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                774.092    c.m"
"             Maximum flow                  0.333    c.m/sec"
"                  0.027     0.333     0.270     0.270 c.m/sec"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.027     0.333     0.333     0.270"
" 40          HYDROGRAPH   Combine    20"
"            6   Combine "
"           20   Node #"
"                FLOW TO POND"
"             Maximum flow                  0.555    c.m/sec"
"             Hydrograph volume          1340.554    c.m"
"                     0.027     0.333     0.333     0.555"
" 40          HYDROGRAPH   Confluence    20"
"            7   Confluence "
```

```
"           20   Node #"
"                FLOW TO POND"
"             Maximum flow                  0.555    c.m/sec"
"             Hydrograph volume          1340.554    c.m"
"                     0.027     0.555     0.333     0.000"
" 54          POND DESIGN"
"        0.555   Current peak flow    c.m/sec"
"        0.001   Target outflow    c.m/sec"
"       1340.6   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                  0.457    c.m/sec"
"             Maximum level               416.482    metre"
"             Maximum storage             467.317    c.m"
"             Centroidal lag                2.196   hours"
"                  0.027     0.555     0.457     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    10"
"            6   Combine "
"           10   Node #"
"                FLOW TO WETLAND"
"             Maximum flow                  0.621    c.m/sec"
"             Hydrograph volume          2358.364    c.m"
"                     0.027     0.555     0.457     0.621"
" 40          HYDROGRAPH Start - New Tributary"
```

```
"            2   Start - New Tributary"
"                     0.027     0.000     0.457     0.621"
" 33          CATCHMENT 2002"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"         2002   SITE REAR"
"        0.000   % Impervious"
"        0.080   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.080   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.018     0.000     0.457     0.621 c.m/sec"
"             Catchment 2002         Pervious   Impervious Total Area "
"             Surface Area           0.080      0.000      0.080      hectare"
"             Time of concentration  12.461     2.172      12.461     minutes"
"             Time to Centroid       93.415     84.536     93.415     minutes"
"             Rainfall depth         86.737     86.737     86.737     mm"
"             Rainfall volume        69.39      0.00       69.39      c.m"
"             Rainfall losses        45.905     2.932      45.905     mm"
"             Runoff depth           40.832     83.805     40.832     mm"
"             Runoff volume          32.67      0.00       32.67      c.m"
"             Runoff coefficient     0.471      0.000      0.471      "
"             Maximum flow           0.018      0.000      0.018      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.018     0.018     0.457     0.621"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.018     0.018     0.018     0.621"
" 40          HYDROGRAPH   Combine    10"
"            6   Combine "
"           10   Node #"
"                FLOW TO WETLAND"
"             Maximum flow                  0.635    c.m/sec"
```

```
"             Hydrograph volume          2391.030    c.m"
"                     0.018     0.018     0.018     0.635"
" 40          HYDROGRAPH   Confluence    10"
"            7   Confluence "
"           10   Node #"
"                FLOW TO WETLAND"
"             Maximum flow                  0.635    c.m/sec"
"             Hydrograph volume          2391.030    c.m"
"                     0.018     0.635     0.018     0.000"
" 33          CATCHMENT 3000"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"         3000   SITE WETLAND"
"        0.000   % Impervious"
"        0.110   Total Area"
"       25.000   Flow length"
"        2.000   Overland Slope"
"        0.110   Pervious Area"
"       25.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       25.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.028     0.635     0.018     0.000 c.m/sec"
"             Catchment 3000         Pervious   Impervious Total Area "
"             Surface Area           0.110      0.000      0.110      hectare"
"             Time of concentration  9.399      1.639      9.399      minutes"
"             Time to Centroid       90.106     83.796     90.106     minutes"
"             Rainfall depth         86.737     86.737     86.737     mm"
"             Rainfall volume        95.41      0.00       95.41      c.m"
"             Rainfall losses        46.010     2.624      46.010     mm"
"             Runoff depth           40.727     84.113     40.727     mm"
"             Runoff volume          44.80      0.00       44.80      c.m"
"             Runoff coefficient     0.470      0.000      0.470      "
"             Maximum flow           0.028      0.000      0.028      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.028     0.652     0.018     0.000"
" 47          FILEI_O 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               2435.830    c.m"
"             Maximum flow                  0.652    c.m/sec"
"                  0.028     0.652     0.018     0.000 c.m/sec"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.028     0.652     0.652     0.000"
" 40          HYDROGRAPH   Combine    30"
"            6   Combine "
"           30   Node #"
"                FLOW FROM SITE"
"             Maximum flow                  0.652    c.m/sec"
"             Hydrograph volume          2435.830    c.m"
"                     0.028     0.652     0.652     0.652"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.028     0.000     0.652     0.652"
" 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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.016     0.000     0.652     0.652 c.m/sec"
"             Catchment 4000         Pervious   Impervious Total Area "
"             Surface Area           0.020      0.030      0.050      hectare"
"             Time of concentration  5.424      0.946      2.056      minutes"
```

