190-216 Arkell Road
Guelph, Ontario

Preliminary

Stormwater Management Report

Project Location:

190 - 216 Arkell Road
Guelph, Ontario

Prepared for:

Crescent Homes
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Prepared by:

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July 4, 2024
Revised: August 14, 2025

MTE File No.: 42063-104

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1.0 INTRODUCTION

1.1 Overview

MTE Consultants Inc. (MTE) was retained by Crescent Homes to prepare a Preliminary Stormwater Management Report in support of a Draft Plan of Subdivision Application. The lands that comprise the Draft Plan of Subdivision are made up of a number of properties, including: 190, 202, 210, and 216 Arkell Road, located in the City of Guelph. These lands are herein referred to as the 'Subject Lands.'

The Subject Lands are approximately 2.58ha in size. Refer to **Figure 1.1** for the location of the Subject Lands. The proposed development plan for the Subject Lands is a residential subdivision with a municipal road bisecting the property. The proposed right-of-way will connect to the existing Dawes Avenue northeast of the Subject Lands and to Arkell Road at its intersection with Summerfield Drive. There are three residential blocks, one with eleven townhouse units fronting onto a municipal right-of-way, and other two are stacked multiple residential blocks. The rest of the Subject Lands is proposed to be divided into the SWM Block, road widening, servicing corridor and an open space block. The open space block is approximately one third of the Subject Lands and it cannot be developed due to the existing wetland and its setbacks. Refer to the Draft Plan of Subdivision prepared by MHBC, dated March 18, 2025, in **Appendix A** for more details.

This report presents stormwater quality, quantity, and erosion control measures that are proposed to be provided for the development. This report should be read in conjunction with the *190-216 Arkell Road – Functional Servicing Report*, prepared by MTE (August, 2025).

1.2 Background Information

The original Stormwater Management Report, prepared by MTE and dated October 10, 2018, was submitted to the City of Guelph (City) as part of Site Plan approval process. After discussions with City staff, it was determined that the proposed road connections through the site would establish a municipal right-of-way, thereby warranting a Draft Plan of Subdivision Application. As such, various departments within the City have reviewed the original submission and provided comments to be addressed prior to Draft Plan approval.

Several revised draft plan submissions and associated reports have been submitted to the City since the original submission to address comments. Several iterations to the Draft Plan layout and corresponding design changes have been made over the course of the process. The most recent revised Stormwater Management Report was submitted dated July 4, 2024. Comments on the revised submission were received from the City of Guelph on October 28, 2024.

This revised Stormwater Management Report is revised based on the abovementioned comments, and consequent discussions with the City.

1.3 Purpose of Study

The purpose of this report is to address the most recent City comments and develop a comprehensive stormwater management strategy for the current development proposal that is acceptable to the City, the Grand River Conservation Authority (GRCA), and the Ministry of the Environment, Conservation and Parks (MECP).

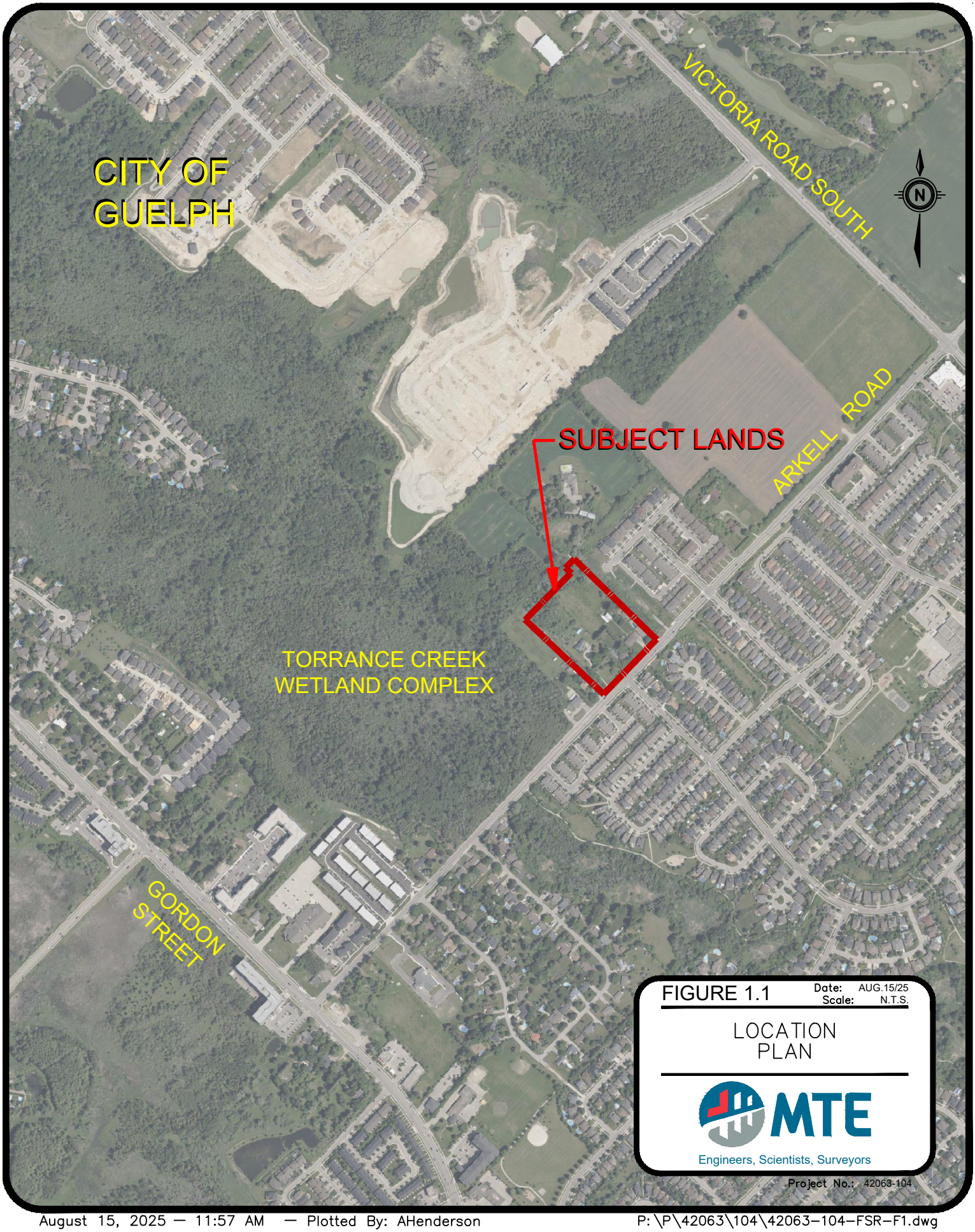

FIGURE 1.1

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LOCATION PLAN

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Engineers, Scientists, Surveyors

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1.4 Objectives

The objective of this stormwater management plan is to ensure that the proposed development includes the necessary controls to protect the hydrology and water quality of the receiving water systems. Furthermore, this plan also ensures that the proposed Draft Plan of Subdivision provides the necessary blocks and corridors for stormwater management measures. The primary objectives of this study are as follows:

- Establish criteria for the management of stormwater runoff from the study area;
- Recommend a comprehensive plan for controlling the quality and quantity of stormwater runoff from the study area;
- Perform monthly infiltration and water balances to analyse the effect of the development on local water systems; and
- Prepare preliminary designs for the recommended stormwater management infrastructure.

2.0 EXISTING CONDITIONS AND BACKGROUND INFORMATION

2.1 Topographical Information

The Subject Lands consist of approximately 2.58ha and are generally bounded by an existing wetland to the northwest, an existing residential development to the northeast, the Arkell Road right-of-way to the southeast, and an existing single family residential property to the southwest. The Subject Lands are legally described as Part of Lot 6, Puslinch Concession 8 in the City of Guelph. They are currently comprised of four residential properties. Municipal addresses for the individual lots are 190, 202, 210, and 216 Arkell Road. The existing homes will be vacated and demolished prior to development.

MTE conducted a detailed topographical survey of the Subject Lands in November 2016. Existing site conditions and topography for the Subject Lands are shown in **Figure 2.1**, as well as the enclosed **MTE Drawing 42063-104-EC1.1**.

The Subject Lands are relatively flat, with slopes generally ranging from 0.5% to 1.5%. Existing elevations within the lands range from 333.3m along the wetland boundary to approximately 335.0m along Arkell Road. Under pre-development conditions, surface runoff from the site flows northwesterly towards the Torrance Creek wetland complex.

2.2 Pre-Development Conditions

The Subject Lands are located within the Torrance Creek subwatershed. The western portion of the property is comprised of the Torrance Creek wetland, which lies at the headwaters of a tributary to Torrance Creek. Approximately one-third of the northerly portion of the site either lies within the wetland complex or within the required 30.0m wetland setback.

As previously mentioned, the majority of the site is internally drained and surface runoff flows northwesterly from Arkell Road to the wetland feature. **Figure 2.2** provides an illustration of the pre-development catchment areas.

Based on existing conditions, the site and surrounding lands were modelled as five separate catchments using the MIDUSS hydrologic modelling program. **Table 2.1** provides a brief description of the catchments and the design parameters used in the hydrologic modelling.

Hydrologic modelling details and results are further discussed in Section 5. A detailed copy of the pre-development catchment parameters and MIDUSS modelling output logs has been included in **Appendix B**.

Table 2.1 – Pre-Development Catchment Parameters

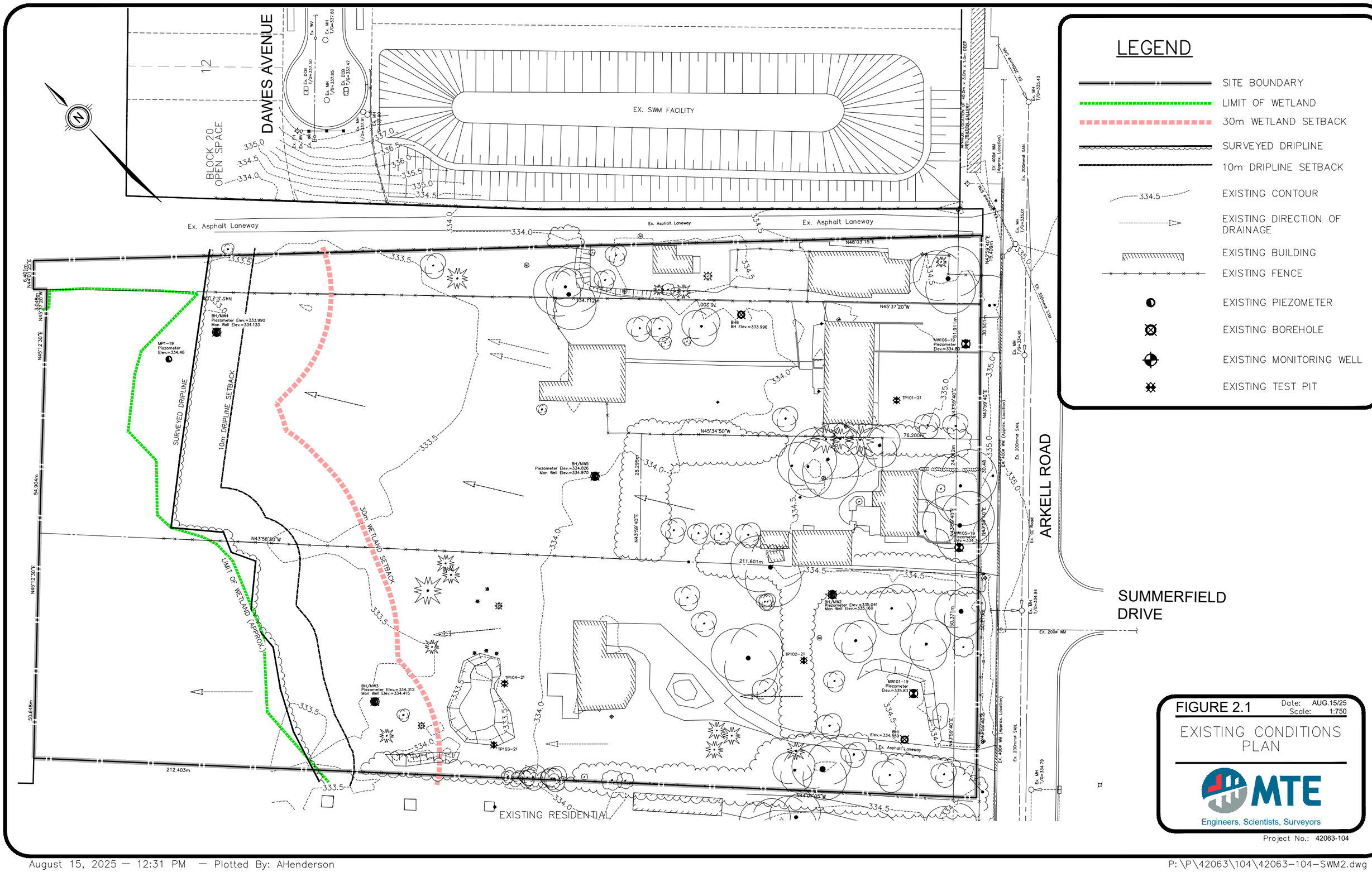
Catchment	Description	Area (ha)	% Impervious	Flow Length (m)	Slope (%)
Within Subject Lands					
101	Existing residential properties and Arkell Road boulevard	1.714	16.0	150	0.5
102	Existing wetland and setbacks	0.863	0.0	50	0.5
Outside of Subject Lands					
103	Private laneway adjacent to subject lands	0.240	30.0	225	0.8
104	Existing SWM facility embankments	0.234	0.0	8	20.0
105	Driveway aprons and ditch within Arkell right-of-way	0.057	20.0	125	0.5
	Total	**3.108**	**11.5**	**-**	**-**

Please note that drainage area 103 is equivalent to drainage area 205 as defined within the Stantec Report *220 Arkell Road Preliminary Servicing. Grading, and Stormwater Management Report* (May 28, 2019). Drainage area 104 represents the existing SWM facility embankment within the adjacent Arkell Meadows Subdivision that is directed towards the subject lands.

A summary of pre-development release rates into the Torrance Creek is provided in **Table 2.2** below.

Table 2.2 – Pre-Development Release Rates (m^3/s)

Catchment	25mm	2-year	5-year	10-year	25-year	50-year	100-year	Regional
101	0.029	0.049	0.081	0.104	0.126	0.142	0.165	0.217
102	0.002	0.007	0.020	0.034	0.057	0.077	0.101	0.123
103	0.007	0.012	0.018	0.026	0.032	0.037	0.042	0.029
104	0.002	0.006	0.015	0.025	0.036	0.046	0.057	0.030
105	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.007
Total to Wetland	**0.038**	**0.069**	**0.122**	**0.166**	**0.213**	**0.252**	**0.302**	**0.392**



LEGEND

- SITE BOUNDARY
- LIMIT OF WETLAND
- 30m WETLAND SETBACK
- SURVEYED DRIPLINE
- 10m DRIPLINE SETBACK
- 334.5 EXISTING CONTOUR
- EXISTING DIRECTION OF DRAINAGE
- EXISTING BUILDING
- EXISTING FENCE
- EXISTING PIEZOMETER
- EXISTING BOREHOLE
- EXISTING MONITORING WELL
- EXISTING TEST PIT

FIGURE 2.1

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EXISTING CONDITIONS PLAN

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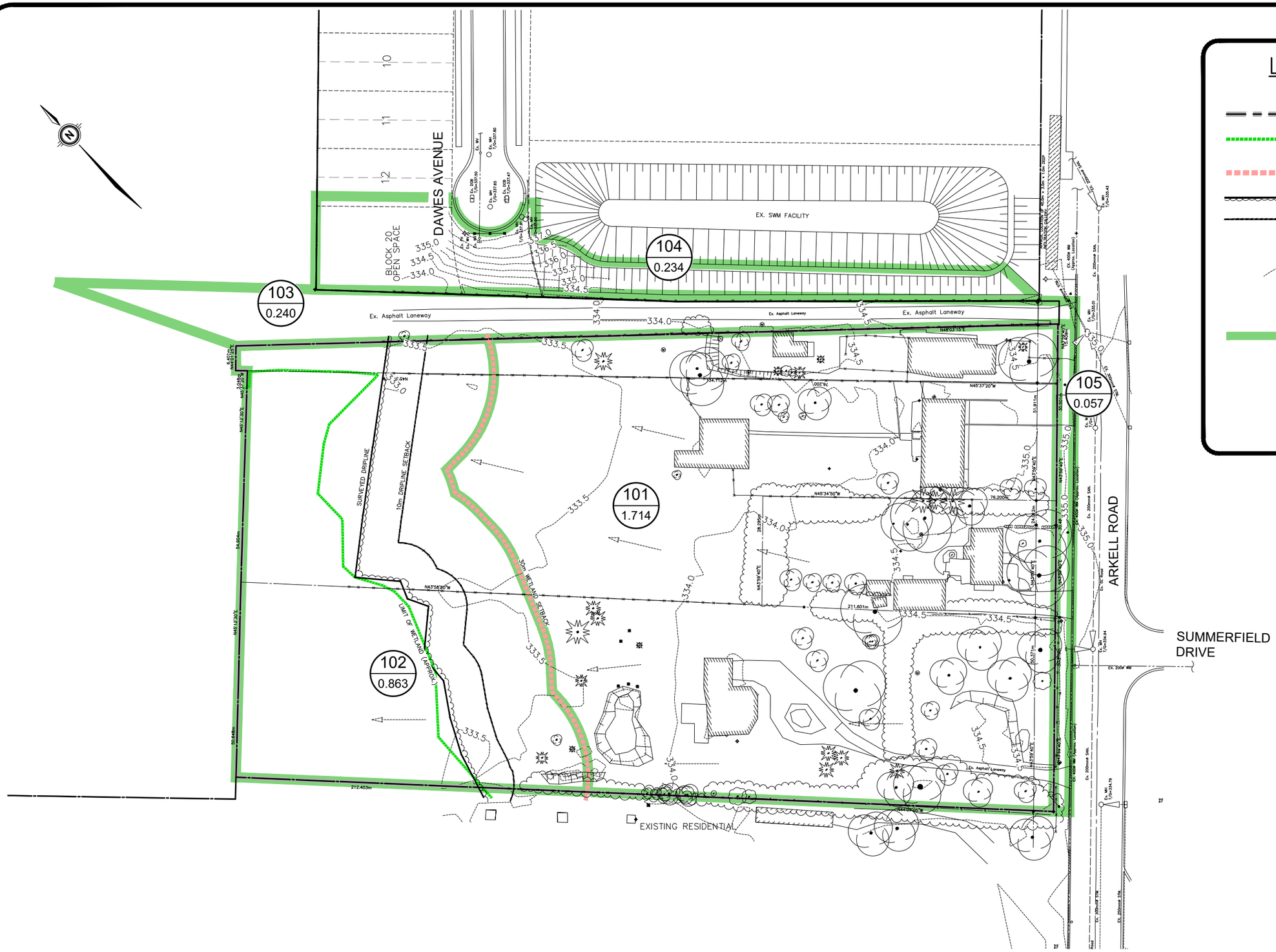

LEGEND

- SITE BOUNDARY
- LIMIT OF WETLAND
- 30m WETLAND SETBACK
- SURVEYED DRIPLINE
- 10m DRIPLINE SETBACK
- 334.5 — EXISTING CONTOUR
- EXISTING DIRECTION OF DRAINAGE
- CATCHMENT AREA
- 101 / 1.715 — SUB-CATCHMENT NUMBER / AREA (ha.)

FIGURE 2.2

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PRE-DEVELOPMENT CATCHMENT AREAS

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Project No.: 42063-104

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2.3 Geotechnical Information

A geotechnical investigation for the property was carried out by Peto MacCallum Ltd. (Peto) in 2017. A total of six (6) boreholes were advanced to depths of approximately 6.6m - 8.1m. A final version of their report, entitled *Geotechnical Investigation Proposed Arkell Road Subdivision* dated October 1, 2018, was prepared. The assessment made recommendations pertaining to the site grading, road pavement structure, stormwater management facilities, and general house construction.

Based on the results of Peto's geotechnical investigation, the subsurface stratigraphy of the site generally consists of topsoil and some localized fill overlying native deposits of silt, sand, and gravel. A thick (~3.6m) layer of silt was encountered 2.2m below existing grades on the easterly portion of the site. The report also summarizes infiltration rates calculated on representative soil samples across the Subject Lands based on grain size analysis. For further geotechnical information, refer to Peto's geotechnical investigation in **Appendix F**.

2.4 Hydrogeological Information

A hydrogeological investigation was conducted by MTE starting in 2017. A supplemental technical memo *Update to Hydrogeological Investigation Report as per City of Guelph Comments* was completed dated January 9, 2020. Monitoring wells were installed in four of the boreholes which were previously advanced by Peto. MTE has conducted continuous groundwater monitoring since March 2017. The highest water table was observed in May of 2017 and ranged from an elevation of 334.0m in the northern portion of the site (MW4) to 333.2m in the southern portion of the site (MW2). These elevations represent depths of 0.9m above existing grade at MW4 and 1.1m below existing grade at MW2. The measured groundwater elevations indicate that the shallow groundwater flows from the north to the south (i.e. away from the wetland in the north portion of the Site).

A revised Hydrogeological Assessment was completed dated December 3, 2021.

Please note that MTE has set the basement floor elevations above the seasonal high groundwater in order to achieve a minimum 1.0m separation.

Please refer to **Appendix G** for a figure depicting the Subject Lands' seasonal high groundwater contours.

2.4.1 In-Situ Infiltration Testing

In-situ infiltration testing was performed as part of the Hydrogeological Investigation. A supplemental technical memo was prepared by MTE (dated May 4, 2023) describing the methodology utilized within the testing (See **Appendix H**). MTE completed test pit and in-situ infiltration testing at the Subject Lands on November 19, 2021. Four test pits (TP101-21 through TP104-21) were advanced at the Subject Lands for infiltration testing purposes using a mini-excavator operated by Steve Neeb of Neeb Excavating Inc., which was observed by MTE. These test pits are shown on **MTE Drawing 42063-104-EC1.1**.

Infiltration tests were completed using a Soil Moisture 2800 K1 Guelph Permeameter in 0.05 m diameter x 0.16 to 0.20 m deep boreholes which were hand augered through the base of the test pit bottom in native overburden sediments in which the permeameter base tip was placed. Water levels within the combined reservoir of the Guelph Permeameter were recorded at regular time intervals to obtain time-varying infiltration rates of the sediment unit being tested.

The field saturated hydraulic conductivity (Kfs) of the tested materials was calculated using the Guelph Permeameter K-sat calculator, available for download on the soil moisture website (soilmoisture.com).

Based on the field measurements, the saturated hydraulic conductivity and the unfactored infiltration rates have been calculated for each of the tested locations, summarized in **Table 2.3** below. The infiltration rate testing methodology and infiltration rate calculations were completed in accordance with the Credit Valley Conservation Stormwater Management Guideline and the City of Guelph Design Engineering Manual.

Table 2.3 – Field Saturation Summary

Test Pit	Depth (mbgs)	Soil Type	Median Kfs[1] (cm/sec)	Unfactored Infiltration Rate (mm/hr)
TP101-21	1.0	Silty SAND	$8.9x10^{-5}$	45
TP101-21	1.6	SAND, trace silt, trace gravel	$3.5x10^{-4}$	64
TP102-21	0.8	SAND and GRAVEL	$5.8x10^{-3}$	249
TP103-21	0.5	SAND and GRAVEL	$5.4x10^{-3}$	133
TP104-21	0.9	SAND and GRAVEL	$4.3x10^{-3}$	125

It should be noted that the infiltration rates calculated by in-situ testing typically exceeded the infiltration rate (30mm/hr) calculated based on grain size analysis by Peto.

As discussed in the hydrogeological report and supplementary technical memos, a factor of safety of 2.0 to 3.0 would be considered appropriate for the Subject Lands based on site-specific criteria determined through the Risk and Variability method and a factor of safety of 2.5 to 3.5 would be suggested based on the Ratio of Median Infiltration Rates Method. Based on the criteria, MTE has applied a Safety Factor of 3 to the above infiltration rates.

In situations where infiltration facilities are utilized in fill locations, the material utilized must have infiltration properties equal to or greater than the native material below.

3.0 STORMWATER MANAGEMENT CRITERIA

New developments are required to provide stormwater management in accordance with provincial and municipal policies. Relevant documents have been referenced in the design of the stormwater management plan for the Subject Lands; including:

- GRCA Policies for the Administration of Ontario Regulation 150/06 (GRCA, 2015);
- Stormwater Management Planning and Design Manual (MOE, 2003);
- The Torrance Creek Subwatershed Study (TCSS) Management Strategy (GRCA, 1999);
- Design Principles for Stormwater Management (City of Guelph, 1996); and
- The City of Guelph's Development Engineering Manual (City of Guelph, 2019).

Based on the above policies and relevant documents, background reports, agency requirements, and site-specific considerations, the following stormwater management criteria have been established for this study area:

- **Water Quality** – Provide an Enhanced (MOE, 2003) level of stormwater quality treatment prior to discharge to surface and groundwater systems.
- **Water Quantity** – Control the peak flow rates for all storms up to and including the 100-year storm event to the allowable pre-development rates; preserve hydraulic and hydrologic functions. Provide erosion control by maintaining existing flow duration characteristics.
- **Erosion Control** – Minimum 12 h extended retention of the 4h 25mm Chicago distribution rainfall event due to small overall drainage area (< 8ha) per MOE Section 4.6.2.
- **Thermal Impact** – Torrance Creek subwatershed supports cold water fish habitats, and therefore thermal impact assessment required with preventive and mitigation measures.
- **Water Balance**

  Infiltration – Maintain or exceed target groundwater volume inputs established within the TCSS through active and/or passive infiltration measures.

  Surface Water – Maintain existing surface water volume inputs into significant environmental features.

A brief discussion of each of these criteria is included in the following subsections.

3.1 Water Quality Control

The City's Engineering Design Guidelines and the TCSS state that all new developments shall provide an Enhanced (Level 1) level of quality treatment. The requirements for this level of quality control are established in Table 3.2 of the *Stormwater Management Planning and Design Manual* (MOE, 2003). The TCSS also identifies a water management objective of minimizing impacts to the receiving waterbody by establishing additional quality targets for development within the subwatershed, as follows:

- **Nutrients** – Total phosphorus should be 30ug/L or less; the use of the quality wet cell will reduce suspended solids and nutrients;
- **Dissolved Oxygen** – Dissolved oxygen (DO) concentration should not be less than 4mg/L during summer months. Reduction of temperature and nutrient concentrations will improve DO levels. Aeration of direct runoff may also be helpful; and
- **Temperature** – Temperatures within Torrance Creek should be below 25°C. New developments can mitigate temperature increases by maximizing infiltration and using underground drainage elements before discharging to surface water.

3.2 Water Quantity and Erosion Control

The primary objective of quantity control is to maintain hydraulic and hydrologic functions from existing conditions with regards to both surface and subsurface flows. As such, the Subwatershed Plan requires future development within the Torrance Creek Subwatershed to maintain post-development peak flows at existing levels for all storms up to and including the 100-year event. For the purpose of this analysis, controls for the Regional storm event will also be included to ensure a positive outlet to the receiving watercourse. Furthermore, existing major flow paths are to be maintained to provide overland flow under major flood events.

It should be noted that the TCSS states that controls should provide at least a 24-hour drawdown period for the 25mm storm event. However, the drainage area towards the proposed SWM facility is considered small (< 8ha), so the minimum detention time required is 12 hours as described in Section 4.6.2 of the MOE SWM manual. Controls have been adjusted within the facility to maximize drawdown as much as possible. With a 50mm diameter orifice placed at permanent pool, a drawdown time of 22.1 hours is achieved for the 25mm-4hr event.

3.3 Water Balance

3.3.1 Infiltration to Groundwater

The City requires that Low Impact Design (LID) best management practices be used to mimic pre-development recharge rates. Infiltration galleries are proposed to direct flows from roofs on-site wherever possible. The SWM facility will introduce an infiltration cell to further promote groundwater recharge. Additionally, increasing the amount of pervious landscaped areas throughout the Subject Lands will improve groundwater recharge by means of passive infiltration.

The TCSS divided the subwatershed into three stormwater management areas, with respect to groundwater recharge, and established specific infiltration targets for each. The Subject Lands fall within Area 2 (Arkell Road to Torrance Creek) and a minimum infiltration target of 150mm/year is recommended. Baseflow enhancement is encouraged on lands within this zone, especially if they are close to the creek.

An infiltration balance was performed to determine the pre-to-post development net change in infiltration, provided in **Appendix E.**

3.3.2 Surface Runoff

The City requires a monthly surface runoff water balance analysis to maintain existing surface water volume inputs into significant environmental features (i.e., the wetland).

An surface runoff calculation to the wetland was performed for the pre and post development conditions and it is provided in **Appendix E.**

3.4 Monitoring

As per the TCSS, both the performance of the proposed SWM facility and its effect on the adjacent wetland and shallow groundwater table must be monitored.

3.4.1 Facility Monitoring

Upon completion of construction, the SWM facility is to be inspected to ensure conformance to the design. Upon confirmation from Municipal staff that the facility is acceptable, it will be monitored for a period of 2 years under the ownership of the developer to confirm the performance of the facility meets the quantity and quality targets. Upon completion of the monitoring program, a monitoring report shall be submitted to the Municipality for approval prior to the assumption of the facility.

The SWM facility will be monitored for peak flow rates and flow durations, water levels and drawdown times, pollutant removal efficiency, and the quality/toxicity of the water discharging to the wetland complex. The facility performance should be compared to the theoretical (design) performance and any aberrations should be noted. Remedial action will be required if facility performance does not meet minimum requirements.

3.4.2 Groundwater Monitoring

Groundwater levels and quality shall be monitored. MTE has completed over 2 years of continuous monitoring of the groundwater levels; which will form the basis against which post-construction levels will be compared. It is recommended that groundwater samples be collected and tested for quality to provide a basis against which post-construction quality results may be compared. Post-construction quality samples should be taken from the shallow groundwater downstream of the SWM facility.

3.4.3 Wellhead Protection

The subject property is located near the City's Burke Well. Due to its close proximity, the southwestern portion of the Subject Lands fall within the well's 100.0m capture zone. As such, this area has been assigned a Wellhead Protection Area vulnerability score of 10. The remainder of the site; located outside of the 100.0m capture zone, is assigned a vulnerability score of 6 to 8. Therefore, it can be concluded that surface runoff and infiltrated runoff generated from the Subject Lands may need to be properly managed in order to protect the surrounding surface water and groundwater quality. Any on-site infiltration measures will be outside of the 100.0m capture zone.

During the detailed design stage of development, as well as during the respective Site Plan Application processes of the two condominium blocks, adequate measures may need to be implemented to satisfy the criteria set forth by the Drinking Water Source Protection Program. An example of such measures is the inclusion of a pond liner, either synthetic or clay, to protect the base of the SWM facility. This liner serves to prevent chloride laden stormwater, present in the wet pond, from infiltrating directly to the groundwater below. Additionally, salt application and snow storage plans may need to include specific strategies to minimize adverse effects to the groundwater supply. In more severe cases, additional measures may include strict restrictions on specific land uses, construction or operational activities, or the use and storage of certain materials.

4.0 PROPOSED DEVELOPMENT AND SWM STRATEGY

4.1 Proposed Area Grading

The grading design of the site was controlled by many factors, which include: servicing constraints (both sanitary and storm), matching existing and proposed boundary grades around the perimeter of the property, ensuring major storm event overland flows are directed towards the existing outlets and to the proposed SWM facility, minimizing impacts to the adjacent environmental feature, and minimizing the cut/fill deficit for the development. A preliminary finished grade contour plan illustrating site grading, **MTE Drawing 42063-104-AG1.1** is enclosed.

The Draft Plan of Subdivision includes two multi-residential stacked townhome development blocks. For the purpose of this report, their current conceptual designs have been incorporated into the overall SWM strategy for the subject lands. This will allow SWM criteria to be established for the two blocks and provide flow targets to which the blocks' respective SPA processes will have to adhere.

4.2 Post-Development Conditions

The proposed SWM plan implements a two-cell SWM facility with a wet cell and infiltration cell designed to accommodate stormwater runoff from the majority of the developed portions of the Subject Lands. The plan has been designed to meet the criteria presented in **Section 3.0** of this report. An overview of the stormwater management plan is discussed below.

The proposed development lands are comprised of residential land uses, a road right-of-way and a proposed SWM facility block. Blocks 1 and 3 will be developed through respective Site Plan Application processes and will require SWM Briefs, as well as grading and servicing designs in support of SPA. This information will identify the stormwater management criteria for the block and how the stormwater control measures will adhere to the Draft Plan of Subdivision SWM criteria as established in this report.

The location of the proposed SWM facility, along with contributing drainage areas, is illustrated in **Figure 4.1**. Minor storm runoff from the controlled portions of the contributing areas will be conveyed through the proposed storm sewer system to the proposed SWM facility. Roof areas from Blocks 1 and 3 will be directed to infiltration galleries prior to any overflow being released to the SWM facility. Excess runoff from the major storms will flow overland to the SWM facility via the proposed right-of-way and designated overland flow routes. Refer to MTE's *190-216 Arkell Road Functional Servicing Report*, dated June 2024, for further details of the storm sewer network.

The proposed SWM facility will utilize a wet cell and infiltration cell design. These measures will provide quality and quantity control of runoff prior to discharge into the adjacent Torrance Creek wetland. The contributing drainage area to the SWM facility (1.350ha) is separated into nine catchments and are described below (catchments 201-1 to 201-9).

Under post-development conditions, the Subject Lands and adjacent areas were delineated into 18 catchments. **Table 4.1** provides a brief description of each catchment area as well as the design parameters used in the hydrologic modelling. A detailed copy of the post-development catchment parameters and MIDUSS modelling output logs has been included in **Appendix C**.

Table 4.1 – Post-Development Catchment Parameters

Catchment	Description	Area (ha)	% Impervious	Flow Length (m)	Slope (%)
To Torrance Creek via SWM Facility					
201-1	Street A to SWMF	0.289	65.0	60	0.8
201-2	Block 2 to SWMF	0.137	84.0	10	2.0
201-3	Block 1 to SWMF	0.418	65.0	80	0.5
201-4	Block 1 Roofs to Gallery	0.128	100.0	10	2.0
201-5*	Block 1 minor to SWMF	0.020	85.0	10	3.0
201-6*	Street A to SWMF	0.057	75.0	20	3.0
201-7	Block 3 to SWMF	0.075	80.0	40	0.5
201-8	Block 3 Roofs to Gallery	0.032	100.0	10	2.0
201-9	Proposed SWMF	0.194	40.0	15	5.0
Directly to Torrance Creek (within Subject Lands)					
202-1	Wetland and buffers	0.863	0.0	50	0.5
202-2	Block 2 rear yards to Wetland	0.144	0.0	15	20.0
To Torrance Creek via Future Parklands					
203-1	Ex. embankment to future trail	0.198	30.0	10	20.0
203-2	Future park trail	0.216	0.0	180	0.5
203-3	Block 1 embankment to future trail	0.109	0.0	10	33.0
To Torrance Creek via Arkell Road					
204-2	Embankment and right-of-ways south to existing stone energy dissipators	0.111	36.0	25	5.0
	Total to Torrance Creek	**2.991**	**34.5**	-	-
To Arkell Road					
204-1	Embankments and right-of-way north to existing infiltration gallery	0.085	12.0	15	2.0
To Adjacent Ex. SWM Facility					
205	Street A/Dawes Avenue to ex. SWMF	0.032	70.0	20	1.3
	Site Total	**3.108**	**34.2**	**-**	**-**

*Note: Excess runoff from major storm events are directed to Arkell Road, where it is conveyed to existing roadside dissipation structures and discharged to Torrance Creek.

For most of the developed lands, stormwater runoff will drain internally through the use of constructed drainage swales and the proposed storm sewer network. Runoff from a small portion of the developed Subject Lands, largely consisting of sloped pervious areas, will flow uncontrolled directly to Torrance Creek.

There is an existing high point along Arkell Road near the driveway entrance to the 202 Arkell Road property. On the southwestern side of the high point (catchment 204-2), flow will be directed to an existing storm sewer system, and ultimately through a stone energy dissipater into the Torrance Creek wetland complex. As such, flow generated from uncontrolled portions of the Subject Lands will ultimately contribute to recharging surface water inputs to the wetland feature and subsurface water inputs to the local groundwater table. Storm flows within the proposed right-of-way in catchment 204-2 are to be directed to an oil-grit separator (OGS) prior to being directed into the existing storm sewer system. The OGS is further discussed in **Section 5.5**.

Northeast of the high point (catchment 204-1), the uncontrolled flows within the subject lands consist of grassed area within Block 1. These flows are directed towards existing storm sewers connected to an existing 40.0m long x 3.0m wide x 1.0m deep infiltration gallery located in the boulevard adjacent to the Arkell Meadows subdivision SWM facility. The existing gallery is further discussed in **Section 5.5**.

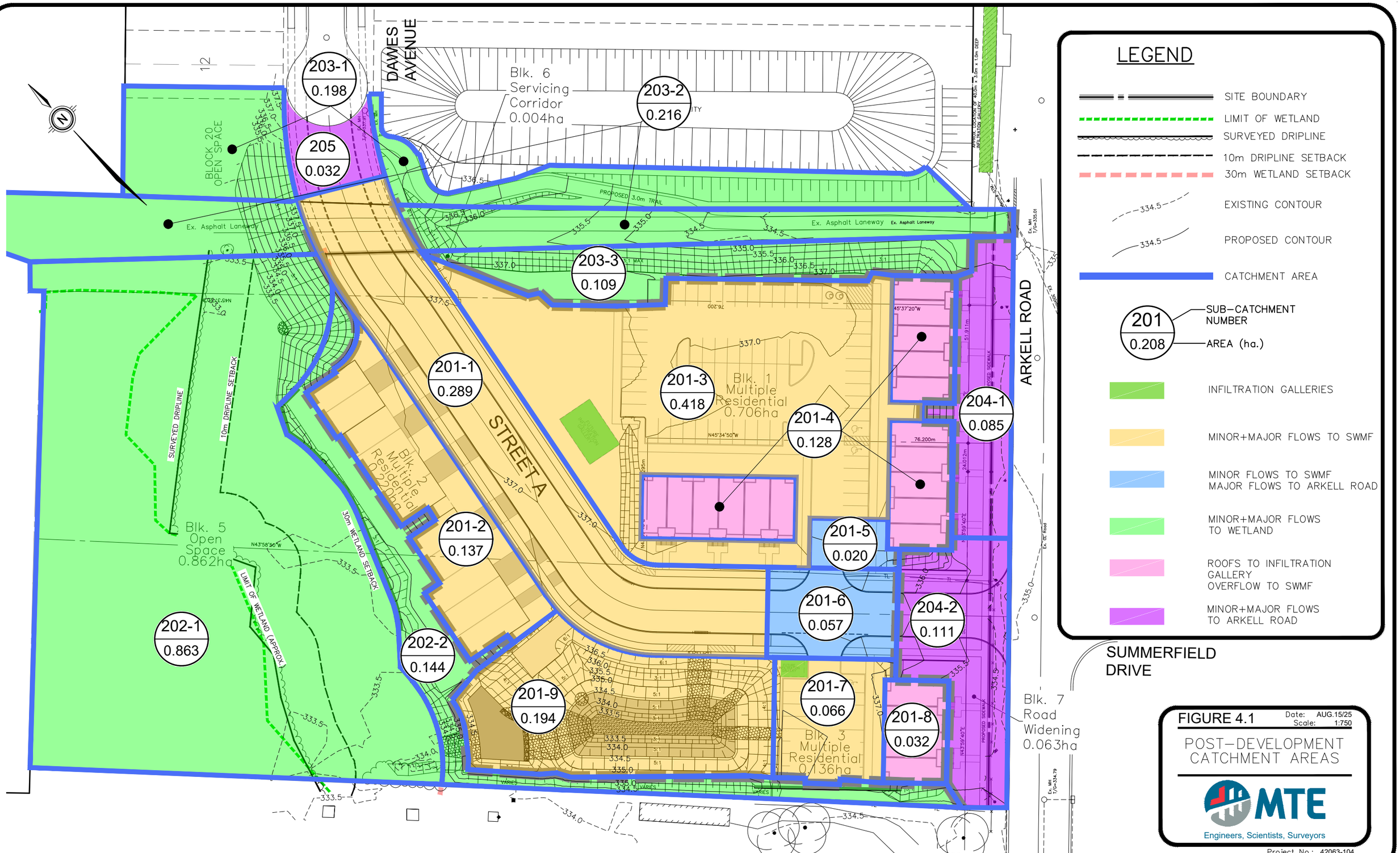

FIGURE 4.1

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POST-DEVELOPMENT CATCHMENT AREAS

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5.0 STORMWATER MANAGEMENT DESIGN

5.1 Hydrologic Modelling

As previously noted, a post-development hydrologic model was constructed, using the MIDUSS modelling software, to reflect the detailed drainage conditions proposed for the Subject Lands. This allows for the quantitative estimate of flows under the proposed development conditions. The proposed development conditions were modelled for the:

- Quality storm event (25mm depth, 4-hour Chicago distribution);
- 2, 5, 10, 25, 50, and 100-year return period rainfall events (3-hour Chicago distribution derived from the City's Intensity-Duration-Frequency (IDF) parameters); and
- Regional storm event (285mm depth, 48-hour Hurricane Hazel).

The IDF parameters, hydrologic parameters, and MIDUSS model output files for each of the pre- and post-development catchment areas are provided in **Appendix B** and **Appendix C**, respectively.

5.2 Water Quality

The proposed SWM facility has been designed as a wet pond with a permanent pool of 1.2m, followed by an infiltration cell. A planting scheme will be prepared that carefully selects plant species and their location in and around the pond and swale to stabilize banks, mitigate temperature increases, deter waterfowl from nesting within the area, and provide aesthetics and safety benefits.

Since most of the annual rainfall occurs in storms less than or equal to a 25mm event, the majority of sediment is also transported to the SWM facility in these less intense events.[1] Therefore, the wet cell is designed as a forebay to target the smaller flows prior to discharging into the infiltration cell. An OGS unit is also proposed immediately upstream of the forebay to provide a 'treatment train' approach that will provide the required Enhanced (Level 1) quality treatment as required by the City of Guelph and Ministry of Environment, Conservation, and Parks.

The OGS unit is designed to treat runoff from minor events (i.e., events ≤ 25mm) before releasing flows to the SWM facility. Flows from events greater than the 25mm storm may by-pass the OGS unit. Per the City's standards, the proposed OGS (model EF08) unit has been verified by the Canadian Environmental Technology Verification Program. It should be noted that the OGS can provide up to 60% TSS removal, but the City of Guelph considers OGS units to operate as capable of achieving 50% TSS removal efficiency. A detailed sizing report for the OGS unit is included in **Appendix D**. It should be noted that the invert of the pipe outletting into the SWMF was set to ensure no backwater effects occur within the OGS under the 25mm event.

The wet cell/forebay design is based on 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.

[1] From MOE-1994, Figure C.1: 62% less than 5mm, 78% less than 10mm, 90% less than 15mm, 95% less than 25mm

A forebay is typically designed to treat minor storm flows. As such, the design of the forebay assumed the flow into the forebay equals the flow through the forebay, which equals the flow out of the forebay. In using this approach, the recommended settling velocity of 0.0003 m/s (from MOE 2003) results in extremely large and unachievable forebay lengths. Therefore, the forebay is designed to satisfy the following four conditions:

- A settling length based on a settling velocity of 0.000013m/s using the main pond's peak discharge from the 25mm storm event and considering an enhanced treatment (70-80% TSS removal 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; and,
- 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 SWM 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 SWM Facility can be found in the forebay design calculations in **Appendix D**.

The total drainage area to the facility is 1.350ha at 69 % imperviousness. According to Table 3.2 from MOE's 2003 stormwater management guidelines, the infiltration cell requires 33.4m^3/ha infiltration storage; the water quality cell requires 222.75m^3/ha of storage volume. As described in Section 3.1, 40m^3/ha of is extended detention and the remainder is permanent pool. As such, the required extended detention volume is 54.0m^3, and a permanent pool volume of 246.7m^3. -

The drainage area towards the proposed SWM facility is considered small (< 8ha), so the minimum detention time required is 12 hours. As described in Section 4.6.2 of the MOE SWM manual, a minimum orifice size of 50mm is acceptable when the primary outlet is a perforated CSP riser. With a 50mm diameter orifice placed at permanent pool, a drawdown time of 15.7 and 23.8 hours is achieved for the MOE extended detention and 25mm-4hr events, respectively. It should be noted that this is a drawdown time between the wet pond and the infiltration cell.

The proposed SWM facility design characteristics are summarized in **Table 5.1**. Refer to **Appendix D** for the relevant design sheets and calculations (e.g. catchment parameters, imperviousness calculations, stage-storage discharge relationships, drawdown calculations, etc.). Refer to **Figure 5.1** to **Figure 5.3** for details of the proposed SWM facility.

Table 5.1 – Water Quality Control Details

General	Facility Characteristics
Stormwater Management Facility Type	Wet Pond/Infiltration Cell
Required MECP Water Quality Protection	Enhanced (Level 1)
Total Contributing Area	1.35ha
Imperviousness	69.0%
Bottom Elevation (Wet Cell)	333.20m
Storage	
Quantity and Erosion Control	
Drawdown Volume (based on 25mm-4hr event)	130m^3
Approximate Drawdown Time (based on 25mm-4hr event)	23.8 hours
Peak Release Rate (based on 25mm-4hr event)	0.003m^3/s
Outlet Controls	
1500mm diameter Perforated CSP Riser Manhole	
Orifice 1 Diameter	50mm Vertical
Orifice 1 Elevation	334.40m
Orifice 2 Diameter	250mm Horizontal
Orifice 2 Elevation	334.70m
Overflow Weir (Bottom Length / Side Slope)	2.0 / 10:1
Overflow Weir Elevation	335.20m

SWM FACILITY - PLAN VIEW

SCALE 1:250

FIGURE 5.1
Date: AUG.15/25
Scale: 1:250

190–216 ARKELL ROAD

SWM FACILITY PLAN

MTE
Engineers, Scientists, Surveyors

Project No.: 42063-104

August 15, 2025 — 12:40 p.m. — Plotted By: AHenderson

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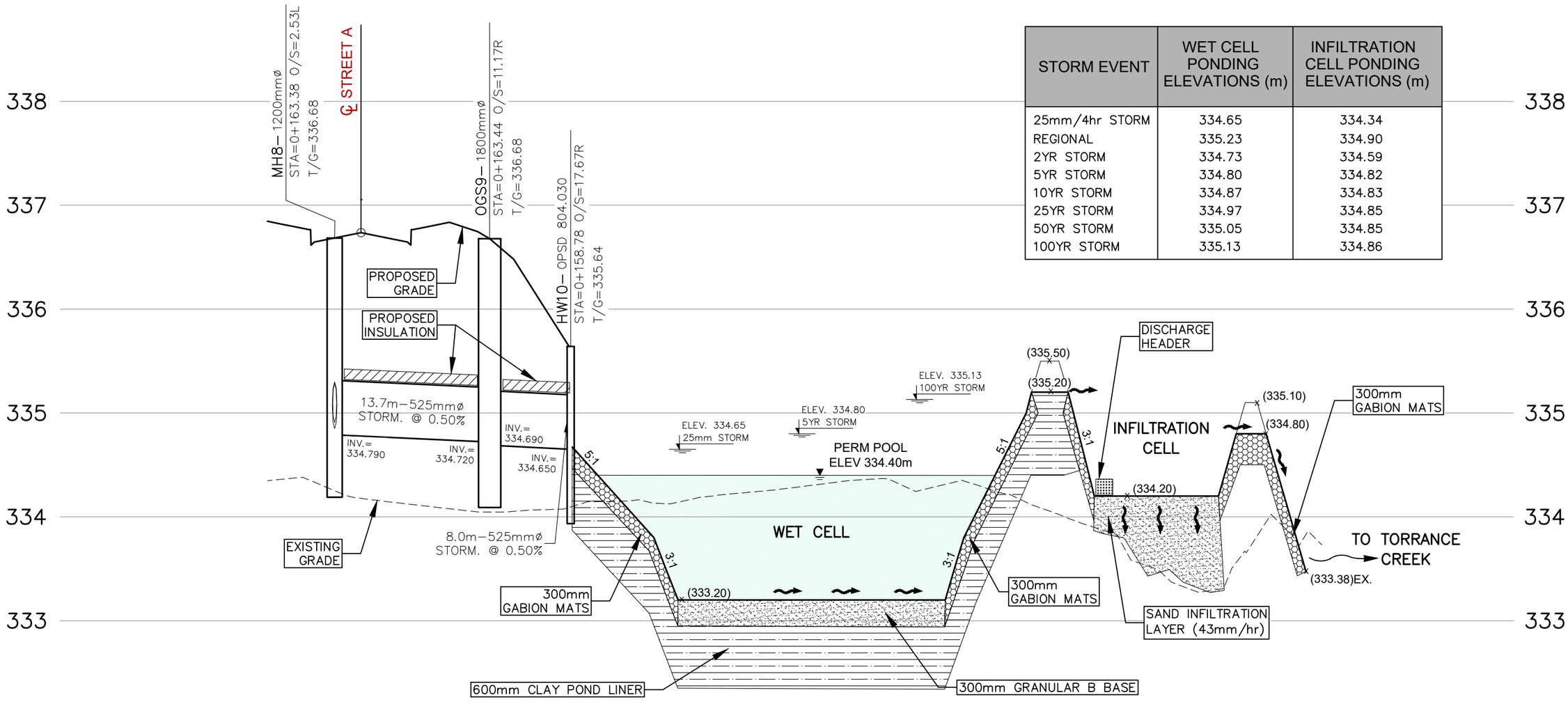


STORM EVENT	WET CELL PONDING ELEVATIONS (m)	INFILTRATION CELL PONDING ELEVATIONS (m)
25mm/4hr STORM	334.65	334.34
REGIONAL	335.23	334.90
2YR STORM	334.73	334.59
5YR STORM	334.80	334.82
10YR STORM	334.87	334.83
25YR STORM	334.97	334.85
50YR STORM	335.05	334.85
100YR STORM	335.13	334.86

STORM OUTLET PROFILE - SECTION A-A

SCALE H 1:400 V 1:40

FIGURE 5.2

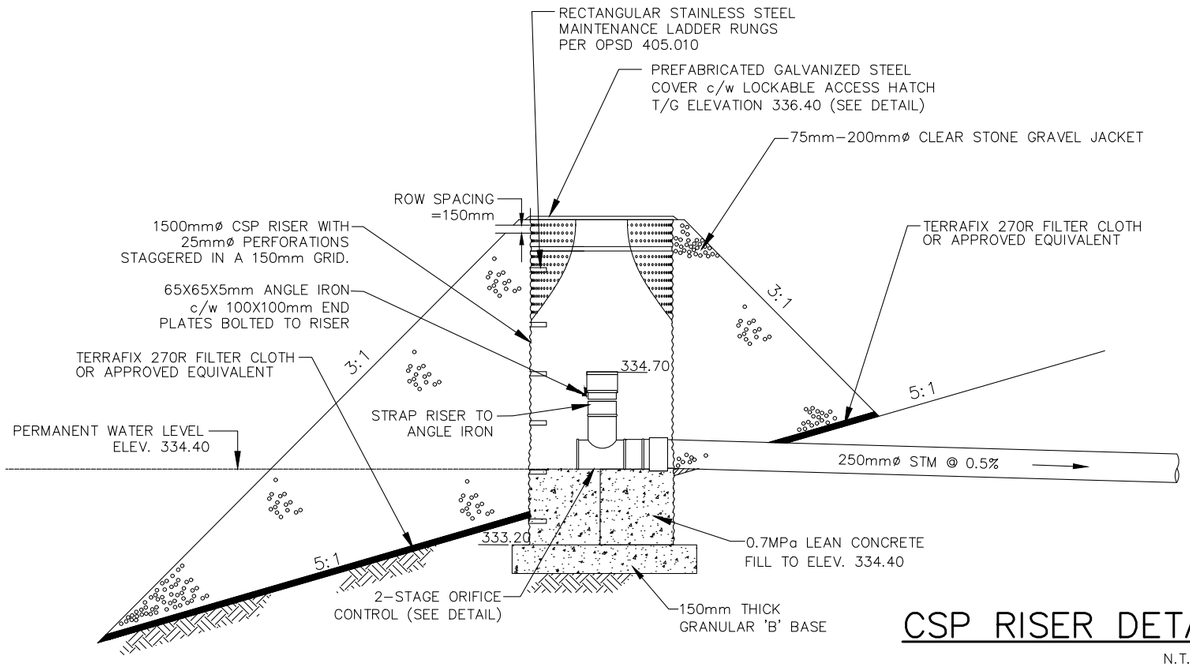
Date: AUG.15/25
Scale: AS NOTED

190–216 ARKELL ROAD

SWM FACILITY DETAILS 1

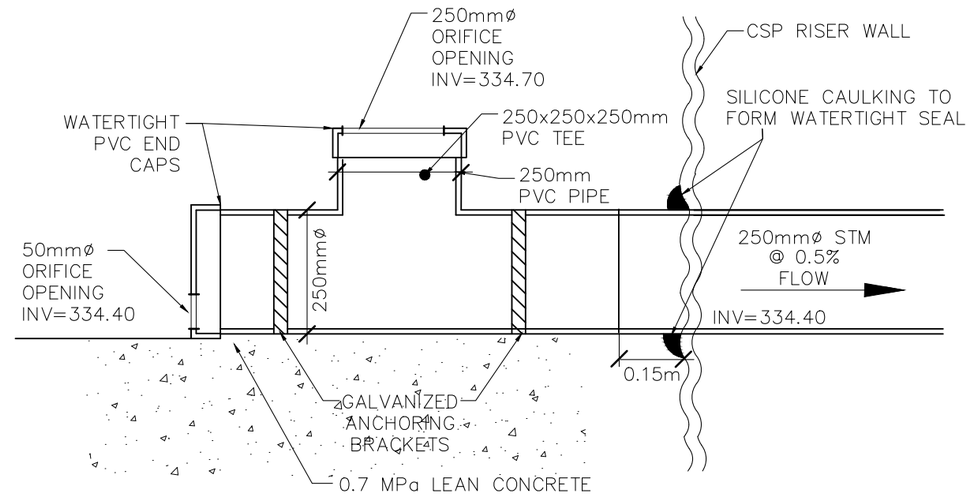
MTE
Engineers, Scientists, Surveyors

Project No.: 42063-104



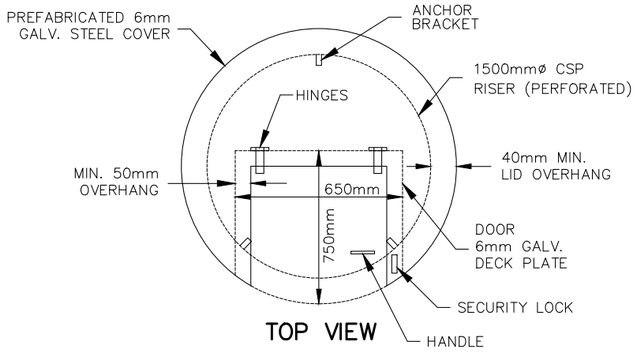
CSP RISER DETAIL

N.T.S.



