3027 Cedar Creek Road

Functional Servicing Report

Project Location:
3027 Cedar Creek Road, Ayr, ON

Prepared for:
Royal Truck and Trailer Sales Ltd.
73 Stafford Drive
Brampton, ON L6W 1L3

Prepared by:
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February 13, 2025

MTE File No.: 55566-100

Engineers, Scientists, Surveyors.

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1.0 INTRODUCTION

MTE Consultants Inc. was retained by Royal Truck and Trailer Sales Ltd. to complete a Functional Servicing Report for a new industrial development to be constructed at 3027 Cedar Creek Road, Ayr (herein referred to as 'the Site') in the Township of North Dumfries in support of the Zoning By-Law Amendment Application. The current zoning of the site is Zone 1 – Agricultural. The property is proposed to be re-zoned as Zone 11 – Industrial.

The Site is legally described as Part of Lot 34, Concession 10 in the Township of North Dumfries. The property is bounded to the north by Cedar Creek Road, to the west by natural areas and farmland, to the south by Highway 401, and to the east by an existing industrial development. For the exact location of the Site, refer to Figure 1.0.

The proposed development for the Site is the construction of slab-on-grade industrial building complete with gravel parking areas and two driveway entrances, as well as the demolition of an existing residential home. The proposed development is intended to function as a trucking facility including 19 loading dock bays as well as 5 repair bays.

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

2.0 CRITERIA

2.1 Existing Topography

The Site encompasses an area of 21.326ha and currently comprises an existing residential building centrally located on the Site with a single gravel driveway. A portion of a large wetland occupies the northwest area of the Site, a smaller wetland is located at the rear of the Site, and a significant woodland occupies the southwest corner of the Site. In the existing condition, surface runoff from a majority of the Site drains overland towards the large wetland, while runoff from a portion of the south area drains overland towards the smaller wetland. The large and small wetland both appear to ultimately drain westerly towards Eden Creek. With the wetlands and woodland, the developable area is limited to approximately 9.0ha. The Site ranges from 311masl in the southwest corner to a high of 320masl near Cedar Creek Road. The Site is approximately 1% impervious in the existing condition.

Engineers, Scientists, Surveyors

PROJECT

3027 CEDAR CREEK ROAD CIVIL WORKS

TITLE

SITE LOCATION PLAN

Drawn: BDW	Scale: 1:7,500	Figure: **1.0**
Checked: AJS	Project No.: 55566-100	
Date: 2024-11-13	Rev No.: 0	

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Plot Date: February 13, 2025 - 12:05 PM

2.2 Existing Servicing

There are no existing storm or sanitary sewers, or watermain located on Cedar Creek Road. The closest municipal services are located within the settled area of Ayr, approximately 4km southwest. The existing industrial areas to the east of the Site are serviced by septic and well.

2.3 Existing Soils Information

The subject property is located within the physiographic region known as the Waterloo Hills. Kame moraines, one of the primary landforms of the Waterloo Hills, are mapped at the Site (Chapman and Putnam, 1984).

15 boreholes were advanced by MTE as part of the Geotechnical Investigation, dated August 2024, in order to determine the underlying soil conditions on the Site. Upon completion of drilling, four monitoring wells were installed to support the Hydrogeological Investigation, prepared by MTE dated September 2024. The subsurface stratigraphy was generally revealed to comprise of topsoil overlying native sand and glacial till. Bedrock was not encountered. Refer to the Geotechnical Investigation for details.

Groundwater was not encountered at the time of drilling. On-going monitoring revealed groundwater ranging from 2.5 to 11 metres below grade, representing elevations ranging from 307.7masl to 305.2masl. Groundwater is generally interpreted to flow from northeast to southwest. Unfactored infiltration rates were estimated utilizing particle size distributions and ranged from 50mm/hr to 540mm/hr, indicating high infiltration capacity. Refer to the Hydrogeological Investigation, dated February 2025, prepared by MTE for details.

2.4 Reviewing Agencies

Grading, servicing and stormwater management designs as well as this Functional Servicing and Stormwater Management Report will be required for submission to the Township of North Dumfries in support of the Zoning By-Law Amendment and the Site Plan Applications. The Township will also be responsible for the review and approval of site plans, site grading, servicing, stormwater management, lighting and landscape design and ultimately issuing building permits.

As the Site falls within GRCA Regulation limit, the site engineering design will also be submitted to the GRCA for their review and approval. A ‘Fill Permit’ will be required.

Cedar Creek Road is a Regional Road. As such, the Region of Waterloo will be circulated on the Site Plan Application submission and will need to approve the site grading, servicing and stormwater management design.

3.0 METHODOLOGY

Preliminary grading and servicing strategies for the proposed development have been developed based on GRCA contours and the Conceptual Site Plan prepared by MHBC, dated November 2024.

3.1 Proposed Grading

The proposed development will include an approximately 10,000m^2 industrial building complete with two driveway connections to Cedar Creek Road. The proposed grading strategy will respect the existing grades along the north and east property lines while wetland and woodland setbacks will be respected in the south and east portions of the Site. The building will have a finished floor elevation of 319.80mASL, which is subject to change during the detailed design. The grading

strategy has been development to ensure that the drainage is directed to a series of storm structures throughout the Site and ultimately to the proposed stormwater management facility (SWMF) located at the west side of the Site. The major storm overland flow route is proposed to be towards the SWMF.

3.1.1 Water

A private well and fire reservoir will be required to service the proposed buildings. The building is not expected to require process water and therefore water demands are expected to be limited. The Hydrogeological Investigation noted water supply wells of sufficient quantity and quality are expected to be available at depths approximately 30 to 40 metres below ground level. A preliminary well location is shown on MTE Drawing C2.1.

As a municipal water connection is not available, an on-site fire reservoir will be required. Preliminary fire reservoir sizing was determined to be 1,853m^3. Refer to Appendix A for details. The largest Wilkinson Precast Concrete Water Holding Tank is 114m^3, therefore 17 tanks connected in tandem are required to provide sufficient firefighting volume. Fire reservoir sizing will be refined and further details provided during detailed design.

3.1.2 Sanitary

A private on-site septic system will be required to service the proposed building and is expected to be designed under Part 8 of the OBC, with Level IV treatment and a Type A dispersal bed. The estimated T-Time at BH109, the closest to the proposed septic location, is 10mins/cm as per the Geotechnical Report prepared by MTE dated August 27, 2024. Exact flows will be confirmed during detailed design but are expected to be under 10,000L/d and therefore an Environmental Compliance Approval (ECA) will not be required. Preliminary estimated flows are provided in the table below.

Table 3.1 – Preliminary Total Daily Sewage Flow

Component	Parameter	OBC Rate	Total Quantity	Daily Flow
Office[1]	Floor area	75 L/day per 9.3m^2 of office area	600m^2	4,840L/day
Warehouse[1]	Water Closets	950 L/d per water closet	1 water closets (total)	950L/day
	Loading Bays	150 L/d per loading bay	24 loading bays (total)	3,600L/day
PRELIMINARY TOTAL				**9,390L/day**

[1] It is assumed one water closet is in the warehouse area. Any water closets servicing the office space are accounted for under the office floor area calculation. Total office area is assumed and is subject to change at detailed design.

It is noted that the on-site wastewater system is not expected to be required to treat any wash water that could be generated at the Site. Only domestic wastewater will be conveyed to the Level IV treatment system. A separate holding tank would be required for any wash water generated at the Site due to washing activities and floor drains in vehicle/repair bays.

Based on the loading rate of 10L/m^2/day for the underlying native soils, per Table 8.7.4.1.A. of OBC, the proposed fill contact area must be greater than 939m^2.

The size of the area bed is determined by the following formulas (OBC):

$$A_{Stone} = \frac{Q}{50} \quad When\ Q > 3000\ Lpd$$

$$A_{Sand} = \frac{QT}{850} \quad when\ T < 15\ \ min/cm$$

Where *Q* is the daily sewage design flow (L/d), and *T* is the T-time of the soils.

From the above calculations, the required stone area is 187.8m^2 and the required sand area is 110.5m^2 for a daily flow of 9,390L and a T-time of 10mins/cm. There is up to 2500m^2 of area allocated to the septic system in the northwest corner of the Site, which is sufficient for the system based on the above preliminary area calculations.

The following clearances are required for the proposed on-site wastewater treatment and disposal system installation:

Table 3.2 – Clearance Requirements

Clearance From	Treatment Tank(s) / Unit	To Distribution Piping
Building or Structure	1.5 m	5 m
Potable Water Wells (Drilled)	15 m	15 m
Water Body	15 m	15 m
Property Line	3 m	3 m

The proposed on-site wastewater works will conform to the required clearance distances.

Details of the septic system including confirming the exact type of system, distribution piping and Level IV treatment system (if required) will be provided at detailed design when the building design and total daily sewage flow is confirmed.

Groundwater was measured at 307.08masl at MW110, the closest monitoring well to the proposed septic location. Proposed grades are expected to be at least 10m above the measured groundwater elevation and thus groundwater is expected to be at sufficient depth to provide the minimum 0.60m separation below the bottom of the stone layer.

A preliminary Nitrate Dilution Assessment and Phosphorus Impact Assessment have been completed and are included in the Hydrogeological Assessment.

3.1.3 Storm

A private storm sewer system will be installed on-site to collect runoff from the common driveway and parking areas. This storm sewer system, which will include catchbasins, manholes and catchbasin manholes, will convey runoff towards the proposed stormwater management facility located at the west side of the development adjacent to the northwest wetland. Runoff from the building rooftop will be directed to an infiltration gallery, before overflowing onto the on-site storm sewer system. Runoff from the frontage of the building will flow towards the Cedar Creel Road right-of-way.

4.0 PRELIMINARY STORMWATER MANAGEMENT DESIGN

4.1 SWM Criteria

The stormwater management design criteria for the subject Site, as established by the Township of North Dumfries and GRCA, are as follows:

i) **Water Quality Control** – Implementation of Enhanced Level (Level 1) water quality controls.

ii) **Water Quantity Control** – Provide attenuation of the post-development peak flows for the 2-, 5-, and 100-year storm events to the pre-development (existing) peak flow.

iii) **Erosion Control** – Implementation of Erosion and Sediment Control measures.

iv) **Annual Water Balance** – Maintain an infiltration balance where reasonably feasible.

4.2 Catchment parameters

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

i) Calculate the allowable runoff rates using MIDUSS NET.

ii) Determine the percent impervious of the site and catchment parameters for inclusion in MIDUSSS modeling.

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

The following table summarizes the catchments used in modeling of the Site. The pre-development condition was separated into three catchment areas: the area directed to Wetland #1, the area directed to Wetland #2, and the area directed off-site. The post-development condition was separated into six catchment areas: area directed to the SWM Facility (SWMF), the SWMF, the uncontrolled area to wetland #1, uncontrolled area off-site, area to Wetland #2, and area directed to the southwest neighboring property. Figure 2.0 illustrates the limits of the pre-development catchment areas. Figure 3.0 illustrates the limits of the post-development catchment areas.

Table 4.1 – Catchment Parameters

#	Catchment	Area (m)	% Impervious	Pervious CN	Impervious CN	Slope (%)	Flow Length (m)
Pre-Development Catchment Areas							
101	Area to Wetland #1	12.476	1.0	65	98	3.0	160
102	Area to Wetland #2	5.190	0.0	65	98	5.0	100
103	Area to Southwest Neighboring Property	3.660	0.0	65	98	8.0	140

#	Catchment	Area (m)	% Impervious	Pervious CN	Impervious CN	Slope (%)	Flow Length (m)
Post-Development Catchment Areas							
201	Area to SWMF	6.736	98.0	65	91	3.5	50
202	SWMF	0.547	100	65	98	10.0	25
203	Uncontrolled Area to Wetland #1	7.044	0.0	65	98	3.0	120
204	Uncontrolled Area to Off-site	0.587	0.0	65	98	8.0	10
205	Area to Wetland #2	2.752	0.0	65	98	5.0	100
206	Area to Southwest Neighboring Property	3.660	0.0	65	98	8.0	140

As previously noted, the subsurface stratigraphy was generally revealed to comprise of topsoil overlying native sand and glacial till. Therefore, a pervious CN of 65 is appropriate. An impervious CN of 91 for the gravel driveway and parking lot is used for MIDUSS modelling.

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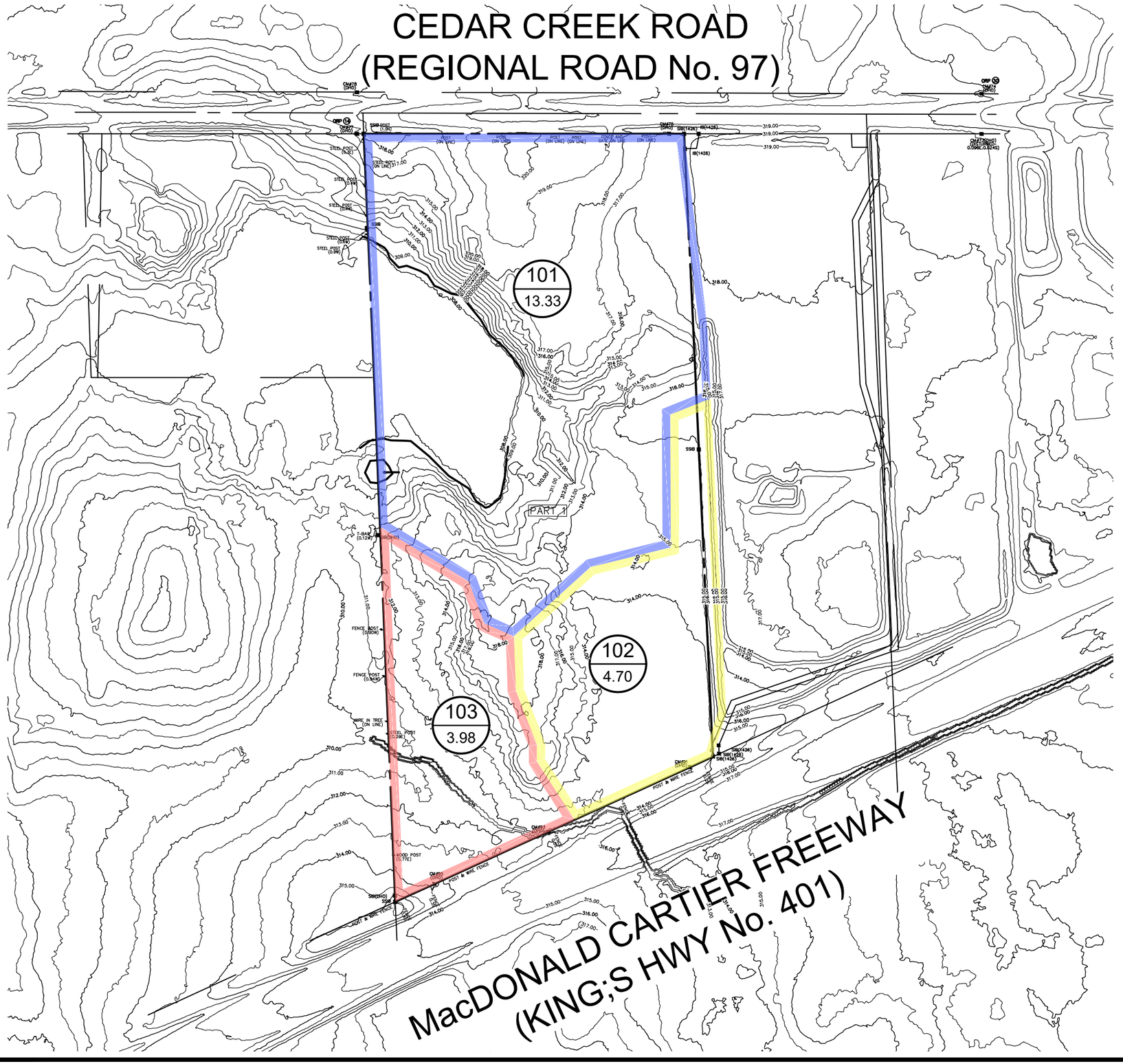
Plot Date: February 13, 2025 - 12:05 PM

CEDAR CREEK ROAD
(REGIONAL ROAD No. 97)



LEGEND

- CATCHMENT 101
- CATCHMENT 102
- CATCHMENT 103

101 / 13.33 — SUB-CATCHMENT NUMBER / AREA (ha.)