```
"             Time to Centroid       85.872     83.025     83.732     minutes"
"             Rainfall depth         86.737     86.737     86.737     mm"
"             Rainfall volume        17.35      26.02      43.37      c.m"
"             Rainfall losses        46.052     4.507      21.125     mm"
"             Runoff depth           40.685     82.229     65.612     mm"
"             Runoff volume          8.14       24.67      32.81      c.m"
"             Runoff coefficient     0.469      0.948      0.756      "
"             Maximum flow           0.006      0.012      0.016      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.016     0.016     0.652     0.652"
" 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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.009     0.016     0.652     0.652 c.m/sec"
"             Catchment 4001         Pervious   Impervious Total Area "
"             Surface Area           0.021      0.009      0.030      hectare"
"             Time of concentration  5.424      0.946      3.345      minutes"
"             Time to Centroid       85.872     83.025     84.551     minutes"
"             Rainfall depth         86.737     86.737     86.737     mm"
"             Rainfall volume        18.21      7.81       26.02      c.m"
"             Rainfall losses        46.052     4.507      33.589     mm"
"             Runoff depth           40.685     82.229     53.148     mm"
"             Runoff volume          8.54       7.40       15.94      c.m"
"             Runoff coefficient     0.469      0.948      0.613      "
"             Maximum flow           0.006      0.004      0.009      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
```

```
"                    0.009     0.025     0.652     0.652"
" 33          CATCHMENT 4002"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"         4002   SITE ENTRANCE"
"       90.000   % Impervious"
"        0.010   Total Area"
"        5.000   Flow length"
"        2.000   Overland Slope"
"        0.001   Pervious Area"
"        5.000   Pervious length"
"        2.000   Pervious slope"
"        0.009   Impervious Area"
"        5.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.004     0.025     0.652     0.652 c.m/sec"
"             Catchment 4002         Pervious   Impervious Total Area "
"             Surface Area           0.001      0.009      0.010      hectare"
"             Time of concentration  3.579      0.624      0.782      minutes"
"             Time to Centroid       83.897     82.980     83.029     minutes"
"             Rainfall depth         86.737     86.737     86.737     mm"
"             Rainfall volume        0.87       7.81       8.67       c.m"
"             Rainfall losses        46.898     8.277      12.139     mm"
"             Runoff depth           39.839     78.460     74.598     mm"
"             Runoff volume          0.40       7.06       7.46       c.m"
"             Runoff coefficient     0.459      0.905      0.860      "
"             Maximum flow           0.000      0.004      0.004      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.004     0.028     0.652     0.652"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.004     0.028     0.028     0.652"
" 40          HYDROGRAPH   Combine    30"
"            6   Combine "
"           30   Node #"
"                FLOW FROM SITE"
"             Maximum flow                 0.663    c.m/sec"
"             Hydrograph volume         2492.040    c.m"
```

```
"                    0.004     0.028     0.028     0.663"
" 40          HYDROGRAPH   Confluence    30"
"            7   Confluence "
"           30   Node #"
"                FLOW FROM SITE"
"             Maximum flow                  0.663    c.m/sec"
"             Hydrograph volume          2492.040    c.m"
"                    0.004     0.663     0.028     0.000"
" 38          START/RE-START TOTALS 30"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      4.570    hectare"
"             Total Impervious area                     1.429    hectare"
"             Total % impervious                       31.258"
" 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\2025-06-16 SWM Pond"
"                Output filename:                 122025 Post 50yr-wetland.out"
"                Licensee name:                                               "
"                Company                                                      "
"                Date & Time last used:               6/24/2025 at 1:45:16 PM"
" 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_O 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              2435.830    c.m"
"             Maximum flow                 0.652    c.m/sec"
"                  0.000     0.652     0.000     0.000 c.m/sec"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.000     0.652     0.652     0.000"
" 40          HYDROGRAPH   Combine    40"
"            6   Combine "
"           40   Node #"
"                FLOW TO WETLAND EXT."
"             Maximum flow                 0.652    c.m/sec"
"             Hydrograph volume         2435.830    c.m"
"                     0.000     0.652     0.652     0.652"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.000     0.000     0.652     0.652"
" 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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.683     0.000     0.652     0.652 c.m/sec"
"             Catchment 5000         Pervious   Impervious Total Area "
"             Surface Area           2.795      1.505      4.300      hectare"
"             Time of concentration  33.908     5.911      19.173     minutes"
"             Time to Centroid       116.590    89.415     102.288    minutes"
"             Rainfall depth         86.737     86.737     86.737     mm"
"             Rainfall volume        2424.29    1305.39    3729.68    c.m"
"             Rainfall losses        45.780     2.225      30.536     mm"
"             Runoff depth           40.957     84.512     56.201     mm"
"             Runoff volume          1144.74    1271.90    2416.64    c.m"
"             Runoff coefficient     0.472      0.974      0.648      "
"             Maximum flow           0.349      0.604      0.683      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.683     0.683     0.652     0.652"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.683     0.683     0.683     0.652"
" 40          HYDROGRAPH   Combine    40"
"            6   Combine "
"           40   Node #"
"                FLOW TO WETLAND EXT."
"             Maximum flow                  1.199    c.m/sec"
"             Hydrograph volume          4852.474    c.m"
"                     0.683     0.683     0.683     1.199"
" 40          HYDROGRAPH   Confluence    40"
"            7   Confluence "
```