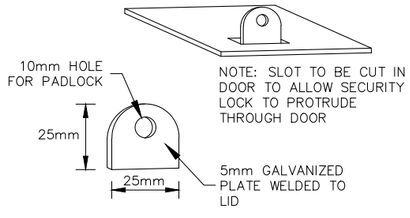
2–STAGE ORIFICE DETAIL FOR CSP RISER

N.T.S.

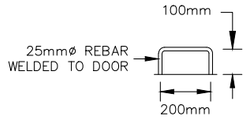


TOP VIEW

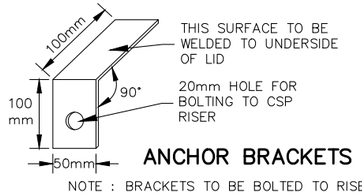
NOTE: CONTRACTOR SHALL SUPPLY A PAD LOCK ON THE STEEL COVER AND PROVIDE THE KEYS TO THE MUNICIPALITY AT THE TIME OF INSTALLATION



SECURITY LOCK

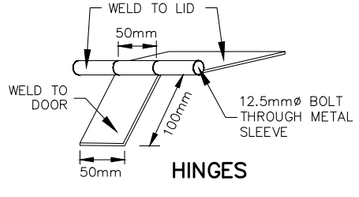


HANDLE



ANCHOR BRACKETS

NOTE : BRACKETS TO BE BOLTED TO RISER PIPE AND WELDED TO UNDERSIDE OF LID.



HINGES

GALVANIZED STEEL COVER DETAIL FOR 1500mmø CSP RISER

N.T.S.

FIGURE 5.3 Date: AUG.15/25 Scale: N.T.S

190–216 ARKELL ROAD

SWM FACILITY DETAILS 2

MTE Engineers, Scientists, Surveyors

Project No.: 42063-104

5.3 Water Quantity

Flows for all storm events will be conveyed to the proposed SWM facility by a combination of storm sewers and overland flow routes (road right-of-way and SWM facility access road). Roofed areas are directed towards infiltration galleries with overflow connections discharging into the storm sewer system and associated SWM facility where possible. Infiltration facilities have been included within the post-development MIDUSS modelling output, which is included in **Appendix C**.

Discharge from the facility will be controlled via a multi-staged outlet located in a 1500mm diameter perforated CSP riser manhole proposed within the wet pond cell. This structure will house a 250mm cap with multiple orifice controls attached to a 250mm diameter outlet pipe. As illustrated in **Figure 5.4**, the multi-staged outlet consists of a 250mm diameter cap/orifice plate with a 50mm diameter orifice at an elevation of 334.40m, and a 250mm diameter horizontal orifice at an elevation of 334.70m. Flows from the CSP riser manhole are then directed to the infiltration cell.

The infiltration cell downstream of the wet cell is sized to completely infiltrate the 25mm-4hr storm conveyed from the wet cell. Larger storms, up to and including the 100-year events, are infiltrated as much as possible up to an elevation of 334.80, where an overflow weir is provided. These flows are directed through the infiltration cell and ultimately to the Torrance Creek Wetland.

A summary of the preliminary stage-storage-discharge relationships of the proposed wet cell and infiltration cell is shown in **Table 5.2 and Table 5.3** below.

Table 5.2 – Wet Cell Stage-Storage-Discharge Summary

Elevation (m)	Discharge (m^3/s)	Volume (m^3)	Remarks
334.40	0.000	0	Permanent Pool Elevation / 50mm Orifice Invert
334.50	0.002	49	Contour
334.60	0.002	103	Contour
334.70	0.003	161	250mm Horizontal Orifice
334.80	0.047	225	Contour
334.90	0.065	295	Contour
335.00	0.079	370	Contour
335.10	0.091	450	Contour
335.20	0.102	534	2.0m Wide Emergency Overflow Weir
335.30	0.237	622	Freeboard
335.40	0.590	714	Freeboard
335.50	1.190	811	Freeboard

Table 5.3 – Infiltration Cell Stage-Storage-Discharge Summary

Elevation (m)	Discharge (m^3/s)	Volume (m^3)	Remarks
334.20	0.000	0	Bottom on Infiltration Cell
334.30	0.002	15	Contour
334.40	0.002	32	Contour
334.50	0.002	50	Contour
334.60	0.003	70	Contour
334.70	0.003	92	Contour
334.80	0.003	117	3.0m Wide Emergency Overflow Weir
334.90	0.155	143	Freeboard
335.00	0.463	172	Freeboard
335.10	0.906	202	Freeboard

The above discharges include an assumed constant infiltration rate of 43.0mm/hr across the surface area of the infiltration cell, equivalent to the average observed hydraulic conductivity at TP103-21 and TP104-21, with a factor of safety of 3 applied (per the Hydrogeological Assessment and in-situ infiltration testing). A summary of the peak flows and associated maximum ponding elevations in the wet cell and infiltration cell under the post-development conditions is provided in **Table 5.4 and Table 5.5** below. As previously mentioned, enough volume has been provided in the wet cell and infiltration cell to store the 100-year storm event to maximum elevation of 335.20m and 334.80m, respectively.

Table 5.4 – Summary of Peak Flows and Maximum Ponding Elevations in Wet Cell

Storm Event	Peak Outflow to Infiltration Cell (m^3/s)	Maximum Ponding Volume (m^3)	Maximum Ponding Elevation (m)
25mm Storm Event	0.003	130	334.65
2-Year Storm Event	0.014	177	334.73
5-Year Storm Event	0.044	222	334.80
10-Year Storm Event	0.059	273	334.87
25-Year Storm Event	0.075	345	334.97
50-Year Storm Event	0.085	407	335.05
100-Year Storm Event	0.094	473	335.13
Regional Storm Event	0.148	564	335.23

Table 5.5 – Summary of Peak Flows and Maximum Ponding Elevations in Infiltration Cell

Storm Event	Peak Infiltration Rate (m^3/s)	Peak Outflow to Torrance (m^3/s)	Maximum Ponding Volume (m^3)	Maximum Ponding Elevation (m)
25mm Storm Event	0.002	-	21	334.34
2-Year Storm Event	0.003	-	68	334.59
5-Year Storm Event	0.003	0.022	121	334.82
10-Year Storm Event	0.003	0.049	125	334.83
25-Year Storm Event	0.003	0.068	129	334.85
50-Year Storm Event	0.003	0.080	131	334.85
100-Year Storm Event	0.003	0.090	132	334.86
Regional Storm Event	0.003	0.143	142	334.90

A summary of the peak flows for the pre- and post-development conditions is summarized in **Table 5.6**. The MIDUSS output for the quantity control can be found in **Appendix C**.

Table 5.6 – Pre and Post-Development Peak Runoff Rates (m^3/s)

Drainage Area	25mm	2-year	5-year	10-year	25-year	50-year	100-year	Regional
Pre-Development								
Total to Wetland	**0.038**	**0.069**	**0.122**	**0.166**	**0.213**	**0.252**	**0.302**	**0.392**
SWMF Release (201-1 to 201-9)	-	-	0.022	0.049	0.068	0.080	0.090	0.143
201-5 (majors)	0.000	0.000	0.000	0.001	0.002	0.003	0.004	0.000
201-6 (majors)	0.000	0.000	0.000	0.003	0.006	0.009	0.012	0.000
202-1	0.003	0.011	0.032	0.054	0.088	0.116	0.144	0.119
202-2	0.001	0.003	0.009	0.014	0.021	0.028	0.035	0.020
203-1	0.009	0.015	0.023	0.031	0.039	0.048	0.058	0.026
203-2	0.000	0.001	0.003	0.005	0.008	0.011	0.014	0.027
203-3	0.001	0.003	0.007	0.012	0.017	0.022	0.026	0.014
204-2	0.006	0.009	0.013	0.017	0.020	0.024	0.030	0.016
Overland flows to Torrance Creek								
Total to Torrance*	**0.015**	**0.027**	**0.061**	**0.097**	**0.147**	**0.195**	**0.253**	**0.328**
Overland flows to Arkell Road								
204-1	0.001	0.002	0.005	0.007	0.011	0.014	0.019	0.012
Overland flows to Ex. Arkell Meadows SWMF								
205	0.003	0.005	0.007	0.009	0.010	0.012	0.013	0.005

*Note: The sums may not add up arithmetically. Flows are based on the timing and sum of hydrographs taken directly from MIDUSS.

To confirm adequate capacity within the existing receiving infrastructure on Arkell Road, Plan and Profile drawings were received from the City of Guelph. It was assumed that the receiving storm sewers were only receiving flow from within the right-of-way prior to the proposed development. These catchments are further discussed in **Section 5.5**.

5.3.1 Future Trail Block to Torrance Creek

Prior to outletting to Torrance Creek, Drainage Areas 203-1, 203-2, and 203-3 are directed towards the future trail block adjacent to the development. Due to the grading restrictions present in this vicinity, a series of drainage swales directing flows to catchbasins and catchbasin manholes are proposed to collect minor and major flows within the trail block. A detail showing the proposed grading within the trail block is provided in **MTE Drawing 42063-104-AG1.1**.

5.4 Block Level Infiltration Galleries

As previously stated, roofed areas are proposed to be directed towards block-level infiltration galleries prior to the proposed SWM Facility, if possible.

Block 1 is proposed to have all roof areas directed towards a proposed infiltration gallery adjacent to Street A within the proposed amenity area (as seen within the Draft Plan per **Appendix A**). An infiltration rate of 43mm/hr was utilized for the soils at the depth of the proposed gallery, based on the in-situ testing completed in the native sand and gravel in TP-103 and 104, and the findings of MW105 in which a similar soil stratigraphy was observed. A factor of safety of 3 was then applied. Based on the current draft plan, the gallery is proposed to be approximately 12m long, 8m wide, and 1m deep.

Block 3 is proposed to have all roof areas directed towards a proposed infiltration gallery adjacent to Street A and the proposed SWMF. An infiltration rate of 83mm/hr was calculated based on the results of in-situ testing completed within the native soils in TP102 at the depth of the proposed gallery, with a factor of safety of 3 applied. Based on the current draft plan, the gallery is proposed to be approximately 4m long, 5m wide, and 1m deep.

Due to Block 2 grading restrictions (i.e., the need for walkout lots with a rear-yard retaining wall), roofs are proposed to be directed towards the storm sewer system, ultimately directing flows into the proposed SWM Facility. The infiltration cell within the SWMF is described within **Section 5.3**.

The locations of the proposed infiltration galleries are provided in **Figure 4.1.**The infiltration galleries have been included within the MIDUSS modelling provided in **Appendix C**.

Additional information regarding the galleries is provided in **Appendix D**. No additional quality control is required within the multi-residential blocks.

Please note that all roof areas and associated sizing of the infiltration galleries is based on the current proposed conceptual block plans within the Draft Plan. All roof areas and infiltration gallery designs are to be confirmed during the detailed design phase.

5.5 Flows to Arkell Road

5.5.1 Drainage Area 204-1

Drainage Area 204-1 is approximately 0.09ha, consisting of grassed area within Block 1 and Arkell Road boulevard. These flows are directed towards existing storm sewers connected to an existing OGS, and ultimately to an existing 40.0m long x 3.0m wide x 1.0m deep infiltration gallery located in the boulevard adjacent to the Arkell Meadows subdivision SWM facility.

As-recorded plan and profile drawing G-66 for Arkell Road (dated November 3, 2008) was provided by the City of Guelph. Using typical storm sewer design, the capacity of the existing storm sewer system was confirmed. The storm sewer spreadsheet is provided within the Functional Servicing Report.

5.5.2 Drainage Area 204-2

Drainage Area 204-2 is approximately 0.12ha, consisting of a portion of Street A, grassed area within Block 2, and a portion of Arkell Road Boulevard. These flows will be directed to an existing storm sewer system, and ultimately through a stone energy dissipater into the Torrance Creek wetland complex. As such, flow generated from uncontrolled portions of the Subject Lands will ultimately contribute to recharging surface water inputs to the wetland feature and subsurface water inputs to the local groundwater table.

As previously stated, as-recorded plan and profile drawings were provided by the City of Guelph, and capacity within the system was confirmed, further described within the Functional Servicing Report.

Storm flows within the proposed right-of-way in catchment 204-2 are to be directed to an oil-grit separator (OGS) prior to being directed into the existing storm sewer system. The OGS unit is designed to treat runoff from minor events (i.e., events ≤ 25mm) before releasing flows to the existing sewer system via a 300mm storm sewer. Flows from events greater than the 25mm storm may by-pass the OGS unit. The proposed OGS (model EF4) unit has been verified by the Canadian Environmental Technology Verification Program and has been sized to provide at least 68% TSS removal. It should be noted that the City of Guelph will credit a maximum of 50% TSS removal, and the implementation of a treatment train will provide additional TSS removal. A detailed sizing report for the OGS unit is included in **Appendix D.**

5.6 Monthly Water Balance

A monthly water budget calculation has been conducted to assess potential hydrologic impacts the proposed development may have on the existing wetland. Refer to **Figure 2.2 & Figure 4.1** for pre and post-development catchments used in the analyses.

Annual precipitation for the Subject Lands was estimated to be approximately 923.2mm/year, based on data gathered at the Guelph Arboretum weather station between 1971 and 2000. Evapotranspiration, runoff and infiltration/recharge rates for pre- and post-development conditions were estimated using the Thornthwaite and Mather method (1957).

5.6.1 Infiltration to Groundwater

Under pre-development conditions, infiltrated water contributes to the shallow groundwater table, which flows southwesterly towards the nearby Burke Well.

As stated in Section 3, the TCSS divided the subwatershed into three stormwater management areas, with respect to groundwater recharge, and established specific infiltration targets for each area. The Subject Lands fall within Area 2 (Arkell Road to Torrance Creek) and has a minimum infiltration target of 150mm/year for any new development within this area.

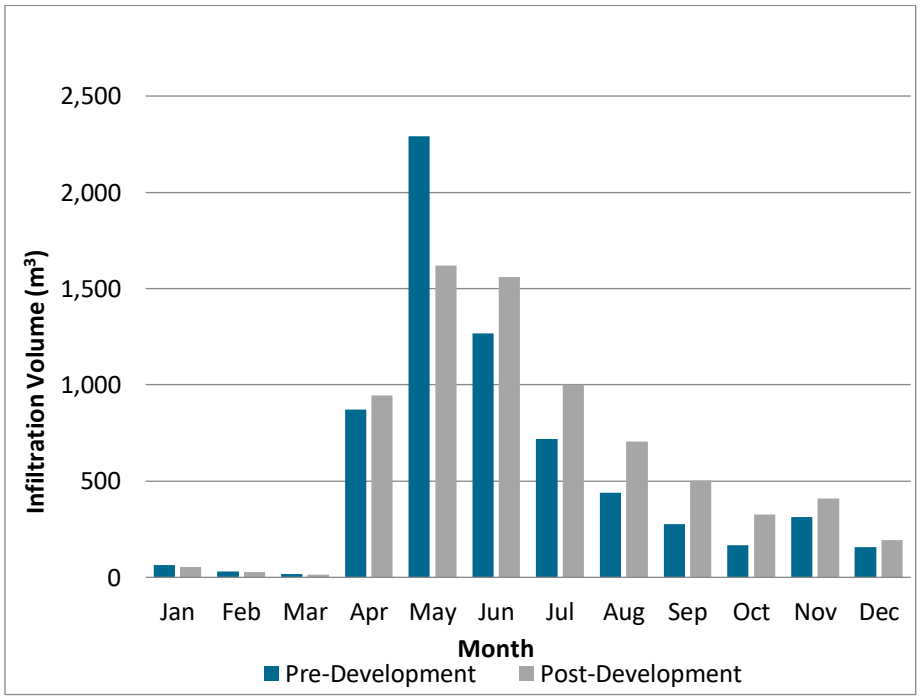
In pre-development conditions, the total drainage area is approximately 3.11ha in area and has an imperviousness coverage of approximately 13.8%. Through the Thornthwaite-Mather water balance, it was calculated that the Subject Lands have a passive infiltration of 6,616m^3/year in existing conditions. In post-development conditions, the drainage area to the wetland is reduced to 2.99ha and the impervious coverage is increased to 35% coverage.

The post-development Site area has a passive infiltration of 5,320m^3/year. Through the implementation of the rooftop infiltration galleries and the end-of-pipe infiltration cell, the total annual infiltration rate over the Site is increased to 7,346m^3/year. This equates to an equivalent infiltration rate across the Subject Lands of 236mm/year, exceeding the TCSS criteria of 150mm/year and providing an annual infiltration surplus.

The infiltration occurring from December to end of March only occurs over pervious area, as the infiltration galleries are conservatively assumed to be non-functioning during winter months. As shown in **Figure 5.4**, the pervious area infiltration over winter months is negligible compared to the total annual infiltration volume.

Please refer to the Water Balance Analysis in **Appendix E** for more details. As shown in the graph below, **Figure 5.4**, the infiltration volume increases from pre-development to post-development conditions through the implementation of the on-site infiltration galleries.

Figure 5.4 – Pre & Post-Development Monthly Infiltration Volume to Wetland Comparison

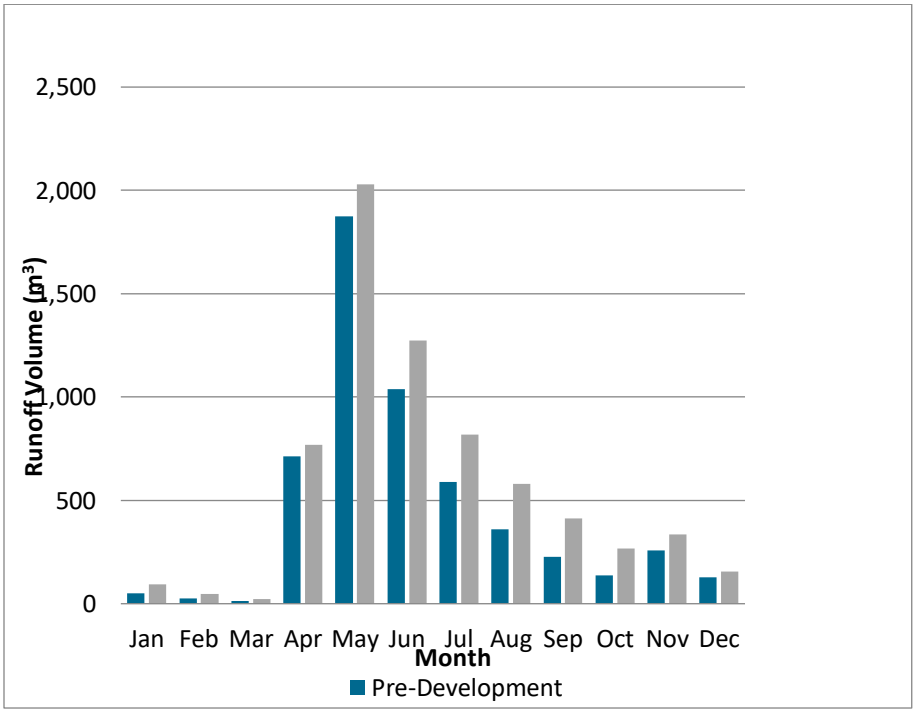


5.6.2 Surface Runoff to Wetland

Under pre-development conditions, the Subject Lands drain to the northwest and provide surface water inputs to the adjacent Torrance Creek wetland complex. Through the Thornthwaite-Mather water balance budget it was determined that approximately 5,413m^3/year of runoff is generated by the Subject Lands in the pre-development condition.

Under post-development conditions, the total area of the Subject Lands that drain to the wetland is approximately 2.99ha, and is inclusive of Catchments 201, 202, 203 and 204-2. Catchments 204 -1 and 205 will drain to Arkell Road without control. The increased impervious areas under post-development conditions result in an increased annual runoff volume to the adjacent wetland. Approximately 7,021m^3/year of runoff is generated by the Subject Lands and outlets to the Wetland under post-development conditions, which equates to an annual rate of 234.7mm/year of surface runoff depth to the wetland complex. On a monthly basis, pre-development volumes are generally sustained, as shown in the graph below, **Figure 5.5**.

Figure 5.5 – Pre & Post-Development Monthly Runoff Volume to Wetland Comparison



5.7 Erosion Assessment

The TCSS recommended that any newly proposed development throughout the watershed should 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. Using the smallest possible orifice size (50mm) per MECP standards, the proposed SWM facility has been designed to provide approximately 25-hour drawdown time on the 25mm storm event volume. A majority of the outflows from the wet cell are directed towards the infiltration cell prior to be discharged into Torrance Creek, therefore MTE does not believe this will cause any adverse effect to the downstream watercourse. The drawdown calculations are provided in **Appendix D.**

5.8 Landscape Design

A landscape design for the proposed SWM facility will be completed during the final design stage of the development. The reasons for landscaping these types of facilities are aesthetics, erosion protection and long-term bank stability, temperature increase mitigation, deterring waterfowl from nesting along their banks, and to limit pedestrian access into the permanent pool components. To that end, the facility will be designed in accordance to the City's stormwater management policies and guidelines for aesthetics, landscaping, and safety of stormwater management facilities.

5.9 Temperature Mitigation

The TCSS requires that the monitored temperature of the creek not exceed 25ºC. Analysis into the need of thermal mitigation was performed. It was determined that additional thermal mitigation measures in the form of a cooling trench and/or enhanced swales are not necessary or beneficial to the current proposed design.

A cooling trench would not be beneficial since the 25mm event is being infiltrated completely during summer months. This will effectively mitigate ~97% of rainfall events in the year. Any flows passing through the cooling trench would need to be in the order of 1-2L/s, which likely would not be feasible for event larger than the 25mm event. As for the remaining uncontrolled flow to Torrance Creek, the runoff is entirely from pervious areas, so it is not anticipated to be warmer than 25°C. Further, this direct drainage to the Creek will sheet flow through the existing vegetated buffer before reaching the creek, which will provide shading and effectively mimic an enhanced swale anyways.

6.0 MONITORING PROGRAM

A monitoring program will be implemented, which will serve to ensure that the stormwater management plan proposed within this report is implemented and performing at an acceptable level.

6.1 During Development Monitoring Program

This stage will begin at the commencement of area grading of the subdivision and will continue until 100% full buildout of the subdivision (i.e. road is urbanized, buildings are constructed, lots are sodded/landscaped, and open spaces are stabilized) of the subdivision. Monitoring of the SWM facility will include:

- Standard inspection of vegetation, structures, and general operation of hydraulic controls (observations of drawdown) within the SWM facility once installed. These inspections are to occur seasonally and typically after a significant rainfall event; and
- Regular inspection and maintenance of erosion and sediment control measures around and within the SWM facility.

Standard inspection and maintenance of the SWM facility will be provided throughout the "During Development" period.

6.2 Post-Development Monitoring Program

This period of the monitoring will begin following 100% full buildout of the subdivision. The purpose of this stage of the monitoring is to ensure that the SWM facility continues to operate as designed. Monitoring during this stage will include:

- Standard inspection of vegetation, structures, and general operation of hydraulic controls (observations of drawdown) within the SWM facility. These inspections are to occur seasonally and typically after a significant rainfall event; until assumption of the facility by the City.

It is recommended that, following completion of the developer's portion of the post-development monitoring program and assumption of the SWM facility by the City, the City continues with a post-development inspection and maintenance program to ensure the long-term effectiveness of the proposed SWM facility.

A monitoring program will be established within the SWM facility according to the requirements outlined within the *City of Guelph Stormwater Management Master Plan* prepared by AMEC Environment & Infrastructure (February 13, 2012).

7.0 EROSION AND SEDIMENT CONTROL MEASURES

Precautions will 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 site development.

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

- Placement of all sediment control fencing where required;
- Stripping and strategic placement of topsoil stockpiles. Placement of sediment control fencing around all stockpile areas;
- Construction of temporary sediment control ponds, which will serve as sedimentation basins for the site during construction;
- Construction of temporary swales to direct runoff to sedimentation basins, with rock check dams as required to control velocities; and
- Re-vegetation of completed areas as soon as possible after construction, including those areas not slated for construction within 60 days.

Where rock check dams are proposed to promote sedimentation and reduce velocities, clean aggregate is to be placed perpendicular to the direction of flow in the swale, with a small volume of excavation on the upstream side to provide storage for accumulated sediment.

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.

Storage consistent with the GRCA's requirement of 125m^3/ha of live and dead storage respectively (total 250m^3/ha), will be provided. This storage will be provided to ensure that suspended material will have ample time to settle out. In addition, the sediment basin will be sized with sufficient capacity to allow flows to pass without breaching. Once the active construction and grading activities have been completed, the sedimentation basins can be cleaned out.

Access to topsoil or fill storage areas will be located on the upstream side of storage piles. This practice will ensure continuity of the sediment control fencing in the downslope direction; which is most vulnerable to erosion and sediment deposition. Further, topsoil and hydroseed will be placed on all exposed areas following the completion of grading activities.

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 City and GRCA. If it is found that the erosion and sediment control measures are not working adequately, they shall be augmented to the satisfaction of the City and the GRCA, based on field decisions.

8.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the foregoing analysis, it is concluded that:

- The stormwater management strategy herein outlined will provide the Subject Lands with appropriate levels of quality, quantity, and erosion controls to meet the criteria set out by the Torrance Creek Subwatershed Study Management Strategy, the City of Guelph, and the Grand River Conservation Authority;
- Enhanced quality control of stormwater runoff can be provided by the proposed stormwater management strategy, which includes: an OGS, a wet pond cell, and an infiltration cell;
- Quantity control targets for post-development peak flows rates to the adjacent wetland can be achieved in the proposed SWM facility for all storm events up to and including the Regional storm event;
- Infiltration targets defined within the TCSS can be satisfactorily met through the use of passive and active infiltration measures;
- Monthly surface water contributions to the wetland will be maintained or exceeded; and
- Post-development erosion will be mitigated by the use of extended detention of the 25mm storm event.

The findings of this report and the above conclusions lead to the following recommendations:

- Upon completion of detailed design, a quality/quantity control SWM facility be constructed to provide control of stormwater as described in Sections 4.0 and 5.0 of this report; and
- That sediment and erosion controls during construction will be implemented as described in Section 7.0 of this report.

All of which is respectfully submitted,

MTE Consultants Inc.

Valentina Lazic, P.Eng.
Design Engineer
519-743-6500
vlazic@mte85.com

jng

https://mte85.sharepoint.com/sites/42063-104/Shared Documents/02 - Reports/MTE Reports/SWM/2025-08/42063-104_rpt_2025-08-14_Preliminary SWM Report.docx

Appendix A

Draft Plan of Subdivision (Reduced)

DRAFT PLAN OF SUBDIVISON

Legal Description

PART OF LOT 6, CONCESSION 8, GEOGRAPHICAL TOWNSHIP OF PUSLINCH.
CITY OF GUELPH

Owner's Certificate

I HEREBY AUTHORIZE MACNAUGHTON HERMSEN BRITTON CLARKSON PLANNING LIMITED TO SUBMIT THIS PLAN FOR APPROVAL.

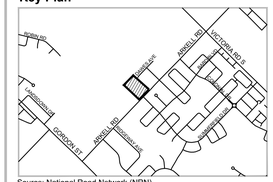
DATE:_____ _____

Surveyor's Certificate

I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LAND TO BE SUBDIVIDED ON THIS PLAN AND THEIR RELATIONSHIP TO THE ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN.

DATE:_____ _____

Key Plan



Additional Information Required Under Section 51(17) of the Planning Act R.S.O. 1990, c.P.13 as Amended

A. AS SHOWN	B. AS SHOWN	C. AS SHOWN
D. MULTIPLE RESIDENTIAL, OPEN SPACE		
E. AS SHOWN	F. AS SHOWN	G. AS SHOWN
H. MUNICIPAL WATER SUPPLY	I. LOAM	J. AS SHOWN
K. ALL SERVICES AS REQUIRED	L. AS SHOWN	

Area Schedule **61T_____**

Description	Lots/Blocks	Units	Area (ha)
Multiple Residential	1-3	80 (Stacked TH) 11 (Townhouse)	1.047
Stormwater Management	4		0.231
Open Space	5		0.830
Servicing Corridor	6		0.003
Road Widening	7		0.066
0.3m Reserve	8-10		0.004
Roads			0.343
Total	**10**	**91**	**2.524**

Notes

1. All dimensions are in metres unless otherwise shown
2. Dripline Limits - Natural Resource Solutions Inc. (NRSI) June, 2016
3. Wetland Limits - Natural Resource Solutions Inc. (NRSI) August, 2016
4. Topographic Survey/ Existing conditions prepared by MTE Consultants Inc. February, 2017.
5. Surveyed property boundary prepared by J.D. Barnes Ltd. February, 2025.
6. Surounding parcel boundaries are approximate/ taken from Vumap (First Base Solutions) aerial imagery
7. Unit yield based on Conceptual Site Plan prepared by MHBC Planning
8. Contains information licensed under the Open Government Licence – City of Guelph.

Revision No.	Date	Issued / Revision	By
15.	March 18, 2025	Revised Boundary Survey;	G.C.
14.	May 13, 2024	Revised Draft Plan;	G.C.
13.	April 27, 2022	Revisions to multiple blocks;	G.C.
12.	April 28, 2021	Adjust Stormwater, Residential Blocks;	G.C.
11.	January 28, 2021	Stacked Townhouse Orientation;	G.C.
10.	March 18, 2020	SWM revision;	G.C.
9.	January 6, 2020	Update/ Issued for Review;	G.C.
8.	December 11, 2019	Update/ Issued for Review;	G.C.
7.	October 9, 2019	Update/ Issued for Review;	G.C.
6.	July 8, 2019	Update/ Issued for Review;	G.C.
5.	December 6, 2018	Update/ Issued for Review;	G.C.
3.	September 12, 2018	Update/ Issued for Review;	G.C.
2.	July 4, 2017	Update/ Issued for Review;	G.C.
1.	March 13, 2017	Issued for Review;	G.C.

MHBC PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE
200-540 BINGEMANS CENTRE DR. KITCHENER, ON, N2B 3X9 | P: 519.576.3650 F: 519.576.0121 | WWW.MHBCPLAN.COM

Approval Stamp	**Date** March 18, 2025
	File No. 15246A
	Plan Scale 1:400 (36x24)
	Drawn By G.C.
Project Arkell Road - Guelph	**Checked By** D.A.
Applicant Crescent Homes 151 Curzon Crescent Guelph, ON. N1K OB3 P: 647.523.6487	**Other** north
File Name Draft Plan of Subdivision	**Dwg No.** 1 of 1
Scale Bar 2.5 0 5 10 25m	

K:\15246A-Crescent Homes-Arkell Road-Guelph\DP\Draft Plan Mar18_2025.dwg

Appendix B

Existing Conditions Catchment Parameters and MIDUSS Modelling

Arkell Road
STORMWATER MANAGEMENT
Guelph, Ontario

Project Number: 42063-104
Date: 25/03/2024
Design By: CVP
File: Q:\42063\104\SWM\november 2023\42063-104 Master SWM Facility Design Sheet_updated 20240325_cvp.xlsx

HYDROLOGIC PARAMETERS
Pre-Development Conditions

Sub-Catchment Number	Area (ha)	Overland Slope (%)	Overland Length (m)	SCS Curve Number Pervious (AMC II)	SCS Curve Number Pervious (AMC III)	SCS Curve Number Impervious	Percent Impervious (%)	Land Use	Comment
Within Subject Lands									
101	1.714	0.5	150	74	87	98	16%	Residential	Ex. Residential and Yards
102	0.863	0.5	50	74	87	98	0%	Wetland	Wetland/Forested Area/Torrance Creek
	2.577						10.6%		
Outside of Subject Lands									
103	0.240	0.8	225	74	87	98	30%	Residential	Private laneway
104	0.234	20	8	74	87	98	0%	SWMF	Ex. SWMF + Embnakments
105	0.057	0.5	125	74	87	98	20%	Residential	Driveways + Ditch within Right-of-way
	0.531						15.7%		
Total	**3.108**						**11.5%**		

Post-Development Conditions

Sub-Catchment Number	Area (ha)	Overland Slope (%)	Overland Length (m)	SCS Curve Number Pervious (AMC II)	SCS Curve Number Pervious (AMC III)	SCS Curve Number Impervious	Percent Impervious (%)	Land Use	Comment
To SWMF									
201-1	0.289	0.80	60	74	87	98	65%	Right-of-way	Street A Right-of-way to SWMF
201-2	0.137	2.00	10	74	87	98	84%	Residential	Block 3 to SWMF
201-3	0.418	0.50	80	74	87	98	65%	Residential	Block 1 to SWMF
201-4	0.128	2.00	10	74	87	98	100%	Residential	Block 1 Roofs to Gallery, overflow to SWMF
201-5	0.020	3.00	10	74	87	98	85%	Residential	Block 1 to SWMF, Major flows to Arkell; Street A
201-6	0.057	3.00	20	74	87	98	75%	Residential	Street A right of way, major to Arkell
201-7	0.075	0.50	40	74	87	98	80%	Residential	Block 2 to SWMF
201-8	0.032	2.00	10	74	87	98	100%	Residential	Block 2 Roofs to Gallery, overflow to SWMF
201-9	0.194	0.50	15	74	87	98	40%	SWMF	Proposed SWMF
	1.350						69.0%		
Subject Lands to Torrance Creek									
202-1	0.863	0.50	50	74	87	98	0%	Wetland	Wetland/Forested Area/Torrance Creek
202-2	0.144	20.00	15	74	87	98	0%	Residential	Block 3 Rear Yards to Torrance Creek
	1.007						0.0%		
Areas to Torrance Creek via Future Trail Block									
203-1	0.198	20	10	74	87	98	30%	Park	Embankments to Trail
203-2	0.216	0.5	180	74	87	98	0%	Park	Future Park Trail
203-3	0.109	33	10	74	87	98	0%	Residential	Block 1 Embankment
	0.523						11.4%		
To Arkell Road									
204-1	0.085	2	15	74	87	98	12%	Residential/RoW	Flows to Arkell Road Infil Gallery
204-2	0.111	5	25	74	87	98	36%	Residential/RoW	Flows to Arkell Road Stone Energy Dissipators
	0.196						25.6%		
To Adjacent Ex. SWMF									
205	0.032	1.25	20	74	87	98	70.0%	Residential/RoW	Dawes Avenue to adjacent SWMF
Total	**3.108**						**34.2%**		

IDF PARAMETERS
City of Guelph

Frequency (Years)	a	b	c	Comment
2	743	6.0	0.7989	
5	1,593	11.0	0.8789	
10	2,221	12.0	0.9080	
25	3,158	15.0	0.9355	
50	3,886	16.0	0.9495	
100	4,688	17.0	0.9624	

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"               MIDUSS Output ----------------------------------------------->"
"               MIDUSS version                          Version 2.25  rev. 473"
"               MIDUSS created                    Sunday, February 7, 2010"
"          10   Units used:                                      ie METRIC"
"               Job folder:            Q:\42063\104\SWM\September 2021\MIDUSS\"
"                                                                      PRE"
"               Output filename:                              25mm4hrPRE.in"
"               Licensee name:                                           A"
"               Company                                         Microsoft"
"               Date & Time last used:             9/24/2021 at 2:02:56 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      240.000   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"
"      240.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           71.966    mm/hr"
"             Total depth                 25.028    mm"
"           5   25hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         101   Catchment 101"
"       16.000   % Impervious"
"        1.714   Total Area"
"      150.000   Flow length"
"        0.500   Overland Slope"
"        1.440   Pervious Area"
"      150.000   Pervious length"
"        0.500   Pervious slope"
"        0.274   Impervious Area"
"      150.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.098   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.806   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.029     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           1.440      0.274      1.714      hectare"
"             Time of concentration  174.896    10.539     74.717     minutes"
"             Time to Centroid       347.290    133.825    217.179    minutes"
"             Rainfall depth         25.028     25.028     25.028     mm"
"             Rainfall volume        360.34     68.64      428.97     c.m"
"             Rainfall losses        22.566     4.855      19.732     mm"
"             Runoff depth           2.462      20.172     5.295      mm"
"             Runoff volume          35.44      55.32      90.76      c.m"
"             Runoff coefficient     0.098      0.806      0.212      "
"             Maximum flow           0.002      0.029      0.029      c.m/sec"
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"           4   Add Runoff "
"                    0.029     0.029     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                    0.029     0.029     0.029     0.000"
" 40          HYDROGRAPH   Combine    900"
"           6   Combine "
"         900   Node #"
"               Torrence Creek"
"             Maximum flow                  0.029    c.m/sec"
"             Hydrograph volume            90.761    c.m"
"                    0.029     0.029     0.029     0.029"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.029     0.000     0.029     0.029"
" 33          CATCHMENT 102"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         102   Catchment 102"
"       0.000   % Impervious"
"       0.863   Total Area"
"      50.000   Flow length"
"       0.500   Overland Slope"
"       0.863   Pervious Area"
"      50.000   Pervious length"
"       0.500   Pervious slope"
"       0.000   Impervious Area"
"      50.000   Impervious length"
"       0.500   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.098   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   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     0.029     0.029 c.m/sec"
"             Catchment 102          Pervious   Impervious Total Area "
"             Surface Area           0.863      0.000      0.863      hectare"
"             Time of concentration  90.470     5.452      90.469     minutes"
"             Time to Centroid       248.117    125.802    248.116    minutes"
"             Rainfall depth         25.028     25.028     25.028     mm"
"             Rainfall volume        215.99     0.00       215.99     c.m"
"             Rainfall losses        22.566     4.865      22.566     mm"
"             Runoff depth           2.461      20.162     2.461      mm"
"             Runoff volume          21.24      0.00       21.24      c.m"
"             Runoff coefficient     0.098      0.000      0.098      "
"             Maximum flow           0.002      0.000      0.002      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.002     0.002     0.029     0.029"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                    0.002     0.002     0.002     0.029"
" 40          HYDROGRAPH   Combine    900"
"           6   Combine "
"         900   Node #"
"               Torrence Creek"
"             Maximum flow                  0.029    c.m/sec"
"             Hydrograph volume           112.003    c.m"
"                    0.002     0.002     0.002     0.029"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
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```
"                   0.002     0.000     0.002     0.029"
" 33          CATCHMENT 103"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         103   Catchment 103 - Laneway"
"      30.000   % Impervious"
"       0.240   Total Area"
"     225.000   Flow length"
"       0.800   Overland Slope"
"       0.168   Pervious Area"
"     225.000   Pervious length"
"       0.800   Pervious slope"
"       0.072   Impervious Area"
"     225.000   Impervious length"
"       0.800   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.098   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.807   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                   0.007     0.000     0.002     0.029 c.m/sec"
"             Catchment 103          Pervious   Impervious Total Area "
"             Surface Area           0.168      0.072      0.240      hectare"
"             Time of concentration  193.730    11.674     51.980     minutes"
"             Time to Centroid       369.414    135.621    187.381    minutes"
"             Rainfall depth         25.028     25.028     25.028     mm"
"             Rainfall volume        42.05      18.02      60.07      c.m"
"             Rainfall losses        22.566     4.828      17.245     mm"
"             Runoff depth           2.462      20.200     7.783      mm"
"             Runoff volume          4.14       14.54      18.68      c.m"
"             Runoff coefficient     0.098      0.807      0.311      "
"             Maximum flow           0.000      0.007      0.007      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.007     0.007     0.002     0.029"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.007     0.007     0.007     0.029"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               External"
"             Maximum flow                 0.007    c.m/sec"
"             Hydrograph volume           18.679    c.m"
"                   0.007     0.007     0.007     0.007"
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"           2   Start - New Tributary"
"                   0.007     0.000     0.007     0.007"
" 33          CATCHMENT 104"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         104   Catchment 104 - Ex. SWMF+Embankment"
"       0.000   % Impervious"
"       0.234   Total Area"
"       8.000   Flow length"
"      20.000   Overland Slope"
"       0.234   Pervious Area"
"       8.000   Pervious length"
"      20.000   Pervious slope"
"       0.000   Impervious Area"
"       8.000   Impervious length"
"      20.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.098   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   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     0.007     0.007 c.m/sec"
"             Catchment 104          Pervious   Impervious Total Area "
"             Surface Area           0.234      0.000      0.234      hectare"
"             Time of concentration  9.962      0.600      9.962      minutes"
"             Time to Centroid       153.643    118.857    153.642    minutes"
"             Rainfall depth         25.028     25.028     25.028     mm"
"             Rainfall volume        58.56      0.00       58.56      c.m"
"             Rainfall losses        22.580     6.253      22.580     mm"
"             Runoff depth           2.447      18.775     2.447      mm"
"             Runoff volume          5.73       0.00       5.73       c.m"
"             Runoff coefficient     0.098      0.000      0.098      "
"             Maximum flow           0.002      0.000      0.002      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.002     0.002     0.007     0.007"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.002     0.002     0.002     0.007"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               External"
"             Maximum flow                  0.009    c.m/sec"
"             Hydrograph volume            24.406    c.m"
"                   0.002     0.002     0.002     0.009"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.002     0.000     0.002     0.009"
" 33          CATCHMENT 105"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         105   Catchment 105 - Driveways + Ditch Within RoW"
"      20.000   % Impervious"
"       0.057   Total Area"
"     125.000   Flow length"
"       0.500   Overland Slope"
"       0.046   Pervious Area"
"     125.000   Pervious length"
"       0.500   Pervious slope"
"       0.011   Impervious Area"
"     125.000   Impervious length"
"       0.500   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.098   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.804   Impervious Runoff coefficient"
```

```
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                  0.001     0.000     0.002     0.009 c.m/sec"
"             Catchment 105          Pervious   Impervious Total Area "
"             Surface Area           0.046      0.011      0.057      hectare"
"             Time of concentration  156.772    9.447      57.847     minutes"
"             Time to Centroid       326.000    132.108    195.806    minutes"
"             Rainfall depth         25.028     25.028     25.028     mm"
"             Rainfall volume        11.41      2.85       14.27      c.m"
"             Rainfall losses        22.566     4.903      19.034     mm"
"             Runoff depth           2.461      20.125     5.994      mm"
"             Runoff volume          1.12       2.29       3.42       c.m"
"             Runoff coefficient     0.098      0.804      0.239      "
"             Maximum flow           0.000      0.001      0.001      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.001     0.001     0.002     0.009"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.001     0.001     0.001     0.009"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               External"
"             Maximum flow                  0.010    c.m/sec"
"             Hydrograph volume            27.823    c.m"
"                  0.001     0.001     0.001     0.010"
" 40          HYDROGRAPH   Confluence    800"
"           7   Confluence "
"         800   Node #"
"               External"
"             Maximum flow                  0.010    c.m/sec"
"             Hydrograph volume            27.823    c.m"
"                  0.001     0.010     0.001     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.001     0.010     0.010     0.000"
" 40          HYDROGRAPH   Combine    900"
"           6   Combine "
"         900   Node #"
"               Torrence Creek"
"             Maximum flow                  0.038    c.m/sec"
"             Hydrograph volume           139.825    c.m"
"                  0.001     0.010     0.010     0.038"
" 40          HYDROGRAPH   Confluence    900"
"           7   Confluence "
"         900   Node #"
"               Torrence Creek"
"             Maximum flow                  0.038    c.m/sec"
"             Hydrograph volume           139.825    c.m"
"                  0.001     0.038     0.010     0.000"
" 38          START/RE-START TOTALS 900"
"           3   Runoff Totals on EXIT"
"             Total Catchment area                    3.108    hectare"
"             Total Impervious area                   0.358    hectare"
"             Total % impervious                     11.507"
" 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:\42063\104\SWM\September 2021\MIDUSS\"
"                                                                        PRE"
"                Output filename:                                    2yrPRE.in"
"                Licensee name:                                              A"
"                Company                                            Microsoft"
"                Date & Time last used:                9/24/2021 at 2:04:39 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   005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           101   Catchment 101"
"        16.000   % Impervious"
"         1.714   Total Area"
"       150.000   Flow length"
"         0.500   Overland Slope"
"         1.440   Pervious Area"
"       150.000   Pervious length"
"         0.500   Pervious slope"
"         0.274   Impervious Area"
"       150.000   Impervious length"
"         0.500   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        74.000   Pervious SCS Curve No."
"         0.163   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.924   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.852   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                   0.049     0.000     0.000     0.000 c.m/sec"
"               Catchment 101          Pervious   Impervious Total Area "
"               Surface Area           1.440      0.274      1.714      hectare"
"               Time of concentration  109.757    8.796      59.477     minutes"
"               Time to Centroid       235.201    101.169    168.451    minutes"
"               Rainfall depth         34.259     34.259     34.259     mm"
"               Rainfall volume        493.24     93.95      587.19     c.m"
"               Rainfall losses        28.657     5.085      24.886     mm"
"               Runoff depth           5.601      29.174     9.373      mm"
"               Runoff volume          80.64      80.01      160.65     c.m"
"               Runoff coefficient     0.163      0.852      0.274      "
"               Maximum flow           0.007      0.048      0.049      c.m/sec"
" 40            HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                   0.049     0.049     0.000     0.000"
```