0 40 80 120 160 200m

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PROJECT	3027 CEDAR CREEK
TITLE	PRE-DEVELOPMENT CATCHMENT AREAS

Drawn: BDW	Scale: 1:4,000	Figure: 2.0
Checked: AJS	Project No.: 55566-100	
Date (yyyy-mm-dd): 2024-11-26	Rev No.: 0	

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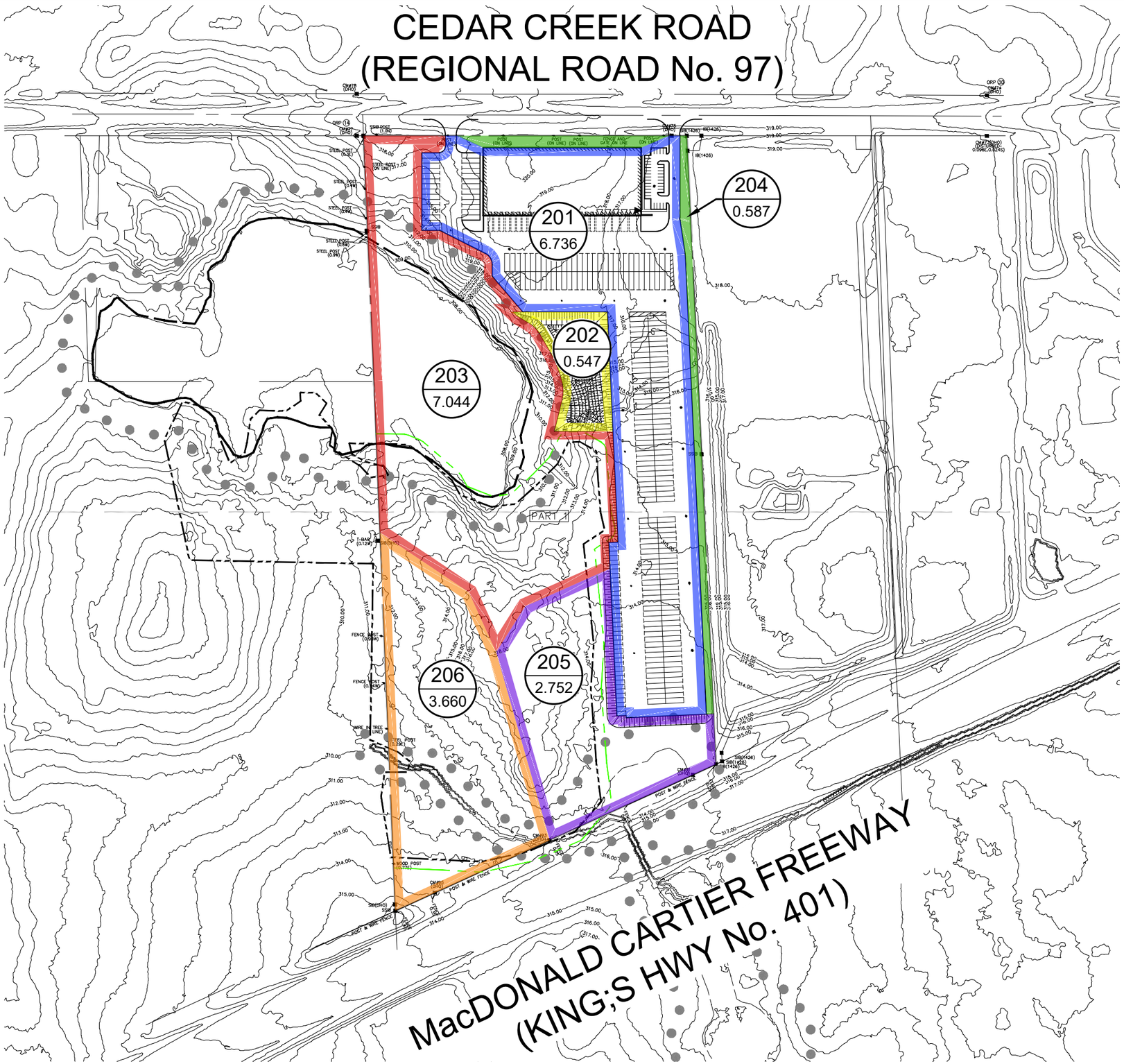
Plot Date: February 13, 2025 - 12:41 PM

CEDAR CREEK ROAD (REGIONAL ROAD No. 97)



LEGEND

- CATCHMENT 201
- CATCHMENT 202
- CATCHMENT 203
- CATCHMENT 204
- CATCHMENT 205
- CATCHMENT 206

201 / 8.56 — 201: SUB-CATCHMENT NUMBER; 8.56: AREA (ha.)

0 40 80 120 160 200m

MTE
Engineers, Scientists, Surveyors

PROJECT	3027 CEDAR CREEK
TITLE	POST-DEVELOPMENT CATCHMENT AREAS
Drawn: BDW	Scale: 1:4,000
Checked: AJS	Project No.: 55566-100
Date (yyyy-mm-dd): 2024-11-26	Rev No.: 0
Figure	3.0

4.3 Water Quality

The proposed SWMF has been designed as a wet pond with a permanent pool depth of 2.0m. The facility will also incorporate a sediment forebay with a depth of 2.5m which offers the benefits of dilution and settling of sediment. A planting scheme will be prepared at detailed design that selects plant species and their location in and around the basins to stabilize banks, mitigate temperature increases, deter waterfowl from nesting within the area, and provide aesthetics and safety benefits.

The forebay design is based on classic particle settling and flow dispersion equations, as presented in the MOE's 2003 *Stormwater Management Planning and Design Manual*. The methodology presented in that document suggests that the design flow for the forebay should be taken as the peak outflow from the facility. A forebay is typically designed to treat minor storm flows. Therefore, the main pond will essentially be empty (or at its permanent pool level) during minor storm events. As such, there will be no mass of water at the outlet of the forebay that would control the flow through the forebay to that of the main pond's discharge rate.

The design of the forebay should be based on the notion that the flow into the forebay equals the flow through the forebay, which equals the flow out of the forebay. Therefore, the forebay is designed to satisfy the following four conditions:

- A settling length based on a settling velocity of 0.0003m/s using the main pond's peak discharge from the 25mm storm event (as per MOE 2003).
- A settling length based on a settling velocity of 0.0055m/s using the forebay inflow/outflow from the 25mm storm event.
- A dispersion length such that, based on flow and depth of water, the velocity through the forebay is less than 0.5m/s.
- That velocity, based on flow divided by cross-sectional area, is less than 0.15m/s to prevent scouring.

The 2003 MOE document suggests that the clean-out frequency for a stormwater management facility be based on the sediment loading within the entire pond; however, it is recommended that the clean-out frequency be based on the loading within the forebay only. While this typically results in more frequent clean-out, it is restricted to the forebay area only and eliminates disturbance of the main pond. The clean-out frequency for the proposed SWMF can be found in the forebay design calculations in **Appendix B**.

Under the future ultimate development condition, the total drainage area for the proposed SWMF is 7.283ha at 98.2% imperviousness. According to Table 3.2 from MOE's 2003 stormwater management guidelines, the constructed wet pond requires 271.92m^3/ha of storage. As described in Section 3.1, 40m^3/ha of which is extended detention and the remainder of which is the permanent pool. As such, the required extended detention volume is 291.32m^3.

The proposed SWMF design characteristics are summarized in **Table 4.2**. Refer to **Appendix B** for the relevant design sheets and calculations (e.g., catchment parameters, imperviousness calculations, stage-storage-discharge relationships, drawdown calculations, etc.) Further details for the SWM facility design will be provided at detailed design.

Table 4.2 – Water Quality Control Details

General	Facility Characteristics
Stormwater Management Facility Type	Wet Pond
Required MECP Water Quality Protection	Enhanced (Level 1)
Total Contributing Area	7.283ha
Imperviousness	98.2%
Bottom Elevation (Wet Pond)	311.00
Storage	
Unit Area Storage Volume Requirements as per SWMMP (MOE 2003)	271.92m^3/ha
Required Total Volume	1980.4m^3
Permanent Pool	
Required Permanent Pool Volume	1,689m^3
Permanent Pool Volume Provided	1,854m^3
Permanent Pool Elevation	313.00m
Extended Detention	
Minimum Required Volume (based on 40m^3/ha)	291m^3
Extended Detention Elevation (MOE)	301.15m
Peak Release Rate for Extended Detention (Quality)	0.0041m^3/s
Quantity and Erosion Control (25mm-4hr)	
Drawdown Volume	681m^3
Approximate Drawdown Time	53.3 hours
Peak Release Rate	0.0068m^3/s
Forebay	
Required Forebay Length	33.0m
Actual Forebay Length	10.0m
Permanent Pool Elevation	313.00m
Bottom Elevation	310.50m
Outlet Controls	
1500mm diameter Outlet Control Manhole	
Orifice 1 Diameter	75mm Vertical
Orifice 1 Invert	313.00m
Orifice 2 Diameter	300mm Vertical
Orifice 2 Invert	313.60m
Emergency Overflow Weir (Bottom Length)	17m
Emergency Overflow Weir Elevation	314.70m

4.4 Water Quantity

In order to achieve the stormwater management requirements for the site, runoff generated from the parking areas will be conveyed to the stormwater management facility via on-site storm sewers, wherein the flow will be controlled with the installation of an outlet control manhole structure complete with a 75mm and 300mm diameter online orifice plates within the control manhole to control events up to and including the 100-year storm event. Storage volume for the orifices will be provided within the forebay and the main cell. An emergency overflow weir is proposed along the west side of the pond, where runoff will be directed toward the existing wetland #1. Runoff from the building rooftop is proposed to be directed to an infiltration gallery sized to retain 30mm of runoff before overflowing onto the on-site storm sewer system. The infiltration gallery is not included in modelling as a conservative design choice. Runoff from the frontage of the building is draining towards the Cedar Creek Road right-of-way. Runoff along the east property of the Site is proposed to drain south along the property line and ultimately towards wetland #2.

The MIDUSS modeling output is included in **Appendix C.**

A summary of the preliminary stage-storage-discharge relationship of the proposed SWMF is shown in shown in **Table 4.3** below.

Table 4.3 – Stage-Storage-Discharge Summary

Elevation (m)	Discharge (m^3/s)	Active Volume (m^3)	Remarks
313.00	0.000	0	Permanent Pool, 75mm diameter Orifice
313.20	0.0048	401	Contour
313.40	0.0073	836	Contour
313.60	0.0091	1301	300 diameter Orifice
313.80	0.0329	1799	Contour
314.00	0.1002	2330	Contour
314.20	0.1380	2895	Contour
314.40	0.1671	3495	Contour
314.60	0.1918	4136	Contour
314.80	0.2621	4840	Emergency Overflow Weir

A summary of the peak flows and associated maximum ponding elevations from the SWMF under the post-development conditions is provided in **Table 4.4** below. A summary of the pre- and post-development peak flows from the Site is included in **Table 4.5**.

Table 4.4 – Summary of Peak Flows and Maximum Ponding Elevations from SWMF

Storm Event	Proposed SWM Facility		
	Peak Outflow from Proposed SWM Facility (m^3/s)	Maximum Ponding Volume (m^3)	Maximum Ponding Elevation (m)
2-Year Storm Event	0.009	1,246	313.58
5-Year Storm Event	0.040	1,887	313.83
100-Year Storm Event	0.180	3,808	314.50

Table 4.5 – Summary of Peak Flows

Modelling Condition		2-Year Storm Event (m^3/s)	5-Year Storm Event (m^3/s)	100-Year Storm Event (m^3/s)
Pre-Development	To Wetland #1	0.032	0.121	0.794
	To Wetland #2	0.018	0.068	0.448
	Overall Pre-Development	**0.062**	**0.235**	**1.540**
Post-Development	To Wetland #1	0.029	0.106	0.676
	To Wetland #2	0.010	0.036	0.238
	Overall Post-Development	**0.056**	**0.205**	**1.299**

Note: Some runoff is directed towards the right-of-way and/or bypasses the wetlands. As such, the overall rates from the Site are greater than the rates directed to the wetlands. Runoff rates to the wetlands have been provided to illustrate the efforts taken to mitigate negative impacts to the wetlands.

4.5 Erosion Control

The MECP recommends that any newly proposed development throughout the watershed implement a SWM solution that provides at least a 24-hour drawdown for the volume generated during the 25mm storm event; to ensure that threshold flow durations do not exceed pre-development levels. As such, the proposed SWMF has been designed to provide approximately a 53-hour drawdown time on the 25mm storm event volume.

4.6 Water Balance

A water balance analysis has been conducted to examine the impacts of the proposed development. Using the Waterloo Wellington Airport weather station, an average annual precipitation estimate for the property of 916.5 mm/yr was utilized.

In the pre-development condition, the Site is almost fully pervious and drains mostly towards Wetland #1, located in the northwest portion of the Site. The southeast portion of the Site drains towards a smaller wetland located in the southeast corner of the Site, while the southwest portion of the Site drains overland towards a creek approximately 600m west of the Site. It is

noted Wetland #1 and Wetland #2 both appear to ultimately drain towards the aforementioned creek.