```
"           40   Node #"
"                FLOW TO WETLAND EXT."
"             Maximum flow                  1.199    c.m/sec"
"             Hydrograph volume          4852.472    c.m"
"                    0.683     1.199     0.683     0.000"
" 54          POND DESIGN"
"        1.199   Current peak flow    c.m/sec"
"        0.001   Target outflow    c.m/sec"
"       4852.5   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                  0.878    c.m/sec"
"             Maximum level               415.425    metre"
"             Maximum storage            1264.988    c.m"
"             Centroidal lag                2.273   hours"
"                  0.683     1.199     0.878     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\2025-06-16 SWM Pond"
"                Output filename:                          122025 Post 100yr.out"
"                Licensee name:                                                 "
"                Company                                                        "
"                Date & Time last used:                 6/16/2025 at 4:52:04 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"
"       25.000   % Impervious"
"        3.450   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
"        2.588   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.863   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.624     0.000     0.000     0.000 c.m/sec"
"             Catchment 1000         Pervious   Impervious Total Area "
"             Surface Area           2.588      0.863      3.450      hectare"
"             Time of concentration  26.527     4.662      18.105     minutes"
"             Time to Centroid       108.738    87.699     100.634    minutes"
"             Rainfall depth         97.921     97.921     97.921     mm"
"             Rainfall volume        2533.71    844.57     3378.29    c.m"
"             Rainfall losses        47.006     2.217      35.808     mm"
"             Runoff depth           50.916     95.704     62.113     mm"
"             Runoff volume          1317.44    825.45     2142.90    c.m"
"             Runoff coefficient     0.520      0.977      0.634      "
"             Maximum flow           0.468      0.371      0.624      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.624     0.624     0.000     0.000"
" 56          DIVERSION"
"          1000   Node number"
"         0.164   Overflow threshold"
"         1.000   Required diverted fraction"
"             0   Conduit type; 1=Pipe;2=Channel"
"             Peak of diverted flow         0.460    c.m/sec"
"             Volume of diverted flow    1061.549    c.m"
"             DIV01000.100hyd"
"             Major flow to pond"
"                     0.624     0.624     0.164     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    10"
"            6   Combine "
"           10   Node #"
"                FLOW TO WETLAND"
"             Maximum flow                  0.164    c.m/sec"
"             Hydrograph volume          1081.347    c.m"
"                     0.624     0.624     0.164     0.164"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.624     0.000     0.164     0.164"
" 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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.273     0.000     0.164     0.164 c.m/sec"
"             Catchment 2000         Pervious   Impervious Total Area "
"             Surface Area           0.222      0.518      0.740      hectare"
"             Time of concentration  7.919      1.392      2.609      minutes"
"             Time to Centroid       88.960     83.436     84.466     minutes"
"             Rainfall depth         97.921     97.921     97.921     mm"
"             Rainfall volume        217.39     507.23     724.62     c.m"
"             Rainfall losses        47.142     2.968      16.220     mm"
"             Runoff depth           50.779     94.954     81.701     mm"
"             Runoff volume          112.73     491.86     604.59     c.m"
"             Runoff coefficient     0.519      0.970      0.834      "
"             Maximum flow           0.072      0.227      0.273      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.273     0.273     0.164     0.164"
" 33          CATCHMENT 2001"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"         2001   SITE SWM"
"        0.000   % Impervious"
"        0.100   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.100   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
```