```
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.049     0.049     0.049     0.000"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                Torrence Creek"
"               Maximum flow                  0.049    c.m/sec"
"               Hydrograph volume           160.650    c.m"
"                    0.049     0.049     0.049     0.049"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.049     0.000     0.049     0.049"
" 33          CATCHMENT 102"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          102   Catchment 102"
"        0.000   % Impervious"
"        0.863   Total Area"
"       50.000   Flow length"
"        0.500   Overland Slope"
"        0.863   Pervious Area"
"       50.000   Pervious length"
"        0.500   Pervious slope"
"        0.000   Impervious Area"
"       50.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.163   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   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"
"                    0.007     0.000     0.049     0.049 c.m/sec"
"             Catchment 102          Pervious   Impervious Total Area "
"             Surface Area           0.863      0.000      0.863      hectare"
"             Time of concentration  56.775     4.550      56.775     minutes"
"             Time to Centroid       171.819    94.883     171.819    minutes"
"             Rainfall depth         34.259     34.259     34.259     mm"
"             Rainfall volume        295.65     0.00       295.65     c.m"
"             Rainfall losses        28.658     5.281      28.658     mm"
"             Runoff depth           5.600      28.978     5.600      mm"
"             Runoff volume          48.33      0.00       48.33      c.m"
"             Runoff coefficient     0.163      0.000      0.163      "
"             Maximum flow           0.007      0.000      0.007      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.007     0.007     0.049     0.049"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.007     0.007     0.007     0.049"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                Torrence Creek"
"               Maximum flow                  0.050    c.m/sec"
"               Hydrograph volume           208.979    c.m"
"                    0.007     0.007     0.007     0.050"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.007     0.000     0.007     0.050"
" 33          CATCHMENT 103"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          103   Catchment 103 - Laneway"
"       30.000   % Impervious"
"        0.240   Total Area"
"      225.000   Flow length"
"        0.800   Overland Slope"
"        0.168   Pervious Area"
"      225.000   Pervious length"
"        0.800   Pervious slope"
"        0.072   Impervious Area"
"      225.000   Impervious length"
"        0.800   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.164   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.849   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.012     0.000     0.007     0.050 c.m/sec"
"             Catchment 103          Pervious   Impervious Total Area "
"             Surface Area           0.168      0.072      0.240      hectare"
"             Time of concentration  121.577    9.744      44.428     minutes"
"             Time to Centroid       249.343    102.633    148.134    minutes"
"             Rainfall depth         34.259     34.259     34.259     mm"
"             Rainfall volume        57.55      24.67      82.22      c.m"
"             Rainfall losses        28.657     5.187      21.616     mm"
"             Runoff depth           5.601      29.072     12.643     mm"
"             Runoff volume          9.41       20.93      30.34      c.m"
"             Runoff coefficient     0.164      0.849      0.369      "
"             Maximum flow           0.001      0.012      0.012      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.012     0.012     0.007     0.050"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.012     0.012     0.012     0.050"
" 40          HYDROGRAPH   Combine    800"
"            6   Combine "
"          800   Node #"
"                External"
"               Maximum flow                  0.012    c.m/sec"
"               Hydrograph volume            30.342    c.m"
"                    0.012     0.012     0.012     0.012"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.012     0.000     0.012     0.012"
" 33          CATCHMENT 104"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          104   Catchment 104 - Ex. SWMF+Embankment"
"        0.000   % Impervious"
"        0.234   Total Area"
"        8.000   Flow length"
"       20.000   Overland Slope"
"        0.234   Pervious Area"
"        8.000   Pervious length"
```

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"       20.000   Pervious slope"
"        0.000   Impervious Area"
"        8.000   Impervious length"
"       20.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.162   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                  0.006     0.000     0.012     0.012 c.m/sec"
"             Catchment 104          Pervious   Impervious Total Area "
"             Surface Area           0.234      0.000      0.234      hectare"
"             Time of concentration  6.252      0.501      6.252      minutes"
"             Time to Centroid       111.541    89.345     111.541    minutes"
"             Rainfall depth         34.259     34.259     34.259     mm"
"             Rainfall volume        80.16      0.00       80.17      c.m"
"             Rainfall losses        28.719     7.755      28.719     mm"
"             Runoff depth           5.540      26.504     5.540      mm"
"             Runoff volume          12.96      0.00       12.96      c.m"
"             Runoff coefficient     0.162      0.000      0.162      "
"             Maximum flow           0.006      0.000      0.006      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.006     0.006     0.012     0.012"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.006     0.006     0.006     0.012"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               External"
"             Maximum flow                  0.017    c.m/sec"
"             Hydrograph volume            43.306    c.m"
"                  0.006     0.006     0.006     0.017"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                  0.006     0.000     0.006     0.017"
" 33          CATCHMENT 105"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         105   Catchment 105 - Driveways + Ditch Within RoW"
"       20.000   % Impervious"
"        0.057   Total Area"
"      125.000   Flow length"
"        0.500   Overland Slope"
"        0.046   Pervious Area"
"      125.000   Pervious length"
"        0.500   Pervious slope"
"        0.011   Impervious Area"
"      125.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.164   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.852   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                  0.002     0.000     0.006     0.017 c.m/sec"
"             Catchment 105          Pervious   Impervious Total Area "
"             Surface Area           0.046      0.011      0.057      hectare"
"             Time of concentration  98.384     7.885      47.187     minutes"
"             Time to Centroid       221.598    99.893     152.747    minutes"
"             Rainfall depth         34.259     34.259     34.259     mm"
"             Rainfall volume        15.62      3.91       19.53      c.m"
"             Rainfall losses        28.657     5.072      23.940     mm"
"             Runoff depth           5.601      29.187     10.318     mm"
"             Runoff volume          2.55       3.33       5.88       c.m"
"             Runoff coefficient     0.164      0.852      0.301      "
"             Maximum flow           0.000      0.002      0.002      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.002     0.002     0.006     0.017"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.002     0.002     0.002     0.017"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               External"
"             Maximum flow                  0.020    c.m/sec"
"             Hydrograph volume            49.187    c.m"
"                  0.002     0.002     0.002     0.020"
" 40          HYDROGRAPH   Confluence    800"
"           7   Confluence "
"         800   Node #"
"               External"
"             Maximum flow                  0.020    c.m/sec"
"             Hydrograph volume            49.187    c.m"
"                  0.002     0.020     0.002     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.002     0.020     0.020     0.000"
" 40          HYDROGRAPH   Combine    900"
"           6   Combine "
"         900   Node #"
"               Torrence Creek"
"             Maximum flow                  0.069    c.m/sec"
"             Hydrograph volume           258.166    c.m"
"                  0.002     0.020     0.020     0.069"
" 40          HYDROGRAPH   Confluence    900"
"           7   Confluence "
"         900   Node #"
"               Torrence Creek"
"             Maximum flow                  0.069    c.m/sec"
"             Hydrograph volume           258.166    c.m"
"                  0.002     0.069     0.020     0.000"
" 38          START/RE-START TOTALS 900"
"           3   Runoff Totals on EXIT"
"             Total Catchment area                    3.108    hectare"
"             Total Impervious area                   0.358    hectare"
"             Total % impervious                     11.507"
" 19          EXIT"
```

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"               MIDUSS Output ------------------------------------------------>"
"               MIDUSS version                          Version 2.25  rev. 473"
"               MIDUSS created                      Sunday, February 7, 2010"
"          10   Units used:                                        ie METRIC"
"               Job folder:           Q:\42063\104\SWM\September 2021\MIDUSS\"
"                                                                       PRE"
"               Output filename:                                 5yrPRE.in"
"               Licensee name:                                           A"
"               Company                                          Microsoft"
"               Date & Time last used:              9/24/2021 at 2:05:29 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          139.250    mm/hr"
"             Total depth                 47.240    mm"
"           6   005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         101   Catchment 101"
"      16.000   % Impervious"
"       1.714   Total Area"
"     150.000   Flow length"
"       0.500   Overland Slope"
"       1.440   Pervious Area"
"     150.000   Pervious length"
"       0.500   Pervious slope"
"       0.274   Impervious Area"
"     150.000   Impervious length"
"       0.500   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.244   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.887   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                   0.081     0.000     0.000     0.000 c.m/sec"
"            Catchment 101          Pervious   Impervious Total Area "
"            Surface Area           1.440      0.274      1.714      hectare"
"            Time of concentration  78.588     7.885      49.638     minutes"
"            Time to Centroid       194.743    97.376     154.875    minutes"
"            Rainfall depth         47.240     47.240     47.240     mm"
"            Rainfall volume        680.14     129.55     809.69     c.m"
"            Rainfall losses        35.733     5.352      30.872     mm"
"            Runoff depth           11.507     41.888     16.368     mm"
"            Runoff volume          165.67     114.87     280.55     c.m"
"            Runoff coefficient     0.244      0.887      0.346      "
"            Maximum flow           0.020      0.079      0.081      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.081     0.081     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.081     0.081     0.081     0.000"
" 40          HYDROGRAPH   Combine    900"
"           6   Combine "
"         900   Node #"
"               Torrence Creek"
"             Maximum flow                  0.081    c.m/sec"
"             Hydrograph volume           280.548    c.m"
"                   0.081     0.081     0.081     0.081"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.081     0.000     0.081     0.081"
" 33          CATCHMENT 102"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         102   Catchment 102"
"       0.000   % Impervious"
"       0.863   Total Area"
"      50.000   Flow length"
"       0.500   Overland Slope"
"       0.863   Pervious Area"
"      50.000   Pervious length"
"       0.500   Pervious slope"
"       0.000   Impervious Area"
"      50.000   Impervious length"
"       0.500   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.243   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   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     0.081     0.081 c.m/sec"
"            Catchment 102          Pervious   Impervious Total Area "
"            Surface Area           0.863      0.000      0.863      hectare"
"            Time of concentration  40.652     4.079      40.652     minutes"
"            Time to Centroid       148.337    91.940     148.336    minutes"
"            Rainfall depth         47.240     47.240     47.240     mm"
"            Rainfall volume        407.68     0.00       407.68     c.m"
"            Rainfall losses        35.737     5.719      35.737     mm"
"            Runoff depth           11.503     41.521     11.503     mm"
"            Runoff volume          99.27      0.00       99.27      c.m"
"            Runoff coefficient     0.243      0.000      0.243      "
"            Maximum flow           0.020      0.000      0.020      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.020     0.020     0.081     0.081"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.020     0.020     0.020     0.081"
" 40          HYDROGRAPH   Combine    900"
"           6   Combine "
"         900   Node #"
"               Torrence Creek"
"             Maximum flow                  0.084    c.m/sec"
"             Hydrograph volume           379.819    c.m"
"                   0.020     0.020     0.020     0.084"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
```

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"                   0.020     0.000     0.020     0.084"
" 33          CATCHMENT 103"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         103   Catchment 103 - Laneway"
"      30.000   % Impervious"
"       0.240   Total Area"
"     225.000   Flow length"
"       0.800   Overland Slope"
"       0.168   Pervious Area"
"     225.000   Pervious length"
"       0.800   Pervious slope"
"       0.072   Impervious Area"
"     225.000   Impervious length"
"       0.800   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.244   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.889   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                   0.018     0.000     0.020     0.084 c.m/sec"
"             Catchment 103          Pervious   Impervious Total Area "
"             Surface Area           0.168      0.072      0.240      hectare"
"             Time of concentration  87.051     8.734      39.283     minutes"
"             Time to Centroid       205.095    98.522     140.093    minutes"
"             Rainfall depth         47.240     47.240     47.240     mm"
"             Rainfall volume        79.36      34.01      113.38     c.m"
"             Rainfall losses        35.732     5.255      26.589     mm"
"             Runoff depth           11.508     41.985     20.651     mm"
"             Runoff volume          19.33      30.23      49.56      c.m"
"             Runoff coefficient     0.244      0.889      0.437      "
"             Maximum flow           0.002      0.018      0.018      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.018     0.018     0.020     0.084"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.018     0.018     0.018     0.084"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               External"
"             Maximum flow                 0.018    c.m/sec"
"             Hydrograph volume           49.562    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 104"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         104   Catchment 104 - Ex. SWMF+Embankment"
"       0.000   % Impervious"
"       0.234   Total Area"
"       8.000   Flow length"
"      20.000   Overland Slope"
"       0.234   Pervious Area"
"       8.000   Pervious length"
"      20.000   Pervious slope"
"       0.000   Impervious Area"
"       8.000   Impervious length"
"      20.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.242   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   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"
"                   0.015     0.000     0.018     0.018 c.m/sec"
"             Catchment 104          Pervious   Impervious Total Area "
"             Surface Area           0.234      0.000      0.234      hectare"
"             Time of concentration  4.476      0.449      4.476      minutes"
"             Time to Centroid       104.105    87.097     104.105    minutes"
"             Rainfall depth         47.240     47.240     47.240     mm"
"             Rainfall volume        110.54     0.00       110.54     c.m"
"             Rainfall losses        35.825     9.778      35.825     mm"
"             Runoff depth           11.415     37.462     11.415     mm"
"             Runoff volume          26.71      0.00       26.71      c.m"
"             Runoff coefficient     0.242      0.000      0.242      "
"             Maximum flow           0.015      0.000      0.015      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.015     0.015     0.018     0.018"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.015     0.015     0.015     0.018"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               External"
"             Maximum flow                 0.034    c.m/sec"
"             Hydrograph volume           76.272    c.m"
"                   0.015     0.015     0.015     0.034"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.015     0.000     0.015     0.034"
" 33          CATCHMENT 105"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         105   Catchment 105 - Driveways + Ditch Within RoW"
"      20.000   % Impervious"
"       0.057   Total Area"
"     125.000   Flow length"
"       0.500   Overland Slope"
"       0.046   Pervious Area"
"     125.000   Pervious length"
"       0.500   Pervious slope"
"       0.011   Impervious Area"
"     125.000   Impervious length"
"       0.500   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.244   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.882   Impervious Runoff coefficient"
```

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"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                  0.003     0.000     0.015     0.034 c.m/sec"
"             Catchment 105          Pervious   Impervious Total Area "
"             Surface Area           0.046      0.011      0.057      hectare"
"             Time of concentration  70.444     7.068      40.326     minutes"
"             Time to Centroid       184.778    96.234     142.700    minutes"
"             Rainfall depth         47.240     47.240     47.240     mm"
"             Rainfall volume        21.54      5.39       26.93      c.m"
"             Rainfall losses        35.732     5.553      29.696     mm"
"             Runoff depth           11.508     41.687     17.544     mm"
"             Runoff volume          5.25       4.75       10.00      c.m"
"             Runoff coefficient     0.244      0.882      0.371      "
"             Maximum flow           0.001      0.003      0.003      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.003     0.003     0.015     0.034"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.003     0.003     0.003     0.034"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               External"
"             Maximum flow                  0.037    c.m/sec"
"             Hydrograph volume            86.272    c.m"
"                  0.003     0.003     0.003     0.037"
" 40          HYDROGRAPH   Confluence    800"
"           7   Confluence "
"         800   Node #"
"               External"
"             Maximum flow                  0.037    c.m/sec"
"             Hydrograph volume            86.272    c.m"
"                  0.003     0.037     0.003     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.003     0.037     0.037     0.000"
" 40          HYDROGRAPH   Combine    900"
"           6   Combine "
"         900   Node #"
"               Torrence Creek"
"             Maximum flow                  0.122    c.m/sec"
"             Hydrograph volume           466.091    c.m"
"                  0.003     0.037     0.037     0.122"
" 40          HYDROGRAPH   Confluence    900"
"           7   Confluence "
"         900   Node #"
"               Torrence Creek"
"             Maximum flow                  0.122    c.m/sec"
"             Hydrograph volume           466.091    c.m"
"                  0.003     0.122     0.037     0.000"
" 38          START/RE-START TOTALS 900"
"           3   Runoff Totals on EXIT"
"             Total Catchment area                      3.108    hectare"
"             Total Impervious area                     0.358    hectare"
"             Total % impervious                       11.507"
" 19          EXIT"
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"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                        Sunday, February 7, 2010"
"           10   Units used:                                        ie METRIC"
"                Job folder:           Q:\42063\104\SWM\September 2021\MIDUSS\"
"                                                                        PRE"
"                Output filename:                                  10yrPRE.in"
"                Licensee name:                                             A"
"                Company                                           Microsoft"
"                Date & Time last used:                9/24/2021 at 2:06:02 PM"
" 31          TIME PARAMETERS"
"         5.000   Time Step"
"       180.000   Max. Storm length"
"      1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"             1   Chicago storm"
"      2221.000   Coefficient A"
"        12.000   Constant B"
"         0.908   Exponent C"
"         0.400   Fraction R"
"       180.000   Duration"
"         1.000   Time step multiplier"
"              Maximum intensity           169.551    mm/hr"
"              Total depth                  56.290    mm"
"             6   010hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           101   Catchment 101"
"        16.000   % Impervious"
"         1.714   Total Area"
"       150.000   Flow length"
"         0.500   Overland Slope"
"         1.440   Pervious Area"
"       150.000   Pervious length"
"         0.500   Pervious slope"
"         0.274   Impervious Area"
"       150.000   Impervious length"
"         0.500   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        74.000   Pervious SCS Curve No."
"         0.292   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.924   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.900   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                   0.104     0.000     0.000     0.000 c.m/sec"
"              Catchment 101          Pervious   Impervious Total Area "
"              Surface Area           1.440      0.274      1.714      hectare"
"              Time of concentration  65.907     7.253      44.199     minutes"
"              Time to Centroid       178.477    95.467     147.755    minutes"
"              Rainfall depth         56.290     56.290     56.290     mm"
"              Rainfall volume        810.44     154.37     964.81     c.m"
"              Rainfall losses        39.871     5.643      34.395     mm"
"              Runoff depth           16.419     50.647     21.896     mm"
"              Runoff volume          236.40     138.89     375.29     c.m"
"              Runoff coefficient     0.292      0.900      0.389      "
"              Maximum flow           0.035      0.100      0.104      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                   0.104     0.104     0.000     0.000"
```

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" 40          HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
"                     0.104     0.104     0.104     0.000"
" 40          HYDROGRAPH   Combine    900"
"             6   Combine "
"           900   Node #"
"                 Torrence Creek"
"             Maximum flow                  0.104    c.m/sec"
"             Hydrograph volume           375.289    c.m"
"                     0.104     0.104     0.104     0.104"
" 40          HYDROGRAPH Start - New Tributary"
"             2   Start - New Tributary"
"                     0.104     0.000     0.104     0.104"
" 33          CATCHMENT 102"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           102   Catchment 102"
"         0.000   % Impervious"
"         0.863   Total Area"
"        50.000   Flow length"
"         0.500   Overland Slope"
"         0.863   Pervious Area"
"        50.000   Pervious length"
"         0.500   Pervious slope"
"         0.000   Impervious Area"
"        50.000   Impervious length"
"         0.500   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        74.000   Pervious SCS Curve No."
"         0.292   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.924   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"
"                     0.034     0.000     0.104     0.104 c.m/sec"
"              Catchment 102          Pervious   Impervious Total Area "
"              Surface Area           0.863      0.000      0.863      hectare"
"              Time of concentration  34.093     3.752      34.093     minutes"
"              Time to Centroid       138.712    90.510     138.712    minutes"
"              Rainfall depth         56.290     56.290     56.290     mm"
"              Rainfall volume        485.78     0.00       485.78     c.m"
"              Rainfall losses        39.876     6.201      39.876     mm"
"              Runoff depth           16.415     50.089     16.415     mm"
"              Runoff volume          141.66     0.00       141.66     c.m"
"              Runoff coefficient     0.292      0.000      0.292      "
"              Maximum flow           0.034      0.000      0.034      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                     0.034     0.034     0.104     0.104"
" 40          HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
"                     0.034     0.034     0.034     0.104"
" 40          HYDROGRAPH   Combine    900"
"             6   Combine "
"           900   Node #"
"                 Torrence Creek"
"             Maximum flow                  0.111    c.m/sec"
"             Hydrograph volume           516.947    c.m"
"                     0.034     0.034     0.034     0.111"
" 40          HYDROGRAPH Start - New Tributary"
"             2   Start - New Tributary"
"                     0.034     0.000     0.034     0.111"
" 33          CATCHMENT 103"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           103   Catchment 103 - Laneway"
"        30.000   % Impervious"
"         0.240   Total Area"
"       225.000   Flow length"
"         0.800   Overland Slope"
"         0.168   Pervious Area"
"       225.000   Pervious length"
"         0.800   Pervious slope"
"         0.072   Impervious Area"
"       225.000   Impervious length"
"         0.800   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        74.000   Pervious SCS Curve No."
"         0.292   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.924   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.904   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                     0.026     0.000     0.034     0.111 c.m/sec"
"              Catchment 103          Pervious   Impervious Total Area "
"              Surface Area           0.168      0.072      0.240      hectare"
"              Time of concentration  73.005     8.034      35.946     minutes"
"              Time to Centroid       187.348    96.576     135.573    minutes"
"              Rainfall depth         56.290     56.290     56.290     mm"
"              Rainfall volume        94.57      40.53      135.10     c.m"
"              Rainfall losses        39.869     5.420      29.535     mm"
"              Runoff depth           16.421     50.870     26.755     mm"
"              Runoff volume          27.59      36.63      64.21      c.m"
"              Runoff coefficient     0.292      0.904      0.475      "
"              Maximum flow           0.004      0.026      0.026      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                     0.026     0.026     0.034     0.111"
" 40          HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
"                     0.026     0.026     0.026     0.111"
" 40          HYDROGRAPH   Combine    800"
"             6   Combine "
"           800   Node #"
"                 External"
"             Maximum flow                  0.026    c.m/sec"
"             Hydrograph volume            64.213    c.m"
"                     0.026     0.026     0.026     0.026"
" 40          HYDROGRAPH Start - New Tributary"
"             2   Start - New Tributary"
"                     0.026     0.000     0.026     0.026"
" 33          CATCHMENT 104"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           104   Catchment 104 - Ex. SWMF+Embankment"
"         0.000   % Impervious"
"         0.234   Total Area"
"         8.000   Flow length"
"        20.000   Overland Slope"
"         0.234   Pervious Area"
"         8.000   Pervious length"
```

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"       20.000   Pervious slope"
"        0.000   Impervious Area"
"        8.000   Impervious length"
"       20.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.286   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   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"
"                  0.025     0.000     0.026     0.026 c.m/sec"
"             Catchment 104          Pervious   Impervious Total Area "
"             Surface Area           0.234      0.000      0.234      hectare"
"             Time of concentration  3.754      0.413      3.754      minutes"
"             Time to Centroid       101.003    85.977     101.003    minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        131.72     0.00       131.72     c.m"
"             Rainfall losses        40.210     11.286     40.210     mm"
"             Runoff depth           16.080     45.004     16.080     mm"
"             Runoff volume          37.63      0.00       37.63      c.m"
"             Runoff coefficient     0.286      0.000      0.286      "
"             Maximum flow           0.025      0.000      0.025      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.025     0.025     0.026     0.026"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.025     0.025     0.025     0.026"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               External"
"             Maximum flow                  0.051    c.m/sec"
"             Hydrograph volume           101.840    c.m"
"                  0.025     0.025     0.025     0.051"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                  0.025     0.000     0.025     0.051"
" 33          CATCHMENT 105"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         105   Catchment 105 - Driveways + Ditch Within RoW"
"       20.000   % Impervious"
"        0.057   Total Area"
"      125.000   Flow length"
"        0.500   Overland Slope"
"        0.046   Pervious Area"
"      125.000   Pervious length"
"        0.500   Pervious slope"
"        0.011   Impervious Area"
"      125.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.292   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.898   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                  0.004     0.000     0.025     0.051 c.m/sec"
"             Catchment 105          Pervious   Impervious Total Area "
"             Surface Area           0.046      0.011      0.057      hectare"
"             Time of concentration  59.078     6.501      36.207     minutes"
"             Time to Centroid       169.938    94.384     137.072    minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        25.67      6.42       32.09      c.m"
"             Rainfall losses        39.871     5.725      33.042     mm"
"             Runoff depth           16.419     50.565     23.248     mm"
"             Runoff volume          7.49       5.76       13.25      c.m"
"             Runoff coefficient     0.292      0.898      0.413      "
"             Maximum flow           0.001      0.004      0.004      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.004     0.004     0.025     0.051"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.004     0.004     0.004     0.051"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               External"
"             Maximum flow                  0.055    c.m/sec"
"             Hydrograph volume           115.092    c.m"
"                  0.004     0.004     0.004     0.055"
" 40          HYDROGRAPH   Confluence    800"
"           7   Confluence "
"         800   Node #"
"               External"
"             Maximum flow                  0.055    c.m/sec"
"             Hydrograph volume           115.092    c.m"
"                  0.004     0.055     0.004     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.004     0.055     0.055     0.000"
" 40          HYDROGRAPH   Combine    900"
"           6   Combine "
"         900   Node #"
"               Torrence Creek"
"             Maximum flow                  0.166    c.m/sec"
"             Hydrograph volume           632.039    c.m"
"                  0.004     0.055     0.055     0.166"
" 40          HYDROGRAPH   Confluence    900"
"           7   Confluence "
"         900   Node #"
"               Torrence Creek"
"             Maximum flow                  0.166    c.m/sec"
"             Hydrograph volume           632.039    c.m"
"                  0.004     0.166     0.055     0.000"
" 38          START/RE-START TOTALS 900"
"           3   Runoff Totals on EXIT"
"             Total Catchment area                      3.108    hectare"
"             Total Impervious area                     0.358    hectare"
"             Total % impervious                       11.507"
" 19          EXIT"
```

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"               MIDUSS Output ------------------------------------------------>"
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"               MIDUSS created                      Sunday, February 7, 2010"
"          10   Units used:                                        ie METRIC"
"               Job folder:            Q:\42063\104\SWM\September 2021\MIDUSS\"
"                                                                       PRE"
"               Output filename:                                 25yrPRE.in"
"               Licensee name:                                            A"
"               Company                                          Microsoft"
"               Date & Time last used:              9/24/2021 at 2:06:44 PM"
" 31          TIME PARAMETERS"
"       5.000   Time Step"
"     180.000   Max. Storm length"
"    1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"           1   Chicago storm"
"    3158.000   Coefficient A"
"      15.000   Constant B"
"       0.936   Exponent C"
"       0.400   Fraction R"
"     180.000   Duration"
"       1.000   Time step multiplier"
"             Maximum intensity          191.271    mm/hr"
"             Total depth                 68.087    mm"
"           6   025hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         101   Catchment 101"
"      16.000   % Impervious"
"       1.714   Total Area"
"     150.000   Flow length"
"       0.500   Overland Slope"
"       1.440   Pervious Area"
"     150.000   Pervious length"
"       0.500   Pervious slope"
"       0.274   Impervious Area"
"     150.000   Impervious length"
"       0.500   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.346   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.912   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                   0.126     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           1.440      0.274      1.714      hectare"
"             Time of concentration  57.570     6.884      40.635     minutes"
"             Time to Centroid       166.282    94.277     142.223    minutes"
"             Rainfall depth         68.087     68.087     68.087     mm"
"             Rainfall volume        980.28     186.72     1167.00    c.m"
"             Rainfall losses        44.506     5.967      38.340     mm"
"             Runoff depth           23.580     62.119     29.746     mm"
"             Runoff volume          339.50     170.36     509.85     c.m"
"             Runoff coefficient     0.346      0.912      0.437      "
"             Maximum flow           0.056      0.119      0.126      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.126     0.126     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.126     0.126     0.126     0.000"
" 40          HYDROGRAPH   Combine    900"
"           6   Combine "
"         900   Node #"
"               Torrence Creek"
"             Maximum flow                  0.126    c.m/sec"
"             Hydrograph volume           509.854    c.m"
"                   0.126     0.126     0.126     0.126"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.126     0.000     0.126     0.126"
" 33          CATCHMENT 102"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         102   Catchment 102"
"       0.000   % Impervious"
"       0.863   Total Area"
"      50.000   Flow length"
"       0.500   Overland Slope"
"       0.863   Pervious Area"
"      50.000   Pervious length"
"       0.500   Pervious slope"
"       0.000   Impervious Area"
"      50.000   Impervious length"
"       0.500   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.346   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   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"
"                   0.057     0.000     0.126     0.126 c.m/sec"
"             Catchment 102          Pervious   Impervious Total Area "
"             Surface Area           0.863      0.000      0.863      hectare"
"             Time of concentration  29.780     3.561      29.780     minutes"
"             Time to Centroid       131.824    89.674     131.824    minutes"
"             Rainfall depth         68.087     68.087     68.087     mm"
"             Rainfall volume        587.59     0.00       587.59     c.m"
"             Rainfall losses        44.508     6.651      44.508     mm"
"             Runoff depth           23.579     61.435     23.579     mm"
"             Runoff volume          203.48     0.00       203.48     c.m"
"             Runoff coefficient     0.346      0.000      0.346      "
"             Maximum flow           0.057      0.000      0.057      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.057     0.057     0.126     0.126"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.057     0.057     0.057     0.126"
" 40          HYDROGRAPH   Combine    900"
"           6   Combine "
"         900   Node #"
"               Torrence Creek"
"             Maximum flow                  0.140    c.m/sec"
"             Hydrograph volume           713.339    c.m"
"                   0.057     0.057     0.057     0.140"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
```

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"                   0.057     0.000     0.057     0.140"
" 33          CATCHMENT 103"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         103   Catchment 103 - Laneway"
"      30.000   % Impervious"
"       0.240   Total Area"
"     225.000   Flow length"
"       0.800   Overland Slope"
"       0.168   Pervious Area"
"     225.000   Pervious length"
"       0.800   Pervious slope"
"       0.072   Impervious Area"
"     225.000   Impervious length"
"       0.800   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.346   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.917   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                   0.032     0.000     0.057     0.140 c.m/sec"
"             Catchment 103          Pervious   Impervious Total Area "
"             Surface Area           0.168      0.072      0.240      hectare"
"             Time of concentration  63.770     7.625      33.932     minutes"
"             Time to Centroid       173.965    95.304     132.161    minutes"
"             Rainfall depth         68.087     68.087     68.087     mm"
"             Rainfall volume        114.39     49.02      163.41     c.m"
"             Rainfall losses        44.504     5.673      32.855     mm"
"             Runoff depth           23.582     62.414     35.232     mm"
"             Runoff volume          39.62      44.94      84.56      c.m"
"             Runoff coefficient     0.346      0.917      0.517      "
"             Maximum flow           0.006      0.031      0.032      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.032     0.032     0.057     0.140"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.032     0.032     0.032     0.140"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               External"
"             Maximum flow                 0.032    c.m/sec"
"             Hydrograph volume           84.556    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 104"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         104   Catchment 104 - Ex. SWMF+Embankment"
"       0.000   % Impervious"
"       0.234   Total Area"
"       8.000   Flow length"
"      20.000   Overland Slope"
"       0.234   Pervious Area"
"       8.000   Pervious length"
"      20.000   Pervious slope"
"       0.000   Impervious Area"
"       8.000   Impervious length"
"      20.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.337   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   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     0.032     0.032 c.m/sec"
"             Catchment 104          Pervious   Impervious Total Area "
"             Surface Area           0.234      0.000      0.234      hectare"
"             Time of concentration  3.279      0.392      3.279      minutes"
"             Time to Centroid       99.107     85.405     99.107     minutes"
"             Rainfall depth         68.087     68.087     68.087     mm"
"             Rainfall volume        159.32     0.00       159.32     c.m"
"             Rainfall losses        45.109     13.152     45.109     mm"
"             Runoff depth           22.977     54.935     22.977     mm"
"             Runoff volume          53.77      0.00       53.77      c.m"
"             Runoff coefficient     0.337      0.000      0.337      "
"             Maximum flow           0.036      0.000      0.036      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.036     0.036     0.032     0.032"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.036     0.036     0.036     0.032"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               External"
"             Maximum flow                 0.068    c.m/sec"
"             Hydrograph volume          138.323    c.m"
"                   0.036     0.036     0.036     0.068"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.036     0.000     0.036     0.068"
" 33          CATCHMENT 105"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         105   Catchment 105 - Driveways + Ditch Within RoW"
"      20.000   % Impervious"
"       0.057   Total Area"
"     125.000   Flow length"
"       0.500   Overland Slope"
"       0.046   Pervious Area"
"     125.000   Pervious length"
"       0.500   Pervious slope"
"       0.011   Impervious Area"
"     125.000   Impervious length"
"       0.500   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.346   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.916   Impervious Runoff coefficient"
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"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                  0.005     0.000     0.036     0.068 c.m/sec"
"             Catchment 105          Pervious   Impervious Total Area "
"             Surface Area           0.046      0.011      0.057      hectare"
"             Time of concentration  51.604     6.171      33.519     minutes"
"             Time to Centroid       158.885    93.272     132.767    minutes"
"             Rainfall depth         68.087     68.087     68.087     mm"
"             Rainfall volume        31.05      7.76       38.81      c.m"
"             Rainfall losses        44.507     5.714      36.748     mm"
"             Runoff depth           23.579     62.373     31.338     mm"
"             Runoff volume          10.75      7.11       17.86      c.m"
"             Runoff coefficient     0.346      0.916      0.460      "
"             Maximum flow           0.002      0.005      0.005      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.005     0.005     0.036     0.068"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.005     0.005     0.005     0.068"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               External"
"             Maximum flow                  0.073    c.m/sec"
"             Hydrograph volume           156.187    c.m"
"                  0.005     0.005     0.005     0.073"
" 40          HYDROGRAPH   Confluence    800"
"           7   Confluence "
"         800   Node #"
"               External"
"             Maximum flow                  0.073    c.m/sec"
"             Hydrograph volume           156.187    c.m"
"                  0.005     0.073     0.005     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.005     0.073     0.073     0.000"
" 40          HYDROGRAPH   Combine    900"
"           6   Combine "
"         900   Node #"
"               Torrence Creek"
"             Maximum flow                  0.213    c.m/sec"
"             Hydrograph volume           869.525    c.m"
"                  0.005     0.073     0.073     0.213"
" 40          HYDROGRAPH   Confluence    900"
"           7   Confluence "
"         900   Node #"
"               Torrence Creek"
"             Maximum flow                  0.213    c.m/sec"
"             Hydrograph volume           869.525    c.m"
"                  0.005     0.213     0.073     0.000"
" 38          START/RE-START TOTALS 900"
"           3   Runoff Totals on EXIT"
"             Total Catchment area                    3.108    hectare"
"             Total Impervious area                   0.358    hectare"
"             Total % impervious                     11.507"
" 19          EXIT"
```

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"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                        Sunday, February 7, 2010"
"            10  Units used:                                        ie METRIC"
"                Job folder:          Q:\42063\104\SWM\September 2021\MIDUSS\"
"                                                                        PRE"
"                Output filename:                                  50yrPRE.in"
"                Licensee name:                                             A"
"                Company                                           Microsoft"
"                Date & Time last used:              9/24/2021 at 2:07:27 PM"
" 31          TIME PARAMETERS"
"         5.000   Time Step"
"       180.000   Max. Storm length"
"      1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"             1   Chicago storm"
"      3886.000   Coefficient A"
"        16.000   Constant B"
"         0.950   Exponent C"
"         0.400   Fraction R"
"       180.000   Duration"
"         1.000   Time step multiplier"
"               Maximum intensity          215.474    mm/hr"
"               Total depth                 77.443    mm"
"             6   050hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           101   Catchment 101"
"        16.000   % Impervious"
"         1.714   Total Area"
"       150.000   Flow length"
"         0.500   Overland Slope"
"         1.440   Pervious Area"
"       150.000   Pervious length"
"         0.500   Pervious slope"
"         0.274   Impervious Area"
"       150.000   Impervious length"
"         0.500   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        74.000   Pervious SCS Curve No."
"         0.384   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.924   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.923   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                   0.142     0.000     0.000     0.000 c.m/sec"
"               Catchment 101          Pervious   Impervious Total Area "
"               Surface Area           1.440      0.274      1.714      hectare"
"               Time of concentration  52.113     6.550      37.809     minutes"
"               Time to Centroid       158.861    93.407     138.312    minutes"
"               Rainfall depth         77.443     77.443     77.443     mm"
"               Rainfall volume        1114.99    212.38     1327.37    c.m"
"               Rainfall losses        47.687     5.956      41.010     mm"
"               Runoff depth           29.756     71.486     36.433     mm"
"               Runoff volume          428.41     196.04     624.46     c.m"
"               Runoff coefficient     0.384      0.923      0.470      "
"               Maximum flow           0.079      0.131      0.142      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                   0.142     0.142     0.000     0.000"
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" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.142     0.142     0.142     0.000"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                Torrence Creek"
"              Maximum flow                  0.142    c.m/sec"
"              Hydrograph volume           624.456    c.m"
"                    0.142     0.142     0.142     0.142"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.142     0.000     0.142     0.142"
" 33          CATCHMENT 102"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          102   Catchment 102"
"        0.000   % Impervious"
"        0.863   Total Area"
"       50.000   Flow length"
"        0.500   Overland Slope"
"        0.863   Pervious Area"
"       50.000   Pervious length"
"        0.500   Pervious slope"
"        0.000   Impervious Area"
"       50.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.384   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   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     0.142     0.142 c.m/sec"
"             Catchment 102          Pervious   Impervious Total Area "
"             Surface Area           0.863      0.000      0.863      hectare"
"             Time of concentration  26.957     3.388      26.957     minutes"
"             Time to Centroid       127.483    89.006     127.483    minutes"
"             Rainfall depth         77.443     77.443     77.443     mm"
"             Rainfall volume        668.33     0.00       668.33     c.m"
"             Rainfall losses        47.692     6.765      47.692     mm"
"             Runoff depth           29.750     70.677     29.750     mm"
"             Runoff volume          256.74     0.00       256.75     c.m"
"             Runoff coefficient     0.384      0.000      0.384      "
"             Maximum flow           0.077      0.000      0.077      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.077     0.077     0.142     0.142"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.077     0.077     0.077     0.142"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                Torrence Creek"
"              Maximum flow                  0.170    c.m/sec"
"              Hydrograph volume           881.201    c.m"
"                    0.077     0.077     0.077     0.170"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.077     0.000     0.077     0.170"
" 33          CATCHMENT 103"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          103   Catchment 103 - Laneway"
"       30.000   % Impervious"
"        0.240   Total Area"
"      225.000   Flow length"
"        0.800   Overland Slope"
"        0.168   Pervious Area"
"      225.000   Pervious length"
"        0.800   Pervious slope"
"        0.072   Impervious Area"
"      225.000   Impervious length"
"        0.800   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.384   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.924   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.037     0.000     0.077     0.170 c.m/sec"
"             Catchment 103          Pervious   Impervious Total Area "
"             Surface Area           0.168      0.072      0.240      hectare"
"             Time of concentration  57.725     7.255      32.116     minutes"
"             Time to Centroid       165.863    94.365     129.585    minutes"
"             Rainfall depth         77.443     77.443     77.443     mm"
"             Rainfall volume        130.10     55.76      185.86     c.m"
"             Rainfall losses        47.687     5.924      35.158     mm"
"             Runoff depth           29.756     71.519     42.285     mm"
"             Runoff volume          49.99      51.49      101.48     c.m"
"             Runoff coefficient     0.384      0.924      0.546      "
"             Maximum flow           0.008      0.036      0.037      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.037     0.037     0.077     0.170"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.037     0.037     0.037     0.170"
" 40          HYDROGRAPH   Combine    800"
"            6   Combine "
"          800   Node #"
"                External"
"              Maximum flow                  0.037    c.m/sec"
"              Hydrograph volume           101.483    c.m"
"                    0.037     0.037     0.037     0.037"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.037     0.000     0.037     0.037"
" 33          CATCHMENT 104"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          104   Catchment 104 - Ex. SWMF+Embankment"
"        0.000   % Impervious"
"        0.234   Total Area"
"        8.000   Flow length"
"       20.000   Overland Slope"
"        0.234   Pervious Area"
"        8.000   Pervious length"
```

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"       20.000   Pervious slope"
"        0.000   Impervious Area"
"        8.000   Impervious length"
"       20.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.376   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   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     0.037     0.037 c.m/sec"
"            Catchment 104          Pervious   Impervious Total Area "
"            Surface Area           0.234      0.000      0.234      hectare"
"            Time of concentration  2.968      0.373      2.968      minutes"
"            Time to Centroid       97.626     84.920     97.626     minutes"
"            Rainfall depth         77.443     77.443     77.443     mm"
"            Rainfall volume        181.22     0.00       181.22     c.m"
"            Rainfall losses        48.309     14.568     48.309     mm"
"            Runoff depth           29.134     62.875     29.134     mm"
"            Runoff volume          68.17      0.00       68.17      c.m"
"            Runoff coefficient     0.376      0.000      0.376      "
"            Maximum flow           0.046      0.000      0.046      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"          4   Add Runoff "
"                  0.046     0.046     0.037     0.037"
" 40         HYDROGRAPH Copy to Outflow"
"          8   Copy to Outflow"
"                  0.046     0.046     0.046     0.037"
" 40         HYDROGRAPH   Combine    800"
"          6   Combine "
"        800   Node #"
"              External"
"            Maximum flow                 0.083    c.m/sec"
"            Hydrograph volume          169.657    c.m"
"                  0.046     0.046     0.046     0.083"
" 40         HYDROGRAPH Start - New Tributary"
"          2   Start - New Tributary"
"                  0.046     0.000     0.046     0.083"
" 33         CATCHMENT 105"
"          1   Triangular SCS"
"          1   Equal length"
"          1   SCS method"
"        105   Catchment 105 - Driveways + Ditch Within RoW"
"       20.000   % Impervious"
"        0.057   Total Area"
"      125.000   Flow length"
"        0.500   Overland Slope"
"        0.046   Pervious Area"
"      125.000   Pervious length"
"        0.500   Pervious slope"
"        0.011   Impervious Area"
"      125.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.384   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.925   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                  0.006     0.000     0.046     0.083 c.m/sec"
"            Catchment 105          Pervious   Impervious Total Area "
"            Surface Area           0.046      0.011      0.057      hectare"
"            Time of concentration  46.713     5.871      31.363     minutes"
"            Time to Centroid       152.126    92.469     129.704    minutes"
"            Rainfall depth         77.443     77.443     77.443     mm"
"            Rainfall volume        35.31      8.83       44.14      c.m"
"            Rainfall losses        47.689     5.779      39.307     mm"
"            Runoff depth           29.754     71.664     38.136     mm"
"            Runoff volume          13.57      8.17       21.74      c.m"
"            Runoff coefficient     0.384      0.925      0.492      "
"            Maximum flow           0.003      0.006      0.006      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"          4   Add Runoff "
"                  0.006     0.006     0.046     0.083"
" 40         HYDROGRAPH Copy to Outflow"
"          8   Copy to Outflow"
"                  0.006     0.006     0.006     0.083"
" 40         HYDROGRAPH   Combine    800"
"          6   Combine "
"        800   Node #"
"              External"
"            Maximum flow                 0.089    c.m/sec"
"            Hydrograph volume          191.394    c.m"
"                  0.006     0.006     0.006     0.089"
" 40         HYDROGRAPH   Confluence    800"
"          7   Confluence "
"        800   Node #"
"              External"
"            Maximum flow                 0.089    c.m/sec"
"            Hydrograph volume          191.394    c.m"
"                  0.006     0.089     0.006     0.000"
" 40         HYDROGRAPH Copy to Outflow"
"          8   Copy to Outflow"
"                  0.006     0.089     0.089     0.000"
" 40         HYDROGRAPH   Combine    900"
"          6   Combine "
"        900   Node #"
"              Torrence Creek"
"            Maximum flow                 0.252    c.m/sec"
"            Hydrograph volume         1072.595    c.m"
"                  0.006     0.089     0.089     0.252"
" 40         HYDROGRAPH   Confluence    900"
"          7   Confluence "
"        900   Node #"
"              Torrence Creek"
"            Maximum flow                 0.252    c.m/sec"
"            Hydrograph volume         1072.595    c.m"
"                  0.006     0.252     0.089     0.000"
" 38         START/RE-START TOTALS 900"
"          3   Runoff Totals on EXIT"
"            Total Catchment area                     3.108    hectare"
"            Total Impervious area                    0.358    hectare"
"            Total % impervious                      11.507"
" 19         EXIT"
```

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"               MIDUSS Output ------------------------------------------------>"
"               MIDUSS version                          Version 2.25  rev. 473"
"               MIDUSS created                      Sunday, February 7, 2010"
"          10   Units used:                                        ie METRIC"
"               Job folder:           Q:\42063\104\SWM\September 2021\MIDUSS\"
"                                                                       PRE"
"               Output filename:                                 100yrPRE.in"
"               Licensee name:                                             A"
"               Company                                           Microsoft"
"               Date & Time last used:              9/24/2021 at 2:08:03 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           239.650    mm/hr"
"             Total depth                  87.263    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          101   Catchment 101"
"       16.000   % Impervious"
"        1.714   Total Area"
"      150.000   Flow length"
"        0.500   Overland Slope"
"        1.440   Pervious Area"
"      150.000   Pervious length"
"        0.500   Pervious slope"
"        0.274   Impervious Area"
"      150.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.419   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.932   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                  0.165     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           1.440      0.274      1.714      hectare"
"             Time of concentration  47.820     6.267      35.467     minutes"
"             Time to Centroid       152.839    92.686     134.956    minutes"
"             Rainfall depth         87.263     87.263     87.263     mm"
"             Rainfall volume        1256.38    239.31     1495.70    c.m"
"             Rainfall losses        50.658     5.957      43.506     mm"
"             Runoff depth           36.606     81.307     43.758     mm"
"             Runoff volume          527.04     222.98     750.01     c.m"
"             Runoff coefficient     0.419      0.932      0.501      "
"             Maximum flow           0.104      0.148      0.165      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.165     0.165     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                  0.165     0.165     0.165     0.000"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                Torrence Creek"
"             Maximum flow                  0.165    c.m/sec"
"             Hydrograph volume           750.010    c.m"
"                  0.165     0.165     0.165     0.165"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                  0.165     0.000     0.165     0.165"
" 33          CATCHMENT 102"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"          102   Catchment 102"
"        0.000   % Impervious"
"        0.863   Total Area"
"       50.000   Flow length"
"        0.500   Overland Slope"
"        0.863   Pervious Area"
"       50.000   Pervious length"
"        0.500   Pervious slope"
"        0.000   Impervious Area"
"       50.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.419   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   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"
"                  0.101     0.000     0.165     0.165 c.m/sec"
"             Catchment 102          Pervious   Impervious Total Area "
"             Surface Area           0.863      0.000      0.863      hectare"
"             Time of concentration  24.737     3.242      24.736     minutes"
"             Time to Centroid       124.000    88.466     124.000    minutes"
"             Rainfall depth         87.263     87.263     87.263     mm"
"             Rainfall volume        753.08     0.00       753.08     c.m"
"             Rainfall losses        50.668     7.034      50.668     mm"
"             Runoff depth           36.595     80.229     36.595     mm"
"             Runoff volume          315.82     0.00       315.82     c.m"
"             Runoff coefficient     0.419      0.000      0.419      "
"             Maximum flow           0.101      0.000      0.101      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.101     0.101     0.165     0.165"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                  0.101     0.101     0.101     0.165"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                Torrence Creek"
"             Maximum flow                  0.211    c.m/sec"
"             Hydrograph volume          1065.829    c.m"
"                  0.101     0.101     0.101     0.211"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
```