In the post-development condition, the southwest catchment area remains in its existing size and condition. As a result of the proposed development, a large portion of the area previously directed towards Wetland #2 is redirected to the SWMF and ultimately Wetland #1. This results in reduced runoff towards Wetland #2 and an increase in runoff towards Wetland #1, in addition to the increase in runoff from the Site as a result of converting pervious area to impervious. To mitigate the increase in runoff, an infiltration gallery is proposed to infiltrate runoff from the proposed building roof. The gallery is sized to retain 30mm of runoff from the proposed roof.

The following table summarizes the pre- and post-development runoff directed to each wetland, as well as runoff and infiltration from the Site as a whole. Please refer to **Appendix D** for detailed calculations.

Table 4.6 – Yearly Water Balance Summary

		Pre-Development	Post-Development	Volume Change	Percentage Change
Runoff Volume (m^3/yr)	Wetland #1	17,092	55,272	38,180	323%
	Wetland #2	7,110	3,440	-3,670	-52%
	Entire Site	29,217	64,021	34,804	219%
Infiltration Volume (m^3/yr)		43,718	36,378	7,341	-17%

While the runoff volume has increased significantly, this is to be expected when development occurs. As previously mentioned, Wetland #1 appears to ultimately drain towards a creek based on GRCA contours. It is expected any excess runoff directed to Wetland #1 will be able to flow through the wetland and towards the creek, mitigating negative impacts from the increase in runoff. Further, while the development results in a slight decrease in infiltration volume from the Site, best efforts have been made to actively infiltrate 'clean' runoff on Site.

5.0 EROSION & SEDIMENT CONTROL

Precautions will need to be taken during construction to limit erosion and sedimentation. Erosion and Sediment Control Plans will be prepared and provided during the detailed design stage. The plans will illustrate the erosion and sediment control measures to be implemented during construction, which will limit impacts associated with the development.

Typically, the recommended construction sequence for erosion and sediment control measures are as follows:

- Erosion and sedimentation facilities are to be installed prior to any area grading operations.
- Stripping and strategic placement of topsoil stockpiles. Placement of sediment control fencing where required and around all stockpile areas.
- All erosion control measures are to be inspected and monitored by the contractor and repairs are to be completed as required.

- All materials and equipment used for the purpose of site preparation and project completion should be operated and stored in a manner that prevents any deleterious substance from leaving the site.
- Construction of temporary swales to direct runoff to sedimentation basins as required, with rock check dams as required to control velocities.
- Re-vegetation of completed areas as soon as possible after construction, including those areas not slated for construction within 60-days.

Sediment control fencing shall consist of filter fabric attached to page wire fencing and sealed at ground level. It will be installed at the perimeter of the work areas and intermittently on sloped areas where required. Sediment control fencing will be placed around all topsoil stockpiles.

It is recommended that during construction, monitoring and inspection of the erosion and sediment controls be conducted to ensure the satisfactory performance of these measures. Reporting of the inspection and monitoring results should be distributed to the Township of North Dumfries.

6.0 CONCLUSIONS

Based on the foregoing analysis, it is concluded that:

- The proposed grading design will respect the natural topography of the Site to achieve a reasonable cut/fill balance where possible and maintain the minimum required cover over the proposed sewers, and the proposed development will respect the limit and setback from the wetlands.
- The Site can be adequately serviced for sanitary servicing by an on-site septic system with further details provided during detailed design.
- An on-site well is expected to be suitable to provide domestic water supply for the proposed development.
- An on-site reservoir will be required to meet fire fighting requirements.
- The stormwater management criteria can be satisfied by directing runoff generated from the developed area to a SWMF which will provide quality and quantity control.
- Additional grading, servicing and stormwater management details will be provided during detailed design.

All of which is respectfully submitted,

MTE Consultants Inc.

55566-100

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AJS:dlb

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Appendix A

Fire Reservoir Sizing

3027 Cedar Creek Road

FIRE FLOW ANALYSIS

Ayr, Ontario

Project Number: 55566-100
Date: February 13, 2025
Design By: JHN

File: Q:\55566\100\Fire Flow\Site Fire Flow Analysis.xlsx

Step 1: Determining Water Supply Coefficient

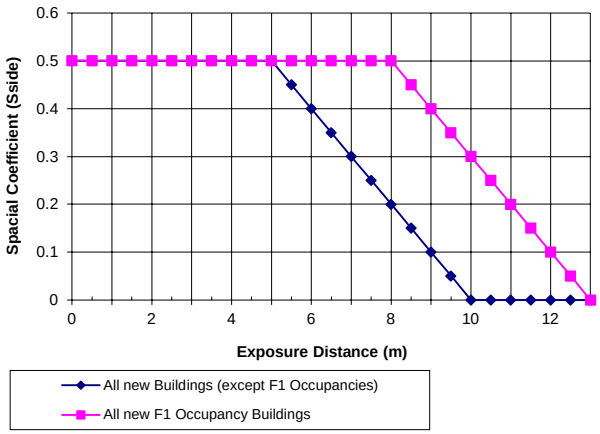
	Table 1 from OBC 2012 A3.2.5.7												
	Type of Construction	Classification by group or division in Accordance with Table 3.1.2.1 of the Ontario Building Code											
		A2	B1	B2	B3	C	D	A4	F3	A1	A3	E	F2	F1
1	Building is of Noncombustible construction with fire separation and fire-resistance ratings provided in accordance with Subsection 3.2.2 of the OBC, including loadbearing walls, columns and arches						10	12		14		17		23
2	Building is of Noncombustible construction or of heavy timber construction conforming to Article 3.1.4.6 of the OBC. Floor assemblies are fire separations but no fire-resistance rating. Roof assemblies, mezzanines, loadbearing walls, columns and arches do not have a fire-resistance rating.						16	19		22		27		37
3	Building is of Combustible Construction with fire separations and fire-resistance ratings provided in accordance with Subsection 3.2.2 of the OBC, including loadbearing walls, columns and arches. Noncombustible construction may be used in lieu of fire resistance rating where permitted in subsection 3.2.2 of the OBC						18	22		25		31		41
4	Building is of combustible construction. Floor assemblies are fire separations but with no fire-resistance rating. Roof assemblies, mezzanines, loadbearing walls, columns and arches do not have a fire-resistance rating.						23	28		32		39		53

Type of Construction	Building Classification	Water Supply Coefficient (K)
2	F3	**19**

Step 2: Determine the Spacial Coefficient

		Distance	S_{side}
N	Exposure Distance 1 (m)	10.50	0.00
S	Exposure Distance 2 (m)	45.00	0.00
E	Exposure Distance 3 (m)	45.00	0.00
W	Exposure Distance 4 (m)	45.00	0.00
	Exposure Distance 5 (m)		
		S_{tot}	**1.00**

Figure 1 - Spatial Coefficient vs Exposure Distance



Step 3: Determine Volume of Building

Building Length(m)	Building Width (m)	Building Height to the underside of roof deck (m)	Volume (m^3)
150.00	65.00	10.00	97500.00

Number of Stories	1

Step 4: Calculate Minimum Water Supply

$$Q = KVS_{tot}$$

Minimum Water Supply (L)	1,852,500.00

Step 5: Calculate Minimum Supply Flow Rate

Table 2 from OBC 2012 A3.2.5.7			
Minimum Water Supply Flow Rates			
Building Code, Part 3 Buildings	Required Minimum Water Supply Flow Rate (L/min)		
One Storey Building with building area not exceeding 600 m2 (excluding F1 occupancy)	1800		
All Other Buildings	if Q> and	Q<=	
		108000	2700
	108000	135000	3600
	135000	162000	4500
	162000	190000	5400
	190000	270000	6300
	270000		9000

Minimum Water Supply Flow Rate (L/min)	9000

Step 6: Is a private fire reservoir required? **Yes**

Appendix B

Preliminary SWM Facility Design Calculations

3027 Cedar Creek Rd

STORMWATER MANAGEMENT

Township of North Dumfries, Ontario

Project Number:	55566-100
Date:	12/23/2024
Design By:	JHN
File:	Q:\55566\100\SWM\JHN Master SWM Facility Design Sheet.xlsx

HYDROLOGIC PARAMETERS

Pre-Development Conditions

Sub-Catchment Number	Area	Overland Slope	Overland Length	SCS Curve Number Pervious (AMC II)	SCS Curve Number Pervious (AMC III)	SCS Curve Number Impervious	Percent Impervious	Land Use	Comment
	(ha)	*(%)*	*(m)*				*(%)*		
101	12.476	3	160	65	81	98	2		
102	5.19	5	100	65	81	98	0		
103	3.66	8	140	65	81	98	0		
Total	**21.326**						**1.17**		

Post-Development Conditions

Sub-Catchment Number	Area	Overland Slope	Overland Length	SCS Curve Number Pervious (AMC II)	SCS Curve Number Pervious (AMC III)	SCS Curve Number Impervious	Percent Impervious	Land Use	Comment
	(ha)	*(%)*	*(m)*				*(%)*		
201	6.736	3.5	50	65	81	91	98		
202	0.547	10	25	65	81	98	100		
203	7.044	3	120	65	81	98	100		
204	0.587	8	10	65	81	98	0		
205	2.752	5	100	65	81	98	0		
206	3.66	8	140	65	81	98	0		
Total to SWMF	**7.283**						**98.15**		

IDF PARAMETERS

Region of Waterloo

Frequency (Years)	a	b	c	Comment
25mm (4hr)	509	6	0.7989	
2	743	6	0.7989	
5	1,593	11	0.8789	
10	2,221	12	0.9080	
25	3,158	15	0.9355	
50	3,886	16	0.9495	
100	4,688	17	0.9624	

3027 Cedar Creek Rd
STORMWATER MANAGEMENT
Township of North Dumfries, Ontario

Project Number:	55566-100
Date:	December 23, 2024
Design By:	JHN
File:	Q:\55566\100\SWM\JHN Master SWM Facility Design Sheet.xlsx

Step 1: Choose Level of Water Quality Control

Enhanced 80% long-term S.S. removal

Step 2: Choose Type of Facility

Wet Pond

Step 3: Define Catchment area and Imperviousness

Catchment Area (ha)	Imperviousness (%)
7.283	98.15

Interpolated Storage Volume Requirement (m^3/ha)

271.92

Permanent Pool Required (m^3)

1689.05

Extended Detention Volume Required (m^3)

291.32

1980.37

Table 3.2 Water Quality Storage Requirements based on Receiving Waters (from MOE Stormwater Management Planning and Design Manual, March 2003)

Protection Level	SWMP Type	Storage Volume (m^3/ha) for Impervious Level			
		35	55	70	85
Enhanced 80% long-term S.S. removal	*Wetlands*	80	105	120	140
	Hybrid Wet Pond/Wetland	110	150	175	195
	Wet Pond	140	190	225	250
Normal 70% long-term S.S. Removal	*Wetlands*	60	70	80	90
	Hybrid Wet Pond/Wetland	75	90	105	120
	Wet Pond	90	110	130	150
Basic 60% long-term S.S. Removal	*Wetlands*	60	60	60	60
	Hybrid Wet Pond/Wetland	60	70	75	80
	Wet Pond	60	75	85	95
	Dry Pond (Continuous Flow)	90	150	200	240

3027 Cedar Creek Rd
STORMWATER MANAGEMENT
Township of North Dumfries, Ontario

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STAGE-STORAGE RELATIONSHIP

Stage	Active Depth	Forebay			Main Pond			Total Pond Volume	Active Storage Volume	Volume Summary	Ponding Elevation	Comments	Stage
		Area	Volume	Cumulative Volume	Area	Volume	Cumulative Volume						
m	m	m^2	m^3	m^3	m^2	m^3	m^3	m^3	m^3	m^3	m		m
310.50		29	0	0				0					310.50
310.60		39	4	4				4					310.60
310.70		51	5	8				8					310.70
310.80		62	6	14				14					310.80
310.90		74	7	21				21					310.90
311.00		86	8	29	177	0	0	29					311.00
311.10		99	9	38	205	19	19	58					311.10
311.20		112	11	49	233	22	42	90					311.20
311.30		126	12	61	263	25	67	127					311.30
311.40		140	13	74	294	28	95	169					311.40
311.50		154	15	89	325	31	126	215					311.50
311.60		169	16	105	358	34	160	265					311.60
311.70		184	18	123	391	38	198	320					311.70
311.80		200	19	142	425	41	239	381					311.80
311.90		216	21	162	464	44	283	446					311.90
312.00		255	24	186	520	49	333	519					312.00
312.10		297	28	214	578	55	388	602					312.10
312.20		340	32	247	639	61	449	696					312.20
312.30		386	37	284	702	67	516	800					312.30
312.40		435	42	326	767	74	590	916					312.40
312.50		485	47	373	834	80	671	1044					312.50
312.60		538	53	426	904	88	758	1184					312.60
312.70		584	57	483	966	94	852	1335					312.70
312.80		631	61	544	1030	100	953	1497					312.80
312.90		679	66	610	1095	107	1059	1670					312.90
313.00		728	71	681	1161	113	1173	1854		1854		Permanent Pool	313.00
313.00	0.00	728	71	681	1161	113	1173	1854	0				313.00
313.10	0.10	777	76	757	1229	120	1292	2050	196				313.10
313.20	0.20	810	80	837	1273	126	1418	2255	401	291	313.15	MOE Extended Detention	313.20
313.30	0.30	843	83	921	1317	130	1548	2469	615				313.30
313.40	0.40	876	87	1007	1362	134	1682	2690	836	681	313.34	25mm (4hrs) Event	313.40
313.50	0.50	910	90	1097	1407	139	1821	2918	1065				313.50
313.60	0.60	944	93	1191	1453	143	1965	3155	1301	1246	313.58	1:2 Year Event	313.60
313.70	0.70	978	97	1288	1500	148	2113	3400	1546				313.70
313.80	0.80	1013	100	1388	1546	153	2265	3653	1799				313.80
313.90	0.90	1049	104	1492	1594	157	2423	3915	2061	1886	313.84	1:5 Year Event	313.90
314.00	1.00	1085	108	1599	1642	162	2585	4184	2330				314.00
314.10	1.10	1121	111	1711	1690	167	2752	4463	2609				314.10
314.20	1.20	1158	115	1825	1739	172	2924	4749	2895				314.20
314.30	1.30	1195	119	1944	1789	177	3101	5045	3191				314.30
314.40	1.40	1232	122	2066	1839	182	3282	5349	3495				314.40
314.50	1.50	1273	126	2193	1891	187	3469	5662	3808	3807	314.50	1:100 Year Event	314.50
314.60	1.60	1351	134	2327	2012	194	3663	5990	4136				314.60
314.70	1.70	1422	139	2465	2109	204	3868	6333	4479				314.70
314.80	1.80	1495	146	2611	2208	215	4083	6694	4840			Emergency Weir	314.80
314.90	1.90	1566	153	2765	2309	225	4308	7073	5219				314.90
315.00	2.00	1639	161	2926	2410	236	4544	7469	5615				315.00
													0.00