```
"        1.500   Impervious Depression storage"
"                     0.033     0.273     0.164     0.164 c.m/sec"
"             Catchment 2001          Pervious   Impervious Total Area "
"             Surface Area            0.100      0.000      0.100      hectare"
"             Time of concentration   7.919      1.392      7.919      minutes"
"             Time to Centroid        88.960     83.436     88.960     minutes"
"             Rainfall depth          97.921     97.921     97.921     mm"
"             Rainfall volume         97.92      0.00       97.92      c.m"
"             Rainfall losses         47.142     2.968      47.142     mm"
"             Runoff depth            50.779     94.954     50.779     mm"
"             Runoff volume           50.78      0.00       50.78      c.m"
"             Runoff coefficient      0.519      0.000      0.519      "
"             Maximum flow            0.033      0.000      0.033      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.033     0.306     0.164     0.164"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.033     0.306     0.306     0.164"
" 40          HYDROGRAPH   Combine    20"
"            6   Combine "
"           20   Node #"
"                FLOW TO POND"
"             Maximum flow                  0.306    c.m/sec"
"             Hydrograph volume           655.368    c.m"
"                     0.033     0.306     0.306     0.306"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.033     0.000     0.306     0.306"
" 47          FILEI_O 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               1061.549    c.m"
"             Maximum flow                  0.460    c.m/sec"
"                  0.033     0.460     0.306     0.306 c.m/sec"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.033     0.460     0.460     0.306"
" 40          HYDROGRAPH   Combine    20"
"            6   Combine "
"           20   Node #"
"                FLOW TO POND"
"             Maximum flow                  0.662    c.m/sec"
"             Hydrograph volume          1716.918    c.m"
"                     0.033     0.460     0.460     0.662"
" 40          HYDROGRAPH   Confluence    20"
"            7   Confluence "
```

```
"           20   Node #"
"                FLOW TO POND"
"             Maximum flow                  0.662    c.m/sec"
"             Hydrograph volume          1716.917    c.m"
"                     0.033     0.662     0.460     0.000"
" 54          POND DESIGN"
"        0.662   Current peak flow    c.m/sec"
"        0.001   Target outflow    c.m/sec"
"       1716.9   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                  0.611    c.m/sec"
"             Maximum level               416.519    metre"
"             Maximum storage             495.445    c.m"
"             Centroidal lag                2.080   hours"
"                  0.033     0.662     0.611     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    10"
"            6   Combine "
"           10   Node #"
"                FLOW TO WETLAND"
"             Maximum flow                  0.775    c.m/sec"
"             Hydrograph volume          2800.300    c.m"
"                     0.033     0.662     0.611     0.775"
" 40          HYDROGRAPH Start - New Tributary"
```

```
"            2   Start - New Tributary"
"                     0.033     0.000     0.611     0.775"
" 33          CATCHMENT 2002"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"         2002   SITE REAR"
"        0.000   % Impervious"
"        0.080   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.080   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.022     0.000     0.611     0.775 c.m/sec"
"             Catchment 2002         Pervious   Impervious Total Area "
"             Surface Area           0.080      0.000      0.080      hectare"
"             Time of concentration  12.003     2.109      12.003     minutes"
"             Time to Centroid       93.273     84.343     93.273     minutes"
"             Rainfall depth         97.921     97.921     97.921     mm"
"             Rainfall volume        78.34      0.00       78.34      c.m"
"             Rainfall losses        47.139     3.112      47.139     mm"
"             Runoff depth           50.782     94.809     50.782     mm"
"             Runoff volume          40.63      0.00       40.63      c.m"
"             Runoff coefficient     0.519      0.000      0.519      "
"             Maximum flow           0.022      0.000      0.022      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.022     0.022     0.611     0.775"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.022     0.022     0.022     0.775"
" 40          HYDROGRAPH   Combine    10"
"            6   Combine "
"           10   Node #"
"                FLOW TO WETLAND"
"             Maximum flow                  0.792    c.m/sec"
```

```
"             Hydrograph volume          2840.924    c.m"
"                     0.022     0.022     0.022     0.792"
" 40          HYDROGRAPH   Confluence    10"
"            7   Confluence "
"           10   Node #"
"                FLOW TO WETLAND"
"             Maximum flow                  0.792    c.m/sec"
"             Hydrograph volume          2840.925    c.m"
"                     0.022     0.792     0.022     0.000"
" 33          CATCHMENT 3000"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"         3000   SITE WETLAND"
"        0.000   % Impervious"
"        0.110   Total Area"
"       25.000   Flow length"
"        2.000   Overland Slope"
"        0.110   Pervious Area"
"       25.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       25.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.034     0.792     0.022     0.000 c.m/sec"
"             Catchment 3000         Pervious   Impervious Total Area "
"             Surface Area           0.110      0.000      0.110      hectare"
"             Time of concentration  9.053      1.591      9.053      minutes"
"             Time to Centroid       90.088     83.657     90.088     minutes"
"             Rainfall depth         97.921     97.921     97.921     mm"
"             Rainfall volume        107.71     0.00       107.71     c.m"
"             Rainfall losses        47.263     2.758      47.263     mm"
"             Runoff depth           50.658     95.164     50.658     mm"
"             Runoff volume          55.72      0.00       55.72      c.m"
"             Runoff coefficient     0.517      0.000      0.517      "
"             Maximum flow           0.034      0.000      0.034      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.034     0.815     0.022     0.000"
" 47          FILEI_O 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               2896.649    c.m"
"             Maximum flow                  0.815    c.m/sec"
"                  0.034     0.815     0.022     0.000 c.m/sec"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.034     0.815     0.815     0.000"
" 40          HYDROGRAPH   Combine    30"
"            6   Combine "
"           30   Node #"
"                FLOW FROM SITE"
"             Maximum flow                  0.815    c.m/sec"
"             Hydrograph volume          2896.649    c.m"
"                     0.034     0.815     0.815     0.815"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.034     0.000     0.815     0.815"
" 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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.018     0.000     0.815     0.815 c.m/sec"
"             Catchment 4000         Pervious   Impervious Total Area "
"             Surface Area           0.020      0.030      0.050      hectare"
"             Time of concentration  5.224      0.918      2.065      minutes"
```