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"                   0.101     0.000     0.101     0.211"
" 33          CATCHMENT 103"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         103   Catchment 103 - Laneway"
"      30.000   % Impervious"
"       0.240   Total Area"
"     225.000   Flow length"
"       0.800   Overland Slope"
"       0.168   Pervious Area"
"     225.000   Pervious length"
"       0.800   Pervious slope"
"       0.072   Impervious Area"
"     225.000   Impervious length"
"       0.800   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.420   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.930   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                   0.042     0.000     0.101     0.211 c.m/sec"
"             Catchment 103          Pervious   Impervious Total Area "
"             Surface Area           0.168      0.072      0.240      hectare"
"             Time of concentration  52.970     6.942      30.550     minutes"
"             Time to Centroid       159.276    93.571     127.271    minutes"
"             Rainfall depth         87.263     87.263     87.263     mm"
"             Rainfall volume        146.60     62.83      209.43     c.m"
"             Rainfall losses        50.650     6.128      37.293     mm"
"             Runoff depth           36.614     81.136     49.971     mm"
"             Runoff volume          61.51      58.42      119.93     c.m"
"             Runoff coefficient     0.420      0.930      0.573      "
"             Maximum flow           0.011      0.040      0.042      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.042     0.042     0.101     0.211"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.042     0.042     0.042     0.211"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               External"
"             Maximum flow                 0.042    c.m/sec"
"             Hydrograph volume          119.929    c.m"
"                   0.042     0.042     0.042     0.042"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.042     0.000     0.042     0.042"
" 33          CATCHMENT 104"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         104   Catchment 104 - Ex. SWMF+Embankment"
"       0.000   % Impervious"
"       0.234   Total Area"
"       8.000   Flow length"
"      20.000   Overland Slope"
"       0.234   Pervious Area"
"       8.000   Pervious length"
"      20.000   Pervious slope"
"       0.000   Impervious Area"
"       8.000   Impervious length"
"      20.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.411   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   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"
"                   0.057     0.000     0.042     0.042 c.m/sec"
"             Catchment 104          Pervious   Impervious Total Area "
"             Surface Area           0.234      0.000      0.234      hectare"
"             Time of concentration  2.724      0.357      2.724      minutes"
"             Time to Centroid       96.470     84.532     96.470     minutes"
"             Rainfall depth         87.263     87.263     87.263     mm"
"             Rainfall volume        204.20     0.00       204.20     c.m"
"             Rainfall losses        51.380     16.052     51.380     mm"
"             Runoff depth           35.883     71.212     35.883     mm"
"             Runoff volume          83.97      0.00       83.97      c.m"
"             Runoff coefficient     0.411      0.000      0.411      "
"             Maximum flow           0.057      0.000      0.057      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.057     0.057     0.042     0.042"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.057     0.057     0.057     0.042"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               External"
"             Maximum flow                 0.098    c.m/sec"
"             Hydrograph volume          203.896    c.m"
"                   0.057     0.057     0.057     0.098"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.057     0.000     0.057     0.098"
" 33          CATCHMENT 105"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         105   Catchment 105 - Driveways + Ditch Within RoW"
"      20.000   % Impervious"
"       0.057   Total Area"
"     125.000   Flow length"
"       0.500   Overland Slope"
"       0.046   Pervious Area"
"     125.000   Pervious length"
"       0.500   Pervious slope"
"       0.011   Impervious Area"
"     125.000   Impervious length"
"       0.500   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.420   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.931   Impervious Runoff coefficient"
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"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                  0.007     0.000     0.057     0.098 c.m/sec"
"             Catchment 105          Pervious   Impervious Total Area "
"             Surface Area           0.046      0.011      0.057      hectare"
"             Time of concentration  42.865     5.618      29.576     minutes"
"             Time to Centroid       146.645    91.757     127.062    minutes"
"             Rainfall depth         87.263     87.263     87.263     mm"
"             Rainfall volume        39.79      9.95       49.74      c.m"
"             Rainfall losses        50.653     6.034      41.729     mm"
"             Runoff depth           36.611     81.229     45.535     mm"
"             Runoff volume          16.69      9.26       25.95      c.m"
"             Runoff coefficient     0.420      0.931      0.522      "
"             Maximum flow           0.004      0.006      0.007      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.007     0.007     0.057     0.098"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.007     0.007     0.007     0.098"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               External"
"             Maximum flow                  0.105    c.m/sec"
"             Hydrograph volume           229.851    c.m"
"                  0.007     0.007     0.007     0.105"
" 40          HYDROGRAPH   Confluence    800"
"           7   Confluence "
"         800   Node #"
"               External"
"             Maximum flow                  0.105    c.m/sec"
"             Hydrograph volume           229.851    c.m"
"                  0.007     0.105     0.007     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.007     0.105     0.105     0.000"
" 40          HYDROGRAPH   Combine    900"
"           6   Combine "
"         900   Node #"
"               Torrence Creek"
"             Maximum flow                  0.302    c.m/sec"
"             Hydrograph volume          1295.680    c.m"
"                  0.007     0.105     0.105     0.302"
" 40          HYDROGRAPH   Confluence    900"
"           7   Confluence "
"         900   Node #"
"               Torrence Creek"
"             Maximum flow                  0.302    c.m/sec"
"             Hydrograph volume          1295.680    c.m"
"                  0.007     0.302     0.105     0.000"
" 38          START/RE-START TOTALS 900"
"           3   Runoff Totals on EXIT"
"             Total Catchment area                    3.108    hectare"
"             Total Impervious area                   0.358    hectare"
"             Total % impervious                     11.507"
" 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:\42063\104\SWM\September 2021\MIDUSS\"
"                                                                        PRE"
"                Output filename:                                   RegPRE.in"
"                Licensee name:                                             A"
"                Company                                           Microsoft"
"                Date & Time last used:              9/29/2021 at 11:13:53 AM"
" 31          TIME PARAMETERS"
"         5.000   Time Step"
"      2880.000   Max. Storm length"
"      9000.000   Max. Hydrograph"
" 32          STORM Mass Curve"
"             3   Mass Curve"
"       285.000   Rainfall depth"
"      2880.000   Duration"
"            69   Q:\42063\104\SWM\September 2021\MIDUSS\POST\Hazel entire 48 hours.mrd   Hurricane
Hazel (entire 48 h)"
"               Maximum intensity           53.012    mm/hr"
"               Total depth                285.000    mm"
"             8   99999hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"           101   Catchment 101"
"        16.000   % Impervious"
"         1.714   Total Area"
"       150.000   Flow length"
"         0.500   Overland Slope"
"         1.440   Pervious Area"
"       150.000   Pervious length"
"         0.500   Pervious slope"
"         0.274   Impervious Area"
"       150.000   Impervious length"
"         0.500   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        74.000   Pervious SCS Curve No."
"         0.732   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.924   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.977   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                   0.217     0.000     0.000     0.000 c.m/sec"
"               Catchment 101          Pervious   Impervious Total Area "
"               Surface Area           1.440      0.274      1.714      hectare"
"               Time of concentration  63.712     11.386     53.101     minutes"
"               Time to Centroid       2575.587   2281.703   2515.991   minutes"
"               Rainfall depth         285.000    285.000    285.000    mm"
"               Rainfall volume        4103.32    781.58     4884.90    c.m"
"               Rainfall losses        76.397     6.423      65.202     mm"
"               Runoff depth           208.603    278.577    219.798    mm"
"               Runoff volume          3003.38    763.97     3767.35    c.m"
"               Runoff coefficient     0.732      0.977      0.771      "
"               Maximum flow           0.188      0.042      0.217      c.m/sec"
" 40            HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                   0.217     0.217     0.000     0.000"
" 40            HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
```

```
"                  0.217     0.217     0.217     0.000"
" 40          HYDROGRAPH   Combine    900"
"               6   Combine "
"             900   Node #"
"                   Torrence Creek"
"               Maximum flow                 0.217    c.m/sec"
"               Hydrograph volume         3767.346    c.m"
"                  0.217     0.217     0.217     0.217"
" 40          HYDROGRAPH Start - New Tributary"
"               2   Start - New Tributary"
"                  0.217     0.000     0.217     0.217"
" 33          CATCHMENT 102"
"               1   Triangular SCS"
"               1   Equal length"
"               1   SCS method"
"             102   Catchment 102"
"           0.000   % Impervious"
"           0.863   Total Area"
"          50.000   Flow length"
"           0.500   Overland Slope"
"           0.863   Pervious Area"
"          50.000   Pervious length"
"           0.500   Pervious slope"
"           0.000   Impervious Area"
"          50.000   Impervious length"
"           0.500   Impervious slope"
"           0.250   Pervious Manning 'n'"
"          74.000   Pervious SCS Curve No."
"           0.732   Pervious Runoff coefficient"
"           0.100   Pervious Ia/S coefficient"
"           8.924   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"
"                  0.123     0.000     0.217     0.217 c.m/sec"
"               Catchment 102          Pervious   Impervious Total Area "
"               Surface Area           0.863      0.000      0.863      hectare"
"               Time of concentration  32.957     5.890      32.957     minutes"
"               Time to Centroid       2532.306   2271.773   2532.307   minutes"
"               Rainfall depth         285.000    285.000    285.000    mm"
"               Rainfall volume        2459.55    0.00       2459.55    c.m"
"               Rainfall losses        76.445     8.151      76.445     mm"
"               Runoff depth           208.555    276.849    208.555    mm"
"               Runoff volume          1799.83    0.00       1799.83    c.m"
"               Runoff coefficient     0.732      0.000      0.732      "
"               Maximum flow           0.123      0.000      0.123      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"               4   Add Runoff "
"                  0.123     0.123     0.217     0.217"
" 40          HYDROGRAPH Copy to Outflow"
"               8   Copy to Outflow"
"                  0.123     0.123     0.123     0.217"
" 40          HYDROGRAPH   Combine    900"
"               6   Combine "
"             900   Node #"
"                   Torrence Creek"
"               Maximum flow                 0.331    c.m/sec"
"               Hydrograph volume         5567.176    c.m"
"                  0.123     0.123     0.123     0.331"
" 40          HYDROGRAPH Start - New Tributary"
"               2   Start - New Tributary"
"                  0.123     0.000     0.123     0.331"
" 33          CATCHMENT 103"
"               1   Triangular SCS"
"               1   Equal length"
"               1   SCS method"
"             103   Catchment 103 - Laneway"
"           30.000   % Impervious"
"            0.240   Total Area"
"          225.000   Flow length"
"            0.800   Overland Slope"
"            0.168   Pervious Area"
"          225.000   Pervious length"
"            0.800   Pervious slope"
"            0.072   Impervious Area"
"          225.000   Impervious length"
"            0.800   Impervious slope"
"            0.250   Pervious Manning 'n'"
"           74.000   Pervious SCS Curve No."
"            0.732   Pervious Runoff coefficient"
"            0.100   Pervious Ia/S coefficient"
"            8.924   Pervious Initial abstraction"
"            0.015   Impervious Manning 'n'"
"           98.000   Impervious SCS Curve No."
"            0.978   Impervious Runoff coefficient"
"            0.100   Impervious Ia/S coefficient"
"            0.518   Impervious Initial abstraction"
"                  0.029     0.000     0.123     0.331 c.m/sec"
"               Catchment 103          Pervious   Impervious Total Area "
"               Surface Area           0.168      0.072      0.240      hectare"
"               Time of concentration  70.573     12.612     49.473     minutes"
"               Time to Centroid       2585.268   2283.863   2475.546   minutes"
"               Rainfall depth         285.000    285.000    285.000    mm"
"               Rainfall volume        478.80     205.20     684.00     c.m"
"               Rainfall losses        76.375     6.354      55.369     mm"
"               Runoff depth           208.625    278.646    229.631    mm"
"               Runoff volume          350.49     200.62     551.12     c.m"
"               Runoff coefficient     0.732      0.978      0.806      "
"               Maximum flow           0.021      0.011      0.029      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"               4   Add Runoff "
"                  0.029     0.029     0.123     0.331"
" 40          HYDROGRAPH Copy to Outflow"
"               8   Copy to Outflow"
"                  0.029     0.029     0.029     0.331"
" 40          HYDROGRAPH   Combine    800"
"               6   Combine "
"             800   Node #"
"                   External"
"               Maximum flow                 0.029    c.m/sec"
"               Hydrograph volume          551.115    c.m"
"                  0.029     0.029     0.029     0.029"
" 40          HYDROGRAPH Start - New Tributary"
"               2   Start - New Tributary"
"                  0.029     0.000     0.029     0.029"
" 33          CATCHMENT 104"
"               1   Triangular SCS"
"               1   Equal length"
"               1   SCS method"
"             104   Catchment 104 - Ex. SWMF+Embankment"
"           0.000   % Impervious"
"           0.234   Total Area"
"           8.000   Flow length"
"          20.000   Overland Slope"
"           0.234   Pervious Area"
"           8.000   Pervious length"
"          20.000   Pervious slope"
"           0.000   Impervious Area"
```

```
"        8.000   Impervious length"
"       20.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.712   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   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"
"                  0.030     0.000     0.029     0.029 c.m/sec"
"            Catchment 104          Pervious   Impervious Total Area "
"            Surface Area           0.234      0.000      0.234      hectare"
"            Time of concentration  3.629      0.649      3.629      minutes"
"            Time to Centroid       2485.855   2238.670   2485.855   minutes"
"            Rainfall depth         285.000    285.000    285.000    mm"
"            Rainfall volume        666.90     0.00       666.90     c.m"
"            Rainfall losses        82.021     24.612     82.021     mm"
"            Runoff depth           202.979    260.388    202.979    mm"
"            Runoff volume          474.97     0.00       474.97     c.m"
"            Runoff coefficient     0.712      0.000      0.712      "
"            Maximum flow           0.030      0.000      0.030      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.030     0.030     0.029     0.029"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.030     0.030     0.030     0.029"
" 40         HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               External"
"            Maximum flow                0.057    c.m/sec"
"            Hydrograph volume        1026.085    c.m"
"                  0.030     0.030     0.030     0.057"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                  0.030     0.000     0.030     0.057"
" 33         CATCHMENT 105"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         105   Catchment 105 - Driveways + Ditch Within RoW"
"       20.000   % Impervious"
"        0.057   Total Area"
"      125.000   Flow length"
"        0.500   Overland Slope"
"        0.046   Pervious Area"
"      125.000   Pervious length"
"        0.500   Pervious slope"
"        0.011   Impervious Area"
"      125.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.732   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.977   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                  0.007     0.000     0.030     0.057 c.m/sec"
"            Catchment 105          Pervious   Impervious Total Area "
"            Surface Area           0.046      0.011      0.057      hectare"
"            Time of concentration  57.110     10.206     45.374     minutes"
"            Time to Centroid       2566.321   2280.284   2494.753   minutes"
"            Rainfall depth         285.000    285.000    285.000    mm"
"            Rainfall volume        129.96     32.49      162.45     c.m"
"            Rainfall losses        76.391     6.548      62.422     mm"
"            Runoff depth           208.609    278.452    222.578    mm"
"            Runoff volume          95.13      31.74      126.87     c.m"
"            Runoff coefficient     0.732      0.977      0.781      "
"            Maximum flow           0.006      0.002      0.007      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.007     0.007     0.030     0.057"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.007     0.007     0.007     0.057"
" 40         HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               External"
"            Maximum flow                0.065    c.m/sec"
"            Hydrograph volume        1152.954    c.m"
"                  0.007     0.007     0.007     0.065"
" 40         HYDROGRAPH   Confluence    800"
"           7   Confluence "
"         800   Node #"
"               External"
"            Maximum flow                0.065    c.m/sec"
"            Hydrograph volume        1152.954    c.m"
"                  0.007     0.065     0.007     0.000"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.007     0.065     0.065     0.000"
" 40         HYDROGRAPH   Combine    900"
"           6   Combine "
"         900   Node #"
"               Torrence Creek"
"            Maximum flow                0.392    c.m/sec"
"            Hydrograph volume        6720.128    c.m"
"                  0.007     0.065     0.065     0.392"
" 40         HYDROGRAPH   Confluence    900"
"           7   Confluence "
"         900   Node #"
"               Torrence Creek"
"            Maximum flow                0.392    c.m/sec"
"            Hydrograph volume        6720.128    c.m"
"                  0.007     0.392     0.065     0.000"
" 38         START/RE-START TOTALS 900"
"           3   Runoff Totals on EXIT"
"            Total Catchment area                    3.108    hectare"
"            Total Impervious area                   0.358    hectare"
"            Total % impervious                     11.507"
" 19         EXIT"
```

Appendix C

Proposed Conditions Catchment Parameters and MIDUSS Modelling

Arkell Road
STORMWATER MANAGEMENT
Guelph, Ontario

Project Number: 42063-104
Date: 25/03/2024
Design By: CVP
File: Q:\42063\104\SWM\november 2023\42063-104 Master SWM Facility Design Sheet_updated 20240325_cvp.xlsx

HYDROLOGIC PARAMETERS

Pre-Development Conditions

Sub-Catchment Number	Area (ha)	Overland Slope (%)	Overland Length (m)	SCS Curve Number Pervious (AMC II)	SCS Curve Number Pervious (AMC III)	SCS Curve Number Impervious	Percent Impervious (%)	Land Use	Comment
Within Subject Lands									
101	1.714	0.5	150	74	87	98	16%	Residential	Ex. Residential and Yards
102	0.863	0.5	50	74	87	98	0%	Wetland	Wetland/Forested Area/Torrance Creek
	2.577						10.6%		
Outside of Subject Lands									
103	0.240	0.8	225	74	87	98	30%	Residential	Private laneway
104	0.234	20	8	74	87	98	0%	SWMF	Ex. SWMF + Embnakments
105	0.057	0.5	125	74	87	98	20%	Residential	Driveways + Ditch within Right-of-way
	0.531						15.7%		
Total	**3.108**						**11.5%**		

Post-Development Conditions

Sub-Catchment Number	Area (ha)	Overland Slope (%)	Overland Length (m)	SCS Curve Number Pervious (AMC II)	SCS Curve Number Pervious (AMC III)	SCS Curve Number Impervious	Percent Impervious (%)	Land Use	Comment
To SWMF									
201-1	0.289	0.80	60	74	87	98	65%	Right-of-way	Street A Right-of-way to SWMF
201-2	0.137	2.00	10	74	87	98	84%	Residential	Block 3 to SWMF
201-3	0.418	0.50	80	74	87	98	65%	Residential	Block 1 to SWMF
201-4	0.128	2.00	10	74	87	98	100%	Residential	Block 1 Roofs to Gallery, overflow to SWMF
201-5	0.020	3.00	10	74	87	98	85%	Residential	Block 1 to SWMF, Major flows to Arkell; Street A
201-6	0.057	3.00	20	74	87	98	75%	Residential	Street A right of way, major to Arkell
201-7	0.075	0.50	40	74	87	98	80%	Residential	Block 2 to SWMF
201-8	0.032	2.00	10	74	87	98	100%	Residential	Block 2 Roofs to Gallery, overflow to SWMF
201-9	0.194	0.50	15	74	87	98	40%	SWMF	Proposed SWMF
	1.350						69.0%		
Subject Lands to Torrance Creek									
202-1	0.863	0.50	50	74	87	98	0%	Wetland	Wetland/Forested Area/Torrance Creek
202-2	0.144	20.00	15	74	87	98	0%	Residential	Block 3 Rear Yards to Torrance Creek
	1.007						0.0%		
Areas to Torrance Creek via Future Trail Block									
203-1	0.198	20	10	74	87	98	30%	Park	Embankments to Trail
203-2	0.216	0.5	180	74	87	98	0%	Park	Future Park Trail
203-3	0.109	33	10	74	87	98	0%	Residential	Block 1 Embankment
	0.523						11.4%		
To Arkell Road									
204-1	0.085	2	15	74	87	98	12%	Residential/RoW	Flows to Arkell Road Infil Gallery
204-2	0.111	5	25	74	87	98	36%	Residential/RoW	Flows to Arkell Road Stone Energy Dissipators
	0.196						25.6%		
To Adjacent Ex. SWMF									
205	0.032	1.25	20	74	87	98	70.0%	Residential/RoW	Dawes Avenue to adjacent SWMF
Total	**3.108**						**34.2%**		

IDF PARAMETERS

City of Guelph

Frequency (Years)	a	b	c	Comment
2	743	6.0	0.7989	
5	1,593	11.0	0.8789	
10	2,221	12.0	0.9080	
25	3,158	15.0	0.9355	
50	3,886	16.0	0.9495	
100	4,688	17.0	0.9624	

```
"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                        Sunday, February 7, 2010"
"           10   Units used:                                        ie METRIC"
"                Job folder:                                 Q:\42063\104\SWM\"
"                2024-06-03 - Revised per GRCA Comments (Aug. 17, 2023)\MIDUSS\POST"
"                Output filename:                                     25mm.out"
"                Licensee name:                                              A"
"                Company                                                     "
"                Date & Time last used:                 6/7/2024 at 8:57:44 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      240.000   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            74.928    mm/hr"
"             Total depth                  23.469    mm"
"            6   025hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 2011"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2011   201-1 - Street A to SWMF"
"       65.000   % Impervious"
"        0.289   Total Area"
"       60.000   Flow length"
"        0.800   Overland Slope"
"        0.101   Pervious Area"
"       60.000   Pervious length"
"        0.750   Pervious slope"
"        0.188   Impervious Area"
"       60.000   Impervious length"
"        0.750   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.087   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.795   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                  0.025     0.000     0.000     0.000 c.m/sec"
"             Catchment 2011         Pervious   Impervious Total Area "
"             Surface Area           0.101      0.188      0.289      hectare"
"             Time of concentration  92.774     5.357      10.213     minutes"
"             Time to Centroid       212.518    97.246     103.650    minutes"
"             Rainfall depth         23.469     23.469     23.469     mm"
"             Rainfall volume        23.74      44.09      67.83      c.m"
"             Rainfall losses        21.431     4.812      10.629     mm"
"             Runoff depth           2.038      18.657     12.841     mm"
"             Runoff volume          2.06       35.05      37.11      c.m"
"             Runoff coefficient     0.087      0.795      0.547      "
"             Maximum flow           0.000      0.025      0.025      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.025     0.025     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                  0.025     0.025     0.025     0.000"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"             Maximum flow                  0.025    c.m/sec"
"             Hydrograph volume            37.109    c.m"
"                  0.025     0.025     0.025     0.025"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                  0.025     0.000     0.025     0.025"
" 33          CATCHMENT 2012"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2012   201-2 - Block 2 Front/Roofs to SWMF"
"       84.000   % Impervious"
"        0.137   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.022   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.115   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.087   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.783   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                  0.017     0.000     0.025     0.025 c.m/sec"
"             Catchment 2012         Pervious   Impervious Total Area "
"             Surface Area           0.022      0.115      0.137      hectare"
"             Time of concentration  23.591     1.362      1.822      minutes"
"             Time to Centroid       135.555    91.213     92.129     minutes"
"             Rainfall depth         23.469     23.469     23.469     mm"
"             Rainfall volume        5.14       27.01      32.15      c.m"
"             Rainfall losses        21.432     5.085      7.700      mm"
"             Runoff depth           2.037      18.384     15.769     mm"
"             Runoff volume          0.45       21.16      21.60      c.m"
"             Runoff coefficient     0.087      0.783      0.672      "
"             Maximum flow           0.000      0.017      0.017      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.017     0.017     0.025     0.025"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                  0.017     0.017     0.017     0.025"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"             Maximum flow                  0.037    c.m/sec"
"             Hydrograph volume            58.712    c.m"
"                  0.017     0.017     0.017     0.037"
```

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" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.017     0.000     0.017     0.037"
" 33          CATCHMENT 2013"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2013   201-3 - Block 1 to SWMF"
"       65.000   % Impervious"
"        0.418   Total Area"
"       80.000   Flow length"
"        0.500   Overland Slope"
"        0.146   Pervious Area"
"       80.000   Pervious length"
"        0.500   Pervious slope"
"        0.272   Impervious Area"
"       80.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.087   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.791   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.036     0.000     0.017     0.037 c.m/sec"
"             Catchment 2013         Pervious   Impervious Total Area "
"             Surface Area           0.146      0.272      0.418      hectare"
"             Time of concentration  124.513    7.189      13.740     minutes"
"             Time to Centroid       247.826    100.053    108.303    minutes"
"             Rainfall depth         23.469     23.469     23.469     mm"
"             Rainfall volume        34.34      63.77      98.10      c.m"
"             Rainfall losses        21.431     4.908      10.691     mm"
"             Runoff depth           2.038      18.561     12.778     mm"
"             Runoff volume          2.98       50.43      53.41      c.m"
"             Runoff coefficient     0.087      0.791      0.544      "
"             Maximum flow           0.000      0.036      0.036      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.036     0.036     0.017     0.037"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.036     0.036     0.036     0.037"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"             Maximum flow                 0.073    c.m/sec"
"             Hydrograph volume          112.124    c.m"
"                    0.036     0.036     0.036     0.073"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.036     0.000     0.036     0.073"
" 33          CATCHMENT 2014"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2014   201-4 - Block 1 Roofs to SWMF"
"      100.000   % Impervious"
"        0.128   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.000   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.128   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.783   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.019     0.000     0.036     0.073 c.m/sec"
"             Catchment 2014         Pervious   Impervious Total Area "
"             Surface Area           0.000      0.128      0.128      hectare"
"             Time of concentration  23.591     1.362      1.362      minutes"
"             Time to Centroid       135.555    91.213     91.213     minutes"
"             Rainfall depth         23.469     23.469     23.469     mm"
"             Rainfall volume        0.00       30.04      30.04      c.m"
"             Rainfall losses        21.432     5.085      5.085      mm"
"             Runoff depth           2.037      18.384     18.384     mm"
"             Runoff volume          0.00       23.53      23.53      c.m"
"             Runoff coefficient     0.000      0.783      0.783      "
"             Maximum flow           0.000      0.019      0.019      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.019     0.019     0.036     0.073"
" 57          TRENCH Design d/s of 2014"
"        0.019   Peak inflow"
"       23.532   Hydrograph volume"
"      335.600   Ground elevation"
"      334.500   Downstream trench invert"
"        1.000   Trench height"
"      333.400   Water table elevation"
"       12.000   Trench top width"
"       12.000   Trench bottom width"
"       40.000   Voids ratio (%)"
"       43.000   Hydraulic conductivity"
"        0.000   Trench gradient (%)"
"        8.000   Trench length"
"        1.000   Include base width"
"          12.   Number of stages"
"                  Level Discharge    Volume"
"                334.500     0.000       0.0"
"                334.600     0.000       3.8"
"                334.700     0.000       7.7"
"                334.800     0.000      11.5"
"                334.900     0.000      15.4"
"                335.000     0.000      19.2"
"                335.100     0.000      23.0"
"                335.200     0.000      26.9"
"                335.300     0.000      30.7"
"                335.400     0.000      34.6"
"                335.500     0.000      38.4"
"                335.600     1.000      38.5"
"           1.   MANHOLE"
"                 Access"
"               diameter"
"                  1.200"
```

```
"            Peak outflow                  0.000    c.m/sec"
"            Outflow volume                0.002    c.m"
"            Peak exfiltration             0.001    c.m/sec"
"            Exfiltration volume          23.517    c.m"
"            Maximum level               334.903    metre"
"            Maximum storage              15.492    c.m"
"            Centroidal lag                3.618   hours"
"            Infiltration area 2 sides   6.455   sq.metre"
"            Infiltration Base area      96.000   sq.metre"
"                 0.019     0.019     0.000     0.001 c.m/sec"
" 40         HYDROGRAPH   Combine    900"
"           6   Combine "
"         900   Node #"
"               SWMF"
"            Maximum flow                  0.073    c.m/sec"
"            Hydrograph volume           112.126    c.m"
"                  0.019     0.019     0.000     0.073"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                 0.019     0.000     0.000     0.073"
" 33         CATCHMENT 2015"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2015   201-5 - Block 1 Ramp minor to SWMF/Major to Arkell"
"      85.000   % Impervious"
"       0.020   Total Area"
"      10.000   Flow length"
"       3.000   Overland Slope"
"       0.003   Pervious Area"
"      10.000   Pervious length"
"       3.000   Pervious slope"
"       0.017   Impervious Area"
"      10.000   Impervious length"
"       3.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.087   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.779   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                 0.003     0.000     0.000     0.073 c.m/sec"
"            Catchment 2015         Pervious   Impervious Total Area "
"            Surface Area           0.003      0.017      0.020      hectare"
"            Time of concentration  20.889     1.206      1.586      minutes"
"            Time to Centroid       132.550    90.948     91.750     minutes"
"            Rainfall depth         23.469     23.469     23.469     mm"
"            Rainfall volume        0.70       3.99       4.69       c.m"
"            Rainfall losses        21.432     5.184      7.621      mm"
"            Runoff depth           2.037      18.285     15.848     mm"
"            Runoff volume          0.06       3.11       3.17       c.m"
"            Runoff coefficient     0.087      0.779      0.675      "
"            Maximum flow           0.000      0.003      0.003      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                 0.003     0.003     0.000     0.073"
" 56         DIVERSION"
"        2015   Node number"
"       0.006   Overflow threshold"
"       1.000   Required diverted fraction"
"           0   Conduit type; 1=Pipe;2=Channel"
"            Peak of diverted flow         0.000    c.m/sec"
"            Volume of diverted flow       0.000    c.m"
"            DIV02015.025hyd"
"            Major flow at 2015"
"                  0.003     0.003     0.003     0.073 c.m/sec"
" 40         HYDROGRAPH Next link "
"           5   Next link "
"                 0.003     0.003     0.003     0.073"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                 0.003     0.003     0.003     0.073"
" 40         HYDROGRAPH   Combine    900"
"           6   Combine "
"         900   Node #"
"               SWMF"
"            Maximum flow                  0.074    c.m/sec"
"            Hydrograph volume           115.295    c.m"
"                  0.003     0.003     0.003     0.074"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                 0.003     0.000     0.003     0.074"
" 33         CATCHMENT 2016"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2016   201-6 - Street A minor to SWMF/Major to Arkell"
"      75.000   % Impervious"
"       0.057   Total Area"
"      20.000   Flow length"
"       3.000   Overland Slope"
"       0.014   Pervious Area"
"      20.000   Pervious length"
"       3.000   Pervious slope"
"       0.043   Impervious Area"
"      20.000   Impervious length"
"       3.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.087   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.787   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                 0.006     0.000     0.003     0.074 c.m/sec"
"            Catchment 2016         Pervious   Impervious Total Area "
"            Surface Area           0.014      0.043      0.057      hectare"
"            Time of concentration  31.662     1.828      2.886      minutes"
"            Time to Centroid       144.537    91.842     93.710     minutes"
"            Rainfall depth         23.469     23.469     23.469     mm"
"            Rainfall volume        3.34       10.03      13.38      c.m"
"            Rainfall losses        21.432     5.000      9.108      mm"
"            Runoff depth           2.037      18.469     14.361     mm"
"            Runoff volume          0.29       7.90       8.19       c.m"
"            Runoff coefficient     0.087      0.787      0.612      "
"            Maximum flow           0.000      0.006      0.006      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                 0.006     0.006     0.003     0.074"
" 56         DIVERSION"
"        2016   Node number"
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"        0.014   Overflow threshold"
"        1.000   Required diverted fraction"
"            0   Conduit type; 1=Pipe;2=Channel"
"             Peak of diverted flow         0.000    c.m/sec"
"             Volume of diverted flow       0.000    c.m"
"             DIV02016.025hyd"
"             Major flow at 2106"
"                    0.006     0.006     0.006     0.074 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.006     0.006     0.006     0.074"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.006     0.006     0.006     0.074"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"             Maximum flow                  0.079    c.m/sec"
"             Hydrograph volume           123.481    c.m"
"                    0.006     0.006     0.006     0.079"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.006     0.000     0.006     0.079"
" 33          CATCHMENT 2017"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2017   201-7 - Block 3 to SWMF"
"       80.000   % Impervious"
"        0.075   Total Area"
"       40.000   Flow length"
"        0.500   Overland Slope"
"        0.015   Pervious Area"
"       40.000   Pervious length"
"        0.500   Pervious slope"
"        0.060   Impervious Area"
"       40.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.087   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.792   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.008     0.000     0.006     0.079 c.m/sec"
"             Catchment 2017         Pervious   Impervious Total Area "
"             Surface Area           0.015      0.060      0.075      hectare"
"             Time of concentration  82.148     4.743      6.808      minutes"
"             Time to Centroid       200.697    96.358     99.142     minutes"
"             Rainfall depth         23.469     23.469     23.469     mm"
"             Rainfall volume        3.52       14.08      17.60      c.m"
"             Rainfall losses        21.431     4.882      8.192      mm"
"             Runoff depth           2.038      18.588     15.278     mm"
"             Runoff volume          0.31       11.15      11.46      c.m"
"             Runoff coefficient     0.087      0.792      0.651      "
"             Maximum flow           0.000      0.008      0.008      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.008     0.008     0.006     0.079"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.008     0.008     0.008     0.079"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"             Maximum flow                  0.087    c.m/sec"
"             Hydrograph volume           134.939    c.m"
"                    0.008     0.008     0.008     0.087"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.008     0.000     0.008     0.087"
" 33          CATCHMENT 2018"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2018   201-8 - Block 2 Roofs to Gallery"
"      100.000   % Impervious"
"        0.032   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.000   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.032   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.783   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.005     0.000     0.008     0.087 c.m/sec"
"             Catchment 2018         Pervious   Impervious Total Area "
"             Surface Area           0.000      0.032      0.032      hectare"
"             Time of concentration  23.591     1.362      1.362      minutes"
"             Time to Centroid       135.555    91.213     91.213     minutes"
"             Rainfall depth         23.469     23.469     23.469     mm"
"             Rainfall volume        0.00       7.51       7.51       c.m"
"             Rainfall losses        21.432     5.085      5.085      mm"
"             Runoff depth           2.037      18.384     18.384     mm"
"             Runoff volume          0.00       5.88       5.88       c.m"
"             Runoff coefficient     0.000      0.783      0.783      "
"             Maximum flow           0.000      0.005      0.005      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.005     0.005     0.008     0.087"
" 57          TRENCH Design d/s of 2018"
"        0.005   Peak inflow"
"        5.883   Hydrograph volume"
"      335.400   Ground elevation"
"      334.300   Downstream trench invert"
"        1.000   Trench height"
"      333.200   Water table elevation"
"        4.000   Trench top width"
"        4.000   Trench bottom width"
"       40.000   Voids ratio (%)"
"       73.000   Hydraulic conductivity"
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"        0.000   Trench gradient (%)"
"        5.000   Trench length"
"        1.000   Include base width"
"          12.   Number of stages"
"                  Level Discharge    Volume"
"                334.300     0.000       0.0"
"                334.400     0.000       0.8"
"                334.500     0.000       1.6"
"                334.600     0.000       2.4"
"                334.700     0.000       3.2"
"                334.800     0.000       4.0"
"                334.900     0.000       4.8"
"                335.000     0.000       5.6"
"                335.100     0.000       6.4"
"                335.200     0.000       7.2"
"                335.300     0.000       8.0"
"                335.400     1.000       8.1"
"           1.   MANHOLE"
"                 Access"
"               diameter"
"                  1.200"
"              Peak outflow                  0.000    c.m/sec"
"              Outflow volume                0.001    c.m"
"              Peak exfiltration             0.001    c.m/sec"
"              Exfiltration volume           5.877    c.m"
"              Maximum level               334.720    metre"
"              Maximum storage               3.363    c.m"
"              Centroidal lag                2.708   hours"
"              Infiltration area 2 sides   4.204   sq.metre"
"              Infiltration Base area      20.000   sq.metre"
"                   0.005     0.005     0.000     0.001 c.m/sec"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"              Maximum flow                  0.087    c.m/sec"
"              Hydrograph volume           134.940    c.m"
"                     0.005     0.005     0.000     0.087"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                      0.005     0.000     0.000     0.087"
" 33          CATCHMENT 2019"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2019   201-9 - SWMF Block"
"       40.000   % Impervious"
"        0.194   Total Area"
"       15.000   Flow length"
"        5.000   Overland Slope"
"        0.116   Pervious Area"
"       15.000   Pervious length"
"        5.000   Pervious slope"
"        0.078   Impervious Area"
"       15.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.087   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.782   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.012     0.000     0.000     0.087 c.m/sec"
"             Catchment 2019         Pervious   Impervious Total Area "
"             Surface Area           0.116      0.078      0.194      hectare"
"             Time of concentration  22.857     1.320      4.391      minutes"
"             Time to Centroid       134.738    91.152     97.368     minutes"
"             Rainfall depth         23.469     23.469     23.469     mm"
"             Rainfall volume        27.32      18.21      45.53      c.m"
"             Rainfall losses        21.433     5.107      14.903     mm"
"             Runoff depth           2.036      18.362     8.567      mm"
"             Runoff volume          2.37       14.25      16.62      c.m"
"             Runoff coefficient     0.087      0.782      0.365      "
"             Maximum flow           0.001      0.012      0.012      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.012     0.012     0.000     0.087"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.012     0.012     0.012     0.087"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"              Maximum flow                  0.095    c.m/sec"
"              Hydrograph volume           151.560    c.m"
"                     0.012     0.012     0.012     0.095"
" 40          HYDROGRAPH   Confluence    900"
"            7   Confluence "
"          900   Node #"
"                SWMF"
"              Maximum flow                  0.095    c.m/sec"
"              Hydrograph volume           151.560    c.m"
"                     0.012     0.095     0.012     0.000"
" 54          POND DESIGN"
"        0.095   Current peak flow    c.m/sec"
"        0.100   Target outflow    c.m/sec"
"        151.6   Hydrograph volume    c.m"
"          12.   Number of stages"
"      334.400   Minimum water level    metre"
"      335.500   Maximum water level    metre"
"      334.400   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                334.400     0.000     0.000"
"                334.500   0.00150    49.000"
"                334.600   0.00230   103.000"
"                334.700   0.00290   161.000"
"                334.800   0.04670   225.000"
"                334.900   0.06500   295.000"
"                335.000   0.07920   370.000"
"                335.100   0.09110   450.000"
"                335.200    0.1017   534.000"
"                335.300    0.2368   622.000"
"                335.400    0.5900   714.000"
"                335.500     1.190   811.000"
"              Peak outflow                  0.003    c.m/sec"
"              Maximum level               334.646    metre"
"              Maximum storage             129.561    c.m"
"              Centroidal lag               12.454   hours"
"                   0.012     0.095     0.003     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.012     0.003     0.003     0.000"
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" 54          POND DESIGN"
"        0.003   Current peak flow    c.m/sec"
"        0.001   Target outflow    c.m/sec"
"        135.7   Hydrograph volume    c.m"
"          10.   Number of stages"
"      334.200   Minimum water level    metre"
"      335.100   Maximum water level    metre"
"      334.200   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                334.200     0.000     0.000"
"                334.300   0.00189    15.000"
"                334.400   0.00209    32.000"
"                334.500   0.00231    50.000"
"                334.600   0.00253    70.000"
"                334.700   0.00276    92.000"
"                334.800   0.00300   117.000"
"                334.900    0.1546   143.000"
"                335.000    0.4631   172.000"
"                335.100    0.9063   202.000"
"             Peak outflow                 0.002    c.m/sec"
"             Maximum level              334.336    metre"
"             Maximum storage             21.046    c.m"
"             Centroidal lag              12.763   hours"
"                  0.012    0.003     0.002     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               Torrance Cree"
"             Maximum flow                 0.002    c.m/sec"
"             Hydrograph volume          130.535    c.m"
"                    0.012     0.003     0.002     0.002"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.012     0.000     0.002     0.002"
" 47          FILEI_O Read/Open DIV02015.025hyd"
"           1   1=read/open; 2=write/save"
"           2   1=rainfall; 2=hydrograph"
"           1   1=runoff; 2=inflow; 3=outflow; 4=junction"
"               DIV02015.025hyd"
"               Major flow at 2015"
"               Total volume                 0.000    c.m"
"               Maximum flow                 0.000    c.m/sec"
"                    0.000     0.000     0.002     0.002 c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.000     0.000     0.002     0.002"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                    0.000     0.000     0.000     0.002"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               Torrance Cree"
"             Maximum flow                 0.002    c.m/sec"
"             Hydrograph volume          130.535    c.m"
"                    0.000     0.000     0.000     0.002"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.000     0.000     0.000     0.002"
" 47          FILEI_O Read/Open DIV02016.025hyd"
"           1   1=read/open; 2=write/save"
"           2   1=rainfall; 2=hydrograph"
"           1   1=runoff; 2=inflow; 3=outflow; 4=junction"
"               DIV02016.025hyd"
"               Major flow at 2106"
"               Total volume                 0.000    c.m"
"               Maximum flow                 0.000    c.m/sec"
"                    0.000     0.000     0.000     0.002 c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.000     0.000     0.000     0.002"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                    0.000     0.000     0.000     0.002"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               Torrance Cree"
"             Maximum flow                 0.002    c.m/sec"
"             Hydrograph volume          130.535    c.m"
"                    0.000     0.000     0.000     0.002"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.000     0.000     0.000     0.002"
" 33          CATCHMENT 2021"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2021   202-1- wetland directly to Torrance"
"       0.000   % Impervious"
"       0.863   Total Area"
"      50.000   Flow length"
"       0.500   Overland Slope"
"       0.863   Pervious Area"
"      50.000   Pervious length"
"       5.000   Pervious slope"
"       0.000   Impervious Area"
"      50.000   Impervious length"
"       5.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.087   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   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     0.000     0.002 c.m/sec"
"            Catchment 2021         Pervious   Impervious Total Area "
"            Surface Area           0.863      0.000      0.863      hectare"
"            Time of concentration  47.070     2.718      47.069     minutes"
"            Time to Centroid       161.673    93.310     161.673    minutes"
"            Rainfall depth         23.469     23.469     23.469     mm"
"            Rainfall volume        202.54     0.00       202.54     c.m"
"            Rainfall losses        21.432     5.056      21.432     mm"
"            Runoff depth           2.038      18.413     2.038      mm"
"            Runoff volume          17.58      0.00       17.58      c.m"
"            Runoff coefficient     0.087      0.000      0.087      "
"            Maximum flow           0.003      0.000      0.003      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.003     0.003     0.000     0.002"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                    0.003     0.003     0.003     0.002"
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" 40          HYDROGRAPH   Combine    800"
"            6   Combine "
"          800   Node #"
"                Torrance Cree"
"              Maximum flow                 0.003    c.m/sec"
"              Hydrograph volume          148.119    c.m"
"                     0.003     0.003     0.003     0.003"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.003     0.000     0.003     0.003"
" 33          CATCHMENT 2022"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2022   202-2- Block 3 Rear Yards to Torrance"
"        0.000   % Impervious"
"        0.144   Total Area"
"       15.000   Flow length"
"       20.000   Overland Slope"
"        0.144   Pervious Area"
"       15.000   Pervious length"
"       20.000   Pervious slope"
"        0.000   Impervious Area"
"       15.000   Impervious length"
"       20.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.087   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   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     0.003 c.m/sec"
"              Catchment 2022          Pervious   Impervious Total Area "
"              Surface Area            0.144      0.000      0.144      hectare"
"              Time of concentration   15.080     0.871      15.080     minutes"
"              Time to Centroid        126.082    90.487     126.082    minutes"
"              Rainfall depth          23.469     23.469     23.469     mm"
"              Rainfall volume         33.80      0.00       33.80      c.m"
"              Rainfall losses         21.434     5.552      21.434     mm"
"              Runoff depth            2.035      17.917     2.035      mm"
"              Runoff volume           2.93       0.00       2.93       c.m"
"              Runoff coefficient      0.087      0.000      0.087      "
"              Maximum flow            0.001      0.000      0.001      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.001     0.001     0.003     0.003"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.001     0.001     0.001     0.003"
" 40          HYDROGRAPH   Combine    800"
"            6   Combine "
"          800   Node #"
"                Torrance Cree"
"              Maximum flow                   0.004    c.m/sec"
"              Hydrograph volume            151.050    c.m"
"                     0.001     0.001     0.001     0.004"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.001     0.000     0.001     0.004"
" 33          CATCHMENT 2031"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2031   203-1 - Arkell Meadows Embankments to Trail"
"        30.000   % Impervious"
"         0.198   Total Area"
"        10.000   Flow length"
"        20.000   Overland Slope"
"         0.139   Pervious Area"
"        10.000   Pervious length"
"        20.000   Pervious slope"
"         0.059   Impervious Area"
"        10.000   Impervious length"
"        20.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        74.000   Pervious SCS Curve No."
"         0.087   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.924   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.749   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                     0.009     0.000     0.001     0.004 c.m/sec"
"              Catchment 2031          Pervious   Impervious Total Area "
"              Surface Area            0.139      0.059      0.198      hectare"
"              Time of concentration   11.823     0.683      3.052      minutes"
"              Time to Centroid        122.459    90.714     97.464     minutes"
"              Rainfall depth          23.469     23.469     23.469     mm"
"              Rainfall volume         32.53      13.94      46.47      c.m"
"              Rainfall losses         21.435     5.899      16.775     mm"
"              Runoff depth            2.034      17.570     6.695      mm"
"              Runoff volume           2.82       10.44      13.26      c.m"
"              Runoff coefficient      0.087      0.749      0.285      "
"              Maximum flow            0.001      0.009      0.009      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.009     0.009     0.001     0.004"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.009     0.009     0.009     0.004"
" 40          HYDROGRAPH   Combine    800"
"            6   Combine "
"          800   Node #"
"                Torrance Cree"
"              Maximum flow                   0.009    c.m/sec"
"              Hydrograph volume            164.305    c.m"
"                     0.009     0.009     0.009     0.009"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.009     0.000     0.009     0.009"
" 33          CATCHMENT 2032"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2032   203-2 Future Park Trail"
"        0.000   % Impervious"
"        0.216   Total Area"
"      180.000   Flow length"
"        0.500   Overland Slope"
"        0.216   Pervious Area"
"      180.000   Pervious length"
"        0.500   Pervious slope"
```