3027 Cedar Creek Rd
STORMWATER MANAGEMENT
Township of North Dumfries, Ontario

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Orifice Calculations

$Q_o=C_d*A_o*(2*g*H_o)^{0.5}$

	Orifice 1	Orifice 2	Orifice 3
C_d	0.63	0.63	0.63
Invert (m)	313.00	313.60	500.00
Width (m)			
Diameter/Height (m)	0.075	0.300	
Type (H/V)	V	V	V

C_d	Description
0.63	Orifice Plate
0.80	Orifice Tube

Weir Calculations

$Q_w = 2/3*C_d*(2g)^{1/2}*L*H_w^{3/2} + 8/15*C_d*(2g)^{1/2}*\tan\theta*H_w^{5/2}$

C_d	0.50	0.50
Invert (m)	314.70	500.00
Length (m)	1.000	
Side Slope (H:V)	1	1
Side Slope (rad)	0.785	0.785

STAGE-DISCHARGE RELATIONSHIP

		Orifice 1			Orifice 2			Orifice 3								Extended Detention	Erosion Control
Stage	Active Volume	Area	H_o	Flow	Area	H_o	Flow	Area	H_o	Flow	Weir 1 Flow	Weir 2 Flow	Total Flow		Average Discharge	Increment Volume	Increment Dewatering Time	Cumulative Dewatering Time	Cumulative Dewatering Time
m	m^3	m^2	*m*	m^3/s	m^2	*m*	m^3/s	m^2	*m*	m^3/s	m^3/s		m^3/s		m^3/s	m^3	*hours*	*hours*	*hours*
313.00	0	0.00	0.00	0.0000	0.00	0.00	0.0000	0.00	0.00	0.0000	0.0000	0.0000	0.0000		0.0015	196	35	97	97
313.10	196	0.00	0.06	0.0031	0.00	0.00	0.0000	0.00	0.00	0.0000	0.0000	0.0000	0.0031		0.0040	206	14.18	61.61	61.61
313.20	401	0.00	0.16	0.0050	0.00	0.00	0.0000	0.00	0.00	0.0000	0.0000	0.0000	0.0050		0.0056	213	10.50	47.43	47.43
313.30	615	0.00	0.26	0.0063	0.00	0.00	0.0000	0.00	0.00	0.0000	0.0000	0.0000	0.0063		0.0069	221	8.94	36.93	36.93
313.40	836	0.00	0.36	0.0074	0.00	0.00	0.0000	0.00	0.00	0.0000	0.0000	0.0000	0.0074		0.0079	229	8.04	28.00	28.00
313.50	1065	0.00	0.46	0.0084	0.00	0.00	0.0000	0.00	0.00	0.0000	0.0000	0.0000	0.0084		0.0088	237	7.46	19.95	19.95
313.60	1301	0.00	0.56	0.0092	0.00	0.00	0.0000	0.00	0.00	0.0000	0.0000	0.0000	0.0092		0.0161	245	4.23	12.49	12.49
313.70	1546	0.00	0.66	0.0100	0.02	0.05	0.0129	0.00	0.00	0.0000	0.0000	0.0000	0.0229		0.0389	253	1.81	8.26	8.26
313.80	1799	0.00	0.76	0.0108	0.05	0.10	0.0442	0.00	0.00	0.0000	0.0000	0.0000	0.0549		0.0714	261	1.02	6.45	6.45
313.90	2061	0.00	0.86	0.0114	0.07	0.15	0.0764	0.00	0.00	0.0000	0.0000	0.0000	0.0878		0.0993	270	0.75	5.43	5.43
314.00	2330	0.00	0.96	0.0121	0.07	0.25	0.0986	0.00	0.00	0.0000	0.0000	0.0000	0.1107		0.1201	278	0.64	4.68	4.68
314.10	2609	0.00	1.06	0.0127	0.07	0.35	0.1167	0.00	0.00	0.0000	0.0000	0.0000	0.1294		0.1375	287	0.58	4.04	4.04
314.20	2895	0.00	1.16	0.0133	0.07	0.45	0.1323	0.00	0.00	0.0000	0.0000	0.0000	0.1456		0.1529	295	0.54	3.46	3.46
314.30	3191	0.00	1.26	0.0139	0.07	0.55	0.1463	0.00	0.00	0.0000	0.0000	0.0000	0.1601		0.1668	304	0.51	2.92	2.92
314.40	3495	0.00	1.36	0.0144	0.07	0.65	0.1590	0.00	0.00	0.0000	0.0000	0.0000	0.1734		0.1796	313	0.48	2.41	2.41
314.50	3808	0.00	1.46	0.0149	0.07	0.75	0.1708	0.00	0.00	0.0000	0.0000	0.0000	0.1857		0.1915	328	0.48	1.93	1.93
314.60	4136	0.00	1.56	0.0154	0.07	0.85	0.1819	0.00	0.00	0.0000	0.0000	0.0000	0.1973		0.2027	343	0.47	1.45	1.45
314.70	4479	0.00	1.66	0.0159	0.07	0.95	0.1923	0.00	0.00	0.0000	0.0000	0.0000	0.2082		0.2385	361	0.42	0.98	0.98
314.80	4840	0.00	1.76	0.0164	0.07	1.05	0.2021	0.00	0.00	0.0000	0.0504	0.0000	0.2689		0.3252	379	0.32	0.56	0.56
314.90	5219	0.00	1.86	0.0168	0.07	1.15	0.2115	0.00	0.00	0.0000	0.1532	0.0000	0.3815		0.4601	397	0.24	0.24	0.24
315.00	5615	0.00	1.96	0.0173	0.07	1.25	0.2205	0.00	0.00	0.0000	0.3008	0.0000	0.5386		0.2693	-5615			

3027 Cedar Creek Rd
STORMWATER MANAGEMENT
Township of North Dumfries, Ontario

Project Number: 55566-100
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FOREBAY DESIGN CALCULATIONS

MOE SWM Planning and Design Manual, 2003

Forebay Design Flows

Flow into forebay during the 1:5-year return period event	1.940	m^3/s
Flow into forebay during the 25 mm - 4 hour design storm event	0.846	m^3/s
Peak flow from main pond outlet for the 25mm design storm (from MIDUSS)	0.026	m^3/s

Forebay Characteristics

b =	2.5	*m*	bottom width
y =	2.5	*m*	depth
z =	3	:1	side slope
w =	10.0	*m*	average width
R =	1.37	*m*	hydraulic radius
A =	25.0	m^2	cross-sectional area

1. Length Calculation Based on Settling Velocity

L = forebay flow length *(m)*
r = length-to-width ratio
Q_p = peak flow rate through forebay *(m^3/s)*
v_s = settling velocity *(m/s)*

Equation 4.5: Forebay Settling Length

a) Required Settling Length (assuming Q_p = forebay through-flow & v_s = 0.0055 m/s)

Q_p =	0.85	m^3/s	peak flow rate through forebay
v_s =	0.0055	*m/s*	settling velocity
r =	1.50		length-to-width ratio
L =	15.2	*m*	required settling length
L =	*15.0*	*m*	*trial length*

b) Required Settling Length (assuming Q_p = pond discharge & v_s = 0.0003 m/s)

Q_p =	0.026	m^3/s	peak flow rate through forebay
v_s =	0.0003	*m/s*	settling velocity
r =	0.85		length-to-width ratio
L =	8.6	*m*	required settling length
L =	*8.5*	*m*	*trial length*

Table 1: Average settling velocities

	Mass Removed	Particle Size Range	Average Settling Velocity
	%	*µm*	*m/s*
	80 - 100	x ≤ 20	0.00000254
Enhanced:	70 - 80	20 < x ≤ 40	0.00001300
Normal:	60 - 70	40 < x ≤ 60	0.00002540
Basic:	40 - 60	60 < x ≤ 130	0.00012700
Medium Sand:	20 - 40	130 < x ≤ 400	0.00059267
Gross Grit:	0 - 20	400 < x ≤ 4000	0.00550333

2. Length Calculation Based on Flow Dispersion Length

Q =	1.94	m^3/s	inlet flow rate
d =	2.5	*m*	depth of permanent pool in forebay
V_f =	0.50	*m/s*	desired velocity in forebay (typical value ≤ 0.50 *m/s*)
L =	12.4	m	required length of dispersion

Equation 4.6: Dispersion Length

3. Required Forebay Length

L =	**33.0**	***m***	**design length**
r =	3.30		design length-to-width ratio (typical minimum of 2.0)

4. Scour Velocity

v_s =	0.15	*m/s*	scour velocity (typical value = 0.15 *m/s*)
v =	**0.078**	***m/s***	**actual velocity**

OK The actual velocity through the forebay is less than the scour velocity.

5. Weir Flow From Forebay

L =	17	*m*	length of crest of weir
α =	1.65		coefficient
H =	0.3	*m*	head
Q =	**4.61**	***m^3/s***	**discharge**

Equation 4.4: Weir Flow

OK The weir flow from the forebay exceeds the flow entering the forebay

6. Estimated Cleanout Frequencies

a) Forebay

Forebay volume	681	m^3
Estimated TSS removal efficiency	50%	
Impervious level	98%	
Estimated annual sediment loading	3.8	m^3/ha
Contributing area	7.28	*ha*
Annual sediment volume	14	m^3/yr
Cleanout frequency for 33% volume reduction	**16.2**	***years***

Table 2: Annual sediment loading

Impervious Level	Annual Loading
%	m^3/ha
35%	0.6
55%	1.9
70%	2.8
85%	3.8

b) Stormwater Management Pond

Wetpond volume (excluding forebay)	1173	m^3
Estimated TSS removal efficiency	30%	
Impervious level	98%	
Estimated annual sediment loading	3.8	m^3/ha
Contributing area	7.28	*ha*
Annual sediment volume	8	m^3/yr
Cleanout frequency for 33% volume reduction	**46.6**	***years***

3027 Cedar Creek Rd
STORMWATER MANAGEMENT
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FALLING HEAD DRAWDOWN CALCULATION
MOE SWM Planning and Design Manual, 2003

$$t = \frac{0.66C_2h^{1.5} + 2C_3h^{0.5}}{2.75A_O}$$ Equation 4.11

where

t =	191998.776	*s*	
	53.3	*hr*	drawdown time
A_p =	2193.99672	m^2	surface area of the pond
C =	0.63		discharge coefficient
d =	75	*mm*	diameter of the orifice
A_O =	0.00441786	m^2	cross-sectional area of the orifice
g =	9.81	m/s^2	gravitational acceleration constant
h_1 =	313.340	*m*	starting water elevation above the orifice
h_2 =	313.000	*m*	ending water elevation above the orifice
h =	0.34	*m*	maximum water elevation above the orifice
C_2 =	850.718		slope coefficient from the area-depth linear regression
C_3 =	1904.7526		intercept from the area-depth linear regression

	ELEVATION *m*	STAGE *m*	AREA m^2	COMMENTS
1	313.000	0	1889.0	Permanent pool
2	313.100	0.1	2006.0	
3	313.200	0.2	2082.3	
4	313.300	0.3	2159.5	
5	313.400	0.4	2237.7	

DRAWDOWN TIME: 191999 *s*
53.3 *hr*

Regression Output:

m_1 =	850.72	slope coefficient from the area-depth linear regression
b =	1904.75	intercept from the area-depth linear regression
se_1 =	45.45	standard error for coefficient m_1
se_b =	11.13	standard error for constant b
R^2 =	0.9915	coefficient of determination
se_y =	14.37	standard error of the *y* estimate
F =	350.41	F statistic
df =	3	degrees of freedom
ss_{reg} =	72372	regression sum of squares
ss_{resid} =	620	residual sum of squares

Appendix C

MIDUSS Output

Pre-Development

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                            ie METRIC"
"                Job folder:        Q:\55566\100\SWM\MIDUSS\2024-12-17 JHN\Pre\"
"                                                                        CN = 65"
"                Output filename:                                          2.out"
"                Licensee name:                                                A"
"                Company                                                        "
"                Date & Time last used:                 12/18/2024 at 4:42:55 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      743.000   Coefficient A"
"        6.000   Constant B"
"        0.799   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           109.374    mm/hr"
"             Total depth                  34.259    mm"
"            6   002hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   Area to Wetland 1"
"        1.000   % Impervious"
"       12.476   Total Area"
"      160.000   Flow length"
"        3.000   Overland Slope"
"       12.351   Pervious Area"
"      160.000   Pervious length"
"        3.000   Pervious slope"
"        0.125   Impervious Area"
"      160.000   Impervious length"
"        3.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.079   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.851   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.032     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           12.351     0.125      12.476     hectare"
"             Time of concentration  99.514     5.342      90.227     minutes"
"             Time to Centroid       220.453    96.042     208.184    minutes"
"             Rainfall depth         34.259     34.259     34.259     mm"
"             Rainfall volume        4231.36    42.74      4274.10    c.m"
"             Rainfall losses        31.567     5.103      31.302     mm"
"             Runoff depth           2.692      29.156     2.957      mm"
"             Runoff volume          332.48     36.37      368.86     c.m"
"             Runoff coefficient     0.079      0.851      0.086      "
"             Maximum flow           0.031      0.026      0.032      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.032     0.032     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.032     0.032     0.032     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                To Wetland 1"
"             Maximum flow                 0.032    c.m/sec"
"             Hydrograph volume          368.855    c.m"
"                    0.032     0.032     0.032     0.032"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.032     0.000     0.032     0.032"
" 33          CATCHMENT 102"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          102   Area to Wetland 2"
"        0.000   % Impervious"
"        5.190   Total Area"
"      100.000   Flow length"
"        5.000   Overland Slope"
"        5.190   Pervious Area"
"      100.000   Pervious length"
"        5.000   Pervious slope"
"        0.000   Impervious Area"
"      100.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.079   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
```

```
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.018     0.000     0.032     0.032 c.m/sec"
"             Catchment 102          Pervious   Impervious Total Area "
"             Surface Area           5.190      0.000      5.190      hectare"
"             Time of concentration  64.396     3.457      64.395     minutes"
"             Time to Centroid       181.567    93.271     181.566    minutes"
"             Rainfall depth         34.259     34.259     34.259     mm"
"             Rainfall volume        1778.02    0.00       1778.02    c.m"
"             Rainfall losses        31.567     5.565      31.567     mm"
"             Runoff depth           2.692      28.694     2.692      mm"
"             Runoff volume          139.70     0.00       139.70     c.m"
"             Runoff coefficient     0.079      0.000      0.079      "
"             Maximum flow           0.018      0.000      0.018      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.018     0.018     0.032     0.032"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.018     0.018     0.018     0.032"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                To Wetland 2"
"             Maximum flow                  0.018    c.m/sec"
"             Hydrograph volume           139.705    c.m"
"                     0.018     0.018     0.018     0.018"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.018     0.000     0.018     0.018"
" 33          CATCHMENT 103"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          103   Area to Southwest Neighboring Property"
"        0.000   % Impervious"
"        3.660   Total Area"
"      140.000   Flow length"
"        8.000   Overland Slope"
"        3.660   Pervious Area"
"      140.000   Pervious length"
"        8.000   Pervious slope"
"        0.000   Impervious Area"
"      140.000   Impervious length"
"        8.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.079   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
```