```
"             Time to Centroid       86.102     82.959     83.796     minutes"
"             Rainfall depth         97.921     97.921     97.921     mm"
"             Rainfall volume        19.58      29.38      48.96      c.m"
"             Rainfall losses        47.399     5.148      22.048     mm"
"             Runoff depth           50.522     92.773     75.873     mm"
"             Runoff volume          10.10      27.83      37.94      c.m"
"             Runoff coefficient     0.516      0.947      0.775      "
"             Maximum flow           0.007      0.013      0.018      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.018     0.018     0.815     0.815"
" 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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.011     0.018     0.815     0.815 c.m/sec"
"             Catchment 4001         Pervious   Impervious Total Area "
"             Surface Area           0.021      0.009      0.030      hectare"
"             Time of concentration  5.224      0.918      3.328      minutes"
"             Time to Centroid       86.102     82.959     84.718     minutes"
"             Rainfall depth         97.921     97.921     97.921     mm"
"             Rainfall volume        20.56      8.81       29.38      c.m"
"             Rainfall losses        47.399     5.148      34.724     mm"
"             Runoff depth           50.522     92.773     63.197     mm"
"             Runoff volume          10.61      8.35       18.96      c.m"
"             Runoff coefficient     0.516      0.947      0.645      "
"             Maximum flow           0.008      0.004      0.011      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
```

```
"                    0.011     0.028     0.815     0.815"
" 33          CATCHMENT 4002"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"         4002   SITE ENTRANCE"
"       90.000   % Impervious"
"        0.010   Total Area"
"        5.000   Flow length"
"        2.000   Overland Slope"
"        0.001   Pervious Area"
"        5.000   Pervious length"
"        2.000   Pervious slope"
"        0.009   Impervious Area"
"        5.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.004     0.028     0.815     0.815 c.m/sec"
"             Catchment 4002         Pervious   Impervious Total Area "
"             Surface Area           0.001      0.009      0.010      hectare"
"             Time of concentration  3.447      0.606      0.773      minutes"
"             Time to Centroid       84.163     82.880     82.955     minutes"
"             Rainfall depth         97.921     97.921     97.921     mm"
"             Rainfall volume        0.98       8.81       9.79       c.m"
"             Rainfall losses        48.291     9.704      13.562     mm"
"             Runoff depth           49.630     88.218     84.359     mm"
"             Runoff volume          0.50       7.94       8.44       c.m"
"             Runoff coefficient     0.507      0.901      0.861      "
"             Maximum flow           0.000      0.004      0.004      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.004     0.032     0.815     0.815"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.004     0.032     0.032     0.815"
" 40          HYDROGRAPH   Combine    30"
"            6   Combine "
"           30   Node #"
"                FLOW FROM SITE"
"             Maximum flow                  0.833    c.m/sec"
"             Hydrograph volume          2961.980    c.m"
```

```
"                    0.004     0.032     0.032     0.833"
" 40          HYDROGRAPH   Confluence    30"
"            7   Confluence "
"           30   Node #"
"                FLOW FROM SITE"
"             Maximum flow                  0.833    c.m/sec"
"             Hydrograph volume          2961.980    c.m"
"                    0.004     0.833     0.032     0.000"
" 38          START/RE-START TOTALS 30"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      4.570    hectare"
"             Total Impervious area                     1.429    hectare"
"             Total % impervious                       31.258"
" 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\2025-06-16 SWM Pond"
"                Output filename:                 122025 Post 100yr-wetland.out"
"                Licensee name:                                               "
"                Company                                                      "
"                Date & Time last used:                6/16/2025 at 4:59:25 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"
" 47          FILEI_O 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               2896.649    c.m"
"             Maximum flow                  0.815    c.m/sec"
"                  0.000     0.815     0.000     0.000 c.m/sec"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.000     0.815     0.815     0.000"
" 40          HYDROGRAPH   Combine    40"
"            6   Combine "
"           40   Node #"
"                FLOW TO WETLAND EXT."
"             Maximum flow                  0.815    c.m/sec"
"             Hydrograph volume          2896.649    c.m"
"                     0.000     0.815     0.815     0.815"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.000     0.000     0.815     0.815"
" 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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.767     0.000     0.815     0.815 c.m/sec"
"             Catchment 5000         Pervious   Impervious Total Area "
"             Surface Area           2.795      1.505      4.300      hectare"
"             Time of concentration  32.659     5.739      19.129     minutes"
"             Time to Centroid       115.282    89.060     102.103    minutes"
"             Rainfall depth         97.921     97.921     97.921     mm"
"             Rainfall volume        2736.90    1473.72    4210.62    c.m"
"             Rainfall losses        46.991     2.350      31.367     mm"
"             Runoff depth           50.930     95.571     66.555     mm"
"             Runoff volume          1423.50    1438.35    2861.85    c.m"
"             Runoff coefficient     0.520      0.976      0.680      "
"             Maximum flow           0.441      0.655      0.767      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.767     0.767     0.815     0.815"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.767     0.767     0.767     0.815"
" 40          HYDROGRAPH   Combine    40"
"            6   Combine "
"           40   Node #"
"                FLOW TO WETLAND EXT."
"             Maximum flow                  1.515    c.m/sec"
"             Hydrograph volume          5758.500    c.m"
"                     0.767     0.767     0.767     1.515"
" 40          HYDROGRAPH   Confluence    40"
"            7   Confluence "
```