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"        0.000   Impervious Area"
"      180.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.087   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   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"
"                    0.000     0.000     0.009     0.009 c.m/sec"
"             Catchment 2032         Pervious   Impervious Total Area "
"             Surface Area           0.216      0.000      0.216      hectare"
"             Time of concentration  202.547    11.695     202.545    minutes"
"             Time to Centroid       334.633    106.665    334.631    minutes"
"             Rainfall depth         23.469     23.469     23.469     mm"
"             Rainfall volume        50.69      0.00       50.69      c.m"
"             Rainfall losses        21.431     4.780      21.431     mm"
"             Runoff depth           2.038      18.689     2.038      mm"
"             Runoff volume          4.40       0.00       4.40       c.m"
"             Runoff coefficient     0.087      0.000      0.087      "
"             Maximum flow           0.000      0.000      0.000      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.000     0.000     0.009     0.009"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.000     0.000     0.000     0.009"
" 40          HYDROGRAPH   Combine    800"
"            6   Combine "
"          800   Node #"
"                Torrance Cree"
"             Maximum flow                  0.009    c.m/sec"
"             Hydrograph volume           168.708    c.m"
"                    0.000     0.000     0.000     0.009"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.000     0.000     0.000     0.009"
" 33          CATCHMENT 2033"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2033   203-3 - Block 1 Embankment to Trail Block"
"        0.000   % Impervious"
"        0.109   Total Area"
"       10.000   Flow length"
"       33.000   Overland Slope"
"        0.109   Pervious Area"
"       10.000   Pervious length"
"       33.000   Pervious slope"
"        0.000   Impervious Area"
"       10.000   Impervious length"
"       33.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.086   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.001     0.000     0.000     0.009 c.m/sec"
"             Catchment 2033         Pervious   Impervious Total Area "
"             Surface Area           0.109      0.000      0.109      hectare"
"             Time of concentration  10.174     0.587      10.174     minutes"
"             Time to Centroid       120.642    90.762     120.642    minutes"
"             Rainfall depth         23.469     23.469     23.469     mm"
"             Rainfall volume        25.58      0.00       25.58      c.m"
"             Rainfall losses        21.440     6.198      21.440     mm"
"             Runoff depth           2.029      17.271     2.029      mm"
"             Runoff volume          2.21       0.00       2.21       c.m"
"             Runoff coefficient     0.086      0.000      0.086      "
"             Maximum flow           0.001      0.000      0.001      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.001     0.001     0.000     0.009"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.001     0.001     0.001     0.009"
" 40          HYDROGRAPH   Combine    800"
"            6   Combine "
"          800   Node #"
"                Torrance Cree"
"             Maximum flow                  0.010    c.m/sec"
"             Hydrograph volume           170.920    c.m"
"                    0.001     0.001     0.001     0.010"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.001     0.000     0.001     0.010"
" 33          CATCHMENT 2041"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2041   204-1 Block 1 rear yeards + Arkell Blvd to Arkell"
"       12.000   % Impervious"
"        0.085   Total Area"
"       15.000   Flow length"
"        2.000   Overland Slope"
"        0.075   Pervious Area"
"       15.000   Pervious length"
"        2.000   Pervious slope"
"        0.010   Impervious Area"
"       15.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.087   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.786   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.001     0.000     0.001     0.010 c.m/sec"
"             Catchment 2041         Pervious   Impervious Total Area "
"             Surface Area           0.075      0.010      0.085      hectare"
"             Time of concentration  30.088     1.737      14.420     minutes"
"             Time to Centroid       142.779    91.683     114.540    minutes"
"             Rainfall depth         23.469     23.469     23.469     mm"
"             Rainfall volume        17.55      2.39       19.95      c.m"
"             Rainfall losses        21.432     5.012      19.462     mm"
"             Runoff depth           2.037      18.458     4.008      mm"
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"            Runoff volume          1.52       1.88       3.41       c.m"
"            Runoff coefficient     0.087      0.786      0.171      "
"            Maximum flow           0.000      0.001      0.001      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.001     0.001     0.001     0.010"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.001     0.001     0.001     0.010"
" 40         HYDROGRAPH   Combine    700"
"           6   Combine "
"         700   Node #"
"               Arkell"
"            Maximum flow                0.001    c.m/sec"
"            Hydrograph volume           3.406    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 2042"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2042   204-2 Street A, Block 2 Rear Yars, Blvd to Arkell"
"      36.000   % Impervious"
"       0.111   Total Area"
"      25.000   Flow length"
"       5.000   Overland Slope"
"       0.071   Pervious Area"
"      25.000   Pervious length"
"       5.000   Pervious slope"
"       0.040   Impervious Area"
"      25.000   Impervious length"
"       5.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.087   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.787   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                  0.006     0.000     0.001     0.001 c.m/sec"
"            Catchment 2042         Pervious   Impervious Total Area "
"            Surface Area           0.071      0.040      0.111      hectare"
"            Time of concentration  31.055     1.793      6.592      minutes"
"            Time to Centroid       143.858    91.777     100.319    minutes"
"            Rainfall depth         23.469     23.469     23.469     mm"
"            Rainfall volume        16.67      9.38       26.05      c.m"
"            Rainfall losses        21.432     5.007      15.519     mm"
"            Runoff depth           2.038      18.462     7.950      mm"
"            Runoff volume          1.45       7.38       8.83       c.m"
"            Runoff coefficient     0.087      0.787      0.339      "
"            Maximum flow           0.000      0.006      0.006      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.006     0.006     0.001     0.001"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.006     0.006     0.006     0.001"
" 40         HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               Torrance Cree"
"            Maximum flow                0.015    c.m/sec"
"            Hydrograph volume         179.745    c.m"
"                  0.006     0.006     0.006     0.015"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                  0.006     0.000     0.006     0.015"
" 33         CATCHMENT 205"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         205   205- Dawes Ave to Ex. SWMF "
"      70.000   % Impervious"
"       0.032   Total Area"
"      20.000   Flow length"
"       1.300   Overland Slope"
"       0.010   Pervious Area"
"      20.000   Pervious length"
"       1.300   Pervious slope"
"       0.022   Impervious Area"
"      20.000   Impervious length"
"       1.300   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.087   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   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"
"                  0.003     0.000     0.006     0.015 c.m/sec"
"            Catchment 205          Pervious   Impervious Total Area "
"            Surface Area           0.010      0.022      0.032      hectare"
"            Time of concentration  40.690     2.349      4.085      minutes"
"            Time to Centroid       154.576    92.732     95.532     minutes"
"            Rainfall depth         23.469     23.469     23.469     mm"
"            Rainfall volume        2.25       5.26       7.51       c.m"
"            Rainfall losses        21.432     5.054      9.967      mm"
"            Runoff depth           2.038      18.415     13.502     mm"
"            Runoff volume          0.20       4.13       4.32       c.m"
"            Runoff coefficient     0.087      0.785      0.575      "
"            Maximum flow           0.000      0.003      0.003      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.003     0.003     0.006     0.015"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.003     0.003     0.003     0.015"
" 40         HYDROGRAPH   Combine    600"
"           6   Combine "
"         600   Node #"
"               Dawes Avenue"
"            Maximum flow                0.003    c.m/sec"
"            Hydrograph volume           4.321    c.m"
"                  0.003     0.003     0.003     0.003"
" 38         START/RE-START TOTALS 205"
"           3   Runoff Totals on EXIT"
"            Total Catchment area                    3.108    hectare"
"            Total Impervious area                   1.064    hectare"
"            Total % impervious                     34.232"
" 19         EXIT"
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"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                        Sunday, February 7, 2010"
"           10   Units used:                                        ie METRIC"
"                Job folder:                                 Q:\42063\104\SWM\"
"                2024-06-03 - Revised per GRCA Comments (Aug. 17, 2023)\MIDUSS\POST"
"                Output filename:                                        2y.out"
"                Licensee name:                                             A"
"                Company                                                    "
"                Date & Time last used:                 6/8/2024 at 8:51:46 AM"
" 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 2011"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2011   201-1 - Street A to SWMF"
"       65.000   % Impervious"
"        0.289   Total Area"
"       60.000   Flow length"
"        0.800   Overland Slope"
"        0.101   Pervious Area"
"       60.000   Pervious length"
"        0.750   Pervious slope"
"        0.188   Impervious Area"
"       60.000   Impervious length"
"        0.750   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.163   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.845   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.039     0.000     0.000     0.000 c.m/sec"
"             Catchment 2011         Pervious   Impervious Total Area "
"             Surface Area           0.101      0.188      0.289      hectare"
"             Time of concentration  56.084     4.495      9.360      minutes"
"             Time to Centroid       170.993    94.804     101.989    minutes"
"             Rainfall depth         34.259     34.259     34.259     mm"
"             Rainfall volume        34.65      64.35      99.01      c.m"
"             Rainfall losses        28.658     5.300      13.475     mm"
"             Runoff depth           5.600      28.959     20.783     mm"
"             Runoff volume          5.66       54.40      60.06      c.m"
"             Runoff coefficient     0.163      0.845      0.607      "
"             Maximum flow           0.001      0.039      0.039      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.039     0.039     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.039     0.039     0.039     0.000"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"             Maximum flow                  0.039    c.m/sec"
"             Hydrograph volume            60.064    c.m"
"                    0.039     0.039     0.039     0.039"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.039     0.000     0.039     0.039"
" 33          CATCHMENT 2012"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2012   201-2 - Block 2 Front/Roofs to SWMF"
"       84.000   % Impervious"
"        0.137   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.022   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.115   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.163   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.831   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.027     0.000     0.039     0.039 c.m/sec"
"             Catchment 2012         Pervious   Impervious Total Area "
"             Surface Area           0.022      0.115      0.137      hectare"
"             Time of concentration  14.261     1.143      1.616      minutes"
"             Time to Centroid       120.965    89.575     90.707     minutes"
"             Rainfall depth         34.259     34.259     34.259     mm"
"             Rainfall volume        7.51       39.42      46.93      c.m"
"             Rainfall losses        28.664     5.776      9.438      mm"
"             Runoff depth           5.594      28.482     24.820     mm"
"             Runoff volume          1.23       32.78      34.00      c.m"
"             Runoff coefficient     0.163      0.831      0.724      "
"             Maximum flow           0.000      0.027      0.027      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.027     0.027     0.039     0.039"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.027     0.027     0.027     0.039"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"             Maximum flow                  0.059    c.m/sec"
"             Hydrograph volume            94.067    c.m"
"                    0.027     0.027     0.027     0.059"
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" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.027     0.000     0.027     0.059"
" 33          CATCHMENT 2013"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2013   201-3 - Block 1 to SWMF"
"       65.000   % Impervious"
"        0.418   Total Area"
"       80.000   Flow length"
"        0.500   Overland Slope"
"        0.146   Pervious Area"
"       80.000   Pervious length"
"        0.500   Pervious slope"
"        0.272   Impervious Area"
"       80.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.163   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.849   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.058     0.000     0.027     0.059 c.m/sec"
"             Catchment 2013         Pervious   Impervious Total Area "
"             Surface Area           0.146      0.272      0.418      hectare"
"             Time of concentration  75.272     6.033      12.539     minutes"
"             Time to Centroid       193.943    97.071     106.173    minutes"
"             Rainfall depth         34.259     34.259     34.259     mm"
"             Rainfall volume        50.12      93.08      143.20     c.m"
"             Rainfall losses        28.658     5.180      13.397     mm"
"             Runoff depth           5.601      29.079     20.861     mm"
"             Runoff volume          8.19       79.01      87.20      c.m"
"             Runoff coefficient     0.163      0.849      0.609      "
"             Maximum flow           0.001      0.058      0.058      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.058     0.058     0.027     0.059"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.058     0.058     0.058     0.059"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"             Maximum flow                 0.114    c.m/sec"
"             Hydrograph volume          181.268    c.m"
"                    0.058     0.058     0.058     0.114"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.058     0.000     0.058     0.114"
" 33          CATCHMENT 2014"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2014   201-4 - Block 1 Roofs to SWMF"
"      100.000   % Impervious"
"        0.128   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.000   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.128   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.831   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.030     0.000     0.058     0.114 c.m/sec"
"             Catchment 2014         Pervious   Impervious Total Area "
"             Surface Area           0.000      0.128      0.128      hectare"
"             Time of concentration  14.261     1.143      1.143      minutes"
"             Time to Centroid       120.965    89.575     89.575     minutes"
"             Rainfall depth         34.259     34.259     34.259     mm"
"             Rainfall volume        0.00       43.85      43.85      c.m"
"             Rainfall losses        28.664     5.776      5.776      mm"
"             Runoff depth           5.594      28.482     28.482     mm"
"             Runoff volume          0.00       36.46      36.46      c.m"
"             Runoff coefficient     0.000      0.831      0.831      "
"             Maximum flow           0.000      0.030      0.030      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.030     0.030     0.058     0.114"
" 57          TRENCH Design d/s of 2014"
"        0.030   Peak inflow"
"       36.457   Hydrograph volume"
"      335.600   Ground elevation"
"      334.500   Downstream trench invert"
"        1.000   Trench height"
"      333.400   Water table elevation"
"       12.000   Trench top width"
"       12.000   Trench bottom width"
"       40.000   Voids ratio (%)"
"       43.000   Hydraulic conductivity"
"        0.000   Trench gradient (%)"
"        8.000   Trench length"
"        1.000   Include base width"
"          12.   Number of stages"
"                  Level Discharge    Volume"
"                334.500     0.000       0.0"
"                334.600     0.000       3.8"
"                334.700     0.000       7.7"
"                334.800     0.000      11.5"
"                334.900     0.000      15.4"
"                335.000     0.000      19.2"
"                335.100     0.000      23.0"
"                335.200     0.000      26.9"
"                335.300     0.000      30.7"
"                335.400     0.000      34.6"
"                335.500     0.000      38.4"
"                335.600     1.000      38.5"
"            1.   MANHOLE"
"                 Access"
"              diameter"
"                 1.200"
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"             Peak outflow                  0.000    c.m/sec"
"             Outflow volume                0.003    c.m"
"             Peak exfiltration             0.002    c.m/sec"
"             Exfiltration volume          36.458    c.m"
"             Maximum level               335.175    metre"
"             Maximum storage              25.923    c.m"
"             Centroidal lag                4.545   hours"
"             Infiltration area 2 sides    10.801   sq.metre"
"             Infiltration Base area       96.000   sq.metre"
"                  0.030     0.030     0.000     0.002 c.m/sec"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"             Maximum flow                  0.114    c.m/sec"
"             Hydrograph volume           181.270    c.m"
"                    0.030     0.030     0.000     0.114"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                   0.030     0.000     0.000     0.114"
" 33          CATCHMENT 2015"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2015   201-5 - Block 1 Ramp minor to SWMF/Major to Arkell"
"       85.000   % Impervious"
"        0.020   Total Area"
"       10.000   Flow length"
"        3.000   Overland Slope"
"        0.003   Pervious Area"
"       10.000   Pervious length"
"        3.000   Pervious slope"
"        0.017   Impervious Area"
"       10.000   Impervious length"
"        3.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.163   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.825   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                   0.004     0.000     0.000     0.114 c.m/sec"
"             Catchment 2015         Pervious   Impervious Total Area "
"             Surface Area           0.003      0.017      0.020      hectare"
"             Time of concentration  12.628     1.012      1.403      minutes"
"             Time to Centroid       119.042    89.322     90.322     minutes"
"             Rainfall depth         34.259     34.259     34.259     mm"
"             Rainfall volume        1.03       5.82       6.85       c.m"
"             Rainfall losses        28.677     5.987      9.391      mm"
"             Runoff depth           5.581      28.271     24.868     mm"
"             Runoff volume          0.17       4.81       4.97       c.m"
"             Runoff coefficient     0.163      0.825      0.726      "
"             Maximum flow           0.000      0.004      0.004      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                   0.004     0.004     0.000     0.114"
" 56          DIVERSION"
"          2015   Node number"
"         0.006   Overflow threshold"
"         1.000   Required diverted fraction"
"             0   Conduit type; 1=Pipe;2=Channel"
"              Peak of diverted flow         0.000    c.m/sec"
"              Volume of diverted flow       0.000    c.m"
"              DIV02015.002hyd"
"              Major flow at 2015"
"                     0.004     0.004     0.004     0.114 c.m/sec"
" 40          HYDROGRAPH Next link "
"             5   Next link "
"                     0.004     0.004     0.004     0.114"
" 40          HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
"                     0.004     0.004     0.004     0.114"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"             Maximum flow                  0.116    c.m/sec"
"             Hydrograph volume           186.244    c.m"
"                    0.004     0.004     0.004     0.116"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                   0.004     0.000     0.004     0.116"
" 33          CATCHMENT 2016"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2016   201-6 - Street A minor to SWMF/Major to Arkell"
"       75.000   % Impervious"
"        0.057   Total Area"
"       20.000   Flow length"
"        3.000   Overland Slope"
"        0.014   Pervious Area"
"       20.000   Pervious length"
"        3.000   Pervious slope"
"        0.043   Impervious Area"
"       20.000   Impervious length"
"        3.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.163   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.841   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                   0.010     0.000     0.004     0.116 c.m/sec"
"             Catchment 2016         Pervious   Impervious Total Area "
"             Surface Area           0.014      0.043      0.057      hectare"
"             Time of concentration  19.140     1.534      2.604      minutes"
"             Time to Centroid       126.808    90.156     92.385     minutes"
"             Rainfall depth         34.259     34.259     34.259     mm"
"             Rainfall volume        4.88       14.65      19.53      c.m"
"             Rainfall losses        28.666     5.461      11.262     mm"
"             Runoff depth           5.592      28.797     22.996     mm"
"             Runoff volume          0.80       12.31      13.11      c.m"
"             Runoff coefficient     0.163      0.841      0.671      "
"             Maximum flow           0.000      0.010      0.010      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                   0.010     0.010     0.004     0.116"
" 56          DIVERSION"
"          2016   Node number"
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"        0.014   Overflow threshold"
"        1.000   Required diverted fraction"
"            0   Conduit type; 1=Pipe;2=Channel"
"             Peak of diverted flow         0.000    c.m/sec"
"             Volume of diverted flow       0.000    c.m"
"             DIV02016.002hyd"
"             Major flow at 2106"
"                    0.010     0.010     0.010     0.116 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.010     0.010     0.010     0.116"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.010     0.010     0.010     0.116"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"             Maximum flow                  0.123    c.m/sec"
"             Hydrograph volume           199.352    c.m"
"                    0.010     0.010     0.010     0.123"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.010     0.000     0.010     0.123"
" 33          CATCHMENT 2017"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2017   201-7 - Block 3 to SWMF"
"       80.000   % Impervious"
"        0.075   Total Area"
"       40.000   Flow length"
"        0.500   Overland Slope"
"        0.015   Pervious Area"
"       40.000   Pervious length"
"        0.500   Pervious slope"
"        0.060   Impervious Area"
"       40.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.163   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.841   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.012     0.000     0.010     0.123 c.m/sec"
"             Catchment 2017         Pervious   Impervious Total Area "
"             Surface Area           0.015      0.060      0.075      hectare"
"             Time of concentration  49.661     3.980      6.097      minutes"
"             Time to Centroid       163.307    94.054     97.264     minutes"
"             Rainfall depth         34.259     34.259     34.259     mm"
"             Rainfall volume        5.14       20.56      25.69      c.m"
"             Rainfall losses        28.659     5.455      10.095     mm"
"             Runoff depth           5.600      28.804     24.163     mm"
"             Runoff volume          0.84       17.28      18.12      c.m"
"             Runoff coefficient     0.163      0.841      0.705      "
"             Maximum flow           0.000      0.012      0.012      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.012     0.012     0.010     0.123"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.012     0.012     0.012     0.123"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"             Maximum flow                  0.136    c.m/sec"
"             Hydrograph volume           217.474    c.m"
"                    0.012     0.012     0.012     0.136"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.012     0.000     0.012     0.136"
" 33          CATCHMENT 2018"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2018   201-8 - Block 2 Roofs to Gallery"
"      100.000   % Impervious"
"        0.032   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.000   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.032   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.831   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.008     0.000     0.012     0.136 c.m/sec"
"             Catchment 2018         Pervious   Impervious Total Area "
"             Surface Area           0.000      0.032      0.032      hectare"
"             Time of concentration  14.261     1.143      1.143      minutes"
"             Time to Centroid       120.965    89.575     89.575     minutes"
"             Rainfall depth         34.259     34.259     34.259     mm"
"             Rainfall volume        0.00       10.96      10.96      c.m"
"             Rainfall losses        28.664     5.776      5.776      mm"
"             Runoff depth           5.594      28.482     28.482     mm"
"             Runoff volume          0.00       9.11       9.11       c.m"
"             Runoff coefficient     0.000      0.831      0.831      "
"             Maximum flow           0.000      0.008      0.008      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.008     0.008     0.012     0.136"
" 57          TRENCH Design d/s of 2018"
"        0.008   Peak inflow"
"        9.114   Hydrograph volume"
"      335.400   Ground elevation"
"      334.300   Downstream trench invert"
"        1.000   Trench height"
"      333.200   Water table elevation"
"        4.000   Trench top width"
"        4.000   Trench bottom width"
"       40.000   Voids ratio (%)"
"       73.000   Hydraulic conductivity"
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"        0.000   Trench gradient (%)"
"        5.000   Trench length"
"        1.000   Include base width"
"          12.   Number of stages"
"                  Level Discharge    Volume"
"                334.300     0.000       0.0"
"                334.400     0.000       0.8"
"                334.500     0.000       1.6"
"                334.600     0.000       2.4"
"                334.700     0.000       3.2"
"                334.800     0.000       4.0"
"                334.900     0.000       4.8"
"                335.000     0.000       5.6"
"                335.100     0.000       6.4"
"                335.200     0.000       7.2"
"                335.300     0.000       8.0"
"                335.400     1.000       8.1"
"           1.   MANHOLE"
"                 Access"
"               diameter"
"                  1.200"
"              Peak outflow                 0.000    c.m/sec"
"              Outflow volume               0.002    c.m"
"              Peak exfiltration            0.001    c.m/sec"
"              Exfiltration volume          9.114    c.m"
"              Maximum level              335.001    metre"
"              Maximum storage              5.612    c.m"
"              Centroidal lag               3.174   hours"
"              Infiltration area 2 sides    7.015   sq.metre"
"              Infiltration Base area      20.000   sq.metre"
"                   0.008     0.008     0.000     0.001 c.m/sec"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"              Maximum flow                 0.136    c.m/sec"
"              Hydrograph volume          217.476    c.m"
"                   0.008     0.008     0.000     0.136"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                   0.008     0.000     0.000     0.136"
" 33          CATCHMENT 2019"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2019   201-9 - SWMF Block"
"       40.000   % Impervious"
"        0.194   Total Area"
"       15.000   Flow length"
"        5.000   Overland Slope"
"        0.116   Pervious Area"
"       15.000   Pervious length"
"        5.000   Pervious slope"
"        0.078   Impervious Area"
"       15.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.163   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.830   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.019     0.000     0.000     0.136 c.m/sec"
"             Catchment 2019         Pervious   Impervious Total Area "
"             Surface Area           0.116      0.078      0.194      hectare"
"             Time of concentration  13.818     1.107      4.004      minutes"
"             Time to Centroid       120.436    89.503     96.552     minutes"
"             Rainfall depth         34.259     34.259     34.259     mm"
"             Rainfall volume        39.88      26.58      66.46      c.m"
"             Rainfall losses        28.665     5.826      19.529     mm"
"             Runoff depth           5.594      28.433     14.729     mm"
"             Runoff volume          6.51       22.06      28.58      c.m"
"             Runoff coefficient     0.163      0.830      0.430      "
"             Maximum flow           0.002      0.018      0.019      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.019     0.019     0.000     0.136"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.019     0.019     0.019     0.136"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"              Maximum flow                 0.148    c.m/sec"
"              Hydrograph volume          246.051    c.m"
"                   0.019     0.019     0.019     0.148"
" 40          HYDROGRAPH   Confluence    900"
"            7   Confluence "
"          900   Node #"
"                SWMF"
"              Maximum flow                 0.148    c.m/sec"
"              Hydrograph volume          246.051    c.m"
"                   0.019     0.148     0.019     0.000"
" 54          POND DESIGN"
"        0.148   Current peak flow    c.m/sec"
"        0.100   Target outflow    c.m/sec"
"        246.1   Hydrograph volume    c.m"
"          12.   Number of stages"
"      334.400   Minimum water level    metre"
"      335.500   Maximum water level    metre"
"      334.400   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                334.400     0.000     0.000"
"                334.500   0.00150    49.000"
"                334.600   0.00230   103.000"
"                334.700   0.00290   161.000"
"                334.800   0.04670   225.000"
"                334.900   0.06500   295.000"
"                335.000   0.07920   370.000"
"                335.100   0.09110   450.000"
"                335.200    0.1017   534.000"
"                335.300    0.2368   622.000"
"                335.400    0.5900   714.000"
"                335.500     1.190   811.000"
"              Peak outflow                 0.014    c.m/sec"
"              Maximum level              334.726    metre"
"              Maximum storage            177.432    c.m"
"              Centroidal lag              10.845   hours"
"                   0.019     0.148     0.014     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.019     0.014     0.014     0.000"
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" 54          POND DESIGN"
"        0.014   Current peak flow    c.m/sec"
"        0.001   Target outflow    c.m/sec"
"        222.5   Hydrograph volume    c.m"
"          10.   Number of stages"
"      334.200   Minimum water level    metre"
"      335.100   Maximum water level    metre"
"      334.200   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                334.200     0.000     0.000"
"                334.300   0.00189    15.000"
"                334.400   0.00209    32.000"
"                334.500   0.00231    50.000"
"                334.600   0.00253    70.000"
"                334.700   0.00276    92.000"
"                334.800   0.00300   117.000"
"                334.900    0.1546   143.000"
"                335.000    0.4631   172.000"
"                335.100    0.9063   202.000"
"             Peak outflow                 0.003    c.m/sec"
"             Maximum level              334.590    metre"
"             Maximum storage             68.049    c.m"
"             Centroidal lag              14.696   hours"
"                  0.019     0.014     0.003     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    800"
"             6   Combine "
"           800   Node #"
"                 Torrance Cree"
"             Maximum flow                 0.003    c.m/sec"
"             Hydrograph volume          197.829    c.m"
"                    0.019     0.014     0.003     0.003"
" 40          HYDROGRAPH Start - New Tributary"
"             2   Start - New Tributary"
"                    0.019     0.000     0.003     0.003"
" 47          FILEI_O Read/Open DIV02015.002hyd"
"             1   1=read/open; 2=write/save"
"             2   1=rainfall; 2=hydrograph"
"             1   1=runoff; 2=inflow; 3=outflow; 4=junction"
"             DIV02015.002hyd"
"             Major flow at 2015"
"             Total volume                 0.000    c.m"
"             Maximum flow                 0.000    c.m/sec"
"                  0.000     0.000     0.003     0.003 c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                    0.000     0.000     0.003     0.003"
" 40          HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
"                    0.000     0.000     0.000     0.003"
" 40          HYDROGRAPH   Combine    800"
"             6   Combine "
"           800   Node #"
"                 Torrance Cree"
"             Maximum flow                 0.003    c.m/sec"
"             Hydrograph volume          197.829    c.m"
"                    0.000     0.000     0.000     0.003"
" 40          HYDROGRAPH Start - New Tributary"
"             2   Start - New Tributary"
"                    0.000     0.000     0.000     0.003"
" 47          FILEI_O Read/Open DIV02016.002hyd"
"             1   1=read/open; 2=write/save"
"             2   1=rainfall; 2=hydrograph"
"             1   1=runoff; 2=inflow; 3=outflow; 4=junction"
"             DIV02016.002hyd"
"             Major flow at 2106"
"             Total volume                 0.000    c.m"
"             Maximum flow                 0.000    c.m/sec"
"                  0.000     0.000     0.000     0.003 c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                    0.000     0.000     0.000     0.003"
" 40          HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
"                    0.000     0.000     0.000     0.003"
" 40          HYDROGRAPH   Combine    800"
"             6   Combine "
"           800   Node #"
"                 Torrance Cree"
"             Maximum flow                 0.003    c.m/sec"
"             Hydrograph volume          197.829    c.m"
"                    0.000     0.000     0.000     0.003"
" 40          HYDROGRAPH Start - New Tributary"
"             2   Start - New Tributary"
"                    0.000     0.000     0.000     0.003"
" 33          CATCHMENT 2021"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"          2021   202-1- wetland directly to Torrance"
"         0.000   % Impervious"
"         0.863   Total Area"
"        50.000   Flow length"
"         0.500   Overland Slope"
"         0.863   Pervious Area"
"        50.000   Pervious length"
"         5.000   Pervious slope"
"         0.000   Impervious Area"
"        50.000   Impervious length"
"         5.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        74.000   Pervious SCS Curve No."
"         0.163   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.924   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.000   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                    0.011     0.000     0.000     0.003 c.m/sec"
"                 Catchment 2021         Pervious   Impervious Total Area "
"                 Surface Area           0.863      0.000      0.863      hectare"
"                 Time of concentration  28.455     2.281      28.455     minutes"
"                 Time to Centroid       137.945    91.371     137.945    minutes"
"                 Rainfall depth         34.259     34.259     34.259     mm"
"                 Rainfall volume        295.65     0.00       295.65     c.m"
"                 Rainfall losses        28.661     5.475      28.661     mm"
"                 Runoff depth           5.597      28.784     5.597      mm"
"                 Runoff volume          48.31      0.00       48.31      c.m"
"                 Runoff coefficient     0.163      0.000      0.163      "
"                 Maximum flow           0.011      0.000      0.011      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                    0.011     0.011     0.000     0.003"
" 40          HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
"                    0.011     0.011     0.011     0.003"
```

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" 40          HYDROGRAPH   Combine    800"
"            6   Combine "
"          800   Node #"
"                Torrance Cree"
"             Maximum flow                 0.012    c.m/sec"
"             Hydrograph volume          246.135    c.m"
"                    0.011     0.011     0.011     0.012"
" 40          HYDROGRAPH Start - New Tributary"
"             2   Start - New Tributary"
"                    0.011     0.000     0.011     0.012"
" 33          CATCHMENT 2022"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"          2022   202-2- Block 3 Rear Yards to Torrance"
"         0.000   % Impervious"
"         0.144   Total Area"
"        15.000   Flow length"
"        20.000   Overland Slope"
"         0.144   Pervious Area"
"        15.000   Pervious length"
"        20.000   Pervious slope"
"         0.000   Impervious Area"
"        15.000   Impervious length"
"        20.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        74.000   Pervious SCS Curve No."
"         0.163   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.924   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     0.011     0.012 c.m/sec"
"             Catchment 2022         Pervious   Impervious Total Area "
"             Surface Area           0.144      0.000      0.144      hectare"
"             Time of concentration  9.116      0.731      9.116      minutes"
"             Time to Centroid       114.843    89.328     114.843    minutes"
"             Rainfall depth         34.259     34.259     34.259     mm"
"             Rainfall volume        49.33      0.00       49.33      c.m"
"             Rainfall losses        28.688     6.625      28.688     mm"
"             Runoff depth           5.571      27.633     5.571      mm"
"             Runoff volume          8.02       0.00       8.02       c.m"
"             Runoff coefficient     0.163      0.000      0.163      "
"             Maximum flow           0.003      0.000      0.003      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                    0.003     0.003     0.011     0.012"
" 40          HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
"                    0.003     0.003     0.003     0.012"
" 40          HYDROGRAPH   Combine    800"
"             6   Combine "
"           800   Node #"
"                 Torrance Cree"
"             Maximum flow                   0.013    c.m/sec"
"             Hydrograph volume            254.157    c.m"
"                    0.003     0.003     0.003     0.013"
" 40          HYDROGRAPH Start - New Tributary"
"             2   Start - New Tributary"
"                    0.003     0.000     0.003     0.013"
" 33          CATCHMENT 2031"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"          2031   203-1 - Arkell Meadows Embankments to Trail"
"         30.000   % Impervious"
"          0.198   Total Area"
"         10.000   Flow length"
"         20.000   Overland Slope"
"          0.139   Pervious Area"
"         10.000   Pervious length"
"         20.000   Pervious slope"
"          0.059   Impervious Area"
"         10.000   Impervious length"
"         20.000   Impervious slope"
"          0.250   Pervious Manning 'n'"
"         74.000   Pervious SCS Curve No."
"          0.162   Pervious Runoff coefficient"
"          0.100   Pervious Ia/S coefficient"
"          8.924   Pervious Initial abstraction"
"          0.015   Impervious Manning 'n'"
"         98.000   Impervious SCS Curve No."
"          0.786   Impervious Runoff coefficient"
"          0.100   Impervious Ia/S coefficient"
"          0.518   Impervious Initial abstraction"
"                    0.015     0.000     0.003     0.013 c.m/sec"
"             Catchment 2031         Pervious   Impervious Total Area "
"             Surface Area           0.139      0.059      0.198      hectare"
"             Time of concentration  7.148      0.573      2.712      minutes"
"             Time to Centroid       112.573    89.401     96.941     minutes"
"             Rainfall depth         34.259     34.259     34.259     mm"
"             Rainfall volume        47.48      20.35      67.83      c.m"
"             Rainfall losses        28.696     7.347      22.291     mm"
"             Runoff depth           5.563      26.911     11.968     mm"
"             Runoff volume          7.71       15.99      23.70      c.m"
"             Runoff coefficient     0.162      0.786      0.349      "
"             Maximum flow           0.004      0.014      0.015      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                    0.015     0.015     0.003     0.013"
" 40          HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
"                    0.015     0.015     0.015     0.013"
" 40          HYDROGRAPH   Combine    800"
"             6   Combine "
"           800   Node #"
"                 Torrance Cree"
"             Maximum flow                   0.017    c.m/sec"
"             Hydrograph volume            277.853    c.m"
"                    0.015     0.015     0.015     0.017"
" 40          HYDROGRAPH Start - New Tributary"
"             2   Start - New Tributary"
"                    0.015     0.000     0.015     0.017"
" 33          CATCHMENT 2032"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"          2032   203-2 Future Park Trail"
"         0.000   % Impervious"
"         0.216   Total Area"
"       180.000   Flow length"
"         0.500   Overland Slope"
"         0.216   Pervious Area"
"       180.000   Pervious length"
"         0.500   Pervious slope"
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"        0.000   Impervious Area"
"      180.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.163   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   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     0.015     0.017 c.m/sec"
"             Catchment 2032         Pervious   Impervious Total Area "
"             Surface Area           0.216      0.000      0.216      hectare"
"             Time of concentration  122.445    9.813      122.444    minutes"
"             Time to Centroid       250.381    102.744    250.381    minutes"
"             Rainfall depth         34.259     34.259     34.259     mm"
"             Rainfall volume        74.00      0.00       74.00      c.m"
"             Rainfall losses        28.657     5.196      28.657     mm"
"             Runoff depth           5.601      29.062     5.601      mm"
"             Runoff volume          12.10      0.00       12.10      c.m"
"             Runoff coefficient     0.163      0.000      0.163      "
"             Maximum flow           0.001      0.000      0.001      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.001     0.001     0.015     0.017"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.001     0.001     0.001     0.017"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               Torrance Cree"
"             Maximum flow                  0.017    c.m/sec"
"             Hydrograph volume           289.952    c.m"
"                  0.001     0.001     0.001     0.017"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                  0.001     0.000     0.001     0.017"
" 33          CATCHMENT 2033"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2033   203-3 - Block 1 Embankment to Trail Block"
"        0.000   % Impervious"
"        0.109   Total Area"
"       10.000   Flow length"
"       33.000   Overland Slope"
"        0.109   Pervious Area"
"       10.000   Pervious length"
"       33.000   Pervious slope"
"        0.000   Impervious Area"
"       10.000   Impervious length"
"       33.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.162   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   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     0.001     0.017 c.m/sec"
"             Catchment 2033         Pervious   Impervious Total Area "
"             Surface Area           0.109      0.000      0.109      hectare"
"             Time of concentration  6.151      0.493      6.151      minutes"
"             Time to Centroid       111.394    89.327     111.394    minutes"
"             Rainfall depth         34.259     34.259     34.259     mm"
"             Rainfall volume        37.34      0.00       37.34      c.m"
"             Rainfall losses        28.713     7.785      28.713     mm"
"             Runoff depth           5.545      26.473     5.545      mm"
"             Runoff volume          6.04       0.00       6.04       c.m"
"             Runoff coefficient     0.162      0.000      0.162      "
"             Maximum flow           0.003      0.000      0.003      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.003     0.003     0.001     0.017"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.003     0.003     0.003     0.017"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               Torrance Cree"
"             Maximum flow                  0.019    c.m/sec"
"             Hydrograph volume           295.996    c.m"
"                  0.003     0.003     0.003     0.019"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                  0.003     0.000     0.003     0.019"
" 33          CATCHMENT 2041"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2041   204-1 Block 1 rear yeards + Arkell Blvd to Arkell"
"       12.000   % Impervious"
"        0.085   Total Area"
"       15.000   Flow length"
"        2.000   Overland Slope"
"        0.075   Pervious Area"
"       15.000   Pervious length"
"        2.000   Pervious slope"
"        0.010   Impervious Area"
"       15.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.163   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.840   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                  0.002     0.000     0.003     0.019 c.m/sec"
"             Catchment 2041         Pervious   Impervious Total Area "
"             Surface Area           0.075      0.010      0.085      hectare"
"             Time of concentration  18.189     1.458      11.292     minutes"
"             Time to Centroid       125.657    90.077     110.989    minutes"
"             Rainfall depth         34.259     34.259     34.259     mm"
"             Rainfall volume        25.63      3.49       29.12      c.m"
"             Rainfall losses        28.664     5.483      25.882     mm"
"             Runoff depth           5.594      28.775     8.376      mm"
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"             Runoff volume          4.18       2.94       7.12       c.m"
"             Runoff coefficient     0.163      0.840      0.244      "
"             Maximum flow           0.001      0.002      0.002      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.002     0.002     0.003     0.019"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.002     0.002     0.002     0.019"
" 40          HYDROGRAPH   Combine    700"
"           6   Combine "
"         700   Node #"
"               Arkell"
"             Maximum flow                0.002    c.m/sec"
"             Hydrograph volume           7.120    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 2042"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2042   204-2 Street A, Block 2 Rear Yars, Blvd to Arkell"
"      36.000   % Impervious"
"       0.111   Total Area"
"      25.000   Flow length"
"       5.000   Overland Slope"
"       0.071   Pervious Area"
"      25.000   Pervious length"
"       5.000   Pervious slope"
"       0.040   Impervious Area"
"      25.000   Impervious length"
"       5.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.163   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.840   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                   0.009     0.000     0.002     0.002 c.m/sec"
"            Catchment 2042         Pervious   Impervious Total Area "
"             Surface Area          0.071      0.040      0.111      hectare"
"             Time of concentration  18.773     1.505      5.939      minutes"
"             Time to Centroid       126.363    90.128     99.432     minutes"
"             Rainfall depth         34.259     34.259     34.259     mm"
"             Rainfall volume        24.34      13.69      38.03      c.m"
"             Rainfall losses        28.663     5.465      20.312     mm"
"             Runoff depth           5.596      28.794     13.947     mm"
"             Runoff volume          3.98       11.51      15.48      c.m"
"             Runoff coefficient     0.163      0.840      0.407      "
"             Maximum flow           0.001      0.009      0.009      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.009     0.009     0.002     0.002"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.009     0.009     0.009     0.002"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               Torrance Cree"
"             Maximum flow                0.027    c.m/sec"
"             Hydrograph volume           311.477    c.m"
"                   0.009     0.009     0.009     0.027"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.009     0.000     0.009     0.027"
" 33          CATCHMENT 205"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         205   205- Dawes Ave to Ex. SWMF "
"      70.000   % Impervious"
"       0.032   Total Area"
"      20.000   Flow length"
"       1.300   Overland Slope"
"       0.010   Pervious Area"
"      20.000   Pervious length"
"       1.300   Pervious slope"
"       0.022   Impervious Area"
"      20.000   Impervious length"
"       1.300   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.163   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.842   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                   0.005     0.000     0.009     0.027 c.m/sec"
"            Catchment 205          Pervious   Impervious Total Area "
"             Surface Area          0.010      0.022      0.032      hectare"
"             Time of concentration  24.598     1.971      3.708      minutes"
"             Time to Centroid       133.333    90.862     94.122     minutes"
"             Rainfall depth         34.259     34.259     34.259     mm"
"             Rainfall volume        3.29       7.67       10.96      c.m"
"             Rainfall losses        28.661     5.404      12.381     mm"
"             Runoff depth           5.598      28.854     21.877     mm"
"             Runoff volume          0.54       6.46       7.00       c.m"
"             Runoff coefficient     0.163      0.842      0.639      "
"             Maximum flow           0.000      0.005      0.005      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.005     0.005     0.009     0.027"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.005     0.005     0.005     0.027"
" 40          HYDROGRAPH   Combine    600"
"           6   Combine "
"         600   Node #"
"               Dawes Avenue"
"             Maximum flow                0.005    c.m/sec"
"             Hydrograph volume           7.001    c.m"
"                   0.005     0.005     0.005     0.005"
" 38          START/RE-START TOTALS 205"
"           3   Runoff Totals on EXIT"
"             Total Catchment area                    3.108    hectare"
"             Total Impervious area                   1.064    hectare"
"             Total % impervious                     34.232"
" 19          EXIT"
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"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                        Sunday, February 7, 2010"
"           10   Units used:                                        ie METRIC"
"                Job folder:                                 Q:\42063\104\SWM\"
"                2024-06-03 - Revised per GRCA Comments (Aug. 17, 2023)\MIDUSS\POST"
"                Output filename:                                        5y.out"
"                Licensee name:                                             A"
"                Company                                                    "
"                Date & Time last used:                 6/8/2024 at 9:02:01 AM"
" 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          139.250    mm/hr"
"             Total depth                 47.240    mm"
"            6   005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 2011"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2011   201-1 - Street A to SWMF"
"       65.000   % Impervious"
"        0.289   Total Area"
"       60.000   Flow length"
"        0.800   Overland Slope"
"        0.101   Pervious Area"
"       60.000   Pervious length"
"        0.750   Pervious slope"
"        0.188   Impervious Area"
"       60.000   Impervious length"
"        0.750   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.244   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.878   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.054     0.000     0.000     0.000 c.m/sec"
"             Catchment 2011         Pervious   Impervious Total Area "
"             Surface Area           0.101      0.188      0.289      hectare"
"             Time of concentration  40.157     4.029      8.722      minutes"
"             Time to Centroid       147.726    91.876     99.130     minutes"
"             Rainfall depth         47.240     47.240     47.240     mm"
"             Rainfall volume        47.78      88.74      136.52     c.m"
"             Rainfall losses        35.735     5.740      16.238     mm"
"             Runoff depth           11.505     41.499     31.001     mm"
"             Runoff volume          11.64      77.96      89.59      c.m"
"             Runoff coefficient     0.244      0.878      0.656      "
"             Maximum flow           0.002      0.054      0.054      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.054     0.054     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.054     0.054     0.054     0.000"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"             Maximum flow                  0.054    c.m/sec"
"             Hydrograph volume            89.594    c.m"
"                    0.054     0.054     0.054     0.054"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.054     0.000     0.054     0.054"
" 33          CATCHMENT 2012"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2012   201-2 - Block 2 Front/Roofs to SWMF"
"       84.000   % Impervious"
"        0.137   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.022   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.115   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.243   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.862   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.037     0.000     0.054     0.054 c.m/sec"
"             Catchment 2012         Pervious   Impervious Total Area "
"             Surface Area           0.022      0.115      0.137      hectare"
"             Time of concentration  10.211     1.025      1.492      minutes"
"             Time to Centroid       111.096    87.416     88.620     minutes"
"             Rainfall depth         47.240     47.240     47.240     mm"
"             Rainfall volume        10.35      54.36      64.72      c.m"
"             Rainfall losses        35.782     6.504      11.188     mm"
"             Runoff depth           11.458     40.736     36.052     mm"
"             Runoff volume          2.51       46.88      49.39      c.m"
"             Runoff coefficient     0.243      0.862      0.763      "
"             Maximum flow           0.001      0.037      0.037      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.037     0.037     0.054     0.054"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.037     0.037     0.037     0.054"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"             Maximum flow                  0.085    c.m/sec"
"             Hydrograph volume           138.984    c.m"
"                    0.037     0.037     0.037     0.085"
```