```
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.012     0.000     0.018     0.018 c.m/sec"
"             Catchment 103          Pervious   Impervious Total Area "
"             Surface Area           3.660      0.000      3.660      hectare"
"             Time of concentration  68.438     3.674      68.437     minutes"
"             Time to Centroid       186.044    93.632     186.043    minutes"
"             Rainfall depth         34.259     34.259     34.259     mm"
"             Rainfall volume        1253.86    0.00       1253.86    c.m"
"             Rainfall losses        31.567     5.652      31.567     mm"
"             Runoff depth           2.692      28.607     2.692      mm"
"             Runoff volume          98.52      0.00       98.52      c.m"
"             Runoff coefficient     0.079      0.000      0.079      "
"             Maximum flow           0.012      0.000      0.012      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.012     0.012     0.018     0.018"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.012     0.012     0.012     0.018"
" 40          HYDROGRAPH   Combine    3"
"            6   Combine "
"            3   Node #"
"                To southest property"
"             Maximum flow                  0.012    c.m/sec"
"             Hydrograph volume            98.525    c.m"
"                     0.012     0.012     0.012     0.012"
" 38          START/RE-START TOTALS 103"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      21.326    hectare"
"             Total Impervious area                      0.125    hectare"
"             Total % impervious                         0.585"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                            ie METRIC"
"                Job folder:        Q:\55566\100\SWM\MIDUSS\2024-12-17 JHN\Pre\"
"                                                                        CN = 65"
"                Output filename:                                          5.out"
"                Licensee name:                                                A"
"                Company                                                        "
"                Date & Time last used:                12/18/2024 at 4:44:52 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     1593.000   Coefficient A"
"       11.000   Constant B"
"        0.879   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity          139.288    mm/hr"
"             Total depth                 47.265    mm"
"            6   005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   Area to Wetland 1"
"        1.000   % Impervious"
"       12.476   Total Area"
"      160.000   Flow length"
"        3.000   Overland Slope"
"       12.351   Pervious Area"
"      160.000   Pervious length"
"        3.000   Pervious slope"
"        0.125   Impervious Area"
"      160.000   Impervious length"
"        3.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.140   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.883   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.121     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           12.351     0.125      12.476     hectare"
"             Time of concentration  64.920     4.788      61.322     minutes"
"             Time to Centroid       176.130    92.965     171.154    minutes"
"             Rainfall depth         47.265     47.265     47.265     mm"
"             Rainfall volume        5837.78    58.97      5896.74    c.m"
"             Rainfall losses        40.643     5.549      40.292     mm"
"             Runoff depth           6.621      41.716     6.972      mm"
"             Runoff volume          817.82     52.04      869.87     c.m"
"             Runoff coefficient     0.140      0.883      0.148      "
"             Maximum flow           0.119      0.036      0.121      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.121     0.121     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.121     0.121     0.121     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                To Wetland 1"
"             Maximum flow                 0.121    c.m/sec"
"             Hydrograph volume          869.865    c.m"
"                    0.121     0.121     0.121     0.121"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.121     0.000     0.121     0.121"
" 33          CATCHMENT 102"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          102   Area to Wetland 2"
"        0.000   % Impervious"
"        5.190   Total Area"
"      100.000   Flow length"
"        5.000   Overland Slope"
"        5.190   Pervious Area"
"      100.000   Pervious length"
"        5.000   Pervious slope"
"        0.000   Impervious Area"
"      100.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.140   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
```

```
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.068     0.000     0.121     0.121 c.m/sec"
"             Catchment 102          Pervious   Impervious Total Area "
"             Surface Area           5.190      0.000      5.190      hectare"
"             Time of concentration  42.010     3.098      42.010     minutes"
"             Time to Centroid       150.158    90.502     150.158    minutes"
"             Rainfall depth         47.265     47.265     47.265     mm"
"             Rainfall volume        2453.03    0.00       2453.04    c.m"
"             Rainfall losses        40.645     5.945      40.645     mm"
"             Runoff depth           6.620      41.319     6.620      mm"
"             Runoff volume          343.58     0.00       343.58     c.m"
"             Runoff coefficient     0.140      0.000      0.140      "
"             Maximum flow           0.068      0.000      0.068      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.068     0.068     0.121     0.121"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.068     0.068     0.068     0.121"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                To Wetland 2"
"             Maximum flow                  0.068    c.m/sec"
"             Hydrograph volume           343.585    c.m"
"                     0.068     0.068     0.068     0.068"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.068     0.000     0.068     0.068"
" 33          CATCHMENT 103"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          103   Area to Southwest Neighboring Property"
"        0.000   % Impervious"
"        3.660   Total Area"
"      140.000   Flow length"
"        8.000   Overland Slope"
"        3.660   Pervious Area"
"      140.000   Pervious length"
"        8.000   Pervious slope"
"        0.000   Impervious Area"
"      140.000   Impervious length"
"        8.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.140   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
```

```
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.046     0.000     0.068     0.068 c.m/sec"
"             Catchment 103          Pervious   Impervious Total Area "
"             Surface Area           3.660      0.000      3.660      hectare"
"             Time of concentration  44.647     3.292      44.647     minutes"
"             Time to Centroid       153.148    90.817     153.148    minutes"
"             Rainfall depth         47.265     47.265     47.265     mm"
"             Rainfall volume        1729.89    0.00       1729.89    c.m"
"             Rainfall losses        40.644     5.962      40.644     mm"
"             Runoff depth           6.620      41.303     6.620      mm"
"             Runoff volume          242.30     0.00       242.30     c.m"
"             Runoff coefficient     0.140      0.000      0.140      "
"             Maximum flow           0.046      0.000      0.046      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.046     0.046     0.068     0.068"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.046     0.046     0.046     0.068"
" 40          HYDROGRAPH   Combine    3"
"            6   Combine "
"            3   Node #"
"                To southest property"
"             Maximum flow                  0.046    c.m/sec"
"             Hydrograph volume           242.302    c.m"
"                     0.046     0.046     0.046     0.046"
" 38          START/RE-START TOTALS 103"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      21.326    hectare"
"             Total Impervious area                      0.125    hectare"
"             Total % impervious                         0.585"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                       Sunday, February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:        Q:\55566\100\SWM\MIDUSS\2024-12-17 JHN\Pre\"
"                                                                       CN = 65"
"                Output filename:                                       100.out"
"                Licensee name:                                               A"
"                Company                                                       "
"                Date & Time last used:               12/18/2024 at 4:52:42 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     4688.000   Coefficient A"
"       17.000   Constant B"
"        0.962   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity          239.354    mm/hr"
"             Total depth                 87.079    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   Area to Wetland 1"
"        1.000   % Impervious"
"       12.476   Total Area"
"      160.000   Flow length"
"        3.000   Overland Slope"
"       12.351   Pervious Area"
"      160.000   Pervious length"
"        3.000   Pervious slope"
"        0.125   Impervious Area"
"      160.000   Impervious length"
"        3.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.294   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.921   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.794     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           12.351     0.125      12.476     hectare"
"             Time of concentration  34.765     3.808      33.815     minutes"
"             Time to Centroid       137.211    89.275     135.741    minutes"
"             Rainfall depth         87.079     87.079     87.079     mm"
"             Rainfall volume        1.0755     0.0109     1.0864     ha-m"
"             Rainfall losses        61.461     6.844      60.915     mm"
"             Runoff depth           25.618     80.236     26.165     mm"
"             Runoff volume          3164.19    100.10     3264.29    c.m"
"             Runoff coefficient     0.294      0.921      0.300      "
"             Maximum flow           0.785      0.064      0.794      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.794     0.794     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.794     0.794     0.794     0.000"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                To Wetland 1"
"             Maximum flow                 0.794    c.m/sec"
"             Hydrograph volume         3264.295    c.m"
"                    0.794     0.794     0.794     0.794"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.794     0.000     0.794     0.794"
" 33          CATCHMENT 102"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          102   Area to Wetland 2"
"        0.000   % Impervious"
"        5.190   Total Area"
"      100.000   Flow length"
"        5.000   Overland Slope"
"        5.190   Pervious Area"
"      100.000   Pervious length"
"        5.000   Pervious slope"
"        0.000   Impervious Area"
"      100.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.294   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
```

```
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.448     0.000     0.794     0.794 c.m/sec"
"             Catchment 102          Pervious   Impervious Total Area "
"             Surface Area           5.190      0.000      5.190      hectare"
"             Time of concentration  22.496     2.464      22.496     minutes"
"             Time to Centroid       122.483    87.300     122.483    minutes"
"             Rainfall depth         87.079     87.079     87.079     mm"
"             Rainfall volume        4519.41    0.00       4519.41    c.m"
"             Rainfall losses        61.481     6.897      61.481     mm"
"             Runoff depth           25.598     80.182     25.598     mm"
"             Runoff volume          1328.54    0.00       1328.54    c.m"
"             Runoff coefficient     0.294      0.000      0.294      "
"             Maximum flow           0.448      0.000      0.448      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.448     0.448     0.794     0.794"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.448     0.448     0.448     0.794"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                To Wetland 2"
"             Maximum flow                  0.448    c.m/sec"
"             Hydrograph volume          1328.543    c.m"
"                     0.448     0.448     0.448     0.448"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.448     0.000     0.448     0.448"
" 33          CATCHMENT 103"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          103   Area to Southwest Neighboring Property"
"        0.000   % Impervious"
"        3.660   Total Area"
"      140.000   Flow length"
"        8.000   Overland Slope"
"        3.660   Pervious Area"
"      140.000   Pervious length"
"        8.000   Pervious slope"
"        0.000   Impervious Area"
"      140.000   Impervious length"
"        8.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.294   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
```