```
"           40   Node #"
"                FLOW TO WETLAND EXT."
"             Maximum flow                  1.515    c.m/sec"
"             Hydrograph volume          5758.500    c.m"
"                    0.767     1.515     0.767     0.000"
" 54          POND DESIGN"
"        1.515   Current peak flow    c.m/sec"
"        0.001   Target outflow    c.m/sec"
"       5758.5   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                  1.014    c.m/sec"
"             Maximum level               415.523    metre"
"             Maximum storage            1628.427    c.m"
"             Centroidal lag                2.260   hours"
"                  0.767     1.515     1.014     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\2025-06-16 SWM Pond"
"                Output filename:                            122025 Post REG.out"
"                Licensee name:                                                 "
"                Company                                                        "
"                Date & Time last used:                6/24/2025 at 11:36:27 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     2.028     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"
"       25.000   % Impervious"
"        3.450   Total Area"
"      150.000   Flow length"
"        2.000   Overland Slope"
"        2.588   Pervious Area"
"      150.000   Pervious length"
"        2.000   Pervious slope"
"        0.863   Impervious Area"
"      150.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
```

```
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.293     0.000     0.000     0.000 c.m/sec"
"             Catchment 1000         Pervious   Impervious Total Area "
"             Surface Area           2.588      0.863      3.450      hectare"
"             Time of concentration  45.242     7.511      25.000     minutes"
"             Time to Centroid       2800.590   2249.031   2504.687   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        7374.38    2458.13    9832.50    c.m"
"             Rainfall losses        209.112    21.494     162.207    mm"
"             Runoff depth           75.888     263.506    122.793    mm"
"             Runoff volume          1963.60    2272.74    4236.34    c.m"
"             Runoff coefficient     0.266      0.925      0.431      "
"             Maximum flow           0.215      0.109      0.293      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.293     0.293     0.000     0.000"
" 56          DIVERSION"
"         1000   Node number"
"        0.164   Overflow threshold"
"        1.000   Required diverted fraction"
"            0   Conduit type; 1=Pipe;2=Channel"
"             Peak of diverted flow         0.129    c.m/sec"
"             Volume of diverted flow     703.510    c.m"
"             DIV01000.200hyd"
"             Major flow to pond"
"                    0.293     0.293     0.164     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    10"
"            6   Combine "
"           10   Node #"
"                FLOW TO WETLAND"
"             Maximum flow                  0.164    c.m/sec"
"             Hydrograph volume          3532.832    c.m"
"                    0.293     0.293     0.164     0.164"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.293     0.000     0.164     0.164"
" 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"
```

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"        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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.085     0.000     0.164     0.164 c.m/sec"
"             Catchment 2000         Pervious   Impervious Total Area "
"             Surface Area           0.222      0.518      0.740      hectare"
"             Time of concentration  13.505     2.242      3.561      minutes"
"             Time to Centroid       2770.029   2266.892   2325.792   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        632.70     1476.30    2109.00    c.m"
"             Rainfall losses        209.394    40.613     91.247     mm"
"             Runoff depth           75.606     244.387    193.753    mm"
"             Runoff volume          167.85     1265.93    1433.77    c.m"
"             Runoff coefficient     0.265      0.857      0.680      "
"             Maximum flow           0.019      0.067      0.085      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.085     0.085     0.164     0.164"
" 33          CATCHMENT 2001"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"         2001   SITE SWM"
"        0.000   % Impervious"
"        0.100   Total Area"
"       20.000   Flow length"
"        2.000   Overland Slope"
"        0.100   Pervious Area"
"       20.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       20.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
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"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.008     0.085     0.164     0.164 c.m/sec"
"             Catchment 2001         Pervious   Impervious Total Area "
"             Surface Area           0.100      0.000      0.100      hectare"
"             Time of concentration  13.505     2.242      13.505     minutes"
"             Time to Centroid       2770.029   2266.892   2770.027   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        285.00     0.00       285.00     c.m"
"             Rainfall losses        209.394    40.613     209.393    mm"
"             Runoff depth           75.606     244.387    75.606     mm"
"             Runoff volume          75.61      0.00       75.61      c.m"
"             Runoff coefficient     0.265      0.000      0.265      "
"             Maximum flow           0.008      0.000      0.008      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.008     0.093     0.164     0.164"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.008     0.093     0.093     0.164"
" 40          HYDROGRAPH   Combine    20"
"            6   Combine "
"           20   Node #"
"                FLOW TO POND"
"             Maximum flow                  0.093    c.m/sec"
"             Hydrograph volume          1509.379    c.m"
"                     0.008     0.093     0.093     0.093"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.008     0.000     0.093     0.093"
" 47          FILEI_O 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                703.510    c.m"
"             Maximum flow                  0.129    c.m/sec"
"                  0.008     0.129     0.093     0.093 c.m/sec"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.008     0.129     0.129     0.093"
" 40          HYDROGRAPH   Combine    20"
"            6   Combine "
"           20   Node #"
```