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" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.037     0.000     0.037     0.085"
" 33          CATCHMENT 2013"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2013   201-3 - Block 1 to SWMF"
"       65.000   % Impervious"
"        0.418   Total Area"
"       80.000   Flow length"
"        0.500   Overland Slope"
"        0.146   Pervious Area"
"       80.000   Pervious length"
"        0.500   Pervious slope"
"        0.272   Impervious Area"
"       80.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.244   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.885   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.080     0.000     0.037     0.085 c.m/sec"
"             Catchment 2013         Pervious   Impervious Total Area "
"             Surface Area           0.146      0.272      0.418      hectare"
"             Time of concentration  53.896     5.407      11.664     minutes"
"             Time to Centroid       164.535    93.831     102.954    minutes"
"             Rainfall depth         47.240     47.240     47.240     mm"
"             Rainfall volume        69.11      128.35     197.46     c.m"
"             Rainfall losses        35.734     5.418      16.028     mm"
"             Runoff depth           11.506     41.822     31.212     mm"
"             Runoff volume          16.83      113.63     130.46     c.m"
"             Runoff coefficient     0.244      0.885      0.661      "
"             Maximum flow           0.003      0.080      0.080      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.080     0.080     0.037     0.085"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.080     0.080     0.080     0.085"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"             Maximum flow                 0.158    c.m/sec"
"             Hydrograph volume          269.449    c.m"
"                    0.080     0.080     0.080     0.158"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.080     0.000     0.080     0.158"
" 33          CATCHMENT 2014"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2014   201-4 - Block 1 Roofs to SWMF"
"      100.000   % Impervious"
"        0.128   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.000   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.128   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.862   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.041     0.000     0.080     0.158 c.m/sec"
"             Catchment 2014         Pervious   Impervious Total Area "
"             Surface Area           0.000      0.128      0.128      hectare"
"             Time of concentration  10.211     1.025      1.025      minutes"
"             Time to Centroid       111.096    87.416     87.416     minutes"
"             Rainfall depth         47.240     47.240     47.240     mm"
"             Rainfall volume        0.00       60.47      60.47      c.m"
"             Rainfall losses        35.782     6.504      6.504      mm"
"             Runoff depth           11.458     40.736     40.736     mm"
"             Runoff volume          0.00       52.14      52.14      c.m"
"             Runoff coefficient     0.000      0.862      0.862      "
"             Maximum flow           0.000      0.041      0.041      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.041     0.041     0.080     0.158"
" 57          TRENCH Design d/s of 2014"
"        0.041   Peak inflow"
"       52.142   Hydrograph volume"
"      335.600   Ground elevation"
"      334.500   Downstream trench invert"
"        1.000   Trench height"
"      333.400   Water table elevation"
"       12.000   Trench top width"
"       12.000   Trench bottom width"
"       40.000   Voids ratio (%)"
"       43.000   Hydraulic conductivity"
"        0.000   Trench gradient (%)"
"        8.000   Trench length"
"        1.000   Include base width"
"          12.   Number of stages"
"                  Level Discharge    Volume"
"                334.500     0.000       0.0"
"                334.600     0.000       3.8"
"                334.700     0.000       7.7"
"                334.800     0.000      11.5"
"                334.900     0.000      15.4"
"                335.000     0.000      19.2"
"                335.100     0.000      23.0"
"                335.200     0.000      26.9"
"                335.300     0.000      30.7"
"                335.400     0.000      34.6"
"                335.500     0.000      38.4"
"                335.600     1.000      38.5"
"            1.   MANHOLE"
"                 Access"
"                diameter"
"                   1.200"
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"             Peak outflow                  0.003    c.m/sec"
"             Outflow volume                1.312    c.m"
"             Peak exfiltration             0.002    c.m/sec"
"             Exfiltration volume          50.651    c.m"
"             Maximum level               335.500    metre"
"             Maximum storage              38.400    c.m"
"             Centroidal lag                1.909   hours"
"             Infiltration area 2 sides    16.000   sq.metre"
"             Infiltration Base area       96.000   sq.metre"
"                  0.041     0.041     0.003     0.002 c.m/sec"
" 40          HYDROGRAPH   Combine    900"
"           6   Combine "
"         900   Node #"
"               SWMF"
"             Maximum flow                  0.158    c.m/sec"
"             Hydrograph volume           270.761    c.m"
"                    0.041     0.041     0.003     0.158"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                  0.041     0.000     0.003     0.158"
" 33          CATCHMENT 2015"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2015   201-5 - Block 1 Ramp minor to SWMF/Major to Arkell"
"      85.000   % Impervious"
"       0.020   Total Area"
"      10.000   Flow length"
"       3.000   Overland Slope"
"       0.003   Pervious Area"
"      10.000   Pervious length"
"       3.000   Pervious slope"
"       0.017   Impervious Area"
"      10.000   Impervious length"
"       3.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.242   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.854   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                  0.006     0.000     0.003     0.158 c.m/sec"
"            Catchment 2015         Pervious   Impervious Total Area "
"            Surface Area           0.003      0.017      0.020      hectare"
"            Time of concentration  9.042      0.907      1.295      minutes"
"            Time to Centroid       109.656    87.251     88.319     minutes"
"            Rainfall depth         47.240     47.240     47.240     mm"
"            Rainfall volume        1.42       8.03       9.45       c.m"
"            Rainfall losses        35.794     6.892      11.227     mm"
"            Runoff depth           11.446     40.348     36.013     mm"
"            Runoff volume          0.34       6.86       7.20       c.m"
"            Runoff coefficient     0.242      0.854      0.762      "
"            Maximum flow           0.000      0.005      0.006      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.006     0.006     0.003     0.158"
" 56          DIVERSION"
"        2015   Node number"
"       0.006   Overflow threshold"
"       1.000   Required diverted fraction"
"           0   Conduit type; 1=Pipe;2=Channel"
"            Peak of diverted flow         0.000    c.m/sec"
"            Volume of diverted flow       0.000    c.m"
"            DIV02015.005hyd"
"            Major flow at 2015"
"                  0.006     0.006     0.006     0.158 c.m/sec"
" 40          HYDROGRAPH Next link "
"           5   Next link "
"                  0.006     0.006     0.006     0.158"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.006     0.006     0.006     0.158"
" 40          HYDROGRAPH   Combine    900"
"           6   Combine "
"         900   Node #"
"               SWMF"
"             Maximum flow                  0.162    c.m/sec"
"             Hydrograph volume           277.964    c.m"
"                    0.006     0.006     0.006     0.162"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                  0.006     0.000     0.006     0.162"
" 33          CATCHMENT 2016"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2016   201-6 - Street A minor to SWMF/Major to Arkell"
"      75.000   % Impervious"
"       0.057   Total Area"
"      20.000   Flow length"
"       3.000   Overland Slope"
"       0.014   Pervious Area"
"      20.000   Pervious length"
"       3.000   Pervious slope"
"       0.043   Impervious Area"
"      20.000   Impervious length"
"       3.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.243   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.875   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                  0.014     0.000     0.006     0.162 c.m/sec"
"            Catchment 2016         Pervious   Impervious Total Area "
"            Surface Area           0.014      0.043      0.057      hectare"
"            Time of concentration  13.705     1.375      2.420      minutes"
"            Time to Centroid       115.360    87.892     90.221     minutes"
"            Rainfall depth         47.240     47.240     47.240     mm"
"            Rainfall volume        6.73       20.20      26.93      c.m"
"            Rainfall losses        35.749     5.888      13.353     mm"
"            Runoff depth           11.491     41.352     33.887     mm"
"            Runoff volume          1.64       17.68      19.32      c.m"
"            Runoff coefficient     0.243      0.875      0.717      "
"            Maximum flow           0.001      0.013      0.014      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.014     0.014     0.006     0.162"
" 56          DIVERSION"
"        2016   Node number"
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"        0.014   Overflow threshold"
"        1.000   Required diverted fraction"
"            0   Conduit type; 1=Pipe;2=Channel"
"             Peak of diverted flow         0.000    c.m/sec"
"             Volume of diverted flow       0.000    c.m"
"             DIV02016.005hyd"
"             Major flow at 2106"
"                    0.014     0.014     0.014     0.162 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.014     0.014     0.014     0.162"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.014     0.014     0.014     0.162"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"             Maximum flow                  0.172    c.m/sec"
"             Hydrograph volume           297.279    c.m"
"                    0.014     0.014     0.014     0.172"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.014     0.000     0.014     0.172"
" 33          CATCHMENT 2017"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2017   201-7 - Block 3 to SWMF"
"       80.000   % Impervious"
"        0.075   Total Area"
"       40.000   Flow length"
"        0.500   Overland Slope"
"        0.015   Pervious Area"
"       40.000   Pervious length"
"        0.500   Pervious slope"
"        0.060   Impervious Area"
"       40.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.244   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.872   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.017     0.000     0.014     0.172 c.m/sec"
"             Catchment 2017         Pervious   Impervious Total Area "
"             Surface Area           0.015      0.060      0.075      hectare"
"             Time of concentration  35.558     3.568      5.656      minutes"
"             Time to Centroid       142.102    91.229     94.550     minutes"
"             Rainfall depth         47.240     47.240     47.240     mm"
"             Rainfall volume        7.09       28.34      35.43      c.m"
"             Rainfall losses        35.735     6.054      11.990     mm"
"             Runoff depth           11.504     41.186     35.250     mm"
"             Runoff volume          1.73       24.71      26.44      c.m"
"             Runoff coefficient     0.244      0.872      0.746      "
"             Maximum flow           0.000      0.017      0.017      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.017     0.017     0.014     0.172"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.017     0.017     0.017     0.172"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"             Maximum flow                  0.188    c.m/sec"
"             Hydrograph volume           323.716    c.m"
"                    0.017     0.017     0.017     0.188"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.017     0.000     0.017     0.188"
" 33          CATCHMENT 2018"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2018   201-8 - Block 2 Roofs to Gallery"
"      100.000   % Impervious"
"        0.032   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.000   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.032   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.862   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.010     0.000     0.017     0.188 c.m/sec"
"             Catchment 2018         Pervious   Impervious Total Area "
"             Surface Area           0.000      0.032      0.032      hectare"
"             Time of concentration  10.211     1.025      1.025      minutes"
"             Time to Centroid       111.096    87.416     87.416     minutes"
"             Rainfall depth         47.240     47.240     47.240     mm"
"             Rainfall volume        0.00       15.12      15.12      c.m"
"             Rainfall losses        35.782     6.504      6.504      mm"
"             Runoff depth           11.458     40.736     40.736     mm"
"             Runoff volume          0.00       13.04      13.04      c.m"
"             Runoff coefficient     0.000      0.862      0.862      "
"             Maximum flow           0.000      0.010      0.010      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.010     0.010     0.017     0.188"
" 57          TRENCH Design d/s of 2018"
"        0.010   Peak inflow"
"       13.036   Hydrograph volume"
"      335.400   Ground elevation"
"      334.300   Downstream trench invert"
"        1.000   Trench height"
"      333.200   Water table elevation"
"        4.000   Trench top width"
"        4.000   Trench bottom width"
"       40.000   Voids ratio (%)"
"       73.000   Hydraulic conductivity"
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"        0.000   Trench gradient (%)"
"        5.000   Trench length"
"        1.000   Include base width"
"          12.   Number of stages"
"                  Level Discharge    Volume"
"                334.300     0.000       0.0"
"                334.400     0.000       0.8"
"                334.500     0.000       1.6"
"                334.600     0.000       2.4"
"                334.700     0.000       3.2"
"                334.800     0.000       4.0"
"                334.900     0.000       4.8"
"                335.000     0.000       5.6"
"                335.100     0.000       6.4"
"                335.200     0.000       7.2"
"                335.300     0.000       8.0"
"                335.400     1.000       8.1"
"           1.   MANHOLE"
"                 Access"
"               diameter"
"                  1.200"
"              Peak outflow                  0.001    c.m/sec"
"              Outflow volume                0.573    c.m"
"              Peak exfiltration             0.001    c.m/sec"
"              Exfiltration volume          12.312    c.m"
"              Maximum level               335.300    metre"
"              Maximum storage               8.000    c.m"
"              Centroidal lag                1.631   hours"
"              Infiltration area 2 sides    10.000   sq.metre"
"              Infiltration Base area       20.000   sq.metre"
"                   0.010     0.010     0.001     0.001 c.m/sec"
" 40          HYDROGRAPH   Combine    900"
"           6   Combine "
"         900   Node #"
"               SWMF"
"              Maximum flow                  0.188    c.m/sec"
"              Hydrograph volume           324.289    c.m"
"                   0.010     0.010     0.001     0.188"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                 0.010     0.000     0.001     0.188"
" 33          CATCHMENT 2019"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2019   201-9 - SWMF Block"
"       40.000   % Impervious"
"        0.194   Total Area"
"       15.000   Flow length"
"        5.000   Overland Slope"
"        0.116   Pervious Area"
"       15.000   Pervious length"
"        5.000   Pervious slope"
"        0.078   Impervious Area"
"       15.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.242   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.860   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                  0.026     0.000     0.001     0.188 c.m/sec"
"             Catchment 2019         Pervious   Impervious Total Area "
"             Surface Area           0.116      0.078      0.194      hectare"
"             Time of concentration  9.894      0.993      3.633      minutes"
"             Time to Centroid       110.733    87.365     94.298     minutes"
"             Rainfall depth         47.240     47.240     47.240     mm"
"             Rainfall volume        54.99      36.66      91.65      c.m"
"             Rainfall losses        35.810     6.598      24.125     mm"
"             Runoff depth           11.430     40.642     23.115     mm"
"             Runoff volume          13.30      31.54      44.84      c.m"
"             Runoff coefficient     0.242      0.860      0.489      "
"             Maximum flow           0.006      0.025      0.026      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.026     0.026     0.001     0.188"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.026     0.026     0.026     0.188"
" 40          HYDROGRAPH   Combine    900"
"           6   Combine "
"         900   Node #"
"               SWMF"
"              Maximum flow                  0.209    c.m/sec"
"              Hydrograph volume           369.132    c.m"
"                   0.026     0.026     0.026     0.209"
" 40          HYDROGRAPH   Confluence    900"
"           7   Confluence "
"         900   Node #"
"               SWMF"
"              Maximum flow                  0.209    c.m/sec"
"              Hydrograph volume           369.132    c.m"
"                   0.026     0.209     0.026     0.000"
" 54          POND DESIGN"
"        0.209   Current peak flow    c.m/sec"
"        0.100   Target outflow    c.m/sec"
"        369.1   Hydrograph volume    c.m"
"          12.   Number of stages"
"      334.400   Minimum water level    metre"
"      335.500   Maximum water level    metre"
"      334.400   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                334.400     0.000     0.000"
"                334.500   0.00150    49.000"
"                334.600   0.00230   103.000"
"                334.700   0.00290   161.000"
"                334.800   0.04670   225.000"
"                334.900   0.06500   295.000"
"                335.000   0.07920   370.000"
"                335.100   0.09110   450.000"
"                335.200    0.1017   534.000"
"                335.300    0.2368   622.000"
"                335.400    0.5900   714.000"
"                335.500     1.190   811.000"
"              Peak outflow                  0.044    c.m/sec"
"              Maximum level               334.795    metre"
"              Maximum storage             221.599    c.m"
"              Centroidal lag                7.946   hours"
"                   0.026     0.209     0.044     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"           5   Next link "
"                  0.026     0.044     0.044     0.000"
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" 54          POND DESIGN"
"        0.044   Current peak flow    c.m/sec"
"        0.001   Target outflow    c.m/sec"
"        345.5   Hydrograph volume    c.m"
"          10.   Number of stages"
"      334.200   Minimum water level    metre"
"      335.100   Maximum water level    metre"
"      334.200   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                334.200     0.000     0.000"
"                334.300   0.00189    15.000"
"                334.400   0.00209    32.000"
"                334.500   0.00231    50.000"
"                334.600   0.00253    70.000"
"                334.700   0.00276    92.000"
"                334.800   0.00300   117.000"
"                334.900    0.1546   143.000"
"                335.000    0.4631   172.000"
"                335.100    0.9063   202.000"
"             Peak outflow                 0.025    c.m/sec"
"             Maximum level              334.815    metre"
"             Maximum storage            120.780    c.m"
"             Centroidal lag              13.243   hours"
"                  0.026     0.044     0.025     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    800"
"             6   Combine "
"           800   Node #"
"                 Torrance Cree"
"             Maximum flow                 0.025    c.m/sec"
"             Hydrograph volume          297.444    c.m"
"                    0.026     0.044     0.025     0.025"
" 40          HYDROGRAPH Start - New Tributary"
"             2   Start - New Tributary"
"                    0.026     0.000     0.025     0.025"
" 47          FILEI_O Read/Open DIV02015.005hyd"
"             1   1=read/open; 2=write/save"
"             2   1=rainfall; 2=hydrograph"
"             1   1=runoff; 2=inflow; 3=outflow; 4=junction"
"             DIV02015.005hyd"
"             Major flow at 2015"
"             Total volume                 0.000    c.m"
"             Maximum flow                 0.000    c.m/sec"
"                  0.000     0.000     0.025     0.025 c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                    0.000     0.000     0.025     0.025"
" 40          HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
"                    0.000     0.000     0.000     0.025"
" 40          HYDROGRAPH   Combine    800"
"             6   Combine "
"           800   Node #"
"                 Torrance Cree"
"             Maximum flow                 0.025    c.m/sec"
"             Hydrograph volume          297.444    c.m"
"                    0.000     0.000     0.000     0.025"
" 40          HYDROGRAPH Start - New Tributary"
"             2   Start - New Tributary"
"                    0.000     0.000     0.000     0.025"
" 47          FILEI_O Read/Open DIV02016.005hyd"
"             1   1=read/open; 2=write/save"
"             2   1=rainfall; 2=hydrograph"
"             1   1=runoff; 2=inflow; 3=outflow; 4=junction"
"             DIV02016.005hyd"
"             Major flow at 2106"
"             Total volume                 0.000    c.m"
"             Maximum flow                 0.000    c.m/sec"
"                  0.000     0.000     0.000     0.025 c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                    0.000     0.000     0.000     0.025"
" 40          HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
"                    0.000     0.000     0.000     0.025"
" 40          HYDROGRAPH   Combine    800"
"             6   Combine "
"           800   Node #"
"                 Torrance Cree"
"             Maximum flow                 0.025    c.m/sec"
"             Hydrograph volume          297.444    c.m"
"                    0.000     0.000     0.000     0.025"
" 40          HYDROGRAPH Start - New Tributary"
"             2   Start - New Tributary"
"                    0.000     0.000     0.000     0.025"
" 33          CATCHMENT 2021"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"          2021   202-1- wetland directly to Torrance"
"         0.000   % Impervious"
"         0.863   Total Area"
"        50.000   Flow length"
"         0.500   Overland Slope"
"         0.863   Pervious Area"
"        50.000   Pervious length"
"         5.000   Pervious slope"
"         0.000   Impervious Area"
"        50.000   Impervious length"
"         5.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        74.000   Pervious SCS Curve No."
"         0.243   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.924   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"
"                    0.032     0.000     0.000     0.025 c.m/sec"
"              Catchment 2021         Pervious   Impervious Total Area "
"              Surface Area           0.863      0.000      0.863      hectare"
"              Time of concentration  20.374     2.044      20.374     minutes"
"              Time to Centroid       123.517    88.872     123.517    minutes"
"              Rainfall depth         47.240     47.240     47.240     mm"
"              Rainfall volume        407.68     0.00       407.68     c.m"
"              Rainfall losses        35.743     5.747      35.743     mm"
"              Runoff depth           11.497     41.493     11.497     mm"
"              Runoff volume          99.22      0.00       99.22      c.m"
"              Runoff coefficient     0.243      0.000      0.243      "
"              Maximum flow           0.032      0.000      0.032      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                    0.032     0.032     0.000     0.025"
" 40          HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
"                    0.032     0.032     0.032     0.025"
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" 40          HYDROGRAPH   Combine    800"
"            6   Combine "
"          800   Node #"
"                Torrance Cree"
"             Maximum flow                 0.034    c.m/sec"
"             Hydrograph volume          396.665    c.m"
"                    0.032     0.032     0.032     0.034"
" 40          HYDROGRAPH Start - New Tributary"
"             2   Start - New Tributary"
"                    0.032     0.000     0.032     0.034"
" 33          CATCHMENT 2022"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"          2022   202-2- Block 3 Rear Yards to Torrance"
"         0.000   % Impervious"
"         0.144   Total Area"
"        15.000   Flow length"
"        20.000   Overland Slope"
"         0.144   Pervious Area"
"        15.000   Pervious length"
"        20.000   Pervious slope"
"         0.000   Impervious Area"
"        15.000   Impervious length"
"        20.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        74.000   Pervious SCS Curve No."
"         0.241   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.924   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.000   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                    0.009     0.000     0.032     0.034 c.m/sec"
"                Catchment 2022         Pervious   Impervious Total Area "
"                Surface Area           0.144      0.000      0.144      hectare"
"                Time of concentration  6.527      0.655      6.527      minutes"
"                Time to Centroid       106.716    87.258     106.716    minutes"
"                Rainfall depth         47.240     47.240     47.240     mm"
"                Rainfall volume        68.03      0.00       68.03      c.m"
"                Rainfall losses        35.856     8.138      35.855     mm"
"                Runoff depth           11.384     39.102     11.384     mm"
"                Runoff volume          16.39      0.00       16.39      c.m"
"                Runoff coefficient     0.241      0.000      0.241      "
"                Maximum flow           0.009      0.000      0.009      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                    0.009     0.009     0.032     0.034"
" 40          HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
"                    0.009     0.009     0.009     0.034"
" 40          HYDROGRAPH   Combine    800"
"             6   Combine "
"           800   Node #"
"                 Torrance Cree"
"             Maximum flow                   0.039    c.m/sec"
"             Hydrograph volume            413.058    c.m"
"                    0.009     0.009     0.009     0.039"
" 40          HYDROGRAPH Start - New Tributary"
"             2   Start - New Tributary"
"                    0.009     0.000     0.009     0.039"
" 33          CATCHMENT 2031"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"          2031   203-1 - Arkell Meadows Embankments to Trail"
"         30.000   % Impervious"
"          0.198   Total Area"
"         10.000   Flow length"
"         20.000   Overland Slope"
"          0.139   Pervious Area"
"         10.000   Pervious length"
"         20.000   Pervious slope"
"          0.059   Impervious Area"
"         10.000   Impervious length"
"         20.000   Impervious slope"
"          0.250   Pervious Manning 'n'"
"         74.000   Pervious SCS Curve No."
"          0.242   Pervious Runoff coefficient"
"          0.100   Pervious Ia/S coefficient"
"          8.924   Pervious Initial abstraction"
"          0.015   Impervious Manning 'n'"
"         98.000   Impervious SCS Curve No."
"          0.802   Impervious Runoff coefficient"
"          0.100   Impervious Ia/S coefficient"
"          0.518   Impervious Initial abstraction"
"                    0.023     0.000     0.009     0.039 c.m/sec"
"                Catchment 2031         Pervious   Impervious Total Area "
"                Surface Area           0.139      0.059      0.198      hectare"
"                Time of concentration  5.118      0.513      2.416      minutes"
"                Time to Centroid       104.854    87.231     94.514     minutes"
"                Rainfall depth         47.240     47.240     47.240     mm"
"                Rainfall volume        65.47      28.06      93.53      c.m"
"                Rainfall losses        35.800     9.346      27.864     mm"
"                Runoff depth           11.440     37.894     19.376     mm"
"                Runoff volume          15.86      22.51      38.37      c.m"
"                Runoff coefficient     0.242      0.802      0.410      "
"                Maximum flow           0.009      0.019      0.023      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                    0.023     0.023     0.009     0.039"
" 40          HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
"                    0.023     0.023     0.023     0.039"
" 40          HYDROGRAPH   Combine    800"
"             6   Combine "
"           800   Node #"
"                 Torrance Cree"
"             Maximum flow                   0.047    c.m/sec"
"             Hydrograph volume            451.423    c.m"
"                    0.023     0.023     0.023     0.047"
" 40          HYDROGRAPH Start - New Tributary"
"             2   Start - New Tributary"
"                    0.023     0.000     0.023     0.047"
" 33          CATCHMENT 2032"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"          2032   203-2 Future Park Trail"
"         0.000   % Impervious"
"         0.216   Total Area"
"       180.000   Flow length"
"         0.500   Overland Slope"
"         0.216   Pervious Area"
"       180.000   Pervious length"
"         0.500   Pervious slope"
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"        0.000   Impervious Area"
"      180.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.244   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   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     0.023     0.047 c.m/sec"
"             Catchment 2032         Pervious   Impervious Total Area "
"             Surface Area           0.216      0.000      0.216      hectare"
"             Time of concentration  87.673     8.796      87.672     minutes"
"             Time to Centroid       205.857    98.611     205.857    minutes"
"             Rainfall depth         47.240     47.240     47.240     mm"
"             Rainfall volume        102.04     0.00       102.04     c.m"
"             Rainfall losses        35.732     5.263      35.732     mm"
"             Runoff depth           11.508     41.977     11.508     mm"
"             Runoff volume          24.86      0.00       24.86      c.m"
"             Runoff coefficient     0.244      0.000      0.244      "
"             Maximum flow           0.003      0.000      0.003      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.003     0.003     0.023     0.047"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                  0.003     0.003     0.003     0.047"
" 40          HYDROGRAPH   Combine    800"
"            6   Combine "
"          800   Node #"
"                Torrance Cree"
"             Maximum flow                  0.048    c.m/sec"
"             Hydrograph volume           476.280    c.m"
"                  0.003     0.003     0.003     0.048"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                  0.003     0.000     0.003     0.048"
" 33          CATCHMENT 2033"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2033   203-3 - Block 1 Embankment to Trail Block"
"        0.000   % Impervious"
"        0.109   Total Area"
"       10.000   Flow length"
"       33.000   Overland Slope"
"        0.109   Pervious Area"
"       10.000   Pervious length"
"       33.000   Pervious slope"
"        0.000   Impervious Area"
"       10.000   Impervious length"
"       33.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.242   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   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"
"                  0.007     0.000     0.003     0.048 c.m/sec"
"             Catchment 2033         Pervious   Impervious Total Area "
"             Surface Area           0.109      0.000      0.109      hectare"
"             Time of concentration  4.404      0.442      4.404      minutes"
"             Time to Centroid       104.023    87.079     104.023    minutes"
"             Rainfall depth         47.240     47.240     47.240     mm"
"             Rainfall volume        51.49      0.00       51.49      c.m"
"             Rainfall losses        35.831     9.835      35.831     mm"
"             Runoff depth           11.408     37.405     11.408     mm"
"             Runoff volume          12.44      0.00       12.44      c.m"
"             Runoff coefficient     0.242      0.000      0.242      "
"             Maximum flow           0.007      0.000      0.007      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                  0.007     0.007     0.003     0.048"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                  0.007     0.007     0.007     0.048"
" 40          HYDROGRAPH   Combine    800"
"            6   Combine "
"          800   Node #"
"                Torrance Cree"
"             Maximum flow                  0.053    c.m/sec"
"             Hydrograph volume           488.715    c.m"
"                  0.007     0.007     0.007     0.053"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                  0.007     0.000     0.007     0.053"
" 33          CATCHMENT 2041"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2041   204-1 Block 1 rear yeards + Arkell Blvd to Arkell"
"       12.000   % Impervious"
"        0.085   Total Area"
"       15.000   Flow length"
"        2.000   Overland Slope"
"        0.075   Pervious Area"
"       15.000   Pervious length"
"        2.000   Pervious slope"
"        0.010   Impervious Area"
"       15.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.243   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.874   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                  0.005     0.000     0.007     0.053 c.m/sec"
"             Catchment 2041         Pervious   Impervious Total Area "
"             Surface Area           0.075      0.010      0.085      hectare"
"             Time of concentration  13.024     1.307      9.164      minutes"
"             Time to Centroid       114.543    87.817     105.739    minutes"
"             Rainfall depth         47.240     47.240     47.240     mm"
"             Rainfall volume        35.34      4.82       40.15      c.m"
"             Rainfall losses        35.778     5.949      32.199     mm"
"             Runoff depth           11.461     41.291     15.041     mm"
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"            Runoff volume          8.57       4.21       12.78      c.m"
"            Runoff coefficient     0.243      0.874      0.318      "
"            Maximum flow           0.004      0.003      0.005      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.005     0.005     0.007     0.053"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.005     0.005     0.005     0.053"
" 40         HYDROGRAPH   Combine    700"
"           6   Combine "
"         700   Node #"
"               Arkell"
"            Maximum flow                0.005    c.m/sec"
"            Hydrograph volume          12.785    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 2042"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2042   204-2 Street A, Block 2 Rear Yars, Blvd to Arkell"
"      36.000   % Impervious"
"       0.111   Total Area"
"      25.000   Flow length"
"       5.000   Overland Slope"
"       0.071   Pervious Area"
"      25.000   Pervious length"
"       5.000   Pervious slope"
"       0.040   Impervious Area"
"      25.000   Impervious length"
"       5.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.243   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.875   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                  0.013     0.000     0.005     0.005 c.m/sec"
"            Catchment 2042         Pervious   Impervious Total Area "
"            Surface Area           0.071      0.040      0.111      hectare"
"            Time of concentration  13.442     1.349      5.347      minutes"
"            Time to Centroid       115.044    87.865     96.851     minutes"
"            Rainfall depth         47.240     47.240     47.240     mm"
"            Rainfall volume        33.56      18.88      52.44      c.m"
"            Rainfall losses        35.756     5.905      25.010     mm"
"            Runoff depth           11.484     41.334     22.230     mm"
"            Runoff volume          8.16       16.52      24.68      c.m"
"            Runoff coefficient     0.243      0.875      0.471      "
"            Maximum flow           0.003      0.013      0.013      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.013     0.013     0.005     0.005"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.013     0.013     0.013     0.005"
" 40         HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               Torrance Cree"
"            Maximum flow                0.061    c.m/sec"
"            Hydrograph volume         513.391    c.m"
"                  0.013     0.013     0.013     0.061"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                  0.013     0.000     0.013     0.061"
" 33         CATCHMENT 205"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         205   205- Dawes Ave to Ex. SWMF "
"      70.000   % Impervious"
"       0.032   Total Area"
"      20.000   Flow length"
"       1.300   Overland Slope"
"       0.010   Pervious Area"
"      20.000   Pervious length"
"       1.300   Pervious slope"
"       0.022   Impervious Area"
"      20.000   Impervious length"
"       1.300   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.243   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.878   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                  0.007     0.000     0.013     0.061 c.m/sec"
"            Catchment 205          Pervious   Impervious Total Area "
"            Surface Area           0.010      0.022      0.032      hectare"
"            Time of concentration  17.613     1.767      3.448      minutes"
"            Time to Centroid       120.126    88.456     91.815     minutes"
"            Rainfall depth         47.240     47.240     47.240     mm"
"            Rainfall volume        4.54       10.58      15.12      c.m"
"            Rainfall losses        35.752     5.744      14.746     mm"
"            Runoff depth           11.488     41.496     32.494     mm"
"            Runoff volume          1.10       9.30       10.40      c.m"
"            Runoff coefficient     0.243      0.878      0.688      "
"            Maximum flow           0.000      0.007      0.007      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.007     0.007     0.013     0.061"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.007     0.007     0.007     0.061"
" 40         HYDROGRAPH   Combine    600"
"           6   Combine "
"         600   Node #"
"               Dawes Avenue"
"            Maximum flow                0.007    c.m/sec"
"            Hydrograph volume          10.398    c.m"
"                  0.007     0.007     0.007     0.007"
" 38         START/RE-START TOTALS 205"
"           3   Runoff Totals on EXIT"
"            Total Catchment area                    3.108    hectare"
"            Total Impervious area                   1.064    hectare"
"            Total % impervious                     34.232"
" 19         EXIT"
```

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"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                        Sunday, February 7, 2010"
"           10   Units used:                                          ie METRIC"
"                Job folder:                                 Q:\42063\104\SWM\"
"                2024-06-03 - Revised per GRCA Comments (Aug. 17, 2023)\MIDUSS\POST"
"                Output filename:                                        10y.out"
"                Licensee name:                                              A"
"                Company                                                     "
"                Date & Time last used:                 6/8/2024 at 2:28:44 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     2221.000   Coefficient A"
"       12.000   Constant B"
"        0.908   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           169.551    mm/hr"
"             Total depth                  56.290    mm"
"            5   10hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 2011"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2011   201-1 - Street A to SWMF"
"       65.000   % Impervious"
"        0.289   Total Area"
"       60.000   Flow length"
"        0.800   Overland Slope"
"        0.101   Pervious Area"
"       60.000   Pervious length"
"        0.750   Pervious slope"
"        0.188   Impervious Area"
"       60.000   Impervious length"
"        0.750   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.292   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.889   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.066     0.000     0.000     0.000 c.m/sec"
"             Catchment 2011         Pervious   Impervious Total Area "
"             Surface Area           0.101      0.188      0.289      hectare"
"             Time of concentration  33.678     3.706      8.208      minutes"
"             Time to Centroid       138.194    90.447     97.618     minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        56.94      105.74     162.68     c.m"
"             Rainfall losses        39.872     6.269      18.030     mm"
"             Runoff depth           16.418     50.021     38.260     mm"
"             Runoff volume          16.61      93.96      110.57     c.m"
"             Runoff coefficient     0.292      0.889      0.680      "
"             Maximum flow           0.004      0.065      0.066      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.066     0.066     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.066     0.066     0.066     0.000"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"             Maximum flow                  0.066    c.m/sec"
"             Hydrograph volume           110.572    c.m"
"                    0.066     0.066     0.066     0.066"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.066     0.000     0.066     0.066"
" 33          CATCHMENT 2012"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2012   201-2 - Block 2 Front/Roofs to SWMF"
"       84.000   % Impervious"
"        0.137   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.022   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.115   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.291   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.872   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.046     0.000     0.066     0.066 c.m/sec"
"             Catchment 2012         Pervious   Impervious Total Area "
"             Surface Area           0.022      0.115      0.137      hectare"
"             Time of concentration  8.564      0.942      1.397      minutes"
"             Time to Centroid       106.793    86.363     87.582     minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        12.34      64.78      77.12      c.m"
"             Rainfall losses        39.928     7.184      12.423     mm"
"             Runoff depth           16.362     49.106     43.867     mm"
"             Runoff volume          3.59       56.51      60.10      c.m"
"             Runoff coefficient     0.291      0.872      0.779      "
"             Maximum flow           0.002      0.046      0.046      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.046     0.046     0.066     0.066"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.046     0.046     0.046     0.066"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"             Maximum flow                  0.107    c.m/sec"
"             Hydrograph volume           170.670    c.m"
"                    0.046     0.046     0.046     0.107"
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" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.046     0.000     0.046     0.107"
" 33          CATCHMENT 2013"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2013   201-3 - Block 1 to SWMF"
"       65.000   % Impervious"
"        0.418   Total Area"
"       80.000   Flow length"
"        0.500   Overland Slope"
"        0.146   Pervious Area"
"       80.000   Pervious length"
"        0.500   Pervious slope"
"        0.272   Impervious Area"
"       80.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.292   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.899   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.099     0.000     0.046     0.107 c.m/sec"
"             Catchment 2013         Pervious   Impervious Total Area "
"             Surface Area           0.146      0.272      0.418      hectare"
"             Time of concentration  45.199     4.974      10.956     minutes"
"             Time to Centroid       152.590    92.233     101.209    minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        82.35      152.94     235.29     c.m"
"             Rainfall losses        39.873     5.688      17.653     mm"
"             Runoff depth           16.417     50.602     38.637     mm"
"             Runoff volume          24.02      137.48     161.50     c.m"
"             Runoff coefficient     0.292      0.899      0.686      "
"             Maximum flow           0.005      0.099      0.099      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.099     0.099     0.046     0.107"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.099     0.099     0.099     0.107"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"             Maximum flow                 0.195    c.m/sec"
"             Hydrograph volume          332.174    c.m"
"                    0.099     0.099     0.099     0.195"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.099     0.000     0.099     0.195"
" 33          CATCHMENT 2014"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2014   201-4 - Block 1 Roofs to SWMF"
"      100.000   % Impervious"
"        0.128   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.000   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.128   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.872   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.051     0.000     0.099     0.195 c.m/sec"
"             Catchment 2014         Pervious   Impervious Total Area "
"             Surface Area           0.000      0.128      0.128      hectare"
"             Time of concentration  8.564      0.942      0.942      minutes"
"             Time to Centroid       106.793    86.363     86.363     minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        0.00       72.05      72.05      c.m"
"             Rainfall losses        39.928     7.184      7.184      mm"
"             Runoff depth           16.362     49.106     49.106     mm"
"             Runoff volume          0.00       62.86      62.86      c.m"
"             Runoff coefficient     0.000      0.872      0.872      "
"             Maximum flow           0.000      0.051      0.051      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.051     0.051     0.099     0.195"
" 57          TRENCH Design d/s of 2014"
"        0.051   Peak inflow"
"       62.856   Hydrograph volume"
"      335.600   Ground elevation"
"      334.500   Downstream trench invert"
"        1.000   Trench height"
"      333.400   Water table elevation"
"       12.000   Trench top width"
"       12.000   Trench bottom width"
"       40.000   Voids ratio (%)"
"       43.000   Hydraulic conductivity"
"        0.000   Trench gradient (%)"
"        8.000   Trench length"
"        1.000   Include base width"
"          12.   Number of stages"
"                  Level Discharge    Volume"
"                334.500     0.000       0.0"
"                334.600     0.000       3.8"
"                334.700     0.000       7.7"
"                334.800     0.000      11.5"
"                334.900     0.000      15.4"
"                335.000     0.000      19.2"
"                335.100     0.000      23.0"
"                335.200     0.000      26.9"
"                335.300     0.000      30.7"
"                335.400     0.000      34.6"
"                335.500     0.000      38.4"
"                335.600     1.000      38.5"
"            1.   MANHOLE"
"                 Access"
"               diameter"
"                  1.200"
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"            Peak outflow                 0.019    c.m/sec"
"            Outflow volume              10.578    c.m"
"            Peak exfiltration            0.002    c.m/sec"
"            Exfiltration volume         51.230    c.m"
"            Maximum level              335.502    metre"
"            Maximum storage             38.403    c.m"
"            Centroidal lag               1.631   hours"
"            Infiltration area 2 sides   16.000   sq.metre"
"            Infiltration Base area      96.000   sq.metre"
"                 0.051     0.051     0.019     0.002 c.m/sec"
" 40         HYDROGRAPH   Combine    900"
"           6   Combine "
"         900   Node #"
"               SWMF"
"            Maximum flow                 0.195    c.m/sec"
"            Hydrograph volume          342.752    c.m"
"                  0.051     0.051     0.019     0.195"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                  0.051     0.000     0.019     0.195"
" 33         CATCHMENT 2015"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2015   201-5 - Block 1 Ramp minor to SWMF/Major to Arkell"
"      85.000   % Impervious"
"       0.020   Total Area"
"      10.000   Flow length"
"       3.000   Overland Slope"
"       0.003   Pervious Area"
"      10.000   Pervious length"
"       3.000   Pervious slope"
"       0.017   Impervious Area"
"      10.000   Impervious length"
"       3.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.290   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.863   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                  0.007     0.000     0.019     0.195 c.m/sec"
"            Catchment 2015         Pervious   Impervious Total Area "
"            Surface Area           0.003      0.017      0.020      hectare"
"            Time of concentration  7.583      0.834      1.213      minutes"
"            Time to Centroid       105.640    86.227     87.315     minutes"
"            Rainfall depth         56.290     56.290     56.290     mm"
"            Rainfall volume        1.69       9.57       11.26      c.m"
"            Rainfall losses        39.941     7.722      12.555     mm"
"            Runoff depth           16.349     48.568     43.735     mm"
"            Runoff volume          0.49       8.26       8.75       c.m"
"            Runoff coefficient     0.290      0.863      0.777      "
"            Maximum flow           0.000      0.007      0.007      c.m/sec"
" 56         DIVERSION"
"         2015   Node number"
"        0.006   Overflow threshold"
"        1.000   Required diverted fraction"
"            0   Conduit type; 1=Pipe;2=Channel"
"            Peak of diverted flow         0.001    c.m/sec"
"            Volume of diverted flow       0.241    c.m"
"            DIV02015.10hyd"
"            Major flow at 2015"
"                  0.007     0.007     0.006     0.195 c.m/sec"
" 40         HYDROGRAPH Next link "
"           5   Next link "
"                  0.007     0.006     0.006     0.195"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.007     0.006     0.006     0.195"
" 40         HYDROGRAPH   Combine    900"
"           6   Combine "
"         900   Node #"
"               SWMF"
"            Maximum flow                 0.199    c.m/sec"
"            Hydrograph volume          351.258    c.m"
"                  0.007     0.006     0.006     0.199"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                  0.007     0.000     0.006     0.199"
" 33         CATCHMENT 2016"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2016   201-6 - Street A minor to SWMF/Major to Arkell"
"      75.000   % Impervious"
"       0.057   Total Area"
"      20.000   Flow length"
"       3.000   Overland Slope"
"       0.014   Pervious Area"
"      20.000   Pervious length"
"       3.000   Pervious slope"
"       0.043   Impervious Area"
"      20.000   Impervious length"
"       3.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.291   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.889   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                  0.017     0.000     0.006     0.199 c.m/sec"
"            Catchment 2016         Pervious   Impervious Total Area "
"            Surface Area           0.014      0.043      0.057      hectare"
"            Time of concentration  11.493     1.265      2.271      minutes"
"            Time to Centroid       110.465    86.789     89.118     minutes"
"            Rainfall depth         56.290     56.290     56.290     mm"
"            Rainfall volume        8.02       24.06      32.09      c.m"
"            Rainfall losses        39.908     6.254      14.667     mm"
"            Runoff depth           16.382     50.036     41.623     mm"
"            Runoff volume          2.33       21.39      23.73      c.m"
"            Runoff coefficient     0.291      0.889      0.739      "
"            Maximum flow           0.001      0.017      0.017      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.017     0.017     0.006     0.199"
" 56         DIVERSION"
"         2016   Node number"
"        0.014   Overflow threshold"
"        1.000   Required diverted fraction"
"            0   Conduit type; 1=Pipe;2=Channel"
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"             Peak of diverted flow         0.003    c.m/sec"
"             Volume of diverted flow       0.898    c.m"
"             DIV02016.10hyd"
"             Major flow at 2106"
"                    0.017     0.017     0.014     0.199 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.017     0.014     0.014     0.199"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.017     0.014     0.014     0.199"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"             Maximum flow                  0.212    c.m/sec"
"             Hydrograph volume           374.085    c.m"
"                    0.017     0.014     0.014     0.212"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.017     0.000     0.014     0.212"
" 33          CATCHMENT 2017"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2017   201-7 - Block 3 to SWMF"
"       80.000   % Impervious"
"        0.075   Total Area"
"       40.000   Flow length"
"        0.500   Overland Slope"
"        0.015   Pervious Area"
"       40.000   Pervious length"
"        0.500   Pervious slope"
"        0.060   Impervious Area"
"       40.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.292   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.890   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.020     0.000     0.014     0.212 c.m/sec"
"             Catchment 2017         Pervious   Impervious Total Area "
"             Surface Area           0.015      0.060      0.075      hectare"
"             Time of concentration  29.821     3.282      5.292      minutes"
"             Time to Centroid       133.383    89.802     93.104     minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        8.44       33.77      42.22      c.m"
"             Rainfall losses        39.870     6.216      12.946     mm"
"             Runoff depth           16.421     50.075     43.344     mm"
"             Runoff volume          2.46       30.04      32.51      c.m"
"             Runoff coefficient     0.292      0.890      0.770      "
"             Maximum flow           0.001      0.020      0.020      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.020     0.020     0.014     0.212"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.020     0.020     0.020     0.212"
```

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" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"             Maximum flow                  0.232    c.m/sec"
"             Hydrograph volume           406.593    c.m"
"                    0.020     0.020     0.020     0.232"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.020     0.000     0.020     0.232"
" 33          CATCHMENT 2018"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2018   201-8 - Block 2 Roofs to Gallery"
"      100.000   % Impervious"
"        0.032   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.000   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.032   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.872   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.013     0.000     0.020     0.232 c.m/sec"
"             Catchment 2018         Pervious   Impervious Total Area "
"             Surface Area           0.000      0.032      0.032      hectare"
"             Time of concentration  8.564      0.942      0.942      minutes"
"             Time to Centroid       106.793    86.363     86.363     minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        0.00       18.01      18.01      c.m"
"             Rainfall losses        39.928     7.184      7.184      mm"
"             Runoff depth           16.362     49.106     49.106     mm"
"             Runoff volume          0.00       15.71      15.71      c.m"
"             Runoff coefficient     0.000      0.872      0.872      "
"             Maximum flow           0.000      0.013      0.013      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.013     0.013     0.020     0.232"
" 57          TRENCH Design d/s of 2018"
"        0.013   Peak inflow"
"       15.714   Hydrograph volume"
"      335.400   Ground elevation"
"      334.300   Downstream trench invert"
"        1.000   Trench height"
"      333.200   Water table elevation"
"        4.000   Trench top width"
"        4.000   Trench bottom width"
"       40.000   Voids ratio (%)"
"       73.000   Hydraulic conductivity"
"        0.000   Trench gradient (%)"
"        5.000   Trench length"
"        1.000   Include base width"
```

```
"          12.   Number of stages"
"                  Level Discharge    Volume"
"                334.300     0.000       0.0"
"                334.400     0.000       0.8"
"                334.500     0.000       1.6"
"                334.600     0.000       2.4"
"                334.700     0.000       3.2"
"                334.800     0.000       4.0"
"                334.900     0.000       4.8"
"                335.000     0.000       5.6"
"                335.100     0.000       6.4"
"                335.200     0.000       7.2"
"                335.300     0.000       8.0"
"                335.400     1.000       8.1"
"           1.   MANHOLE"
"                 Access"
"               diameter"
"                  1.200"
"              Peak outflow                  0.004    c.m/sec"
"              Outflow volume                2.380    c.m"
"              Peak exfiltration             0.001    c.m/sec"
"              Exfiltration volume          12.609    c.m"
"              Maximum level               335.301    metre"
"              Maximum storage               8.001    c.m"
"              Centroidal lag                1.525   hours"
"              Infiltration area 2 sides    10.000   sq.metre"
"              Infiltration Base area       20.000   sq.metre"
"                   0.013     0.013     0.004     0.001 c.m/sec"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"              Maximum flow                  0.232    c.m/sec"
"              Hydrograph volume           408.973    c.m"
"                     0.013     0.013     0.004     0.232"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.013     0.000     0.004     0.232"
" 33          CATCHMENT 2019"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"          2019   201-9 - SWMF Block"
"        40.000   % Impervious"
"         0.194   Total Area"
"        15.000   Flow length"
"         5.000   Overland Slope"
"         0.116   Pervious Area"
"        15.000   Pervious length"
"         5.000   Pervious slope"
"         0.078   Impervious Area"
"        15.000   Impervious length"
"         5.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        74.000   Pervious SCS Curve No."
"         0.291   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.924   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.870   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                     0.033     0.000     0.004     0.232 c.m/sec"
```

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"             Catchment 2019         Pervious   Impervious Total Area "
"             Surface Area           0.116      0.078      0.194      hectare"
"             Time of concentration  8.297      0.913      3.380      minutes"
"             Time to Centroid       106.531    86.324     93.074     minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        65.52      43.68      109.20     c.m"
"             Rainfall losses        39.914     7.321      26.877     mm"
"             Runoff depth           16.376     48.969     29.413     mm"
"             Runoff volume          19.06      38.00      57.06      c.m"
"             Runoff coefficient     0.291      0.870      0.523      "
"             Maximum flow           0.010      0.031      0.033      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.033     0.033     0.004     0.232"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.033     0.033     0.033     0.232"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"              Maximum flow                  0.260    c.m/sec"
"              Hydrograph volume           466.035    c.m"
"                     0.033     0.033     0.033     0.260"
" 40          HYDROGRAPH   Confluence    900"
"            7   Confluence "
"          900   Node #"
"                SWMF"
"              Maximum flow                  0.260    c.m/sec"
"              Hydrograph volume           466.035    c.m"
"                     0.033     0.260     0.033     0.000"
" 54          POND DESIGN"
"         0.260   Current peak flow    c.m/sec"
"         0.100   Target outflow    c.m/sec"
"         466.0   Hydrograph volume    c.m"
"           12.   Number of stages"
"       334.400   Minimum water level    metre"
"       335.500   Maximum water level    metre"
"       334.400   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                 334.400     0.000     0.000"
"                 334.500   0.00150    49.000"
"                 334.600   0.00230   103.000"
"                 334.700   0.00290   161.000"
"                 334.800   0.04670   225.000"
"                 334.900   0.06500   295.000"
"                 335.000   0.07920   370.000"
"                 335.100   0.09110   450.000"
"                 335.200    0.1017   534.000"
"                 335.300    0.2368   622.000"
"                 335.400    0.5900   714.000"
"                 335.500     1.190   811.000"
"              Peak outflow                  0.059    c.m/sec"
"              Maximum level               334.868    metre"
"              Maximum storage             272.529    c.m"
"              Centroidal lag                6.799   hours"
"                   0.033     0.260     0.059     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                     0.033     0.059     0.059     0.000"
" 54          POND DESIGN"
"         0.059   Current peak flow    c.m/sec"
"         0.001   Target outflow    c.m/sec"
```

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"        441.8   Hydrograph volume    c.m"
"          10.   Number of stages"
"      334.200   Minimum water level    metre"
"      335.100   Maximum water level    metre"
"      334.200   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                334.200     0.000     0.000"
"                334.300   0.00189    15.000"
"                334.400   0.00209    32.000"
"                334.500   0.00231    50.000"
"                334.600   0.00253    70.000"
"                334.700   0.00276    92.000"
"                334.800   0.00300   117.000"
"                334.900    0.1546   143.000"
"                335.000    0.4631   172.000"
"                335.100    0.9063   202.000"
"             Peak outflow                  0.052    c.m/sec"
"             Maximum level              334.832    metre"
"             Maximum storage            125.380    c.m"
"             Centroidal lag              10.887   hours"
"                  0.033     0.059     0.052     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               Torrance Cree"
"             Maximum flow                  0.052    c.m/sec"
"             Hydrograph volume           393.635    c.m"
"                   0.033     0.059     0.052     0.052"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.033     0.000     0.052     0.052"
" 47          FILEI_O Read/Open DIV02015.10hyd"
"           1   1=read/open; 2=write/save"
"           2   1=rainfall; 2=hydrograph"
"           1   1=runoff; 2=inflow; 3=outflow; 4=junction"
"            DIV02015.10hyd"
"            Major flow at 2015"
"            Total volume                  0.241    c.m"
"            Maximum flow                  0.001    c.m/sec"
"                 0.001     0.000     0.052     0.052 c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.001     0.001     0.052     0.052"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.001     0.001     0.001     0.052"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               Torrance Cree"
"             Maximum flow                  0.052    c.m/sec"
"             Hydrograph volume           393.877    c.m"
"                   0.001     0.001     0.001     0.052"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.001     0.000     0.001     0.052"
" 47          FILEI_O Read/Open DIV02016.10hyd"
"           1   1=read/open; 2=write/save"
"           2   1=rainfall; 2=hydrograph"
"           1   1=runoff; 2=inflow; 3=outflow; 4=junction"
"            DIV02016.10hyd"
"            Major flow at 2106"
"            Total volume                  0.898    c.m"
"             Maximum flow                  0.003    c.m/sec"
"                  0.003     0.000     0.001     0.052 c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.003     0.003     0.001     0.052"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.003     0.003     0.003     0.052"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               Torrance Cree"
"             Maximum flow                  0.052    c.m/sec"
"             Hydrograph volume           394.774    c.m"
"                   0.003     0.003     0.003     0.052"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.003     0.000     0.003     0.052"
" 33          CATCHMENT 2021"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2021   202-1- wetland directly to Torrance"
"       0.000   % Impervious"
"       0.863   Total Area"
"      50.000   Flow length"
"       0.500   Overland Slope"
"       0.863   Pervious Area"
"      50.000   Pervious length"
"       5.000   Pervious slope"
"       0.000   Impervious Area"
"      50.000   Impervious length"
"       5.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.291   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   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"
"                   0.054     0.000     0.003     0.052 c.m/sec"
"            Catchment 2021         Pervious   Impervious Total Area "
"            Surface Area           0.863      0.000      0.863      hectare"
"            Time of concentration  17.087     1.880      17.087     minutes"
"            Time to Centroid       117.457    87.653     117.456    minutes"
"            Rainfall depth         56.290     56.290     56.290     mm"
"            Rainfall volume        485.78     0.00       485.78     c.m"
"            Rainfall losses        39.897     5.967      39.897     mm"
"            Runoff depth           16.393     50.323     16.393     mm"
"            Runoff volume          141.47     0.00       141.47     c.m"
"            Runoff coefficient     0.291      0.000      0.291      "
"            Maximum flow           0.054      0.000      0.054      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.054     0.054     0.003     0.052"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.054     0.054     0.054     0.052"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
```

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"               Torrance Cree"
"            Maximum flow                0.066    c.m/sec"
"            Hydrograph volume         536.245    c.m"
"                   0.054     0.054     0.054     0.066"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.054     0.000     0.054     0.066"
" 33         CATCHMENT 2022"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2022   202-2- Block 3 Rear Yards to Torrance"
"       0.000   % Impervious"
"       0.144   Total Area"
"      15.000   Flow length"
"      20.000   Overland Slope"
"       0.144   Pervious Area"
"      15.000   Pervious length"
"      20.000   Pervious slope"
"       0.000   Impervious Area"
"      15.000   Impervious length"
"      20.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.290   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.000   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                   0.014     0.000     0.054     0.066 c.m/sec"
"            Catchment 2022         Pervious   Impervious Total Area "
"            Surface Area           0.144      0.000      0.144      hectare"
"            Time of concentration  5.474      0.602      5.474      minutes"
"            Time to Centroid       102.985    86.221     102.985    minutes"
"            Rainfall depth         56.290     56.290     56.290     mm"
"            Rainfall volume        81.06      0.00       81.06      c.m"
"            Rainfall losses        39.960     9.432      39.960     mm"
"            Runoff depth           16.330     46.858     16.331     mm"
"            Runoff volume          23.52      0.00       23.52      c.m"
"            Runoff coefficient     0.290      0.000      0.290      "
"            Maximum flow           0.014      0.000      0.014      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.014     0.014     0.054     0.066"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.014     0.014     0.014     0.066"
" 40         HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               Torrance Cree"
"            Maximum flow                0.068    c.m/sec"
"            Hydrograph volume         559.761    c.m"
"                   0.014     0.014     0.014     0.068"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.014     0.000     0.014     0.068"
" 33         CATCHMENT 2031"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2031   203-1 - Arkell Meadows Embankments to Trail"
"       30.000   % Impervious"
"       0.198   Total Area"
"      10.000   Flow length"
"      20.000   Overland Slope"
"       0.139   Pervious Area"
"      10.000   Pervious length"
"      20.000   Pervious slope"
"       0.059   Impervious Area"
"      10.000   Impervious length"
"      20.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.289   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.809   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                   0.031     0.000     0.014     0.068 c.m/sec"
"            Catchment 2031         Pervious   Impervious Total Area "
"            Surface Area           0.139      0.059      0.198      hectare"
"            Time of concentration  4.292      0.472      2.208      minutes"
"            Time to Centroid       101.544    86.116     93.127     minutes"
"            Rainfall depth         56.290     56.290     56.290     mm"
"            Rainfall volume        78.02      33.44      111.45     c.m"
"            Rainfall losses        40.026     10.725     31.236     mm"
"            Runoff depth           16.264     45.565     25.054     mm"
"            Runoff volume          22.54      27.07      49.61      c.m"
"            Runoff coefficient     0.289      0.809      0.445      "
"            Maximum flow           0.014      0.023      0.031      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.031     0.031     0.014     0.068"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.031     0.031     0.031     0.068"
" 40         HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               Torrance Cree"
"            Maximum flow                0.077    c.m/sec"
"            Hydrograph volume         609.369    c.m"
"                   0.031     0.031     0.031     0.077"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.031     0.000     0.031     0.077"
" 33         CATCHMENT 2032"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2032   203-2 Future Park Trail"
"       0.000   % Impervious"
"       0.216   Total Area"
"     180.000   Flow length"
"       0.500   Overland Slope"
"       0.216   Pervious Area"
"     180.000   Pervious length"
"       0.500   Pervious slope"
"       0.000   Impervious Area"
"     180.000   Impervious length"
"       0.500   Impervious slope"
```

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"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.292   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   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     0.031     0.077 c.m/sec"
"            Catchment 2032         Pervious   Impervious Total Area "
"            Surface Area           0.216      0.000      0.216      hectare"
"            Time of concentration  73.526     8.091      73.526     minutes"
"            Time to Centroid       187.998    96.658     187.998    minutes"
"            Rainfall depth         56.290     56.290     56.290     mm"
"            Rainfall volume        121.59     0.00       121.59     c.m"
"            Rainfall losses        39.869     5.406      39.869     mm"
"            Runoff depth           16.421     50.884     16.421     mm"
"            Runoff volume          35.47      0.00       35.47      c.m"
"            Runoff coefficient     0.292      0.000      0.292      "
"            Maximum flow           0.005      0.000      0.005      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"          4   Add Runoff "
"                 0.005     0.005     0.031     0.077"
" 40         HYDROGRAPH Copy to Outflow"
"          8   Copy to Outflow"
"                 0.005     0.005     0.005     0.077"
" 40         HYDROGRAPH   Combine    800"
"          6   Combine "
"        800   Node #"
"              Torrance Cree"
"            Maximum flow                 0.078    c.m/sec"
"            Hydrograph volume          644.839    c.m"
"                 0.005     0.005     0.005     0.078"
" 40         HYDROGRAPH Start - New Tributary"
"          2   Start - New Tributary"
"                 0.005     0.000     0.005     0.078"
" 33         CATCHMENT 2033"
"          1   Triangular SCS"
"          1   Equal length"
"          1   SCS method"
"       2033   203-3 - Block 1 Embankment to Trail Block"
"      0.000   % Impervious"
"      0.109   Total Area"
"     10.000   Flow length"
"     33.000   Overland Slope"
"      0.109   Pervious Area"
"     10.000   Pervious length"
"     33.000   Pervious slope"
"      0.000   Impervious Area"
"     10.000   Impervious length"
"     33.000   Impervious slope"
"      0.250   Pervious Manning 'n'"
"     74.000   Pervious SCS Curve No."
"      0.285   Pervious Runoff coefficient"
"      0.100   Pervious Ia/S coefficient"
"      8.924   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     0.005     0.078 c.m/sec"
```

```
"            Catchment 2033         Pervious   Impervious Total Area "
"            Surface Area           0.109      0.000      0.109      hectare"
"            Time of concentration  3.693      0.406      3.693      minutes"
"            Time to Centroid       100.959    85.958     100.959    minutes"
"            Rainfall depth         56.290     56.290     56.290     mm"
"            Rainfall volume        61.36      0.00       61.36      c.m"
"            Rainfall losses        40.243     11.359     40.243     mm"
"            Runoff depth           16.047     44.931     16.047     mm"
"            Runoff volume          17.49      0.00       17.49      c.m"
"            Runoff coefficient     0.285      0.000      0.285      "
"            Maximum flow           0.012      0.000      0.012      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"          4   Add Runoff "
"                 0.012     0.012     0.005     0.078"
" 40         HYDROGRAPH Copy to Outflow"
"          8   Copy to Outflow"
"                 0.012     0.012     0.012     0.078"
" 40         HYDROGRAPH   Combine    800"
"          6   Combine "
"        800   Node #"
"              Torrance Cree"
"            Maximum flow                 0.086    c.m/sec"
"            Hydrograph volume          662.331    c.m"
"                 0.012     0.012     0.012     0.086"
" 40         HYDROGRAPH Start - New Tributary"
"          2   Start - New Tributary"
"                 0.012     0.000     0.012     0.086"
" 33         CATCHMENT 2041"
"          1   Triangular SCS"
"          1   Equal length"
"          1   SCS method"
"       2041   204-1 Block 1 rear yeards + Arkell Blvd to Arkell"
"     12.000   % Impervious"
"      0.085   Total Area"
"     15.000   Flow length"
"      2.000   Overland Slope"
"      0.075   Pervious Area"
"     15.000   Pervious length"
"      2.000   Pervious slope"
"      0.010   Impervious Area"
"     15.000   Impervious length"
"      2.000   Impervious slope"
"      0.250   Pervious Manning 'n'"
"     74.000   Pervious SCS Curve No."
"      0.291   Pervious Runoff coefficient"
"      0.100   Pervious Ia/S coefficient"
"      8.924   Pervious Initial abstraction"
"      0.015   Impervious Manning 'n'"
"     98.000   Impervious SCS Curve No."
"      0.887   Impervious Runoff coefficient"
"      0.100   Impervious Ia/S coefficient"
"      0.518   Impervious Initial abstraction"
"                 0.007     0.000     0.012     0.086 c.m/sec"
"            Catchment 2041         Pervious   Impervious Total Area "
"            Surface Area           0.075      0.010      0.085      hectare"
"            Time of concentration  10.922     1.202      8.070      minutes"
"            Time to Centroid       109.745    86.719     102.989    minutes"
"            Rainfall depth         56.290     56.290     56.290     mm"
"            Rainfall volume        42.11      5.74       47.85      c.m"
"            Rainfall losses        39.899     6.369      35.876     mm"
"            Runoff depth           16.391     49.921     20.415     mm"
"            Runoff volume          12.26      5.09       17.35      c.m"
"            Runoff coefficient     0.291      0.887      0.363      "
"            Maximum flow           0.006      0.004      0.007      c.m/sec"
```