```
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.298     0.000     0.448     0.448 c.m/sec"
"             Catchment 103          Pervious   Impervious Total Area "
"             Surface Area           3.660      0.000      3.660      hectare"
"             Time of concentration  23.909     2.619      23.908     minutes"
"             Time to Centroid       124.173    87.544     124.173    minutes"
"             Rainfall depth         87.079     87.079     87.079     mm"
"             Rainfall volume        3187.10    0.00       3187.10    c.m"
"             Rainfall losses        61.470     7.054      61.470     mm"
"             Runoff depth           25.609     80.026     25.609     mm"
"             Runoff volume          937.29     0.00       937.30     c.m"
"             Runoff coefficient     0.294      0.000      0.294      "
"             Maximum flow           0.298      0.000      0.298      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.298     0.298     0.448     0.448"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.298     0.298     0.298     0.448"
" 40          HYDROGRAPH   Combine    3"
"            6   Combine "
"            3   Node #"
"                To southest property"
"             Maximum flow                  0.298    c.m/sec"
"             Hydrograph volume           937.296    c.m"
"                     0.298     0.298     0.298     0.298"
" 38          START/RE-START TOTALS 103"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      21.326    hectare"
"             Total Impervious area                      0.125    hectare"
"             Total % impervious                         0.585"
" 19          EXIT"
```

Post-Development

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:           Q:\55566\100\SWM\MIDUSS\2024-12-17 JHN\"
"                                                                          Post"
"                Output filename:                                    2 c.out"
"                Licensee name:                                            A"
"                Company                                                    "
"                Date & Time last used:                12/18/2024 at 5:45:43 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      743.000   Coefficient A"
"        6.000   Constant B"
"        0.799   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity          109.374    mm/hr"
"             Total depth                 34.259    mm"
"            6   002hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   Area to SWMF"
"       98.000   % Impervious"
"        6.736   Total Area"
"       50.000   Flow length"
"        3.000   Overland Slope"
"        0.135   Pervious Area"
"       50.000   Pervious length"
"        3.000   Pervious slope"
"        6.601   Impervious Area"
"       50.000   Impervious length"
"        3.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.079   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       91.000   Impervious SCS Curve No."
"        0.507   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        2.512   Impervious Initial abstraction"
```

```
"                    0.816     0.000     0.000     0.000 c.m/sec"
"            Catchment 201          Pervious   Impervious Total Area "
"            Surface Area           0.135      6.601      6.736      hectare"
"            Time of concentration  49.521     3.300      3.446      minutes"
"            Time to Centroid       165.095    99.443     99.649     minutes"
"            Rainfall depth         34.259     34.259     34.259     mm"
"            Rainfall volume        46.15      2261.50    2307.66    c.m"
"            Rainfall losses        31.567     16.873     17.167     mm"
"            Runoff depth           2.691      17.385     17.091     mm"
"            Runoff volume          3.63       1147.66    1151.28    c.m"
"            Runoff coefficient     0.079      0.507      0.499      "
"            Maximum flow           0.001      0.816      0.816      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.816     0.816     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.816     0.816     0.816     0.000"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.816     0.816     0.816     0.000"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   SWMF"
"      100.000   % Impervious"
"        0.547   Total Area"
"       25.000   Flow length"
"       10.000   Overland Slope"
"        0.000   Pervious Area"
"       25.000   Pervious length"
"       10.000   Pervious slope"
"        0.547   Impervious Area"
"       25.000   Impervious length"
"       10.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.835   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.129     0.816     0.816     0.000 c.m/sec"
"            Catchment 202          Pervious   Impervious Total Area "
"            Surface Area           0.000      0.547      0.547      hectare"
"            Time of concentration  22.767     1.222      1.222      minutes"
```

```
"             Time to Centroid       135.475    89.722     89.722     minutes"
"             Rainfall depth         34.259     34.259     34.259     mm"
"             Rainfall volume        0.00       187.39     187.39     c.m"
"             Rainfall losses        31.571     5.667      5.667      mm"
"             Runoff depth           2.688      28.592     28.592     mm"
"             Runoff volume          0.00       156.40     156.40     c.m"
"             Runoff coefficient     0.000      0.835      0.835      "
"             Maximum flow           0.000      0.129      0.129      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.129     0.897     0.816     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.129     0.897     0.897     0.000"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.129     0.897     0.897     0.000"
" 54          POND DESIGN"
"        0.897   Current peak flow    c.m/sec"
"        0.600   Target outflow    c.m/sec"
"       1307.7   Hydrograph volume    c.m"
"         19.   Number of stages"
"      313.000   Minimum water level    metre"
"      314.800   Maximum water level    metre"
"      313.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                313.000     0.000     0.000"
"                313.100   0.00276   196.000"
"                313.200   0.00478   401.000"
"                313.300   0.00616   615.000"
"                313.400   0.00729   836.000"
"                313.500   0.00827  1065.000"
"                313.600   0.00914  1301.000"
"                313.700   0.01626  1546.000"
"                313.800   0.03292  1799.000"
"                313.900   0.05552  2061.000"
"                314.000    0.1002  2330.000"
"                314.100    0.1207  2609.000"
"                314.200    0.1380  2895.000"
"                314.300    0.1533  3191.000"
"                314.400    0.1671  3495.000"
"                314.500    0.1799  3808.000"
"                314.600    0.1918  4136.000"
"                314.700    0.2030  4479.000"
"                314.800    0.2621  4840.000"
"           1.   WEIRS"
"                  Crest      Weir     Crest      Left     Right"
"              elevation coefficie   breadth sideslope sideslope"
"                314.700     0.900     1.000     0.000     0.000"
```

```
"           2.   ORIFICES"
"                Orifice   Orifice   Orifice Number of"
"                 invert coefficie  diameter  orifices"
"                313.000     0.630    0.0750     1.000"
"                313.600     0.630    0.3000     1.000"
"             Peak outflow                  0.009    c.m/sec"
"             Maximum level               313.577    metre"
"             Maximum storage            1245.993    c.m"
"             Centroidal lag               28.115   hours"
"                  0.129     0.897     0.009     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                To Wetland 1"
"             Maximum flow                  0.009    c.m/sec"
"             Hydrograph volume           659.019    c.m"
"                     0.129     0.897     0.009     0.009"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.129     0.000     0.009     0.009"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          203   Uncontrolled area to wetland 1"
"        0.000   % Impervious"
"        7.044   Total Area"
"      120.000   Flow length"
"        3.000   Overland Slope"
"        7.044   Pervious Area"
"      120.000   Pervious length"
"        3.000   Pervious slope"
"        0.000   Impervious Area"
"      120.000   Impervious length"
"        3.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.079   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.020     0.000     0.009     0.009 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           7.044      0.000      7.044      hectare"
"             Time of concentration  83.737     4.495      83.737     minutes"
"             Time to Centroid       202.985    94.804     202.983    minutes"
```

```
"             Rainfall depth         34.259     34.259     34.259     mm"
"             Rainfall volume        2413.17    0.00       2413.17    c.m"
"             Rainfall losses        31.567     5.300      31.567     mm"
"             Runoff depth           2.692      28.959     2.692      mm"
"             Runoff volume          189.62     0.00       189.62     c.m"
"             Runoff coefficient     0.079      0.000      0.079      "
"             Maximum flow           0.020      0.000      0.020      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.020     0.020     0.009     0.009"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.020     0.020     0.020     0.009"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                To Wetland 1"
"             Maximum flow                  0.029    c.m/sec"
"             Hydrograph volume           848.643    c.m"
"                    0.020     0.020     0.020     0.029"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.020     0.000     0.020     0.029"
" 33          CATCHMENT 204"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          204   Uncontrolled area to offsite"
"        0.000   % Impervious"
"        0.587   Total Area"
"       10.000   Flow length"
"        8.000   Overland Slope"
"        0.587   Pervious Area"
"       10.000   Pervious length"
"        8.000   Pervious slope"
"        0.000   Impervious Area"
"       10.000   Impervious length"
"        8.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.078   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.005     0.000     0.020     0.029 c.m/sec"
"             Catchment 204          Pervious   Impervious Total Area "
```

```
"             Surface Area           0.587      0.000      0.587      hectare"
"             Time of concentration  14.048     0.754      14.048     minutes"
"             Time to Centroid       125.822    89.304     125.821    minutes"
"             Rainfall depth         34.259     34.259     34.259     mm"
"             Rainfall volume        201.10     0.00       201.10     c.m"
"             Rainfall losses        31.572     6.550      31.572     mm"
"             Runoff depth           2.686      27.709     2.686      mm"
"             Runoff volume          15.77      0.00       15.77      c.m"
"             Runoff coefficient     0.078      0.000      0.078      "
"             Maximum flow           0.005      0.000      0.005      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.005     0.005     0.020     0.029"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.005     0.005     0.005     0.029"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Offiste"
"             Maximum flow                  0.005    c.m/sec"
"             Hydrograph volume            15.770    c.m"
"                     0.005     0.005     0.005     0.005"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.005     0.000     0.005     0.005"
" 33          CATCHMENT 205"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          205   Area to wetland 2"
"        0.000   % Impervious"
"        2.752   Total Area"
"      100.000   Flow length"
"        5.000   Overland Slope"
"        2.752   Pervious Area"
"      100.000   Pervious length"
"        5.000   Pervious slope"
"        0.000   Impervious Area"
"      100.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.079   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                     0.010     0.000     0.005     0.005 c.m/sec"
"             Catchment 205          Pervious   Impervious Total Area "
"             Surface Area           2.752      0.000      2.752      hectare"
"             Time of concentration  64.396     3.457      64.395     minutes"
"             Time to Centroid       181.567    93.271     181.566    minutes"
"             Rainfall depth         34.259     34.259     34.259     mm"
"             Rainfall volume        942.79     0.00       942.80     c.m"
"             Rainfall losses        31.567     5.565      31.567     mm"
"             Runoff depth           2.692      28.694     2.692      mm"
"             Runoff volume          74.08      0.00       74.08      c.m"
"             Runoff coefficient     0.079      0.000      0.079      "
"             Maximum flow           0.010      0.000      0.010      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.010     0.010     0.005     0.005"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.010     0.010     0.010     0.005"
" 40          HYDROGRAPH   Combine    3"
"            6   Combine "
"            3   Node #"
"                To Wetland 2"
"             Maximum flow                  0.010    c.m/sec"
"             Hydrograph volume            74.079    c.m"
"                     0.010     0.010     0.010     0.010"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.010     0.000     0.010     0.010"
" 33          CATCHMENT 206"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          206   Area to southwest property"
"        0.000   % Impervious"
"        3.660   Total Area"
"      140.000   Flow length"
"        8.000   Overland Slope"
"        3.660   Pervious Area"
"      140.000   Pervious length"
"        8.000   Pervious slope"
"        0.000   Impervious Area"
"      140.000   Impervious length"
"        8.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.079   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
```

```
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.012     0.000     0.010     0.010 c.m/sec"
"             Catchment 206          Pervious   Impervious Total Area "
"             Surface Area           3.660      0.000      3.660      hectare"
"             Time of concentration  68.438     3.674      68.437     minutes"
"             Time to Centroid       186.044    93.632     186.043    minutes"
"             Rainfall depth         34.259     34.259     34.259     mm"
"             Rainfall volume        1253.86    0.00       1253.86    c.m"
"             Rainfall losses        31.567     5.652      31.567     mm"
"             Runoff depth           2.692      28.607     2.692      mm"
"             Runoff volume          98.52      0.00       98.52      c.m"
"             Runoff coefficient     0.079      0.000      0.079      "
"             Maximum flow           0.012      0.000      0.012      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.012     0.012     0.010     0.010"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.012     0.012     0.012     0.010"
" 40          HYDROGRAPH   Combine    4"
"            6   Combine "
"            4   Node #"
"                To Southwest Property"
"             Maximum flow                 0.012    c.m/sec"
"             Hydrograph volume           98.525    c.m"
"                     0.012     0.012     0.012     0.012"
" 38          START/RE-START TOTALS 206"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                    21.326    hectare"
"             Total Impervious area                    7.148    hectare"
"             Total % impervious                      33.519"
" 19          EXIT"
```

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:           Q:\55566\100\SWM\MIDUSS\2024-12-17 JHN\"
"                                                                          Post"
"                Output filename:                                    5 c.out"
"                Licensee name:                                            A"
"                Company                                                    "
"                Date & Time last used:                12/18/2024 at 5:49:22 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     1593.000   Coefficient A"
"       11.000   Constant B"
"        0.879   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity          139.288    mm/hr"
"             Total depth                 47.265    mm"
"            6   005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   Area to SWMF"
"       98.000   % Impervious"
"        6.736   Total Area"
"       50.000   Flow length"
"        3.000   Overland Slope"
"        0.135   Pervious Area"
"       50.000   Pervious length"
"        3.000   Pervious slope"
"        6.601   Impervious Area"
"       50.000   Impervious length"
"        3.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.140   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       91.000   Impervious SCS Curve No."
"        0.595   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        2.512   Impervious Initial abstraction"
```

```
"                    1.271     0.000     0.000     0.000 c.m/sec"
"            Catchment 201          Pervious   Impervious Total Area "
"            Surface Area           0.135      6.601      6.736      hectare"
"            Time of concentration  32.306     2.782      2.923      minutes"
"            Time to Centroid       139.163    95.260     95.470     minutes"
"            Rainfall depth         47.265     47.265     47.265     mm"
"            Rainfall volume        63.67      3120.07    3183.75    c.m"
"            Rainfall losses        40.646     19.141     19.571     mm"
"            Runoff depth           6.619      28.123     27.693     mm"
"            Runoff volume          8.92       1856.50    1865.41    c.m"
"            Runoff coefficient     0.140      0.595      0.586      "
"            Maximum flow           0.002      1.271      1.271      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    1.271     1.271     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    1.271     1.271     1.271     0.000"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    1.271     1.271     1.271     0.000"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   SWMF"
"      100.000   % Impervious"
"        0.547   Total Area"
"       25.000   Flow length"
"       10.000   Overland Slope"
"        0.000   Pervious Area"
"       25.000   Pervious length"
"       10.000   Pervious slope"
"        0.547   Impervious Area"
"       25.000   Impervious length"
"       10.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.866   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.175     1.271     1.271     0.000 c.m/sec"
"            Catchment 202          Pervious   Impervious Total Area "
"            Surface Area           0.000      0.547      0.547      hectare"
"            Time of concentration  14.853     1.095      1.095      minutes"
```

```
"             Time to Centroid       119.386    87.526     87.526     minutes"
"             Rainfall depth         47.265     47.265     47.265     mm"
"             Rainfall volume        0.00       258.54     258.54     c.m"
"             Rainfall losses        40.654     6.318      6.318      mm"
"             Runoff depth           6.611      40.947     40.947     mm"
"             Runoff volume          0.00       223.98     223.98     c.m"
"             Runoff coefficient     0.000      0.866      0.866      "
"             Maximum flow           0.000      0.175      0.175      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.175     1.385     1.271     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.175     1.385     1.385     0.000"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.175     1.385     1.385     0.000"
" 54          POND DESIGN"
"        1.385   Current peak flow    c.m/sec"
"        0.600   Target outflow    c.m/sec"
"       2089.4   Hydrograph volume    c.m"
"         19.   Number of stages"
"      313.000   Minimum water level    metre"
"      314.800   Maximum water level    metre"
"      313.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                313.000     0.000     0.000"
"                313.100   0.00276   196.000"
"                313.200   0.00478   401.000"
"                313.300   0.00616   615.000"
"                313.400   0.00729   836.000"
"                313.500   0.00827  1065.000"
"                313.600   0.00914  1301.000"
"                313.700   0.01626  1546.000"
"                313.800   0.03292  1799.000"
"                313.900   0.05552  2061.000"
"                314.000    0.1002  2330.000"
"                314.100    0.1207  2609.000"
"                314.200    0.1380  2895.000"
"                314.300    0.1533  3191.000"
"                314.400    0.1671  3495.000"
"                314.500    0.1799  3808.000"
"                314.600    0.1918  4136.000"
"                314.700    0.2030  4479.000"
"                314.800    0.2621  4840.000"
"           1.   WEIRS"
"                  Crest      Weir     Crest      Left     Right"
"              elevation coefficie   breadth sideslope sideslope"
"                314.700     0.900     1.000     0.000     0.000"
```

```
"           2.   ORIFICES"
"                Orifice   Orifice   Orifice Number of"
"                 invert coefficie  diameter  orifices"
"                313.000     0.630    0.0750     1.000"
"                313.600     0.630    0.3000     1.000"
"             Peak outflow                  0.040    c.m/sec"
"             Maximum level               313.833    metre"
"             Maximum storage            1886.469    c.m"
"             Centroidal lag               26.261   hours"
"                  0.175     1.385     0.040     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                To Wetland 1"
"             Maximum flow                  0.040    c.m/sec"
"             Hydrograph volume          1171.329    c.m"
"                     0.175     1.385     0.040     0.040"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.175     0.000     0.040     0.040"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          203   Uncontrolled area to wetland 1"
"        0.000   % Impervious"
"        7.044   Total Area"
"      120.000   Flow length"
"        3.000   Overland Slope"
"        7.044   Pervious Area"
"      120.000   Pervious length"
"        3.000   Pervious slope"
"        0.000   Impervious Area"
"      120.000   Impervious length"
"        3.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.140   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.077     0.000     0.040     0.040 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           7.044      0.000      7.044      hectare"
"             Time of concentration  54.628     4.029      54.627     minutes"
"             Time to Centroid       164.465    91.877     164.465    minutes"
```

```
"             Rainfall depth         47.265     47.265     47.265     mm"
"             Rainfall volume        3329.32    0.00       3329.32    c.m"
"             Rainfall losses        40.644     5.741      40.644     mm"
"             Runoff depth           6.621      41.524     6.621      mm"
"             Runoff volume          466.35     0.00       466.36     c.m"
"             Runoff coefficient     0.140      0.000      0.140      "
"             Maximum flow           0.077      0.000      0.077      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.077     0.077     0.040     0.040"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.077     0.077     0.077     0.040"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                To Wetland 1"
"             Maximum flow                  0.106    c.m/sec"
"             Hydrograph volume          1637.686    c.m"
"                    0.077     0.077     0.077     0.106"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.077     0.000     0.077     0.106"
" 33          CATCHMENT 204"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          204   Uncontrolled area to offsite"
"        0.000   % Impervious"
"        0.587   Total Area"
"       10.000   Flow length"
"        8.000   Overland Slope"
"        0.587   Pervious Area"
"       10.000   Pervious length"
"        8.000   Pervious slope"
"        0.000   Impervious Area"
"       10.000   Impervious length"
"        8.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.139   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.017     0.000     0.077     0.106 c.m/sec"
"             Catchment 204          Pervious   Impervious Total Area "
```