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"               FLOW TO POND"
"             Maximum flow                  0.200    c.m/sec"
"             Hydrograph volume          2212.888    c.m"
"                     0.008     0.129     0.129     0.200"
" 40          HYDROGRAPH   Confluence    20"
"            7   Confluence "
"           20   Node #"
"               FLOW TO POND"
"             Maximum flow                  0.200    c.m/sec"
"             Hydrograph volume          2212.888    c.m"
"                     0.008     0.200     0.129     0.000"
" 54          POND DESIGN"
"        0.200   Current peak flow    c.m/sec"
"        0.001   Target outflow    c.m/sec"
"       2212.9   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                  0.197    c.m/sec"
"             Maximum level               416.405    metre"
"             Maximum storage             410.990    c.m"
"             Centroidal lag               42.736   hours"
"                  0.008     0.200     0.197     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    10"
"            6   Combine "
```

```
"           10   Node #"
"                FLOW TO WETLAND"
"             Maximum flow                  0.361    c.m/sec"
"             Hydrograph volume          5745.778    c.m"
"                    0.008     0.200     0.197     0.361"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.008     0.000     0.197     0.361"
" 33          CATCHMENT 2002"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"         2002   SITE REAR"
"        0.000   % Impervious"
"        0.080   Total Area"
"       40.000   Flow length"
"        2.000   Overland Slope"
"        0.080   Pervious Area"
"       40.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       40.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.007     0.000     0.197     0.361 c.m/sec"
"             Catchment 2002         Pervious   Impervious Total Area "
"             Surface Area           0.080      0.000      0.080      hectare"
"             Time of concentration  20.470     3.398      20.470     minutes"
"             Time to Centroid       2778.671   2240.650   2778.670   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        228.00     0.00       228.00     c.m"
"             Rainfall losses        207.046    39.000     207.046    mm"
"             Runoff depth           77.954     246.000    77.954     mm"
"             Runoff volume          62.36      0.00       62.36      c.m"
"             Runoff coefficient     0.274      0.000      0.274      "
"             Maximum flow           0.007      0.000      0.007      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.007     0.007     0.197     0.361"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
```

```
"                    0.007     0.007     0.007     0.361"
" 40          HYDROGRAPH   Combine    10"
"            6   Combine "
"           10   Node #"
"                FLOW TO WETLAND"
"             Maximum flow                  0.368    c.m/sec"
"             Hydrograph volume          5808.142    c.m"
"                    0.007     0.007     0.007     0.368"
" 40          HYDROGRAPH   Confluence    10"
"            7   Confluence "
"           10   Node #"
"                FLOW TO WETLAND"
"             Maximum flow                  0.368    c.m/sec"
"             Hydrograph volume          5808.142    c.m"
"                    0.007     0.368     0.007     0.000"
" 33          CATCHMENT 3000"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"         3000   SITE WETLAND"
"        0.000   % Impervious"
"        0.110   Total Area"
"       25.000   Flow length"
"        2.000   Overland Slope"
"        0.110   Pervious Area"
"       25.000   Pervious length"
"        2.000   Pervious slope"
"        0.000   Impervious Area"
"       25.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                    0.009     0.368     0.007     0.000 c.m/sec"
"             Catchment 3000         Pervious   Impervious Total Area "
"             Surface Area           0.110      0.000      0.110      hectare"
"             Time of concentration  15.440     2.563      15.440     minutes"
"             Time to Centroid       2772.868   2258.395   2772.866   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        313.50     0.00       313.50     c.m"
"             Rainfall losses        208.265    40.119     208.265    mm"
"             Runoff depth           76.735     244.881    76.735     mm"
"             Runoff volume          84.41      0.00       84.41      c.m"
```