```
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.007     0.007     0.012     0.086"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.007     0.007     0.007     0.086"
" 40          HYDROGRAPH   Combine    700"
"           6   Combine "
"         700   Node #"
"               Arkell"
"             Maximum flow                 0.007    c.m/sec"
"             Hydrograph volume           17.352    c.m"
"                   0.007     0.007     0.007     0.007"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.007     0.000     0.007     0.007"
" 33          CATCHMENT 2042"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2042   204-2 Street A, Block 2 Rear Yars, Blvd to Arkell"
"      36.000   % Impervious"
"       0.111   Total Area"
"      25.000   Flow length"
"       5.000   Overland Slope"
"       0.071   Pervious Area"
"      25.000   Pervious length"
"       5.000   Pervious slope"
"       0.040   Impervious Area"
"      25.000   Impervious length"
"       5.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.291   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.888   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                   0.017     0.000     0.007     0.007 c.m/sec"
"             Catchment 2042         Pervious   Impervious Total Area "
"             Surface Area           0.071      0.040      0.111      hectare"
"             Time of concentration  11.273     1.241      4.935      minutes"
"             Time to Centroid       110.187    86.762     95.388     minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        39.99      22.49      62.48      c.m"
"             Rainfall losses        39.899     6.298      27.803     mm"
"             Runoff depth           16.391     49.992     28.488     mm"
"             Runoff volume          11.64      19.98      31.62      c.m"
"             Runoff coefficient     0.291      0.888      0.506      "
"             Maximum flow           0.005      0.016      0.017      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.017     0.017     0.007     0.007"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.017     0.017     0.017     0.007"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               Torrance Cree"
"             Maximum flow                 0.097    c.m/sec"
"             Hydrograph volume          693.952    c.m"
"                   0.017     0.017     0.017     0.097"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.017     0.000     0.017     0.097"
" 33          CATCHMENT 205"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         205   205- Dawes Ave to Ex. SWMF "
"      70.000   % Impervious"
"       0.032   Total Area"
"      20.000   Flow length"
"       1.300   Overland Slope"
"       0.010   Pervious Area"
"      20.000   Pervious length"
"       1.300   Pervious slope"
"       0.022   Impervious Area"
"      20.000   Impervious length"
"       1.300   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.291   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.894   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                   0.009     0.000     0.017     0.097 c.m/sec"
"             Catchment 205          Pervious   Impervious Total Area "
"             Surface Area           0.010      0.022      0.032      hectare"
"             Time of concentration  14.771     1.625      3.234      minutes"
"             Time to Centroid       114.584    87.265     90.609     minutes"
"             Rainfall depth         56.290     56.290     56.290     mm"
"             Rainfall volume        5.40       12.61      18.01      c.m"
"             Rainfall losses        39.905     5.939      16.129     mm"
"             Runoff depth           16.385     50.351     40.161     mm"
"             Runoff volume          1.57       11.28      12.85      c.m"
"             Runoff coefficient     0.291      0.894      0.713      "
"             Maximum flow           0.001      0.009      0.009      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.009     0.009     0.017     0.097"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.009     0.009     0.009     0.097"
" 40          HYDROGRAPH   Combine    600"
"           6   Combine "
"         600   Node #"
"               Dawes Avenue"
"             Maximum flow                 0.009    c.m/sec"
"             Hydrograph volume           12.851    c.m"
"                   0.009     0.009     0.009     0.009"
" 38          START/RE-START TOTALS 205"
"           3   Runoff Totals on EXIT"
"             Total Catchment area                    3.108    hectare"
"             Total Impervious area                   1.064    hectare"
"             Total % impervious                     34.232"
" 19          EXIT"
```

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"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                        Sunday, February 7, 2010"
"           10   Units used:                                        ie METRIC"
"                Job folder:                                 Q:\42063\104\SWM\"
"                2024-06-03 - Revised per GRCA Comments (Aug. 17, 2023)\MIDUSS\POST"
"                Output filename:                                      25y.out"
"                Licensee name:                                             A"
"                Company                                                    "
"                Date & Time last used:                 6/8/2024 at 2:33:40 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     3158.000   Coefficient A"
"       15.000   Constant B"
"        0.936   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           191.271    mm/hr"
"             Total depth                  68.087    mm"
"            5   25hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 2011"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2011   201-1 - Street A to SWMF"
"       65.000   % Impervious"
"        0.289   Total Area"
"       60.000   Flow length"
"        0.800   Overland Slope"
"        0.101   Pervious Area"
"       60.000   Pervious length"
"        0.750   Pervious slope"
"        0.188   Impervious Area"
"       60.000   Impervious length"
"        0.750   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.346   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.903   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.077     0.000     0.000     0.000 c.m/sec"
"             Catchment 2011         Pervious   Impervious Total Area "
"             Surface Area           0.101      0.188      0.289      hectare"
"             Time of concentration  29.417     3.518      7.950      minutes"
"             Time to Centroid       131.369    89.616     96.762     minutes"
"             Rainfall depth         68.087     68.087     68.087     mm"
"             Rainfall volume        68.87      127.90     196.77     c.m"
"             Rainfall losses        44.516     6.617      19.882     mm"
"             Runoff depth           23.571     61.469     48.205     mm"
"             Runoff volume          23.84      115.47     139.31     c.m"
"             Runoff coefficient     0.346      0.903      0.708      "
"             Maximum flow           0.007      0.075      0.077      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.077     0.077     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.077     0.077     0.077     0.000"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"             Maximum flow                  0.077    c.m/sec"
"             Hydrograph volume           139.311    c.m"
"                    0.077     0.077     0.077     0.077"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.077     0.000     0.077     0.077"
" 33          CATCHMENT 2012"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2012   201-2 - Block 2 Front/Roofs to SWMF"
"       84.000   % Impervious"
"        0.137   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.022   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.115   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.344   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   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"
"                    0.053     0.000     0.077     0.077 c.m/sec"
"             Catchment 2012         Pervious   Impervious Total Area "
"             Surface Area           0.022      0.115      0.137      hectare"
"             Time of concentration  7.480      0.894      1.350      minutes"
"             Time to Centroid       104.266    85.842     87.116     minutes"
"             Rainfall depth         68.087     68.087     68.087     mm"
"             Rainfall volume        14.92      78.35      93.28      c.m"
"             Rainfall losses        44.633     7.961      13.829     mm"
"             Runoff depth           23.454     60.125     54.258     mm"
"             Runoff volume          5.14       69.19      74.33      c.m"
"             Runoff coefficient     0.344      0.883      0.797      "
"             Maximum flow           0.003      0.052      0.053      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.053     0.053     0.077     0.077"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.053     0.053     0.053     0.077"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"             Maximum flow                  0.127    c.m/sec"
"             Hydrograph volume           213.645    c.m"
"                    0.053     0.053     0.053     0.127"
```

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" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.053     0.000     0.053     0.127"
" 33          CATCHMENT 2013"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2013   201-3 - Block 1 to SWMF"
"       65.000   % Impervious"
"        0.418   Total Area"
"       80.000   Flow length"
"        0.500   Overland Slope"
"        0.146   Pervious Area"
"       80.000   Pervious length"
"        0.500   Pervious slope"
"        0.272   Impervious Area"
"       80.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.346   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.915   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.116     0.000     0.053     0.127 c.m/sec"
"             Catchment 2013         Pervious   Impervious Total Area "
"             Surface Area           0.146      0.272      0.418      hectare"
"             Time of concentration  39.482     4.721      10.606     minutes"
"             Time to Centroid       143.857    91.254     100.159    minutes"
"             Rainfall depth         68.087     68.087     68.087     mm"
"             Rainfall volume        99.61      184.99     284.60     c.m"
"             Rainfall losses        44.507     5.784      19.337     mm"
"             Runoff depth           23.580     62.303     48.750     mm"
"             Runoff volume          34.50      169.28     203.77     c.m"
"             Runoff coefficient     0.346      0.915      0.716      "
"             Maximum flow           0.008      0.114      0.116      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.116     0.116     0.053     0.127"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.116     0.116     0.116     0.127"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"             Maximum flow                 0.228    c.m/sec"
"             Hydrograph volume          417.419    c.m"
"                    0.116     0.116     0.116     0.228"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.116     0.000     0.116     0.228"
" 33          CATCHMENT 2014"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2014   201-4 - Block 1 Roofs to SWMF"
"      100.000   % Impervious"
"        0.128   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.000   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.128   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   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"
"                    0.058     0.000     0.116     0.228 c.m/sec"
"             Catchment 2014         Pervious   Impervious Total Area "
"             Surface Area           0.000      0.128      0.128      hectare"
"             Time of concentration  7.480      0.894      0.894      minutes"
"             Time to Centroid       104.266    85.842     85.842     minutes"
"             Rainfall depth         68.087     68.087     68.087     mm"
"             Rainfall volume        0.00       87.15      87.15      c.m"
"             Rainfall losses        44.633     7.961      7.961      mm"
"             Runoff depth           23.454     60.125     60.125     mm"
"             Runoff volume          0.00       76.96      76.96      c.m"
"             Runoff coefficient     0.000      0.883      0.883      "
"             Maximum flow           0.000      0.058      0.058      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.058     0.058     0.116     0.228"
" 57          TRENCH Design d/s of 2014"
"        0.058   Peak inflow"
"       76.960   Hydrograph volume"
"      335.600   Ground elevation"
"      334.500   Downstream trench invert"
"        1.000   Trench height"
"      333.400   Water table elevation"
"       12.000   Trench top width"
"       12.000   Trench bottom width"
"       40.000   Voids ratio (%)"
"       43.000   Hydraulic conductivity"
"        0.000   Trench gradient (%)"
"        8.000   Trench length"
"        1.000   Include base width"
"          12.   Number of stages"
"                  Level Discharge    Volume"
"                334.500     0.000       0.0"
"                334.600     0.000       3.8"
"                334.700     0.000       7.7"
"                334.800     0.000      11.5"
"                334.900     0.000      15.4"
"                335.000     0.000      19.2"
"                335.100     0.000      23.0"
"                335.200     0.000      26.9"
"                335.300     0.000      30.7"
"                335.400     0.000      34.6"
"                335.500     0.000      38.4"
"                335.600     1.000      38.5"
"            1.   MANHOLE"
"                 Access"
"                diameter"
"                   1.200"
```

```
"            Peak outflow                 0.043    c.m/sec"
"            Outflow volume              24.030    c.m"
"            Peak exfiltration            0.002    c.m/sec"
"            Exfiltration volume         52.093    c.m"
"            Maximum level              335.507    metre"
"            Maximum storage             38.407    c.m"
"            Centroidal lag               1.558   hours"
"            Infiltration area 2 sides   16.000   sq.metre"
"            Infiltration Base area      96.000   sq.metre"
"                 0.058     0.058     0.043     0.002 c.m/sec"
" 40         HYDROGRAPH   Combine    900"
"           6   Combine "
"         900   Node #"
"               SWMF"
"            Maximum flow                 0.228    c.m/sec"
"            Hydrograph volume          441.449    c.m"
"                  0.058     0.058     0.043     0.228"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                 0.058     0.000     0.043     0.228"
" 33         CATCHMENT 2015"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2015   201-5 - Block 1 Ramp minor to SWMF/Major to Arkell"
"      85.000   % Impervious"
"       0.020   Total Area"
"      10.000   Flow length"
"       3.000   Overland Slope"
"       0.003   Pervious Area"
"      10.000   Pervious length"
"       3.000   Pervious slope"
"       0.017   Impervious Area"
"      10.000   Impervious length"
"       3.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.343   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.873   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                 0.008     0.000     0.043     0.228 c.m/sec"
"            Catchment 2015         Pervious   Impervious Total Area "
"            Surface Area           0.003      0.017      0.020      hectare"
"            Time of concentration  6.624      0.792      1.170      minutes"
"            Time to Centroid       103.224    85.740     86.873     minutes"
"            Rainfall depth         68.087     68.087     68.087     mm"
"            Rainfall volume        2.04       11.57      13.62      c.m"
"            Rainfall losses        44.752     8.678      14.089     mm"
"            Runoff depth           23.334     59.409     53.997     mm"
"            Runoff volume          0.70       10.10      10.80      c.m"
"            Runoff coefficient     0.343      0.873      0.793      "
"            Maximum flow           0.000      0.008      0.008      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                 0.008     0.008     0.043     0.228"
" 56         DIVERSION"
"        2015   Node number"
"       0.006   Overflow threshold"
"       1.000   Required diverted fraction"
"           0   Conduit type; 1=Pipe;2=Channel"
"            Peak of diverted flow        0.002    c.m/sec"
"            Volume of diverted flow      0.555    c.m"
"            DIV02015.25hyd"
"            Major flow at 2015"
"                  0.008     0.008     0.006     0.228 c.m/sec"
" 40         HYDROGRAPH Next link "
"           5   Next link "
"                 0.008     0.006     0.006     0.228"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                 0.008     0.006     0.006     0.228"
" 40         HYDROGRAPH   Combine    900"
"           6   Combine "
"         900   Node #"
"               SWMF"
"            Maximum flow                 0.233    c.m/sec"
"            Hydrograph volume          451.694    c.m"
"                  0.008     0.006     0.006     0.233"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                 0.008     0.000     0.006     0.233"
" 33         CATCHMENT 2016"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2016   201-6 - Street A minor to SWMF/Major to Arkell"
"      75.000   % Impervious"
"       0.057   Total Area"
"      20.000   Flow length"
"       3.000   Overland Slope"
"       0.014   Pervious Area"
"      20.000   Pervious length"
"       3.000   Pervious slope"
"       0.043   Impervious Area"
"      20.000   Impervious length"
"       3.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.344   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.902   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                 0.020     0.000     0.006     0.233 c.m/sec"
"            Catchment 2016         Pervious   Impervious Total Area "
"            Surface Area           0.014      0.043      0.057      hectare"
"            Time of concentration  10.040     1.200      2.199      minutes"
"            Time to Centroid       107.346    86.234     88.618     minutes"
"            Rainfall depth         68.087     68.087     68.087     mm"
"            Rainfall volume        9.70       29.11      38.81      c.m"
"            Rainfall losses        44.633     6.669      16.160     mm"
"            Runoff depth           23.453     61.417     51.926     mm"
"            Runoff volume          3.34       26.26      29.60      c.m"
"            Runoff coefficient     0.344      0.902      0.763      "
"            Maximum flow           0.002      0.019      0.020      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                 0.020     0.020     0.006     0.233"
" 56         DIVERSION"
"        2016   Node number"
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"        0.014   Overflow threshold"
"        1.000   Required diverted fraction"
"            0   Conduit type; 1=Pipe;2=Channel"
"             Peak of diverted flow         0.006    c.m/sec"
"             Volume of diverted flow       2.020    c.m"
"             DIV02016.25hyd"
"             Major flow at 2106"
"                    0.020     0.020     0.014     0.233 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.020     0.014     0.014     0.233"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.020     0.014     0.014     0.233"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"             Maximum flow                  0.247    c.m/sec"
"             Hydrograph volume           479.272    c.m"
"                    0.020     0.014     0.014     0.247"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.020     0.000     0.014     0.247"
" 33          CATCHMENT 2017"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2017   201-7 - Block 3 to SWMF"
"       80.000   % Impervious"
"        0.075   Total Area"
"       40.000   Flow length"
"        0.500   Overland Slope"
"        0.015   Pervious Area"
"       40.000   Pervious length"
"        0.500   Pervious slope"
"        0.060   Impervious Area"
"       40.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.346   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.904   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.024     0.000     0.014     0.247 c.m/sec"
"             Catchment 2017         Pervious   Impervious Total Area "
"             Surface Area           0.015      0.060      0.075      hectare"
"             Time of concentration  26.048     3.115      5.118      minutes"
"             Time to Centroid       127.186    89.000     92.336     minutes"
"             Rainfall depth         68.087     68.087     68.087     mm"
"             Rainfall volume        10.21      40.85      51.06      c.m"
"             Rainfall losses        44.530     6.570      14.162     mm"
"             Runoff depth           23.557     61.516     53.925     mm"
"             Runoff volume          3.53       36.91      40.44      c.m"
"             Runoff coefficient     0.346      0.904      0.792      "
"             Maximum flow           0.001      0.024      0.024      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.024     0.024     0.014     0.247"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.024     0.024     0.024     0.247"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"             Maximum flow                  0.271    c.m/sec"
"             Hydrograph volume           519.715    c.m"
"                    0.024     0.024     0.024     0.271"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.024     0.000     0.024     0.271"
" 33          CATCHMENT 2018"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2018   201-8 - Block 2 Roofs to Gallery"
"      100.000   % Impervious"
"        0.032   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.000   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.032   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   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"
"                    0.015     0.000     0.024     0.271 c.m/sec"
"             Catchment 2018         Pervious   Impervious Total Area "
"             Surface Area           0.000      0.032      0.032      hectare"
"             Time of concentration  7.480      0.894      0.894      minutes"
"             Time to Centroid       104.266    85.842     85.842     minutes"
"             Rainfall depth         68.087     68.087     68.087     mm"
"             Rainfall volume        0.00       21.79      21.79      c.m"
"             Rainfall losses        44.633     7.961      7.961      mm"
"             Runoff depth           23.454     60.125     60.125     mm"
"             Runoff volume          0.00       19.24      19.24      c.m"
"             Runoff coefficient     0.000      0.883      0.883      "
"             Maximum flow           0.000      0.015      0.015      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.015     0.015     0.024     0.271"
" 57          TRENCH Design d/s of 2018"
"        0.015   Peak inflow"
"       19.240   Hydrograph volume"
"      335.400   Ground elevation"
"      334.300   Downstream trench invert"
"        1.000   Trench height"
"      333.200   Water table elevation"
"        4.000   Trench top width"
"        4.000   Trench bottom width"
"       40.000   Voids ratio (%)"
"       73.000   Hydraulic conductivity"
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"        0.000   Trench gradient (%)"
"        5.000   Trench length"
"        1.000   Include base width"
"          12.   Number of stages"
"                  Level Discharge    Volume"
"                334.300     0.000       0.0"
"                334.400     0.000       0.8"
"                334.500     0.000       1.6"
"                334.600     0.000       2.4"
"                334.700     0.000       3.2"
"                334.800     0.000       4.0"
"                334.900     0.000       4.8"
"                335.000     0.000       5.6"
"                335.100     0.000       6.4"
"                335.200     0.000       7.2"
"                335.300     0.000       8.0"
"                335.400     1.000       8.1"
"           1.   MANHOLE"
"                 Access"
"               diameter"
"                  1.200"
"              Peak outflow                  0.010    c.m/sec"
"              Outflow volume                4.696    c.m"
"              Peak exfiltration             0.001    c.m/sec"
"              Exfiltration volume          13.063    c.m"
"              Maximum level               335.302    metre"
"              Maximum storage               8.002    c.m"
"              Centroidal lag                1.505   hours"
"              Infiltration area 2 sides    10.000   sq.metre"
"              Infiltration Base area       20.000   sq.metre"
"                   0.015     0.015     0.010     0.001 c.m/sec"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"              Maximum flow                  0.271    c.m/sec"
"              Hydrograph volume           524.411    c.m"
"                     0.015     0.015     0.010     0.271"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                      0.015     0.000     0.010     0.271"
" 33          CATCHMENT 2019"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"          2019   201-9 - SWMF Block"
"        40.000   % Impervious"
"         0.194   Total Area"
"        15.000   Flow length"
"         5.000   Overland Slope"
"         0.116   Pervious Area"
"        15.000   Pervious length"
"         5.000   Pervious slope"
"         0.078   Impervious Area"
"        15.000   Impervious length"
"         5.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        74.000   Pervious SCS Curve No."
"         0.344   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.924   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.880   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                      0.040     0.000     0.010     0.271 c.m/sec"
"              Catchment 2019         Pervious   Impervious Total Area "
"              Surface Area           0.116      0.078      0.194      hectare"
"              Time of concentration  7.248      0.867      3.225      minutes"
"              Time to Centroid       103.983    85.811     92.527     minutes"
"              Rainfall depth         68.087     68.087     68.087     mm"
"              Rainfall volume        79.25      52.84      132.09     c.m"
"              Rainfall losses        44.658     8.140      30.051     mm"
"              Runoff depth           23.428     59.946     38.036     mm"
"              Runoff volume          27.27      46.52      73.79      c.m"
"              Runoff coefficient     0.344      0.880      0.559      "
"              Maximum flow           0.016      0.035      0.040      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                      0.040     0.040     0.010     0.271"
" 40          HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
"                      0.040     0.040     0.040     0.271"
" 40          HYDROGRAPH   Combine    900"
"             6   Combine "
"           900   Node #"
"                 SWMF"
"              Maximum flow                  0.307    c.m/sec"
"              Hydrograph volume           598.200    c.m"
"                      0.040     0.040     0.040     0.307"
" 40          HYDROGRAPH   Confluence    900"
"             7   Confluence "
"           900   Node #"
"                 SWMF"
"              Maximum flow                  0.307    c.m/sec"
"              Hydrograph volume           598.200    c.m"
"                      0.040     0.307     0.040     0.000"
" 54          POND DESIGN"
"         0.307   Current peak flow    c.m/sec"
"         0.100   Target outflow    c.m/sec"
"         598.2   Hydrograph volume    c.m"
"           12.   Number of stages"
"       334.400   Minimum water level    metre"
"       335.500   Maximum water level    metre"
"       334.400   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                 334.400     0.000     0.000"
"                 334.500   0.00150    49.000"
"                 334.600   0.00230   103.000"
"                 334.700   0.00290   161.000"
"                 334.800   0.04670   225.000"
"                 334.900   0.06500   295.000"
"                 335.000   0.07920   370.000"
"                 335.100   0.09110   450.000"
"                 335.200    0.1017   534.000"
"                 335.300    0.2368   622.000"
"                 335.400    0.5900   714.000"
"                 335.500     1.190   811.000"
"              Peak outflow                  0.075    c.m/sec"
"              Maximum level               334.967    metre"
"              Maximum storage             345.411    c.m"
"              Centroidal lag                5.809   hours"
"                   0.040     0.307     0.075     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"             5   Next link "
"                      0.040     0.075     0.075     0.000"
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" 54          POND DESIGN"
"        0.075   Current peak flow    c.m/sec"
"        0.001   Target outflow    c.m/sec"
"        574.4   Hydrograph volume    c.m"
"          10.   Number of stages"
"      334.200   Minimum water level    metre"
"      335.100   Maximum water level    metre"
"      334.200   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                334.200     0.000     0.000"
"                334.300   0.00189    15.000"
"                334.400   0.00209    32.000"
"                334.500   0.00231    50.000"
"                334.600   0.00253    70.000"
"                334.700   0.00276    92.000"
"                334.800   0.00300   117.000"
"                334.900    0.1546   143.000"
"                335.000    0.4631   172.000"
"                335.100    0.9063   202.000"
"              Peak outflow                 0.071    c.m/sec"
"              Maximum level              334.845    metre"
"              Maximum storage            128.724    c.m"
"              Centroidal lag               8.967   hours"
"                   0.040    0.075     0.071     0.000 c.m/sec"
" 40           HYDROGRAPH   Combine    800"
"              6   Combine "
"            800   Node #"
"                  Torrance Cree"
"              Maximum flow                 0.071    c.m/sec"
"              Hydrograph volume          526.014    c.m"
"                     0.040     0.075     0.071     0.071"
" 40           HYDROGRAPH Start - New Tributary"
"              2   Start - New Tributary"
"                     0.040     0.000     0.071     0.071"
" 47           FILEI_O Read/Open DIV02015.25hyd"
"              1   1=read/open; 2=write/save"
"              2   1=rainfall; 2=hydrograph"
"              1   1=runoff; 2=inflow; 3=outflow; 4=junction"
"              DIV02015.25hyd"
"              Major flow at 2015"
"              Total volume                 0.555    c.m"
"              Maximum flow                 0.002    c.m/sec"
"                   0.002     0.000     0.071     0.071 c.m/sec"
" 40           HYDROGRAPH Add Runoff "
"              4   Add Runoff "
"                     0.002     0.002     0.071     0.071"
" 40           HYDROGRAPH Copy to Outflow"
"              8   Copy to Outflow"
"                     0.002     0.002     0.002     0.071"
" 40           HYDROGRAPH   Combine    800"
"              6   Combine "
"            800   Node #"
"                  Torrance Cree"
"              Maximum flow                 0.071    c.m/sec"
"              Hydrograph volume          526.569    c.m"
"                     0.002     0.002     0.002     0.071"
" 40           HYDROGRAPH Start - New Tributary"
"              2   Start - New Tributary"
"                     0.002     0.000     0.002     0.071"
" 47           FILEI_O Read/Open DIV02016.25hyd"
"              1   1=read/open; 2=write/save"
"              2   1=rainfall; 2=hydrograph"
"              1   1=runoff; 2=inflow; 3=outflow; 4=junction"
"              DIV02016.25hyd"
"              Major flow at 2106"
"              Total volume                 2.020    c.m"
"              Maximum flow                 0.006    c.m/sec"
"                   0.006     0.000     0.002     0.071 c.m/sec"
" 40           HYDROGRAPH Add Runoff "
"              4   Add Runoff "
"                     0.006     0.006     0.002     0.071"
" 40           HYDROGRAPH Copy to Outflow"
"              8   Copy to Outflow"
"                     0.006     0.006     0.006     0.071"
" 40           HYDROGRAPH   Combine    800"
"              6   Combine "
"            800   Node #"
"                  Torrance Cree"
"              Maximum flow                 0.071    c.m/sec"
"              Hydrograph volume          528.589    c.m"
"                     0.006     0.006     0.006     0.071"
" 40           HYDROGRAPH Start - New Tributary"
"              2   Start - New Tributary"
"                     0.006     0.000     0.006     0.071"
" 33           CATCHMENT 2021"
"              1   Triangular SCS"
"              1   Equal length"
"              1   SCS method"
"           2021   202-1- wetland directly to Torrance"
"          0.000   % Impervious"
"          0.863   Total Area"
"         50.000   Flow length"
"          0.500   Overland Slope"
"          0.863   Pervious Area"
"         50.000   Pervious length"
"          5.000   Pervious slope"
"          0.000   Impervious Area"
"         50.000   Impervious length"
"          5.000   Impervious slope"
"          0.250   Pervious Manning 'n'"
"         74.000   Pervious SCS Curve No."
"          0.346   Pervious Runoff coefficient"
"          0.100   Pervious Ia/S coefficient"
"          8.924   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"
"                     0.088     0.000     0.006     0.071 c.m/sec"
"               Catchment 2021         Pervious   Impervious Total Area "
"               Surface Area           0.863      0.000      0.863      hectare"
"               Time of concentration  14.925     1.785      14.925     minutes"
"               Time to Centroid       113.404    87.012     113.404    minutes"
"               Rainfall depth         68.087     68.087     68.087     mm"
"               Rainfall volume        587.59     0.00       587.59     c.m"
"               Rainfall losses        44.556     6.127      44.556     mm"
"               Runoff depth           23.531     61.959     23.531     mm"
"               Runoff volume          203.07     0.00       203.07     c.m"
"               Runoff coefficient     0.346      0.000      0.346      "
"               Maximum flow           0.088      0.000      0.088      c.m/sec"
" 40           HYDROGRAPH Add Runoff "
"              4   Add Runoff "
"                     0.088     0.088     0.006     0.071"
" 40           HYDROGRAPH Copy to Outflow"
"              8   Copy to Outflow"
"                     0.088     0.088     0.088     0.071"
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" 40          HYDROGRAPH   Combine    800"
"            6   Combine "
"          800   Node #"
"                Torrance Cree"
"             Maximum flow                 0.097    c.m/sec"
"             Hydrograph volume          731.661    c.m"
"                    0.088     0.088     0.088     0.097"
" 40          HYDROGRAPH Start - New Tributary"
"             2   Start - New Tributary"
"                    0.088     0.000     0.088     0.097"
" 33          CATCHMENT 2022"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"          2022   202-2- Block 3 Rear Yards to Torrance"
"         0.000   % Impervious"
"         0.144   Total Area"
"        15.000   Flow length"
"        20.000   Overland Slope"
"         0.144   Pervious Area"
"        15.000   Pervious length"
"        20.000   Pervious slope"
"         0.000   Impervious Area"
"        15.000   Impervious length"
"        20.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        74.000   Pervious SCS Curve No."
"         0.344   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.924   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"
"                    0.021     0.000     0.088     0.097 c.m/sec"
"                Catchment 2022          Pervious   Impervious Total Area "
"                Surface Area            0.144      0.000      0.144      hectare"
"                Time of concentration   4.782      0.572      4.782      minutes"
"                Time to Centroid        100.833    85.721     100.833    minutes"
"                Rainfall depth          68.087     68.087     68.087     mm"
"                Rainfall volume         98.04      0.00       98.04      c.m"
"                Rainfall losses         44.632     10.955     44.632     mm"
"                Runoff depth            23.455     57.131     23.455     mm"
"                Runoff volume           33.77      0.00       33.77      c.m"
"                Runoff coefficient      0.344      0.000      0.344      "
"                Maximum flow            0.021      0.000      0.021      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                    0.021     0.021     0.088     0.097"
" 40          HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
"                    0.021     0.021     0.021     0.097"
" 40          HYDROGRAPH   Combine    800"
"             6   Combine "
"           800   Node #"
"                 Torrance Cree"
"             Maximum flow                   0.102    c.m/sec"
"             Hydrograph volume            765.436    c.m"
"                    0.021     0.021     0.021     0.102"
" 40          HYDROGRAPH Start - New Tributary"
"             2   Start - New Tributary"
"                    0.021     0.000     0.021     0.102"
" 33          CATCHMENT 2031"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"          2031   203-1 - Arkell Meadows Embankments to Trail"
"         30.000   % Impervious"
"          0.198   Total Area"
"         10.000   Flow length"
"         20.000   Overland Slope"
"          0.139   Pervious Area"
"         10.000   Pervious length"
"         20.000   Pervious slope"
"          0.059   Impervious Area"
"         10.000   Impervious length"
"         20.000   Impervious slope"
"          0.250   Pervious Manning 'n'"
"         74.000   Pervious SCS Curve No."
"          0.339   Pervious Runoff coefficient"
"          0.100   Pervious Ia/S coefficient"
"          8.924   Pervious Initial abstraction"
"          0.015   Impervious Manning 'n'"
"         98.000   Impervious SCS Curve No."
"          0.817   Impervious Runoff coefficient"
"          0.100   Impervious Ia/S coefficient"
"          0.518   Impervious Initial abstraction"
"                    0.039     0.000     0.021     0.102 c.m/sec"
"                Catchment 2031          Pervious   Impervious Total Area "
"                Surface Area            0.139      0.059      0.198      hectare"
"                Time of concentration   3.749      0.448      2.072      minutes"
"                Time to Centroid        99.741     85.556     92.534     minutes"
"                Rainfall depth          68.087     68.087     68.087     mm"
"                Rainfall volume         94.37      40.44      134.81     c.m"
"                Rainfall losses         45.019     12.492     35.261     mm"
"                Runoff depth            23.067     55.594     32.826     mm"
"                Runoff volume           31.97      33.02      64.99      c.m"
"                Runoff coefficient      0.339      0.817      0.482      "
"                Maximum flow            0.021      0.026      0.039      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                    0.039     0.039     0.021     0.102"
" 40          HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
"                    0.039     0.039     0.039     0.102"
" 40          HYDROGRAPH   Combine    800"
"             6   Combine "
"           800   Node #"
"                 Torrance Cree"
"             Maximum flow                   0.118    c.m/sec"
"             Hydrograph volume            830.430    c.m"
"                    0.039     0.039     0.039     0.118"
" 40          HYDROGRAPH Start - New Tributary"
"             2   Start - New Tributary"
"                    0.039     0.000     0.039     0.118"
" 33          CATCHMENT 2032"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"          2032   203-2 Future Park Trail"
"         0.000   % Impervious"
"         0.216   Total Area"
"        180.000  Flow length"
"         0.500   Overland Slope"
"         0.216   Pervious Area"
"        180.000  Pervious length"
"         0.500   Pervious slope"
```

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"        0.000   Impervious Area"
"      180.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.346   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   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"
"                    0.008     0.000     0.039     0.118 c.m/sec"
"             Catchment 2032         Pervious   Impervious Total Area "
"             Surface Area           0.216      0.000      0.216      hectare"
"             Time of concentration  64.225     7.680      64.225     minutes"
"             Time to Centroid       174.527    95.380     174.527    minutes"
"             Rainfall depth         68.087     68.087     68.087     mm"
"             Rainfall volume        147.07     0.00       147.07     c.m"
"             Rainfall losses        44.504     5.659      44.504     mm"
"             Runoff depth           23.583     62.428     23.583     mm"
"             Runoff volume          50.94      0.00       50.94      c.m"
"             Runoff coefficient     0.346      0.000      0.346      "
"             Maximum flow           0.008      0.000      0.008      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.008     0.008     0.039     0.118"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.008     0.008     0.008     0.118"
" 40          HYDROGRAPH   Combine    800"
"            6   Combine "
"          800   Node #"
"                Torrance Cree"
"             Maximum flow                  0.120    c.m/sec"
"             Hydrograph volume           881.369    c.m"
"                    0.008     0.008     0.008     0.120"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.008     0.000     0.008     0.120"
" 33          CATCHMENT 2033"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2033   203-3 - Block 1 Embankment to Trail Block"
"        0.000   % Impervious"
"        0.109   Total Area"
"       10.000   Flow length"
"       33.000   Overland Slope"
"        0.109   Pervious Area"
"       10.000   Pervious length"
"       33.000   Pervious slope"
"        0.000   Impervious Area"
"       10.000   Impervious length"
"       33.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.338   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   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     0.008     0.120 c.m/sec"
"             Catchment 2033         Pervious   Impervious Total Area "
"             Surface Area           0.109      0.000      0.109      hectare"
"             Time of concentration  3.226      0.386      3.226      minutes"
"             Time to Centroid       99.023     85.385     99.023     minutes"
"             Rainfall depth         68.087     68.087     68.087     mm"
"             Rainfall volume        74.21      0.00       74.21      c.m"
"             Rainfall losses        45.081     13.216     45.081     mm"
"             Runoff depth           23.006     54.870     23.006     mm"
"             Runoff volume          25.08      0.00       25.08      c.m"
"             Runoff coefficient     0.338      0.000      0.338      "
"             Maximum flow           0.017      0.000      0.017      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.017     0.017     0.008     0.120"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.017     0.017     0.017     0.120"
" 40          HYDROGRAPH   Combine    800"
"            6   Combine "
"          800   Node #"
"                Torrance Cree"
"             Maximum flow                  0.130    c.m/sec"
"             Hydrograph volume           906.445    c.m"
"                    0.017     0.017     0.017     0.130"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.017     0.000     0.017     0.130"
" 33          CATCHMENT 2041"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2041   204-1 Block 1 rear yeards + Arkell Blvd to Arkell"
"       12.000   % Impervious"
"        0.085   Total Area"
"       15.000   Flow length"
"        2.000   Overland Slope"
"        0.075   Pervious Area"
"       15.000   Pervious length"
"        2.000   Pervious slope"
"        0.010   Impervious Area"
"       15.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.344   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.899   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.011     0.000     0.017     0.130 c.m/sec"
"             Catchment 2041         Pervious   Impervious Total Area "
"             Surface Area           0.075      0.010      0.085      hectare"
"             Time of concentration  9.541      1.141      7.335      minutes"
"             Time to Centroid       106.721    86.165     101.324    minutes"
"             Rainfall depth         68.087     68.087     68.087     mm"
"             Rainfall volume        50.93      6.94       57.87      c.m"
"             Rainfall losses        44.632     6.843      40.097     mm"
"             Runoff depth           23.455     61.244     27.989     mm"
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"            Runoff volume          17.54      6.25       23.79      c.m"
"            Runoff coefficient     0.344      0.899      0.411      "
"            Maximum flow           0.009      0.005      0.011      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.011     0.011     0.017     0.130"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.011     0.011     0.011     0.130"
" 40         HYDROGRAPH   Combine    700"
"           6   Combine "
"         700   Node #"
"               Arkell"
"            Maximum flow                0.011    c.m/sec"
"            Hydrograph volume          23.791    c.m"
"                  0.011     0.011     0.011     0.011"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                  0.011     0.000     0.011     0.011"
" 33         CATCHMENT 2042"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2042   204-2 Street A, Block 2 Rear Yars, Blvd to Arkell"
"      36.000   % Impervious"
"       0.111   Total Area"
"      25.000   Flow length"
"       5.000   Overland Slope"
"       0.071   Pervious Area"
"      25.000   Pervious length"
"       5.000   Pervious slope"
"       0.040   Impervious Area"
"      25.000   Impervious length"
"       5.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.344   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.901   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                  0.020     0.000     0.011     0.011 c.m/sec"
"            Catchment 2042         Pervious   Impervious Total Area "
"            Surface Area           0.071      0.040      0.111      hectare"
"            Time of concentration  9.847      1.177      4.683      minutes"
"            Time to Centroid       107.117    86.210     94.664     minutes"
"            Rainfall depth         68.087     68.087     68.087     mm"
"            Rainfall volume        48.37      27.21      75.58      c.m"
"            Rainfall losses        44.655     6.729      31.002     mm"
"            Runoff depth           23.431     61.357     37.085     mm"
"            Runoff volume          16.65      24.52      41.16      c.m"
"            Runoff coefficient     0.344      0.901      0.545      "
"            Maximum flow           0.008      0.018      0.020      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.020     0.020     0.011     0.011"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.020     0.020     0.020     0.011"
" 40         HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               Torrance Cree"
"            Maximum flow                0.147    c.m/sec"
"            Hydrograph volume          947.609    c.m"
"                  0.020     0.020     0.020     0.147"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                  0.020     0.000     0.020     0.147"
" 33         CATCHMENT 205"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         205   205- Dawes Ave to Ex. SWMF "
"      70.000   % Impervious"
"       0.032   Total Area"
"      20.000   Flow length"
"       1.300   Overland Slope"
"       0.010   Pervious Area"
"      20.000   Pervious length"
"       1.300   Pervious slope"
"       0.022   Impervious Area"
"      20.000   Impervious length"
"       1.300   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.345   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.909   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                  0.010     0.000     0.020     0.147 c.m/sec"
"            Catchment 205          Pervious   Impervious Total Area "
"            Surface Area           0.010      0.022      0.032      hectare"
"            Time of concentration  12.902     1.543      3.133      minutes"
"            Time to Centroid       110.896    86.655     90.048     minutes"
"            Rainfall depth         68.087     68.087     68.087     mm"
"            Rainfall volume        6.54       15.25      21.79      c.m"
"            Rainfall losses        44.590     6.216      17.728     mm"
"            Runoff depth           23.497     61.871     50.359     mm"
"            Runoff volume          2.26       13.86      16.11      c.m"
"            Runoff coefficient     0.345      0.909      0.740      "
"            Maximum flow           0.001      0.010      0.010      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.010     0.010     0.020     0.147"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.010     0.010     0.010     0.147"
" 40         HYDROGRAPH   Combine    600"
"           6   Combine "
"         600   Node #"
"               Dawes Avenue"
"            Maximum flow                0.010    c.m/sec"
"            Hydrograph volume          16.115    c.m"
"                  0.010     0.010     0.010     0.010"
" 38         START/RE-START TOTALS 205"
"           3   Runoff Totals on EXIT"
"            Total Catchment area                    3.108    hectare"
"            Total Impervious area                   1.064    hectare"
"            Total % impervious                     34.232"
" 19         EXIT"
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"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                        Sunday, February 7, 2010"
"           10   Units used:                                        ie METRIC"
"                Job folder:                                 Q:\42063\104\SWM\"
"                2024-06-03 - Revised per GRCA Comments (Aug. 17, 2023)\MIDUSS\POST"
"                Output filename:                                      50y.out"
"                Licensee name:                                             A"
"                Company                                                    "
"                Date & Time last used:                 6/8/2024 at 4:37:30 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"           1   Chicago storm"
"     3886.000   Coefficient A"
"       16.000   Constant B"
"        0.950   Exponent C"
"        0.400   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           215.474    mm/hr"
"             Total depth                  77.443    mm"
"            6   050hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 2011"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2011   201-1 - Street A to SWMF"
"       65.000   % Impervious"
"        0.289   Total Area"
"       60.000   Flow length"
"        0.800   Overland Slope"
"        0.101   Pervious Area"
"       60.000   Pervious length"
"        0.750   Pervious slope"
"        0.188   Impervious Area"
"       60.000   Impervious length"
"        0.750   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.384   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.913   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.087     0.000     0.000     0.000 c.m/sec"
"             Catchment 2011         Pervious   Impervious Total Area "
"             Surface Area           0.101      0.188      0.289      hectare"
"             Time of concentration  26.629     3.347      7.648      minutes"
"             Time to Centroid       127.071    88.941     95.985     minutes"
"             Rainfall depth         77.443     77.443     77.443     mm"
"             Rainfall volume        78.33      145.48     223.81     c.m"
"             Rainfall losses        47.699     6.760      21.089     mm"
"             Runoff depth           29.744     70.683     56.354     mm"
"             Runoff volume          30.09      132.78     162.86     c.m"
"             Runoff coefficient     0.384      0.913      0.728      "
"             Maximum flow           0.009      0.085      0.087      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.087     0.087     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.087     0.087     0.087     0.000"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"              Maximum flow                  0.087    c.m/sec"
"              Hydrograph volume           162.863    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 2012"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2012   201-2 - Block 2 Front/Roofs to SWMF"
"       84.000   % Impervious"
"        0.137   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.022   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.115   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.380   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.887   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.061     0.000     0.087     0.087 c.m/sec"
"             Catchment 2012         Pervious   Impervious Total Area "
"             Surface Area           0.022      0.115      0.137      hectare"
"             Time of concentration  6.771      0.851      1.298      minutes"
"             Time to Centroid       102.464    85.418     86.704     minutes"
"             Rainfall depth         77.443     77.443     77.443     mm"
"             Rainfall volume        16.98      89.12      106.10     c.m"
"             Rainfall losses        48.008     8.731      15.015     mm"
"             Runoff depth           29.434     68.712     62.427     mm"
"             Runoff volume          6.45       79.07      85.53      c.m"
"             Runoff coefficient     0.380      0.887      0.806      "
"             Maximum flow           0.004      0.059      0.061      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.061     0.061     0.087     0.087"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.061     0.061     0.061     0.087"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"              Maximum flow                  0.146    c.m/sec"
"              Hydrograph volume           248.389    c.m"
"                    0.061     0.061     0.061     0.146"
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" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.061     0.000     0.061     0.146"
" 33          CATCHMENT 2013"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2013   201-3 - Block 1 to SWMF"
"       65.000   % Impervious"
"        0.418   Total Area"
"       80.000   Flow length"
"        0.500   Overland Slope"
"        0.146   Pervious Area"
"       80.000   Pervious length"
"        0.500   Pervious slope"
"        0.272   Impervious Area"
"       80.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.384   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.923   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.131     0.000     0.061     0.146 c.m/sec"
"             Catchment 2013         Pervious   Impervious Total Area "
"             Surface Area           0.146      0.272      0.418      hectare"
"             Time of concentration  35.739     4.492      10.211     minutes"
"             Time to Centroid       138.439    90.546     99.311     minutes"
"             Rainfall depth         77.443     77.443     77.443     mm"
"             Rainfall volume        113.30     210.41     323.71     c.m"
"             Rainfall losses        47.694     5.932      20.549     mm"
"             Runoff depth           29.749     71.510     56.894     mm"
"             Runoff volume          43.52      194.29     237.82     c.m"
"             Runoff coefficient     0.384      0.923      0.735      "
"             Maximum flow           0.011      0.129      0.131      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.131     0.131     0.061     0.146"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.131     0.131     0.131     0.146"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"             Maximum flow                 0.259    c.m/sec"
"             Hydrograph volume          486.205    c.m"
"                    0.131     0.131     0.131     0.259"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.131     0.000     0.131     0.259"
" 33          CATCHMENT 2014"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2014   201-4 - Block 1 Roofs to SWMF"
"      100.000   % Impervious"
"        0.128   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.000   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.128   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.887   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.066     0.000     0.131     0.259 c.m/sec"
"             Catchment 2014         Pervious   Impervious Total Area "
"             Surface Area           0.000      0.128      0.128      hectare"
"             Time of concentration  6.771      0.851      0.851      minutes"
"             Time to Centroid       102.464    85.418     85.418     minutes"
"             Rainfall depth         77.443     77.443     77.443     mm"
"             Rainfall volume        0.00       99.13      99.13      c.m"
"             Rainfall losses        48.008     8.731      8.731      mm"
"             Runoff depth           29.434     68.712     68.712     mm"
"             Runoff volume          0.00       87.95      87.95      c.m"
"             Runoff coefficient     0.000      0.887      0.887      "
"             Maximum flow           0.000      0.066      0.066      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.066     0.066     0.131     0.259"
" 57          TRENCH Design d/s of 2014"
"        0.066   Peak inflow"
"       87.951   Hydrograph volume"
"      335.600   Ground elevation"
"      334.500   Downstream trench invert"
"        1.000   Trench height"
"      333.400   Water table elevation"
"       12.000   Trench top width"
"       12.000   Trench bottom width"
"       40.000   Voids ratio (%)"
"       43.000   Hydraulic conductivity"
"        0.000   Trench gradient (%)"
"        8.000   Trench length"
"        1.000   Include base width"
"          12.   Number of stages"
"                  Level Discharge    Volume"
"                334.500     0.000       0.0"
"                334.600     0.000       3.8"
"                334.700     0.000       7.7"
"                334.800     0.000      11.5"
"                334.900     0.000      15.4"
"                335.000     0.000      19.2"
"                335.100     0.000      23.0"
"                335.200     0.000      26.9"
"                335.300     0.000      30.7"
"                335.400     0.000      34.6"
"                335.500     0.000      38.4"
"                335.600     1.000      38.5"
"            1.   MANHOLE"
"                 Access"
"                diameter"
"                   1.200"
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"            Peak outflow                 0.049    c.m/sec"
"            Outflow volume              32.154    c.m"
"            Peak exfiltration            0.002    c.m/sec"
"            Exfiltration volume         52.543    c.m"
"            Maximum level              335.507    metre"
"            Maximum storage             38.408    c.m"
"            Centroidal lag               1.541   hours"
"            Infiltration area 2 sides   16.000   sq.metre"
"            Infiltration Base area      96.000   sq.metre"
"                 0.066     0.066     0.049     0.002 c.m/sec"
" 40         HYDROGRAPH   Combine    900"
"          6   Combine "
"        900   Node #"
"              SWMF"
"            Maximum flow                 0.273    c.m/sec"
"            Hydrograph volume          518.359    c.m"
"                  0.066     0.066     0.049     0.273"
" 40         HYDROGRAPH Start - New Tributary"
"          2   Start - New Tributary"
"                0.066     0.000     0.049     0.273"
" 33         CATCHMENT 2015"
"          1   Triangular SCS"
"          1   Equal length"
"          1   SCS method"
"       2015   201-5 - Block 1 Ramp minor to SWMF/Major to Arkell"
"     85.000   % Impervious"
"      0.020   Total Area"
"     10.000   Flow length"
"      3.000   Overland Slope"
"      0.003   Pervious Area"
"     10.000   Pervious length"
"      3.000   Pervious slope"
"      0.017   Impervious Area"
"     10.000   Impervious length"
"      3.000   Impervious slope"
"      0.250   Pervious Manning 'n'"
"     74.000   Pervious SCS Curve No."
"      0.380   Pervious Runoff coefficient"
"      0.100   Pervious Ia/S coefficient"
"      8.924   Pervious Initial abstraction"
"      0.015   Impervious Manning 'n'"
"     98.000   Impervious SCS Curve No."
"      0.876   Impervious Runoff coefficient"
"      0.100   Impervious Ia/S coefficient"
"      0.518   Impervious Initial abstraction"
"                0.009     0.000     0.049     0.273 c.m/sec"
"            Catchment 2015         Pervious   Impervious Total Area "
"            Surface Area           0.003      0.017      0.020      hectare"
"            Time of concentration  5.996      0.754      1.127      minutes"
"            Time to Centroid       101.462    85.331     86.480     minutes"
"            Rainfall depth         77.443     77.443     77.443     mm"
"            Rainfall volume        2.32       13.17      15.49      c.m"
"            Rainfall losses        47.978     9.602      15.358     mm"
"            Runoff depth           29.465     67.841     62.085     mm"
"            Runoff volume          0.88       11.53      12.42      c.m"
"            Runoff coefficient     0.380      0.876      0.802      "
"            Maximum flow           0.001      0.009      0.009      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"          4   Add Runoff "
"                0.009     0.009     0.049     0.273"
" 56         DIVERSION"
"       2015   Node number"
"      0.006   Overflow threshold"
"      1.000   Required diverted fraction"
"           0   Conduit type; 1=Pipe;2=Channel"
"            Peak of diverted flow        0.003    c.m/sec"
"            Volume of diverted flow      0.885    c.m"
"            DIV02015.050hyd"
"            Major flow at 2015"
"                  0.009     0.009     0.006     0.273 c.m/sec"
" 40         HYDROGRAPH Next link "
"          5   Next link "
"                0.009     0.006     0.006     0.273"
" 40         HYDROGRAPH Copy to Outflow"
"          8   Copy to Outflow"
"                0.009     0.006     0.006     0.273"
" 40         HYDROGRAPH   Combine    900"
"          6   Combine "
"        900   Node #"
"              SWMF"
"            Maximum flow                 0.279    c.m/sec"
"            Hydrograph volume          529.892    c.m"
"                  0.009     0.006     0.006     0.279"
" 40         HYDROGRAPH Start - New Tributary"
"          2   Start - New Tributary"
"                0.009     0.000     0.006     0.279"
" 33         CATCHMENT 2016"
"          1   Triangular SCS"
"          1   Equal length"
"          1   SCS method"
"       2016   201-6 - Street A minor to SWMF/Major to Arkell"
"     75.000   % Impervious"
"      0.057   Total Area"
"     20.000   Flow length"
"      3.000   Overland Slope"
"      0.014   Pervious Area"
"     20.000   Pervious length"
"      3.000   Pervious slope"
"      0.043   Impervious Area"
"     20.000   Impervious length"
"      3.000   Impervious slope"
"      0.250   Pervious Manning 'n'"
"     74.000   Pervious SCS Curve No."
"      0.382   Pervious Runoff coefficient"
"      0.100   Pervious Ia/S coefficient"
"      8.924   Pervious Initial abstraction"
"      0.015   Impervious Manning 'n'"
"     98.000   Impervious SCS Curve No."
"      0.908   Impervious Runoff coefficient"
"      0.100   Impervious Ia/S coefficient"
"      0.518   Impervious Initial abstraction"
"                0.023     0.000     0.006     0.279 c.m/sec"
"            Catchment 2016         Pervious   Impervious Total Area "
"            Surface Area           0.014      0.043      0.057      hectare"
"            Time of concentration  9.088      1.142      2.120      minutes"
"            Time to Centroid       105.207    85.784     88.174     minutes"
"            Rainfall depth         77.443     77.443     77.443     mm"
"            Rainfall volume        11.04      33.11      44.14      c.m"
"            Rainfall losses        47.833     7.102      17.284     mm"
"            Runoff depth           29.610     70.341     60.158     mm"
"            Runoff volume          4.22       30.07      34.29      c.m"
"            Runoff coefficient     0.382      0.908      0.777      "
"            Maximum flow           0.002      0.022      0.023      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"          4   Add Runoff "
"                0.023     0.023     0.006     0.279"
" 56         DIVERSION"
"       2016   Node number"
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"        0.014   Overflow threshold"
"        1.000   Required diverted fraction"
"            0   Conduit type; 1=Pipe;2=Channel"
"             Peak of diverted flow         0.009    c.m/sec"
"             Volume of diverted flow       3.582    c.m"
"             DIV02016.050hyd"
"             Major flow at 2106"
"                    0.023     0.023     0.014     0.279 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.023     0.014     0.014     0.279"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.023     0.014     0.014     0.279"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"             Maximum flow                  0.293    c.m/sec"
"             Hydrograph volume           560.599    c.m"
"                    0.023     0.014     0.014     0.293"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.023     0.000     0.014     0.293"
" 33          CATCHMENT 2017"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2017   201-7 - Block 3 to SWMF"
"       80.000   % Impervious"
"        0.075   Total Area"
"       40.000   Flow length"
"        0.500   Overland Slope"
"        0.015   Pervious Area"
"       40.000   Pervious length"
"        0.500   Pervious slope"
"        0.060   Impervious Area"
"       40.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.384   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.910   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.028     0.000     0.014     0.293 c.m/sec"
"             Catchment 2017         Pervious   Impervious Total Area "
"             Surface Area           0.015      0.060      0.075      hectare"
"             Time of concentration  23.579     2.964      4.932      minutes"
"             Time to Centroid       123.280    88.390     91.721     minutes"
"             Rainfall depth         77.443     77.443     77.443     mm"
"             Rainfall volume        11.62      46.47      58.08      c.m"
"             Rainfall losses        47.702     6.993      15.135     mm"
"             Runoff depth           29.741     70.449     62.308     mm"
"             Runoff volume          4.46       42.27      46.73      c.m"
"             Runoff coefficient     0.384      0.910      0.805      "
"             Maximum flow           0.001      0.028      0.028      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.028     0.028     0.014     0.293"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.028     0.028     0.028     0.293"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"             Maximum flow                  0.319    c.m/sec"
"             Hydrograph volume           607.330    c.m"
"                    0.028     0.028     0.028     0.319"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.028     0.000     0.028     0.319"
" 33          CATCHMENT 2018"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2018   201-8 - Block 2 Roofs to Gallery"
"      100.000   % Impervious"
"        0.032   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.000   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.032   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.887   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.016     0.000     0.028     0.319 c.m/sec"
"             Catchment 2018         Pervious   Impervious Total Area "
"             Surface Area           0.000      0.032      0.032      hectare"
"             Time of concentration  6.771      0.851      0.851      minutes"
"             Time to Centroid       102.464    85.418     85.418     minutes"
"             Rainfall depth         77.443     77.443     77.443     mm"
"             Rainfall volume        0.00       24.78      24.78      c.m"
"             Rainfall losses        48.008     8.731      8.731      mm"
"             Runoff depth           29.434     68.712     68.712     mm"
"             Runoff volume          0.00       21.99      21.99      c.m"
"             Runoff coefficient     0.000      0.887      0.887      "
"             Maximum flow           0.000      0.016      0.016      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.016     0.016     0.028     0.319"
" 57          TRENCH Design d/s of 2018"
"        0.016   Peak inflow"
"       21.988   Hydrograph volume"
"      335.400   Ground elevation"
"      334.300   Downstream trench invert"
"        1.000   Trench height"
"      333.200   Water table elevation"
"        4.000   Trench top width"
"        4.000   Trench bottom width"
"       40.000   Voids ratio (%)"
"       73.000   Hydraulic conductivity"
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"        0.000   Trench gradient (%)"
"        5.000   Trench length"
"        1.000   Include base width"
"          12.   Number of stages"
"                  Level Discharge    Volume"
"                334.300     0.000       0.0"
"                334.400     0.000       0.8"
"                334.500     0.000       1.6"
"                334.600     0.000       2.4"
"                334.700     0.000       3.2"
"                334.800     0.000       4.0"
"                334.900     0.000       4.8"
"                335.000     0.000       5.6"
"                335.100     0.000       6.4"
"                335.200     0.000       7.2"
"                335.300     0.000       8.0"
"                335.400     1.000       8.1"
"           1.   MANHOLE"
"                 Access"
"               diameter"
"                  1.200"
"              Peak outflow                  0.012    c.m/sec"
"              Outflow volume                6.448    c.m"
"              Peak exfiltration             0.001    c.m/sec"
"              Exfiltration volume          13.327    c.m"
"              Maximum level               335.302    metre"
"              Maximum storage               8.002    c.m"
"              Centroidal lag                1.494   hours"
"              Infiltration area 2 sides    10.000   sq.metre"
"              Infiltration Base area       20.000   sq.metre"
"                   0.016     0.016     0.012     0.001 c.m/sec"
" 40          HYDROGRAPH   Combine    900"
"           6   Combine "
"         900   Node #"
"               SWMF"
"              Maximum flow                  0.322    c.m/sec"
"              Hydrograph volume           613.778    c.m"
"                     0.016     0.016     0.012     0.322"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.016     0.000     0.012     0.322"
" 33          CATCHMENT 2019"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2019   201-9 - SWMF Block"
"       40.000   % Impervious"
"        0.194   Total Area"
"       15.000   Flow length"
"        5.000   Overland Slope"
"        0.116   Pervious Area"
"       15.000   Pervious length"
"        5.000   Pervious slope"
"        0.078   Impervious Area"
"       15.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.380   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.884   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.048     0.000     0.012     0.322 c.m/sec"
"             Catchment 2019         Pervious   Impervious Total Area "
"             Surface Area           0.116      0.078      0.194      hectare"
"             Time of concentration  6.561      0.825      3.074      minutes"
"             Time to Centroid       102.176    85.390     91.971     minutes"
"             Rainfall depth         77.443     77.443     77.443     mm"
"             Rainfall volume        90.14      60.10      150.24     c.m"
"             Rainfall losses        47.990     8.947      32.373     mm"
"             Runoff depth           29.452     68.496     45.070     mm"
"             Runoff volume          34.28      53.15      87.44      c.m"
"             Runoff coefficient     0.380      0.884      0.582      "
"             Maximum flow           0.020      0.040      0.048      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                     0.048     0.048     0.012     0.322"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                     0.048     0.048     0.048     0.322"
" 40          HYDROGRAPH   Combine    900"
"           6   Combine "
"         900   Node #"
"               SWMF"
"              Maximum flow                  0.366    c.m/sec"
"              Hydrograph volume           701.213    c.m"
"                     0.048     0.048     0.048     0.366"
" 40          HYDROGRAPH   Confluence    900"
"           7   Confluence "
"         900   Node #"
"               SWMF"
"              Maximum flow                  0.366    c.m/sec"
"              Hydrograph volume           701.213    c.m"
"                     0.048     0.366     0.048     0.000"
" 54          POND DESIGN"
"        0.366   Current peak flow    c.m/sec"
"        0.100   Target outflow    c.m/sec"
"        701.2   Hydrograph volume    c.m"
"          12.   Number of stages"
"      334.400   Minimum water level    metre"
"      335.500   Maximum water level    metre"
"      334.400   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                334.400     0.000     0.000"
"                334.500   0.00150    49.000"
"                334.600   0.00230   103.000"
"                334.700   0.00290   161.000"
"                334.800   0.04670   225.000"
"                334.900   0.06500   295.000"
"                335.000   0.07920   370.000"
"                335.100   0.09110   450.000"
"                335.200    0.1017   534.000"
"                335.300    0.2368   622.000"
"                335.400    0.5900   714.000"
"                335.500     1.190   811.000"
"              Peak outflow                  0.085    c.m/sec"
"              Maximum level               335.047    metre"
"              Maximum storage             407.496    c.m"
"              Centroidal lag                5.444   hours"
"                   0.048     0.366     0.085     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"           5   Next link "
"                     0.048     0.085     0.085     0.000"
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" 54          POND DESIGN"
"        0.085   Current peak flow    c.m/sec"
"        0.001   Target outflow    c.m/sec"
"        675.3   Hydrograph volume    c.m"
"          10.   Number of stages"
"      334.200   Minimum water level    metre"
"      335.100   Maximum water level    metre"
"      334.200   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                334.200     0.000     0.000"
"                334.300   0.00189    15.000"
"                334.400   0.00209    32.000"
"                334.500   0.00231    50.000"
"                334.600   0.00253    70.000"
"                334.700   0.00276    92.000"
"                334.800   0.00300   117.000"
"                334.900    0.1546   143.000"
"                335.000    0.4631   172.000"
"                335.100    0.9063   202.000"
"             Peak outflow                 0.083    c.m/sec"
"             Maximum level              334.853    metre"
"             Maximum storage            130.709    c.m"
"             Centroidal lag               8.101   hours"
"                  0.048     0.085     0.083     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    800"
"             6   Combine "
"           800   Node #"
"                 Torrance Cree"
"             Maximum flow                 0.083    c.m/sec"
"             Hydrograph volume          625.278    c.m"
"                    0.048     0.085     0.083     0.083"
" 40          HYDROGRAPH Start - New Tributary"
"             2   Start - New Tributary"
"                    0.048     0.000     0.083     0.083"
" 47          FILEI_O Read/Open DIV02015.050hyd"
"             1   1=read/open; 2=write/save"
"             2   1=rainfall; 2=hydrograph"
"             1   1=runoff; 2=inflow; 3=outflow; 4=junction"
"             DIV02015.050hyd"
"             Major flow at 2015"
"             Total volume                 0.885    c.m"
"             Maximum flow                 0.003    c.m/sec"
"                  0.003     0.000     0.083     0.083 c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                    0.003     0.003     0.083     0.083"
" 40          HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
"                    0.003     0.003     0.003     0.083"
" 40          HYDROGRAPH   Combine    800"
"             6   Combine "
"           800   Node #"
"                 Torrance Cree"
"             Maximum flow                 0.083    c.m/sec"
"             Hydrograph volume          626.163    c.m"
"                    0.003     0.003     0.003     0.083"
" 40          HYDROGRAPH Start - New Tributary"
"             2   Start - New Tributary"
"                    0.003     0.000     0.003     0.083"
" 47          FILEI_O Read/Open DIV02016.050hyd"
"             1   1=read/open; 2=write/save"
"             2   1=rainfall; 2=hydrograph"
"             1   1=runoff; 2=inflow; 3=outflow; 4=junction"
"             DIV02016.050hyd"
"             Major flow at 2106"
"             Total volume                 3.582    c.m"
"             Maximum flow                 0.009    c.m/sec"
"                  0.009     0.000     0.003     0.083 c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                    0.009     0.009     0.003     0.083"
" 40          HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
"                    0.009     0.009     0.009     0.083"
" 40          HYDROGRAPH   Combine    800"
"             6   Combine "
"           800   Node #"
"                 Torrance Cree"
"             Maximum flow                 0.083    c.m/sec"
"             Hydrograph volume          629.746    c.m"
"                    0.009     0.009     0.009     0.083"
" 40          HYDROGRAPH Start - New Tributary"
"             2   Start - New Tributary"
"                    0.009     0.000     0.009     0.083"
" 33          CATCHMENT 2021"
"             1   Triangular SCS"
"             1   Equal length"
"             1   SCS method"
"          2021   202-1- wetland directly to Torrance"
"         0.000   % Impervious"
"         0.863   Total Area"
"        50.000   Flow length"
"         0.500   Overland Slope"
"         0.863   Pervious Area"
"        50.000   Pervious length"
"         5.000   Pervious slope"
"         0.000   Impervious Area"
"        50.000   Impervious length"
"         5.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        74.000   Pervious SCS Curve No."
"         0.384   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.924   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"
"                    0.116     0.000     0.009     0.083 c.m/sec"
"                 Catchment 2021         Pervious   Impervious Total Area "
"                 Surface Area           0.863      0.000      0.863      hectare"
"                 Time of concentration  13.511     1.698      13.511     minutes"
"                 Time to Centroid       110.736    86.497     110.736    minutes"
"                 Rainfall depth         77.443     77.443     77.443     mm"
"                 Rainfall volume        668.33     0.00       668.33     c.m"
"                 Rainfall losses        47.743     6.284      47.743     mm"
"                 Runoff depth           29.700     71.159     29.700     mm"
"                 Runoff volume          256.31     0.00       256.31     c.m"
"                 Runoff coefficient     0.384      0.000      0.384      "
"                 Maximum flow           0.116      0.000      0.116      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                    0.116     0.116     0.009     0.083"
" 40          HYDROGRAPH Copy to Outflow"
"             8   Copy to Outflow"
"                    0.116     0.116     0.116     0.083"
```