```
"             Surface Area           0.587      0.000      0.587      hectare"
"             Time of concentration  9.165      0.676      9.165      minutes"
"             Time to Centroid       112.946    87.252     112.945    minutes"
"             Rainfall depth         47.265     47.265     47.265     mm"
"             Rainfall volume        277.44     0.00       277.44     c.m"
"             Rainfall losses        40.677     7.998      40.677     mm"
"             Runoff depth           6.587      39.266     6.587      mm"
"             Runoff volume          38.67      0.00       38.67      c.m"
"             Runoff coefficient     0.139      0.000      0.139      "
"             Maximum flow           0.017      0.000      0.017      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.017     0.017     0.077     0.106"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.017     0.017     0.017     0.106"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Offiste"
"             Maximum flow                  0.017    c.m/sec"
"             Hydrograph volume            38.668    c.m"
"                     0.017     0.017     0.017     0.017"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.017     0.000     0.017     0.017"
" 33          CATCHMENT 205"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          205   Area to wetland 2"
"        0.000   % Impervious"
"        2.752   Total Area"
"      100.000   Flow length"
"        5.000   Overland Slope"
"        2.752   Pervious Area"
"      100.000   Pervious length"
"        5.000   Pervious slope"
"        0.000   Impervious Area"
"      100.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.140   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                     0.036     0.000     0.017     0.017 c.m/sec"
"             Catchment 205          Pervious   Impervious Total Area "
"             Surface Area           2.752      0.000      2.752      hectare"
"             Time of concentration  42.010     3.098      42.010     minutes"
"             Time to Centroid       150.158    90.502     150.158    minutes"
"             Rainfall depth         47.265     47.265     47.265     mm"
"             Rainfall volume        1300.72    0.00       1300.72    c.m"
"             Rainfall losses        40.645     5.945      40.645     mm"
"             Runoff depth           6.620      41.319     6.620      mm"
"             Runoff volume          182.19     0.00       182.19     c.m"
"             Runoff coefficient     0.140      0.000      0.140      "
"             Maximum flow           0.036      0.000      0.036      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.036     0.036     0.017     0.017"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.036     0.036     0.036     0.017"
" 40          HYDROGRAPH   Combine    3"
"            6   Combine "
"            3   Node #"
"                To Wetland 2"
"             Maximum flow                  0.036    c.m/sec"
"             Hydrograph volume           182.186    c.m"
"                     0.036     0.036     0.036     0.036"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.036     0.000     0.036     0.036"
" 33          CATCHMENT 206"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          206   Area to southwest property"
"        0.000   % Impervious"
"        3.660   Total Area"
"      140.000   Flow length"
"        8.000   Overland Slope"
"        3.660   Pervious Area"
"      140.000   Pervious length"
"        8.000   Pervious slope"
"        0.000   Impervious Area"
"      140.000   Impervious length"
"        8.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.140   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
```

```
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.046     0.000     0.036     0.036 c.m/sec"
"             Catchment 206          Pervious   Impervious Total Area "
"             Surface Area           3.660      0.000      3.660      hectare"
"             Time of concentration  44.647     3.292      44.647     minutes"
"             Time to Centroid       153.148    90.817     153.148    minutes"
"             Rainfall depth         47.265     47.265     47.265     mm"
"             Rainfall volume        1729.89    0.00       1729.89    c.m"
"             Rainfall losses        40.644     5.962      40.644     mm"
"             Runoff depth           6.620      41.303     6.620      mm"
"             Runoff volume          242.30     0.00       242.30     c.m"
"             Runoff coefficient     0.140      0.000      0.140      "
"             Maximum flow           0.046      0.000      0.046      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.046     0.046     0.036     0.036"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.046     0.046     0.046     0.036"
" 40          HYDROGRAPH   Combine    4"
"            6   Combine "
"            4   Node #"
"                To Southwest Property"
"             Maximum flow                 0.046    c.m/sec"
"             Hydrograph volume          242.302    c.m"
"                     0.046     0.046     0.046     0.046"
" 38          START/RE-START TOTALS 206"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                    21.326    hectare"
"             Total Impervious area                    7.148    hectare"
"             Total % impervious                      33.519"
" 19          EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:           Q:\55566\100\SWM\MIDUSS\2024-12-17 JHN\"
"                                                                          Post"
"                Output filename:                                    25mm c.out"
"                Licensee name:                                              A"
"                Company                                                      "
"                Date & Time last used:               12/20/2024 at 10:22:14 AM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"      509.000   Coefficient A"
"        6.000   Constant B"
"        0.799   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity            74.946    mm/hr"
"             Total depth                  23.481    mm"
"            6   000hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   Area to SWMF"
"       98.000   % Impervious"
"        6.736   Total Area"
"       50.000   Flow length"
"        3.000   Overland Slope"
"        0.135   Pervious Area"
"       50.000   Pervious length"
"        3.000   Pervious slope"
"        6.601   Impervious Area"
"       50.000   Impervious length"
"        3.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.028   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       91.000   Impervious SCS Curve No."
"        0.402   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        2.512   Impervious Initial abstraction"
```

```
"                    0.416     0.000     0.000     0.000 c.m/sec"
"            Catchment 201          Pervious   Impervious Total Area "
"            Surface Area           0.135      6.601      6.736      hectare"
"            Time of concentration  107.203    4.314      4.459      minutes"
"            Time to Centroid       219.190    102.811    102.975    minutes"
"            Rainfall depth         23.481     23.481     23.481     mm"
"            Rainfall volume        31.63      1550.08    1581.71    c.m"
"            Rainfall losses        22.826     14.033     14.209     mm"
"            Runoff depth           0.656      9.448      9.272      mm"
"            Runoff volume          0.88       623.70     624.58     c.m"
"            Runoff coefficient     0.028      0.402      0.395      "
"            Maximum flow           0.000      0.416      0.416      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.416     0.416     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.416     0.416     0.416     0.000"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.416     0.416     0.416     0.000"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   SWMF"
"      100.000   % Impervious"
"        0.547   Total Area"
"       25.000   Flow length"
"       10.000   Overland Slope"
"        0.000   Pervious Area"
"       25.000   Pervious length"
"       10.000   Pervious slope"
"        0.547   Impervious Area"
"       25.000   Impervious length"
"       10.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.785   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.081     0.416     0.416     0.000 c.m/sec"
"            Catchment 202          Pervious   Impervious Total Area "
"            Surface Area           0.000      0.547      0.547      hectare"
"            Time of concentration  49.286     1.456      1.456      minutes"
```

```
"             Time to Centroid       166.426    91.342     91.342     minutes"
"             Rainfall depth         23.481     23.481     23.481     mm"
"             Rainfall volume        0.00       128.44     128.44     c.m"
"             Rainfall losses        22.826     5.052      5.052      mm"
"             Runoff depth           0.656      18.430     18.430     mm"
"             Runoff volume          0.00       100.81     100.81     c.m"
"             Runoff coefficient     0.000      0.785      0.785      "
"             Maximum flow           0.000      0.081      0.081      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.081     0.472     0.416     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.081     0.472     0.472     0.000"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.081     0.472     0.472     0.000"
" 54          POND DESIGN"
"        0.472   Current peak flow    c.m/sec"
"        0.600   Target outflow    c.m/sec"
"        725.4   Hydrograph volume    c.m"
"          19.   Number of stages"
"      313.000   Minimum water level    metre"
"      314.800   Maximum water level    metre"
"      313.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                313.000     0.000     0.000"
"                313.100   0.00276   196.000"
"                313.200   0.00478   401.000"
"                313.300   0.00616   615.000"
"                313.400   0.00729   836.000"
"                313.500   0.00827  1065.000"
"                313.600   0.00914  1301.000"
"                313.700   0.01626  1546.000"
"                313.800   0.03292  1799.000"
"                313.900   0.05552  2061.000"
"                314.000    0.1002  2330.000"
"                314.100    0.1207  2609.000"
"                314.200    0.1380  2895.000"
"                314.300    0.1533  3191.000"
"                314.400    0.1671  3495.000"
"                314.500    0.1799  3808.000"
"                314.600    0.1918  4136.000"
"                314.700    0.2030  4479.000"
"                314.800    0.2621  4840.000"
"           1.   WEIRS"
"                  Crest      Weir     Crest      Left     Right"
"              elevation coefficie   breadth sideslope sideslope"
"                314.700     0.900     1.000     0.000     0.000"
```

```
"           2.   ORIFICES"
"                Orifice   Orifice   Orifice Number of"
"                 invert coefficie  diameter  orifices"
"                313.000     0.630    0.0750     1.000"
"                313.600     0.630    0.3000     1.000"
"             Peak outflow                  0.007    c.m/sec"
"             Maximum level               313.330    metre"
"             Maximum storage             681.213    c.m"
"             Centroidal lag               22.826   hours"
"                  0.081     0.472     0.007     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                To Wetland 1"
"             Maximum flow                  0.007    c.m/sec"
"             Hydrograph volume           441.666    c.m"
"                     0.081     0.472     0.007     0.007"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.081     0.000     0.007     0.007"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          203   Uncontrolled area to wetland 1"
"        0.000   % Impervious"
"        7.044   Total Area"
"      120.000   Flow length"
"        3.000   Overland Slope"
"        7.044   Pervious Area"
"      120.000   Pervious length"
"        3.000   Pervious slope"
"        0.000   Impervious Area"
"      120.000   Impervious length"
"        3.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.028   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.003     0.000     0.007     0.007 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           7.044      0.000      7.044      hectare"
"             Time of concentration  181.273    5.356      181.268    minutes"
"             Time to Centroid       286.663    97.246     286.657    minutes"
```

```
"             Rainfall depth         23.481     23.481     23.481     mm"
"             Rainfall volume        1654.03    0.00       1654.03    c.m"
"             Rainfall losses        22.826     4.812      22.826     mm"
"             Runoff depth           0.656      18.669     0.656      mm"
"             Runoff volume          46.20      0.00       46.20      c.m"
"             Runoff coefficient     0.028      0.000      0.028      "
"             Maximum flow           0.003      0.000      0.003      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.003     0.003     0.007     0.007"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.003     0.003     0.003     0.007"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                To Wetland 1"
"             Maximum flow                 0.010    c.m/sec"
"             Hydrograph volume          487.864    c.m"
"                    0.003     0.003     0.003     0.010"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.003     0.000     0.003     0.010"
" 33          CATCHMENT 204"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          204   Uncontrolled area to offsite"
"        0.000   % Impervious"
"        0.587   Total Area"
"       10.000   Flow length"
"        8.000   Overland Slope"
"        0.587   Pervious Area"
"       10.000   Pervious length"
"        8.000   Pervious slope"
"        0.000   Impervious Area"
"       10.000   Impervious length"
"        8.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.028   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.001     0.000     0.003     0.010 c.m/sec"
"             Catchment 204          Pervious   Impervious Total Area "
```

```
"             Surface Area           0.587      0.000      0.587      hectare"
"             Time of concentration  30.411     0.899      30.410     minutes"
"             Time to Centroid       149.230    90.480     149.229    minutes"
"             Rainfall depth         23.481     23.481     23.481     mm"
"             Rainfall volume        137.84     0.00       137.84     c.m"
"             Rainfall losses        22.826     5.518      22.826     mm"
"             Runoff depth           0.655      17.964     0.655      mm"
"             Runoff volume          3.85       0.00       3.85       c.m"
"             Runoff coefficient     0.028      0.000      0.028      "
"             Maximum flow           0.001      0.000      0.001      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.001     0.001     0.003     0.010"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.001     0.001     0.001     0.010"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Offiste"
"             Maximum flow                  0.001    c.m/sec"
"             Hydrograph volume             3.847    c.m"
"                     0.001     0.001     0.001     0.001"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.001     0.000     0.001     0.001"
" 33          CATCHMENT 205"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          205   Area to wetland 2"
"        0.000   % Impervious"
"        2.752   Total Area"
"      100.000   Flow length"
"        5.000   Overland Slope"
"        2.752   Pervious Area"
"      100.000   Pervious length"
"        5.000   Pervious slope"
"        0.000   Impervious Area"
"      100.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.028   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                     0.002     0.000     0.001     0.001 c.m/sec"
"             Catchment 205          Pervious   Impervious Total Area "
"             Surface Area           2.752      0.000      2.752      hectare"
"             Time of concentration  139.402    4.119      139.398    minutes"
"             Time to Centroid       248.523    95.493     248.518    minutes"
"             Rainfall depth         23.481     23.481     23.481     mm"
"             Rainfall volume        646.21     0.00       646.21     c.m"
"             Rainfall losses        22.826     5.005      22.826     mm"
"             Runoff depth           0.656      18.476     0.656      mm"
"             Runoff volume          18.05      0.00       18.05      c.m"
"             Runoff coefficient     0.028      0.000      0.028      "
"             Maximum flow           0.002      0.000      0.002      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.002     0.002     0.001     0.001"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.002     0.002     0.002     0.001"
" 40          HYDROGRAPH   Combine    3"
"            6   Combine "
"            3   Node #"
"                To Wetland 2"
"             Maximum flow                  0.002    c.m/sec"
"             Hydrograph volume            18.049    c.m"
"                     0.002     0.002     0.002     0.002"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.002     0.000     0.002     0.002"
" 33          CATCHMENT 206"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          206   Area to southwest property"
"        0.000   % Impervious"
"        3.660   Total Area"
"      140.000   Flow length"
"        8.000   Overland Slope"
"        3.660   Pervious Area"
"      140.000   Pervious length"
"        8.000   Pervious slope"
"        0.000   Impervious Area"
"      140.000   Impervious length"
"        8.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.028   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
```

```
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.002     0.000     0.002     0.002 c.m/sec"
"             Catchment 206          Pervious   Impervious Total Area "
"             Surface Area           3.660      0.000      3.660      hectare"
"             Time of concentration  148.153    4.377      148.149    minutes"
"             Time to Centroid       256.494    95.868     256.489    minutes"
"             Rainfall depth         23.481     23.481     23.481     mm"
"             Rainfall volume        859.42     0.00       859.42     c.m"
"             Rainfall losses        22.826     4.945      22.826     mm"
"             Runoff depth           0.656      18.536     0.656      mm"
"             Runoff volume          24.00      0.00       24.00      c.m"
"             Runoff coefficient     0.028      0.000      0.028      "
"             Maximum flow           0.002      0.000      0.002      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.002     0.002     0.002     0.002"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.002     0.002     0.002     0.002"
" 40          HYDROGRAPH   Combine    4"
"            6   Combine "
"            4   Node #"
"                To Southwest Property"
"             Maximum flow                 0.002    c.m/sec"
"             Hydrograph volume           24.004    c.m"
"                     0.002     0.002     0.002     0.002"
" 38          START/RE-START TOTALS 206"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                    21.326    hectare"
"             Total Impervious area                    7.148    hectare"
"             Total % impervious                      33.519"
" 19          EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                          Sunday, February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:           Q:\55566\100\SWM\MIDUSS\2024-12-17 JHN\"
"                                                                          Post"
"                Output filename:                                    100 c.out"
"                Licensee name:                                             A"
"                Company                                                     "
"                Date & Time last used:                12/18/2024 at 5:51:18 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     4688.000   Coefficient A"
"       17.000   Constant B"
"        0.962   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity          239.354    mm/hr"
"             Total depth                 87.079    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          201   Area to SWMF"
"       98.000   % Impervious"
"        6.736   Total Area"
"       50.000   Flow length"
"        3.000   Overland Slope"
"        0.135   Pervious Area"
"       50.000   Pervious length"
"        3.000   Pervious slope"
"        6.601   Impervious Area"
"       50.000   Impervious length"
"        3.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.294   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       91.000   Impervious SCS Curve No."
"        0.739   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        2.512   Impervious Initial abstraction"
```