```
"             Runoff coefficient     0.269      0.000      0.269      "
"             Maximum flow           0.009      0.000      0.009      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.009     0.376     0.007     0.000"
" 47          FILEI_O 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               5892.551    c.m"
"             Maximum flow                  0.376    c.m/sec"
"                  0.009     0.376     0.007     0.000 c.m/sec"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.009     0.376     0.376     0.000"
" 40          HYDROGRAPH   Combine    30"
"            6   Combine "
"           30   Node #"
"                FLOW FROM SITE"
"             Maximum flow                  0.376    c.m/sec"
"             Hydrograph volume          5892.551    c.m"
"                     0.009     0.376     0.376     0.376"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.009     0.000     0.376     0.376"
" 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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
```

```
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.006     0.000     0.376     0.376 c.m/sec"
"             Catchment 4000         Pervious   Impervious Total Area "
"             Surface Area           0.020      0.030      0.050      hectare"
"             Time of concentration  8.910      1.479      2.684      minutes"
"             Time to Centroid       2761.635   2281.822   2359.582   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        57.00      85.50      142.50     c.m"
"             Rainfall losses        213.998    40.260     109.755    mm"
"             Runoff depth           71.002     244.740    175.245    mm"
"             Runoff volume          14.20      73.42      87.62      c.m"
"             Runoff coefficient     0.249      0.859      0.615      "
"             Maximum flow           0.002      0.004      0.006      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.006     0.006     0.376     0.376"
" 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'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.003     0.006     0.376     0.376 c.m/sec"
"             Catchment 4001         Pervious   Impervious Total Area "
"             Surface Area           0.021      0.009      0.030      hectare"
"             Time of concentration  8.910      1.479      4.479      minutes"
"             Time to Centroid       2761.635   2281.822   2475.509   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        59.85      25.65      85.50      c.m"
"             Rainfall losses        213.998    40.260     161.876    mm"
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"             Runoff depth           71.002     244.740    123.124    mm"
"             Runoff volume          14.91      22.03      36.94      c.m"
"             Runoff coefficient     0.249      0.859      0.432      "
"             Maximum flow           0.002      0.001      0.003      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.003     0.009     0.376     0.376"
" 33          CATCHMENT 4002"
"            1   Triangular SCS"
"            1   Equal length"
"            2   Horton equation"
"         4002   SITE ENTRANCE"
"       90.000   % Impervious"
"        0.010   Total Area"
"        5.000   Flow length"
"        2.000   Overland Slope"
"        0.001   Pervious Area"
"        5.000   Pervious length"
"        2.000   Pervious slope"
"        0.009   Impervious Area"
"        5.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       75.000   Pervious Max.infiltration"
"       12.500   Pervious Min.infiltration"
"        0.250   Pervious Lag constant (hours)"
"        5.000   Pervious Depression storage"
"        0.015   Impervious Manning 'n'"
"        0.000   Impervious Max.infiltration"
"        0.000   Impervious Min.infiltration"
"        0.050   Impervious Lag constant (hours)"
"        1.500   Impervious Depression storage"
"                     0.001     0.009     0.376     0.376 c.m/sec"
"             Catchment 4002         Pervious   Impervious Total Area "
"             Surface Area           0.001      0.009      0.010      hectare"
"             Time of concentration  5.879      0.976      1.117      minutes"
"             Time to Centroid       2754.292   2277.042   2290.813   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        2.85       25.65      28.50      c.m"
"             Rainfall losses        218.607    36.710     54.900     mm"
"             Runoff depth           66.393     248.290    230.100    mm"
"             Runoff volume          0.66       22.35      23.01      c.m"
"             Runoff coefficient     0.233      0.871      0.807      "
"             Maximum flow           0.000      0.001      0.001      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.001     0.010     0.376     0.376"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.001     0.010     0.010     0.376"
```

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" 40          HYDROGRAPH   Combine    30"
"            6   Combine "
"           30   Node #"
"                FLOW FROM SITE"
"             Maximum flow                  0.383    c.m/sec"
"             Hydrograph volume          6040.121    c.m"
"                     0.001     0.010     0.010     0.383"
" 40          HYDROGRAPH   Confluence    30"
"            7   Confluence "
"           30   Node #"
"                FLOW FROM SITE"
"             Maximum flow                  0.383    c.m/sec"
"             Hydrograph volume          6040.122    c.m"
"                     0.001     0.383     0.010     0.000"
" 38          START/RE-START TOTALS 30"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      4.570    hectare"
"             Total Impervious area                     1.429    hectare"
"             Total % impervious                       31.258"
" 19          EXIT"
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