```
"                    2.935     0.000     0.000     0.000 c.m/sec"
"            Catchment 201          Pervious   Impervious Total Area "
"            Surface Area           0.135      6.601      6.736      hectare"
"            Time of concentration  17.300     2.042      2.165      minutes"
"            Time to Centroid       116.228    90.433     90.641     minutes"
"            Rainfall depth         87.079     87.079     87.079     mm"
"            Rainfall volume        117.31     5748.34    5865.66    c.m"
"            Rainfall losses        61.468     22.768     23.542     mm"
"            Runoff depth           25.611     64.311     63.537     mm"
"            Runoff volume          34.50      4245.37    4279.88    c.m"
"            Runoff coefficient     0.294      0.739      0.730      "
"            Maximum flow           0.013      2.933      2.935      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    2.935     2.935     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    2.935     2.935     2.935     0.000"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    2.935     2.935     2.935     0.000"
" 33          CATCHMENT 202"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          202   SWMF"
"      100.000   % Impervious"
"        0.547   Total Area"
"       25.000   Flow length"
"       10.000   Overland Slope"
"        0.000   Pervious Area"
"       25.000   Pervious length"
"       10.000   Pervious slope"
"        0.547   Impervious Area"
"       25.000   Impervious length"
"       10.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.896   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.315     2.935     2.935     0.000 c.m/sec"
"            Catchment 202          Pervious   Impervious Total Area "
"            Surface Area           0.000      0.547      0.547      hectare"
"            Time of concentration  7.954      0.871      0.871      minutes"
```

```
"             Time to Centroid       105.041    85.145     85.145     minutes"
"             Rainfall depth         87.079     87.079     87.079     mm"
"             Rainfall volume        0.00       476.32     476.32     c.m"
"             Rainfall losses        61.542     9.040      9.040      mm"
"             Runoff depth           25.537     78.039     78.039     mm"
"             Runoff volume          0.00       426.87     426.87     c.m"
"             Runoff coefficient     0.000      0.896      0.896      "
"             Maximum flow           0.000      0.315      0.315      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.315     3.250     2.935     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.315     3.250     3.250     0.000"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.315     3.250     3.250     0.000"
" 54          POND DESIGN"
"        3.250   Current peak flow    c.m/sec"
"        0.600   Target outflow    c.m/sec"
"       4706.7   Hydrograph volume    c.m"
"         19.   Number of stages"
"      313.000   Minimum water level    metre"
"      314.800   Maximum water level    metre"
"      313.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                313.000     0.000     0.000"
"                313.100   0.00276   196.000"
"                313.200   0.00478   401.000"
"                313.300   0.00616   615.000"
"                313.400   0.00729   836.000"
"                313.500   0.00827  1065.000"
"                313.600   0.00914  1301.000"
"                313.700   0.01626  1546.000"
"                313.800   0.03292  1799.000"
"                313.900   0.05552  2061.000"
"                314.000    0.1002  2330.000"
"                314.100    0.1207  2609.000"
"                314.200    0.1380  2895.000"
"                314.300    0.1533  3191.000"
"                314.400    0.1671  3495.000"
"                314.500    0.1799  3808.000"
"                314.600    0.1918  4136.000"
"                314.700    0.2030  4479.000"
"                314.800    0.2621  4840.000"
"           1.   WEIRS"
"                  Crest      Weir     Crest      Left     Right"
"              elevation coefficie   breadth sideslope sideslope"
"                314.700     0.900     1.000     0.000     0.000"
```

```
"           2.   ORIFICES"
"                Orifice   Orifice   Orifice Number of"
"                 invert coefficie  diameter  orifices"
"                313.000     0.630    0.0750     1.000"
"                313.600     0.630    0.3000     1.000"
"             Peak outflow                  0.180    c.m/sec"
"             Maximum level               314.500    metre"
"             Maximum storage            3808.390    c.m"
"             Centroidal lag               15.661   hours"
"                  0.315     3.250     0.180     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                To Wetland 1"
"             Maximum flow                  0.180    c.m/sec"
"             Hydrograph volume          3659.444    c.m"
"                     0.315     3.250     0.180     0.180"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.315     0.000     0.180     0.180"
" 33          CATCHMENT 203"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          203   Uncontrolled area to wetland 1"
"        0.000   % Impervious"
"        7.044   Total Area"
"      120.000   Flow length"
"        3.000   Overland Slope"
"        7.044   Pervious Area"
"      120.000   Pervious length"
"        3.000   Pervious slope"
"        0.000   Impervious Area"
"      120.000   Impervious length"
"        3.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.294   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.508     0.000     0.180     0.180 c.m/sec"
"             Catchment 203          Pervious   Impervious Total Area "
"             Surface Area           7.044      0.000      7.044      hectare"
"             Time of concentration  29.253     3.204      29.253     minutes"
"             Time to Centroid       130.590    88.407     130.590    minutes"
```

```
"             Rainfall depth         87.079     87.079     87.079     mm"
"             Rainfall volume        6133.85    0.01       6133.86    c.m"
"             Rainfall losses        61.461     7.042      61.461     mm"
"             Runoff depth           25.618     80.037     25.618     mm"
"             Runoff volume          1804.56    0.01       1804.56    c.m"
"             Runoff coefficient     0.294      0.000      0.294      "
"             Maximum flow           0.508      0.000      0.508      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.508     0.508     0.180     0.180"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.508     0.508     0.508     0.180"
" 40          HYDROGRAPH   Combine    1"
"            6   Combine "
"            1   Node #"
"                To Wetland 1"
"             Maximum flow                  0.676    c.m/sec"
"             Hydrograph volume          5464.013    c.m"
"                     0.508     0.508     0.508     0.676"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.508     0.000     0.508     0.676"
" 33          CATCHMENT 204"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          204   Uncontrolled area to offsite"
"        0.000   % Impervious"
"        0.587   Total Area"
"       10.000   Flow length"
"        8.000   Overland Slope"
"        0.587   Pervious Area"
"       10.000   Pervious length"
"        8.000   Pervious slope"
"        0.000   Impervious Area"
"       10.000   Impervious length"
"        8.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.293   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.087     0.000     0.508     0.676 c.m/sec"
"             Catchment 204          Pervious   Impervious Total Area "
```

```
"             Surface Area           0.587      0.000      0.587      hectare"
"             Time of concentration  4.908      0.538      4.908      minutes"
"             Time to Centroid       101.371    84.961     101.371    minutes"
"             Rainfall depth         87.079     87.079     87.079     mm"
"             Rainfall volume        511.15     0.00       511.15     c.m"
"             Rainfall losses        61.587     13.501     61.587     mm"
"             Runoff depth           25.492     73.578     25.492     mm"
"             Runoff volume          149.64     0.00       149.64     c.m"
"             Runoff coefficient     0.293      0.000      0.293      "
"             Maximum flow           0.087      0.000      0.087      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.087     0.087     0.508     0.676"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.087     0.087     0.087     0.676"
" 40          HYDROGRAPH   Combine    2"
"            6   Combine "
"            2   Node #"
"                Offiste"
"             Maximum flow                  0.087    c.m/sec"
"             Hydrograph volume           149.637    c.m"
"                    0.087     0.087     0.087     0.087"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.087     0.000     0.087     0.087"
" 33          CATCHMENT 205"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          205   Area to wetland 2"
"        0.000   % Impervious"
"        2.752   Total Area"
"      100.000   Flow length"
"        5.000   Overland Slope"
"        2.752   Pervious Area"
"      100.000   Pervious length"
"        5.000   Pervious slope"
"        0.000   Impervious Area"
"      100.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.294   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
```

```
"        0.518   Impervious Initial abstraction"
"                     0.238     0.000     0.087     0.087 c.m/sec"
"             Catchment 205          Pervious   Impervious Total Area "
"             Surface Area           2.752      0.000      2.752      hectare"
"             Time of concentration  22.496     2.464      22.496     minutes"
"             Time to Centroid       122.483    87.300     122.483    minutes"
"             Rainfall depth         87.079     87.079     87.079     mm"
"             Rainfall volume        2396.42    0.00       2396.42    c.m"
"             Rainfall losses        61.481     6.897      61.481     mm"
"             Runoff depth           25.598     80.182     25.598     mm"
"             Runoff volume          704.46     0.00       704.46     c.m"
"             Runoff coefficient     0.294      0.000      0.294      "
"             Maximum flow           0.238      0.000      0.238      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.238     0.238     0.087     0.087"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.238     0.238     0.238     0.087"
" 40          HYDROGRAPH   Combine    3"
"            6   Combine "
"            3   Node #"
"                To Wetland 2"
"             Maximum flow                  0.238    c.m/sec"
"             Hydrograph volume           704.460    c.m"
"                     0.238     0.238     0.238     0.238"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.238     0.000     0.238     0.238"
" 33          CATCHMENT 206"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          206   Area to southwest property"
"        0.000   % Impervious"
"        3.660   Total Area"
"      140.000   Flow length"
"        8.000   Overland Slope"
"        3.660   Pervious Area"
"      140.000   Pervious length"
"        8.000   Pervious slope"
"        0.000   Impervious Area"
"      140.000   Impervious length"
"        8.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       65.000   Pervious SCS Curve No."
"        0.294   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"       13.677   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
```

```
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.298     0.000     0.238     0.238 c.m/sec"
"             Catchment 206          Pervious   Impervious Total Area "
"             Surface Area           3.660      0.000      3.660      hectare"
"             Time of concentration  23.909     2.619      23.908     minutes"
"             Time to Centroid       124.173    87.544     124.173    minutes"
"             Rainfall depth         87.079     87.079     87.079     mm"
"             Rainfall volume        3187.10    0.00       3187.10    c.m"
"             Rainfall losses        61.470     7.054      61.470     mm"
"             Runoff depth           25.609     80.026     25.609     mm"
"             Runoff volume          937.29     0.00       937.30     c.m"
"             Runoff coefficient     0.294      0.000      0.294      "
"             Maximum flow           0.298      0.000      0.298      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.298     0.298     0.238     0.238"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.298     0.298     0.298     0.238"
" 40          HYDROGRAPH   Combine    4"
"            6   Combine "
"            4   Node #"
"                To Southwest Property"
"             Maximum flow                 0.298    c.m/sec"
"             Hydrograph volume          937.296    c.m"
"                     0.298     0.298     0.298     0.298"
" 38          START/RE-START TOTALS 206"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                    21.326    hectare"
"             Total Impervious area                    7.148    hectare"
"             Total % impervious                      33.519"
" 19          EXIT"
```

Appendix D

Annual Water Balance Calculations

3027 Cedar Creek Road

WATER BALANCE (SURFACE RUNOFF) ANALYSIS

Ayr, Ontario

Project Number:	55566-100
Date:	February 13, 2025
Design By:	AJS
File:	Q:\55566\100\SWM\2024-12-17 Micro Drainage Analysis_Rev3.xlsx

	Pre-Development	Post-Development
Topography:	Rolling Lands	Flat Lands
Coverage:	Moderately Rooted Crop	Urban Lawns
Soil Type:	Fine Sandy Loam	Fine Sandy Loam

Weather Station:	Waterloo Wellington Airport
Total Precipitation:	916.5mm

ET:	574	559
Runoff:	137	125
Infiltration:	205	232

SURFACE RUNOFF

Location	Pre-development			Post-development						Comments
				Pervious			Impervious			
	Area Draining to Location	Runoff Rate	Runoff Volume	Area Draining to Location	Runoff Rate	Runoff Volume	Area Draining to Location	Runoff Rate	Runoff Volume	
	ha	*mm/yr/m^2*	*m^3/yr*	*ha*	*mm/yr/m^2*	*m^3/yr*	*ha*	*mm/yr/m^2*	*m^3/yr*	
Wetland #1	12.476	137.0	17092	7.179	125.0	8974	6.173	750	46298	Impervious area excludes the proposed roof area which is infiltrated
Wetland #2	5.190	137	7110	2.752	125.00	3440	0.000		0	
Rest of Site	3.660	137	5014	4.247	125.00	5309	0.000		0	
Total	21.326	411.0	**29217**	14.178	375.0	**17723**	6.173	750	**46298**	

SUMMARY

Post-development Runoff Volume

Pervious		17723	*m^3/yr*
Impervious	+	46298	*m^3/yr*
		64020	*m^3/yr*
Pre-development Runoff Volume	-	29217	*m^3/yr*
Net Gain of Surface Runoff		**34,803**	***m^3/yr***

3027 Cedar Creek Road

WATER BALANCE (INFILTRATION) ANALYSIS

Ayr, Ontario

Project Number:	55566-100
Date:	February 13, 2025
Design By:	AJS
File:	Q:\55566\100\SWM\2024-12-17 Micro Drainage Analysis_Rev3.xlsx

	Pre-Development	Post Development (uncontrolled)
Topography:	Flat land	Flat land
Coverage:	Moderately Rooted Crop	Moderately Rooted Crop
Soil Type:	Fine Sandy Loam	Fine Sandy Loam

Weather Station:	Waterloo Wellington Airport
Total Precipitation:	916.5mm

ET:	574	559
Runoff:	137	125
Infiltration:	205	232

INFILTRATION

Location	Pre-development			Post-development						Comments
				Pervious			Impervious			
	Area Draining to Location	Infiltration Rate	Infiltration Volume	Area Draining to Location	Infiltration Rate	Infiltration Volume	Area Draining to Location	Infiltration Rate	Infiltration Volume	
	ha	*mm/yr/m²*	*m³/yr*	*ha*	*mm/yr/m²*	*m³/yr*	*ha*	*mm/yr/m²*	*m³/yr*	
Entire Site	21.326	205.0	43718	14.178	205.0	29065	0.975	750	7313	Runoff from roof is directed to gallery. Most pervious is remaining from existing therefore same infiltration rate is used in the post-development condition.
Total	21.326	205.0	**43718**	14.178	205.0	**29065**	0.975	750	**7313**	

SUMMARY

Post-development Infiltration Volume			
Pervious		29065	*m³/yr*
Impervious	+	7313	*m³/yr*
		36377	*m³/yr*
Pre-development Infiltration Volume	-	43718	*m³/yr*
Net Loss of Infiltration		**7341**	***m³/yr***