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" 40          HYDROGRAPH   Combine    800"
"            6   Combine "
"          800   Node #"
"                Torrance Cree"
"              Maximum flow                0.118    c.m/sec"
"              Hydrograph volume         886.059    c.m"
"                     0.116     0.116     0.116     0.118"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.116     0.000     0.116     0.118"
" 33          CATCHMENT 2022"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2022   202-2- Block 3 Rear Yards to Torrance"
"        0.000   % Impervious"
"        0.144   Total Area"
"       15.000   Flow length"
"       20.000   Overland Slope"
"        0.144   Pervious Area"
"       15.000   Pervious length"
"       20.000   Pervious slope"
"        0.000   Impervious Area"
"       15.000   Impervious length"
"       20.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.381   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   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"
"                     0.028     0.000     0.116     0.118 c.m/sec"
"              Catchment 2022          Pervious   Impervious Total Area "
"              Surface Area            0.144      0.000      0.144      hectare"
"              Time of concentration   4.328      0.544      4.328      minutes"
"              Time to Centroid        99.350     85.295     99.350     minutes"
"              Rainfall depth          77.443     77.443     77.443     mm"
"              Rainfall volume         111.52     0.00       111.52     c.m"
"              Rainfall losses         47.968     12.354     47.967     mm"
"              Runoff depth            29.475     65.089     29.475     mm"
"              Runoff volume           42.44      0.00       42.44      c.m"
"              Runoff coefficient      0.381      0.000      0.381      "
"              Maximum flow            0.028      0.000      0.028      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.028     0.028     0.116     0.118"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.028     0.028     0.028     0.118"
" 40          HYDROGRAPH   Combine    800"
"            6   Combine "
"          800   Node #"
"                Torrance Cree"
"              Maximum flow                0.132    c.m/sec"
"              Hydrograph volume         928.503    c.m"
"                     0.028     0.028     0.028     0.132"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.028     0.000     0.028     0.132"
" 33          CATCHMENT 2031"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2031   203-1 - Arkell Meadows Embankments to Trail"
"        30.000   % Impervious"
"         0.198   Total Area"
"        10.000   Flow length"
"        20.000   Overland Slope"
"         0.139   Pervious Area"
"        10.000   Pervious length"
"        20.000   Pervious slope"
"         0.059   Impervious Area"
"        10.000   Impervious length"
"        20.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        74.000   Pervious SCS Curve No."
"         0.375   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.924   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.819   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                     0.048     0.000     0.028     0.132 c.m/sec"
"              Catchment 2031          Pervious   Impervious Total Area "
"              Surface Area            0.139      0.059      0.198      hectare"
"              Time of concentration   3.394      0.427      1.959      minutes"
"              Time to Centroid        98.270     85.091     91.895     minutes"
"              Rainfall depth          77.443     77.443     77.443     mm"
"              Rainfall volume         107.34     46.00      153.34     c.m"
"              Rainfall losses         48.415     13.993     38.088     mm"
"              Runoff depth            29.028     63.450     39.355     mm"
"              Runoff volume           40.23      37.69      77.92      c.m"
"              Runoff coefficient      0.375      0.819      0.508      "
"              Maximum flow            0.027      0.030      0.048      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.048     0.048     0.028     0.132"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.048     0.048     0.048     0.132"
" 40          HYDROGRAPH   Combine    800"
"            6   Combine "
"          800   Node #"
"                Torrance Cree"
"              Maximum flow                0.158    c.m/sec"
"              Hydrograph volume          1006.425    c.m"
"                     0.048     0.048     0.048     0.158"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.048     0.000     0.048     0.158"
" 33          CATCHMENT 2032"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2032   203-2 Future Park Trail"
"        0.000   % Impervious"
"        0.216   Total Area"
"      180.000   Flow length"
"        0.500   Overland Slope"
"        0.216   Pervious Area"
"      180.000   Pervious length"
"        0.500   Pervious slope"
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"        0.000   Impervious Area"
"      180.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.384   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.011     0.000     0.048     0.158 c.m/sec"
"             Catchment 2032         Pervious   Impervious Total Area "
"             Surface Area           0.216      0.000      0.216      hectare"
"             Time of concentration  58.137     7.307      58.137     minutes"
"             Time to Centroid       166.376    94.438     166.376    minutes"
"             Rainfall depth         77.443     77.443     77.443     mm"
"             Rainfall volume        167.28     0.00       167.28     c.m"
"             Rainfall losses        47.686     5.906      47.685     mm"
"             Runoff depth           29.757     71.537     29.757     mm"
"             Runoff volume          64.28      0.00       64.28      c.m"
"             Runoff coefficient     0.384      0.000      0.384      "
"             Maximum flow           0.011      0.000      0.011      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.011     0.011     0.048     0.158"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.011     0.011     0.011     0.158"
" 40          HYDROGRAPH   Combine    800"
"            6   Combine "
"          800   Node #"
"                Torrance Cree"
"             Maximum flow                  0.160    c.m/sec"
"             Hydrograph volume          1070.701    c.m"
"                    0.011     0.011     0.011     0.160"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.011     0.000     0.011     0.160"
" 33          CATCHMENT 2033"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2033   203-3 - Block 1 Embankment to Trail Block"
"        0.000   % Impervious"
"        0.109   Total Area"
"       10.000   Flow length"
"       33.000   Overland Slope"
"        0.109   Pervious Area"
"       10.000   Pervious length"
"       33.000   Pervious slope"
"        0.000   Impervious Area"
"       10.000   Impervious length"
"       33.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.376   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   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"
"                    0.022     0.000     0.011     0.160 c.m/sec"
"             Catchment 2033         Pervious   Impervious Total Area "
"             Surface Area           0.109      0.000      0.109      hectare"
"             Time of concentration  2.920      0.367      2.920      minutes"
"             Time to Centroid       97.553     84.895     97.553     minutes"
"             Rainfall depth         77.443     77.443     77.443     mm"
"             Rainfall volume        84.41      0.00       84.41      c.m"
"             Rainfall losses        48.296     14.614     48.295     mm"
"             Runoff depth           29.147     62.828     29.147     mm"
"             Runoff volume          31.77      0.00       31.77      c.m"
"             Runoff coefficient     0.376      0.000      0.376      "
"             Maximum flow           0.022      0.000      0.022      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.022     0.022     0.011     0.160"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.022     0.022     0.022     0.160"
" 40          HYDROGRAPH   Combine    800"
"            6   Combine "
"          800   Node #"
"                Torrance Cree"
"             Maximum flow                  0.174    c.m/sec"
"             Hydrograph volume          1102.472    c.m"
"                    0.022     0.022     0.022     0.174"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.022     0.000     0.022     0.174"
" 33          CATCHMENT 2041"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2041   204-1 Block 1 rear yeards + Arkell Blvd to Arkell"
"       12.000   % Impervious"
"        0.085   Total Area"
"       15.000   Flow length"
"        2.000   Overland Slope"
"        0.075   Pervious Area"
"       15.000   Pervious length"
"        2.000   Pervious slope"
"        0.010   Impervious Area"
"       15.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.383   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.906   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.014     0.000     0.022     0.174 c.m/sec"
"             Catchment 2041         Pervious   Impervious Total Area "
"             Surface Area           0.075      0.010      0.085      hectare"
"             Time of concentration  8.636      1.085      6.794      minutes"
"             Time to Centroid       104.625    85.713     100.012    minutes"
"             Rainfall depth         77.443     77.443     77.443     mm"
"             Rainfall volume        57.93      7.90       65.83      c.m"
"             Rainfall losses        47.804     7.314      42.945     mm"
"             Runoff depth           29.639     70.128     34.498     mm"
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"            Runoff volume          22.17      7.15       29.32      c.m"
"            Runoff coefficient     0.383      0.906      0.445      "
"            Maximum flow           0.012      0.005      0.014      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.014     0.014     0.022     0.174"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.014     0.014     0.014     0.174"
" 40         HYDROGRAPH   Combine    700"
"           6   Combine "
"         700   Node #"
"               Arkell"
"            Maximum flow                0.014    c.m/sec"
"            Hydrograph volume          29.323    c.m"
"                  0.014     0.014     0.014     0.014"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                  0.014     0.000     0.014     0.014"
" 33         CATCHMENT 2042"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2042   204-2 Street A, Block 2 Rear Yars, Blvd to Arkell"
"      36.000   % Impervious"
"       0.111   Total Area"
"      25.000   Flow length"
"       5.000   Overland Slope"
"       0.071   Pervious Area"
"      25.000   Pervious length"
"       5.000   Pervious slope"
"       0.040   Impervious Area"
"      25.000   Impervious length"
"       5.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.382   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.907   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                  0.024     0.000     0.014     0.014 c.m/sec"
"            Catchment 2042         Pervious   Impervious Total Area "
"            Surface Area           0.071      0.040      0.111      hectare"
"            Time of concentration  8.914      1.120      4.458      minutes"
"            Time to Centroid       104.988    85.758     93.993     minutes"
"            Rainfall depth         77.443     77.443     77.443     mm"
"            Rainfall volume        55.02      30.95      85.96      c.m"
"            Rainfall losses        47.837     7.179      33.200     mm"
"            Runoff depth           29.605     70.264     44.242     mm"
"            Runoff volume          21.03      28.08      49.11      c.m"
"            Runoff coefficient     0.382      0.907      0.571      "
"            Maximum flow           0.011      0.021      0.024      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.024     0.024     0.014     0.014"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.024     0.024     0.024     0.014"
" 40         HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               Torrance Cree"
"            Maximum flow                0.195    c.m/sec"
"            Hydrograph volume        1151.581    c.m"
"                  0.024     0.024     0.024     0.195"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                  0.024     0.000     0.024     0.195"
" 33         CATCHMENT 205"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         205   205- Dawes Ave to Ex. SWMF "
"      70.000   % Impervious"
"       0.032   Total Area"
"      20.000   Flow length"
"       1.300   Overland Slope"
"       0.010   Pervious Area"
"      20.000   Pervious length"
"       1.300   Pervious slope"
"       0.022   Impervious Area"
"      20.000   Impervious length"
"       1.300   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.383   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.917   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                  0.012     0.000     0.024     0.195 c.m/sec"
"            Catchment 205          Pervious   Impervious Total Area "
"            Surface Area           0.010      0.022      0.032      hectare"
"            Time of concentration  11.679     1.468      3.018      minutes"
"            Time to Centroid       108.430    86.165     89.545     minutes"
"            Rainfall depth         77.443     77.443     77.443     mm"
"            Rainfall volume        7.43       17.35      24.78      c.m"
"            Rainfall losses        47.782     6.410      18.822     mm"
"            Runoff depth           29.661     71.033     58.621     mm"
"            Runoff volume          2.85       15.91      18.76      c.m"
"            Runoff coefficient     0.383      0.917      0.757      "
"            Maximum flow           0.001      0.011      0.012      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.012     0.012     0.024     0.195"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.012     0.012     0.012     0.195"
" 40         HYDROGRAPH   Combine    600"
"           6   Combine "
"         600   Node #"
"               Dawes Avenue"
"            Maximum flow                0.012    c.m/sec"
"            Hydrograph volume          18.759    c.m"
"                  0.012     0.012     0.012     0.012"
" 38         START/RE-START TOTALS 205"
"           3   Runoff Totals on EXIT"
"            Total Catchment area                    3.108    hectare"
"            Total Impervious area                   1.064    hectare"
"            Total % impervious                     34.232"
" 19         EXIT"
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"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                        Sunday, February 7, 2010"
"           10   Units used:                                        ie METRIC"
"                Job folder:                                 Q:\42063\104\SWM\"
"                2024-06-03 - Revised per GRCA Comments (Aug. 17, 2023)\MIDUSS\POST"
"                Output filename:                                     100y.out"
"                Licensee name:                                             A"
"                Company                                                    "
"                Date & Time last used:                 6/8/2024 at 4:44:29 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          239.650    mm/hr"
"             Total depth                 87.263    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 2011"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2011   201-1 - Street A to SWMF"
"       65.000   % Impervious"
"        0.289   Total Area"
"       60.000   Flow length"
"        0.800   Overland Slope"
"        0.101   Pervious Area"
"       60.000   Pervious length"
"        0.750   Pervious slope"
"        0.188   Impervious Area"
"       60.000   Impervious length"
"        0.750   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.419   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.919   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.098     0.000     0.000     0.000 c.m/sec"
"             Catchment 2011         Pervious   Impervious Total Area "
"             Surface Area           0.101      0.188      0.289      hectare"
"             Time of concentration  24.435     3.203      7.391      minutes"
"             Time to Centroid       123.623    88.411     95.357     minutes"
"             Rainfall depth         87.263     87.263     87.263     mm"
"             Rainfall volume        88.27      163.92     252.19     c.m"
"             Rainfall losses        50.658     7.047      22.311     mm"
"             Runoff depth           36.605     80.217     64.953     mm"
"             Runoff volume          37.03      150.69     187.71     c.m"
"             Runoff coefficient     0.419      0.919      0.744      "
"             Maximum flow           0.012      0.096      0.098      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.098     0.098     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.098     0.098     0.098     0.000"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"             Maximum flow                  0.098    c.m/sec"
"             Hydrograph volume           187.713    c.m"
"                    0.098     0.098     0.098     0.098"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.098     0.000     0.098     0.098"
" 33          CATCHMENT 2012"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2012   201-2 - Block 2 Front/Roofs to SWMF"
"       84.000   % Impervious"
"        0.137   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.022   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.115   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.415   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.890   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.068     0.000     0.098     0.098 c.m/sec"
"             Catchment 2012         Pervious   Impervious Total Area "
"             Surface Area           0.022      0.115      0.137      hectare"
"             Time of concentration  6.214      0.814      1.255      minutes"
"             Time to Centroid       100.973    85.085     86.381     minutes"
"             Rainfall depth         87.263     87.263     87.263     mm"
"             Rainfall volume        19.13      100.42     119.55     c.m"
"             Rainfall losses        51.029     9.575      16.208     mm"
"             Runoff depth           36.234     77.688     71.056     mm"
"             Runoff volume          7.94       89.40      97.35      c.m"
"             Runoff coefficient     0.415      0.890      0.814      "
"             Maximum flow           0.005      0.066      0.068      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.068     0.068     0.098     0.098"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.068     0.068     0.068     0.098"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"             Maximum flow                  0.166    c.m/sec"
"             Hydrograph volume           285.060    c.m"
"                    0.068     0.068     0.068     0.166"
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" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.068     0.000     0.068     0.166"
" 33          CATCHMENT 2013"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2013   201-3 - Block 1 to SWMF"
"       65.000   % Impervious"
"        0.418   Total Area"
"       80.000   Flow length"
"        0.500   Overland Slope"
"        0.146   Pervious Area"
"       80.000   Pervious length"
"        0.500   Pervious slope"
"        0.272   Impervious Area"
"       80.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.419   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.929   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.147     0.000     0.068     0.166 c.m/sec"
"             Catchment 2013         Pervious   Impervious Total Area "
"             Surface Area           0.146      0.272      0.418      hectare"
"             Time of concentration  32.795     4.298      9.870      minutes"
"             Time to Centroid       134.059    89.937     98.564     minutes"
"             Rainfall depth         87.263     87.263     87.263     mm"
"             Rainfall volume        127.67     237.09     364.76     c.m"
"             Rainfall losses        50.657     6.170      21.741     mm"
"             Runoff depth           36.606     81.093     65.523     mm"
"             Runoff volume          53.55      220.33     273.88     c.m"
"             Runoff coefficient     0.419      0.929      0.751      "
"             Maximum flow           0.014      0.144      0.147      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.147     0.147     0.068     0.166"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.147     0.147     0.147     0.166"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"             Maximum flow                 0.295    c.m/sec"
"             Hydrograph volume          558.944    c.m"
"                    0.147     0.147     0.147     0.295"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.147     0.000     0.147     0.295"
" 33          CATCHMENT 2014"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2014   201-4 - Block 1 Roofs to SWMF"
"      100.000   % Impervious"
"        0.128   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.000   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.128   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.890   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.074     0.000     0.147     0.295 c.m/sec"
"             Catchment 2014         Pervious   Impervious Total Area "
"             Surface Area           0.000      0.128      0.128      hectare"
"             Time of concentration  6.214      0.814      0.814      minutes"
"             Time to Centroid       100.973    85.085     85.085     minutes"
"             Rainfall depth         87.263     87.263     87.263     mm"
"             Rainfall volume        0.00       111.70     111.70     c.m"
"             Rainfall losses        51.029     9.575      9.575      mm"
"             Runoff depth           36.234     77.688     77.688     mm"
"             Runoff volume          0.00       99.44      99.44      c.m"
"             Runoff coefficient     0.000      0.890      0.890      "
"             Maximum flow           0.000      0.074      0.074      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.074     0.074     0.147     0.295"
" 57          TRENCH Design d/s of 2014"
"        0.074   Peak inflow"
"       99.441   Hydrograph volume"
"      335.600   Ground elevation"
"      334.500   Downstream trench invert"
"        1.000   Trench height"
"      333.400   Water table elevation"
"       12.000   Trench top width"
"       12.000   Trench bottom width"
"       40.000   Voids ratio (%)"
"       43.000   Hydraulic conductivity"
"        0.000   Trench gradient (%)"
"        8.000   Trench length"
"        1.000   Include base width"
"          12.   Number of stages"
"                  Level Discharge    Volume"
"                334.500     0.000       0.0"
"                334.600     0.000       3.8"
"                334.700     0.000       7.7"
"                334.800     0.000      11.5"
"                334.900     0.000      15.4"
"                335.000     0.000      19.2"
"                335.100     0.000      23.0"
"                335.200     0.000      26.9"
"                335.300     0.000      30.7"
"                335.400     0.000      34.6"
"                335.500     0.000      38.4"
"                335.600     1.000      38.5"
"            1.   MANHOLE"
"                 Access"
"               diameter"
"                  1.200"
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"            Peak outflow                 0.055    c.m/sec"
"            Outflow volume              35.354    c.m"
"            Peak exfiltration            0.002    c.m/sec"
"            Exfiltration volume         52.986    c.m"
"            Maximum level              335.510    metre"
"            Maximum storage             38.411    c.m"
"            Centroidal lag               1.563   hours"
"            Infiltration area 2 sides   16.000   sq.metre"
"            Infiltration Base area      96.000   sq.metre"
"                 0.074     0.074     0.055     0.002 c.m/sec"
" 40         HYDROGRAPH   Combine    900"
"           6   Combine "
"         900   Node #"
"               SWMF"
"            Maximum flow                 0.301    c.m/sec"
"            Hydrograph volume          594.299    c.m"
"                  0.074     0.074     0.055     0.301"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                 0.074     0.000     0.055     0.301"
" 33         CATCHMENT 2015"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2015   201-5 - Block 1 Ramp minor to SWMF/Major to Arkell"
"      85.000   % Impervious"
"       0.020   Total Area"
"      10.000   Flow length"
"       3.000   Overland Slope"
"       0.003   Pervious Area"
"      10.000   Pervious length"
"       3.000   Pervious slope"
"       0.017   Impervious Area"
"      10.000   Impervious length"
"       3.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.417   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.878   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                 0.010     0.000     0.055     0.301 c.m/sec"
"            Catchment 2015         Pervious   Impervious Total Area "
"            Surface Area           0.003      0.017      0.020      hectare"
"            Time of concentration  5.502      0.721      1.091      minutes"
"            Time to Centroid       99.994     85.013     86.171     minutes"
"            Rainfall depth         87.263     87.263     87.263     mm"
"            Rainfall volume        2.62       14.83      17.45      c.m"
"            Rainfall losses        50.866     10.613     16.651     mm"
"            Runoff depth           36.398     76.651     70.613     mm"
"            Runoff volume          1.09       13.03      14.12      c.m"
"            Runoff coefficient     0.417      0.878      0.809      "
"            Maximum flow           0.001      0.010      0.010      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                 0.010     0.010     0.055     0.301"
" 56         DIVERSION"
"        2015   Node number"
"       0.006   Overflow threshold"
"       1.000   Required diverted fraction"
"           0   Conduit type; 1=Pipe;2=Channel"
"            Peak of diverted flow        0.004    c.m/sec"
"            Volume of diverted flow      1.381    c.m"
"            DIV02015.100hyd"
"            Major flow at 2015"
"                  0.010     0.010     0.006     0.301 c.m/sec"
" 40         HYDROGRAPH Next link "
"           5   Next link "
"                 0.010     0.006     0.006     0.301"
" 40         HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                 0.010     0.006     0.006     0.301"
" 40         HYDROGRAPH   Combine    900"
"           6   Combine "
"         900   Node #"
"               SWMF"
"            Maximum flow                 0.307    c.m/sec"
"            Hydrograph volume          607.038    c.m"
"                  0.010     0.006     0.006     0.307"
" 40         HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                 0.010     0.000     0.006     0.307"
" 33         CATCHMENT 2016"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2016   201-6 - Street A minor to SWMF/Major to Arkell"
"      75.000   % Impervious"
"       0.057   Total Area"
"      20.000   Flow length"
"       3.000   Overland Slope"
"       0.014   Pervious Area"
"      20.000   Pervious length"
"       3.000   Pervious slope"
"       0.043   Impervious Area"
"      20.000   Impervious length"
"       3.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.418   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.913   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                 0.026     0.000     0.006     0.307 c.m/sec"
"            Catchment 2016         Pervious   Impervious Total Area "
"            Surface Area           0.014      0.043      0.057      hectare"
"            Time of concentration  8.339      1.093      2.053      minutes"
"            Time to Centroid       103.476    85.426     87.816     minutes"
"            Rainfall depth         87.263     87.263     87.263     mm"
"            Rainfall volume        12.44      37.31      49.74      c.m"
"            Rainfall losses        50.767     7.569      18.369     mm"
"            Runoff depth           36.496     79.694     68.895     mm"
"            Runoff volume          5.20       34.07      39.27      c.m"
"            Runoff coefficient     0.418      0.913      0.790      "
"            Maximum flow           0.003      0.025      0.026      c.m/sec"
" 40         HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                 0.026     0.026     0.006     0.307"
" 56         DIVERSION"
"        2016   Node number"
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"        0.014   Overflow threshold"
"        1.000   Required diverted fraction"
"            0   Conduit type; 1=Pipe;2=Channel"
"             Peak of diverted flow         0.012    c.m/sec"
"             Volume of diverted flow       5.197    c.m"
"             DIV02016.100hyd"
"             Major flow at 2106"
"                    0.026     0.026     0.014     0.307 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.026     0.014     0.014     0.307"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.026     0.014     0.014     0.307"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"             Maximum flow                  0.321    c.m/sec"
"             Hydrograph volume           641.111    c.m"
"                    0.026     0.014     0.014     0.321"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.026     0.000     0.014     0.321"
" 33          CATCHMENT 2017"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2017   201-7 - Block 3 to SWMF"
"       80.000   % Impervious"
"        0.075   Total Area"
"       40.000   Flow length"
"        0.500   Overland Slope"
"        0.015   Pervious Area"
"       40.000   Pervious length"
"        0.500   Pervious slope"
"        0.060   Impervious Area"
"       40.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.419   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.917   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.032     0.000     0.014     0.321 c.m/sec"
"             Catchment 2017         Pervious   Impervious Total Area "
"             Surface Area           0.015      0.060      0.075      hectare"
"             Time of concentration  21.637     2.836      4.765      minutes"
"             Time to Centroid       120.119    87.884     91.192     minutes"
"             Rainfall depth         87.263     87.263     87.263     mm"
"             Rainfall volume        13.09      52.36      65.45      c.m"
"             Rainfall losses        50.676     7.282      15.961     mm"
"             Runoff depth           36.587     79.981     71.302     mm"
"             Runoff volume          5.49       47.99      53.48      c.m"
"             Runoff coefficient     0.419      0.917      0.817      "
"             Maximum flow           0.002      0.032      0.032      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.032     0.032     0.014     0.321"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.032     0.032     0.032     0.321"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"             Maximum flow                  0.350    c.m/sec"
"             Hydrograph volume           694.588    c.m"
"                    0.032     0.032     0.032     0.350"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.032     0.000     0.032     0.350"
" 33          CATCHMENT 2018"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2018   201-8 - Block 2 Roofs to Gallery"
"      100.000   % Impervious"
"        0.032   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.000   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.032   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.890   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.018     0.000     0.032     0.350 c.m/sec"
"             Catchment 2018         Pervious   Impervious Total Area "
"             Surface Area           0.000      0.032      0.032      hectare"
"             Time of concentration  6.214      0.814      0.814      minutes"
"             Time to Centroid       100.973    85.085     85.085     minutes"
"             Rainfall depth         87.263     87.263     87.263     mm"
"             Rainfall volume        0.00       27.92      27.92      c.m"
"             Rainfall losses        51.029     9.575      9.575      mm"
"             Runoff depth           36.234     77.688     77.688     mm"
"             Runoff volume          0.00       24.86      24.86      c.m"
"             Runoff coefficient     0.000      0.890      0.890      "
"             Maximum flow           0.000      0.018      0.018      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.018     0.018     0.032     0.350"
" 57          TRENCH Design d/s of 2018"
"        0.018   Peak inflow"
"       24.860   Hydrograph volume"
"      335.400   Ground elevation"
"      334.300   Downstream trench invert"
"        1.000   Trench height"
"      333.200   Water table elevation"
"        4.000   Trench top width"
"        4.000   Trench bottom width"
"       40.000   Voids ratio (%)"
"       73.000   Hydraulic conductivity"
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"        0.000   Trench gradient (%)"
"        5.000   Trench length"
"        1.000   Include base width"
"          12.   Number of stages"
"                  Level Discharge    Volume"
"                334.300     0.000       0.0"
"                334.400     0.000       0.8"
"                334.500     0.000       1.6"
"                334.600     0.000       2.4"
"                334.700     0.000       3.2"
"                334.800     0.000       4.0"
"                334.900     0.000       4.8"
"                335.000     0.000       5.6"
"                335.100     0.000       6.4"
"                335.200     0.000       7.2"
"                335.300     0.000       8.0"
"                335.400     1.000       8.1"
"           1.   MANHOLE"
"                 Access"
"               diameter"
"                  1.200"
"              Peak outflow                  0.021    c.m/sec"
"              Outflow volume               10.594    c.m"
"              Peak exfiltration             0.001    c.m/sec"
"              Exfiltration volume          13.584    c.m"
"              Maximum level               335.303    metre"
"              Maximum storage               8.004    c.m"
"              Centroidal lag                1.442   hours"
"              Infiltration area 2 sides    10.000   sq.metre"
"              Infiltration Base area       20.000   sq.metre"
"                   0.018     0.018     0.021     0.001 c.m/sec"
" 40          HYDROGRAPH   Combine    900"
"           6   Combine "
"         900   Node #"
"               SWMF"
"              Maximum flow                  0.372    c.m/sec"
"              Hydrograph volume           705.181    c.m"
"                     0.018     0.018     0.021     0.372"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.018     0.000     0.021     0.372"
" 33          CATCHMENT 2019"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2019   201-9 - SWMF Block"
"       40.000   % Impervious"
"        0.194   Total Area"
"       15.000   Flow length"
"        5.000   Overland Slope"
"        0.116   Pervious Area"
"       15.000   Pervious length"
"        5.000   Pervious slope"
"        0.078   Impervious Area"
"       15.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.415   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.887   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.056     0.000     0.021     0.372 c.m/sec"
"             Catchment 2019         Pervious   Impervious Total Area "
"             Surface Area           0.116      0.078      0.194      hectare"
"             Time of concentration  6.020      0.789      2.946      minutes"
"             Time to Centroid       100.721    85.061     91.518     minutes"
"             Rainfall depth         87.263     87.263     87.263     mm"
"             Rainfall volume        101.57     67.72      169.29     c.m"
"             Rainfall losses        51.039     9.836      34.558     mm"
"             Runoff depth           36.224     77.427     52.706     mm"
"             Runoff volume          42.17      60.08      102.25     c.m"
"             Runoff coefficient     0.415      0.887      0.604      "
"             Maximum flow           0.025      0.045      0.056      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                     0.056     0.056     0.021     0.372"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                     0.056     0.056     0.056     0.372"
" 40          HYDROGRAPH   Combine    900"
"           6   Combine "
"         900   Node #"
"               SWMF"
"              Maximum flow                  0.425    c.m/sec"
"              Hydrograph volume           807.430    c.m"
"                     0.056     0.056     0.056     0.425"
" 40          HYDROGRAPH   Confluence    900"
"           7   Confluence "
"         900   Node #"
"               SWMF"
"              Maximum flow                  0.425    c.m/sec"
"              Hydrograph volume           807.430    c.m"
"                     0.056     0.425     0.056     0.000"
" 54          POND DESIGN"
"        0.425   Current peak flow    c.m/sec"
"        0.100   Target outflow    c.m/sec"
"        807.4   Hydrograph volume    c.m"
"          12.   Number of stages"
"      334.400   Minimum water level    metre"
"      335.500   Maximum water level    metre"
"      334.400   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                334.400     0.000     0.000"
"                334.500   0.00150    49.000"
"                334.600   0.00230   103.000"
"                334.700   0.00290   161.000"
"                334.800   0.04670   225.000"
"                334.900   0.06500   295.000"
"                335.000   0.07920   370.000"
"                335.100   0.09110   450.000"
"                335.200    0.1017   534.000"
"                335.300    0.2368   622.000"
"                335.400    0.5900   714.000"
"                335.500     1.190   811.000"
"              Peak outflow                  0.094    c.m/sec"
"              Maximum level               335.128    metre"
"              Maximum storage             473.496    c.m"
"              Centroidal lag                5.100   hours"
"                   0.056     0.425     0.094     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"           5   Next link "
"                     0.056     0.094     0.094     0.000"
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" 54          POND DESIGN"
"        0.094   Current peak flow    c.m/sec"
"        0.001   Target outflow    c.m/sec"
"        781.3   Hydrograph volume    c.m"
"          10.   Number of stages"
"      334.200   Minimum water level    metre"
"      335.100   Maximum water level    metre"
"      334.200   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                334.200     0.000     0.000"
"                334.300   0.00189    15.000"
"                334.400   0.00209    32.000"
"                334.500   0.00231    50.000"
"                334.600   0.00253    70.000"
"                334.700   0.00276    92.000"
"                334.800   0.00300   117.000"
"                334.900    0.1546   143.000"
"                335.000    0.4631   172.000"
"                335.100    0.9063   202.000"
"             Peak outflow                  0.093    c.m/sec"
"             Maximum level               334.859    metre"
"             Maximum storage             132.439    c.m"
"             Centroidal lag                7.489   hours"
"                  0.056     0.094     0.093     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               Torrance Cree"
"             Maximum flow                  0.093    c.m/sec"
"             Hydrograph volume           728.464    c.m"
"                    0.056     0.094     0.093     0.093"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.056     0.000     0.093     0.093"
" 47          FILEI_O Read/Open DIV02015.100hyd"
"           1   1=read/open; 2=write/save"
"           2   1=rainfall; 2=hydrograph"
"           1   1=runoff; 2=inflow; 3=outflow; 4=junction"
"            DIV02015.100hyd"
"            Major flow at 2015"
"            Total volume                  1.381    c.m"
"            Maximum flow                  0.004    c.m/sec"
"                 0.004     0.000     0.093     0.093 c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.004     0.004     0.093     0.093"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                    0.004     0.004     0.004     0.093"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               Torrance Cree"
"             Maximum flow                  0.093    c.m/sec"
"             Hydrograph volume           729.846    c.m"
"                    0.004     0.004     0.004     0.093"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.004     0.000     0.004     0.093"
" 47          FILEI_O Read/Open DIV02016.100hyd"
"           1   1=read/open; 2=write/save"
"           2   1=rainfall; 2=hydrograph"
"           1   1=runoff; 2=inflow; 3=outflow; 4=junction"
"            DIV02016.100hyd"
"            Major flow at 2106"
"            Total volume                  5.197    c.m"
"            Maximum flow                  0.012    c.m/sec"
"                 0.012     0.000     0.004     0.093 c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.012     0.012     0.004     0.093"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                    0.012     0.012     0.012     0.093"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               Torrance Cree"
"             Maximum flow                  0.093    c.m/sec"
"             Hydrograph volume           735.043    c.m"
"                    0.012     0.012     0.012     0.093"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.012     0.000     0.012     0.093"
" 33          CATCHMENT 2021"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2021   202-1- wetland directly to Torrance"
"       0.000   % Impervious"
"       0.863   Total Area"
"      50.000   Flow length"
"       0.500   Overland Slope"
"       0.863   Pervious Area"
"      50.000   Pervious length"
"       5.000   Pervious slope"
"       0.000   Impervious Area"
"      50.000   Impervious length"
"       5.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.418   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   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"
"                    0.144     0.000     0.012     0.093 c.m/sec"
"            Catchment 2021         Pervious   Impervious Total Area "
"            Surface Area           0.863      0.000      0.863      hectare"
"            Time of concentration  12.398     1.625      12.398     minutes"
"            Time to Centroid       108.580    86.100     108.580    minutes"
"            Rainfall depth         87.263     87.263     87.263     mm"
"            Rainfall volume        753.08     0.00       753.08     c.m"
"            Rainfall losses        50.752     6.488      50.752     mm"
"            Runoff depth           36.512     80.775     36.512     mm"
"            Runoff volume          315.10     0.00       315.10     c.m"
"            Runoff coefficient     0.418      0.000      0.418      "
"            Maximum flow           0.144      0.000      0.144      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.144     0.144     0.012     0.093"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                    0.144     0.144     0.144     0.093"
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" 40          HYDROGRAPH   Combine    800"
"            6   Combine "
"          800   Node #"
"                Torrance Cree"
"              Maximum flow                 0.146    c.m/sec"
"              Hydrograph volume         1050.139    c.m"
"                     0.144     0.144     0.144     0.146"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.144     0.000     0.144     0.146"
" 33          CATCHMENT 2022"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2022   202-2- Block 3 Rear Yards to Torrance"
"        0.000   % Impervious"
"        0.144   Total Area"
"       15.000   Flow length"
"       20.000   Overland Slope"
"        0.144   Pervious Area"
"       15.000   Pervious length"
"       20.000   Pervious slope"
"        0.000   Impervious Area"
"       15.000   Impervious length"
"       20.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.413   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   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"
"                     0.035     0.000     0.144     0.146 c.m/sec"
"              Catchment 2022         Pervious   Impervious Total Area "
"              Surface Area           0.144      0.000      0.144      hectare"
"              Time of concentration  3.972      0.521      3.972      minutes"
"              Time to Centroid       98.168     84.953     98.168     minutes"
"              Rainfall depth         87.263     87.263     87.263     mm"
"              Rainfall volume        125.66     0.00       125.66     c.m"
"              Rainfall losses        51.231     13.867     51.231     mm"
"              Runoff depth           36.032     73.397     36.032     mm"
"              Runoff volume          51.89      0.00       51.89      c.m"
"              Runoff coefficient     0.413      0.000      0.413      "
"              Maximum flow           0.035      0.000      0.035      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.035     0.035     0.144     0.146"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.035     0.035     0.035     0.146"
" 40          HYDROGRAPH   Combine    800"
"            6   Combine "
"          800   Node #"
"                Torrance Cree"
"              Maximum flow                 0.170    c.m/sec"
"              Hydrograph volume         1102.026    c.m"
"                     0.035     0.035     0.035     0.170"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.035     0.000     0.035     0.170"
" 33          CATCHMENT 2031"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2031   203-1 - Arkell Meadows Embankments to Trail"
"        30.000   % Impervious"
"         0.198   Total Area"
"        10.000   Flow length"
"        20.000   Overland Slope"
"         0.139   Pervious Area"
"        10.000   Pervious length"
"        20.000   Pervious slope"
"         0.059   Impervious Area"
"        10.000   Impervious length"
"        20.000   Impervious slope"
"         0.250   Pervious Manning 'n'"
"        74.000   Pervious SCS Curve No."
"         0.410   Pervious Runoff coefficient"
"         0.100   Pervious Ia/S coefficient"
"         8.924   Pervious Initial abstraction"
"         0.015   Impervious Manning 'n'"
"        98.000   Impervious SCS Curve No."
"         0.822   Impervious Runoff coefficient"
"         0.100   Impervious Ia/S coefficient"
"         0.518   Impervious Initial abstraction"
"                     0.058     0.000     0.035     0.170 c.m/sec"
"              Catchment 2031         Pervious   Impervious Total Area "
"              Surface Area           0.139      0.059      0.198      hectare"
"              Time of concentration  3.114      0.408      1.864      minutes"
"              Time to Centroid       97.051     84.720     91.354     minutes"
"              Rainfall depth         87.263     87.263     87.263     mm"
"              Rainfall volume        120.95     51.83      172.78     c.m"
"              Rainfall losses        51.469     15.544     40.692     mm"
"              Runoff depth           35.794     71.720     46.572     mm"
"              Runoff volume          49.61      42.60      92.21      c.m"
"              Runoff coefficient     0.410      0.822      0.534      "
"              Maximum flow           0.034      0.033      0.058      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.058     0.058     0.035     0.170"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.058     0.058     0.058     0.170"
" 40          HYDROGRAPH   Combine    800"
"            6   Combine "
"          800   Node #"
"                Torrance Cree"
"              Maximum flow                 0.203    c.m/sec"
"              Hydrograph volume         1194.237    c.m"
"                     0.058     0.058     0.058     0.203"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.058     0.000     0.058     0.203"
" 33          CATCHMENT 2032"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2032   203-2 Future Park Trail"
"        0.000   % Impervious"
"        0.216   Total Area"
"      180.000   Flow length"
"        0.500   Overland Slope"
"        0.216   Pervious Area"
"      180.000   Pervious length"
"        0.500   Pervious slope"
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"        0.000   Impervious Area"
"      180.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.420   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                  0.014     0.000     0.058     0.203 c.m/sec"
"             Catchment 2032         Pervious   Impervious Total Area "
"             Surface Area           0.216      0.000      0.216      hectare"
"             Time of concentration  53.348     6.992      53.348     minutes"
"             Time to Centroid       159.744    93.640     159.744    minutes"
"             Rainfall depth         87.263     87.263     87.263     mm"
"             Rainfall volume        188.49     0.00       188.49     c.m"
"             Rainfall losses        50.656     6.109      50.656     mm"
"             Runoff depth           36.608     81.154     36.608     mm"
"             Runoff volume          79.07      0.00       79.07      c.m"
"             Runoff coefficient     0.420      0.000      0.420      "
"             Maximum flow           0.014      0.000      0.014      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.014     0.014     0.058     0.203"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.014     0.014     0.014     0.203"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               Torrance Cree"
"             Maximum flow                  0.206    c.m/sec"
"             Hydrograph volume          1273.309    c.m"
"                  0.014     0.014     0.014     0.206"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                  0.014     0.000     0.014     0.206"
" 33          CATCHMENT 2033"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2033   203-3 - Block 1 Embankment to Trail Block"
"        0.000   % Impervious"
"        0.109   Total Area"
"       10.000   Flow length"
"       33.000   Overland Slope"
"        0.109   Pervious Area"
"       10.000   Pervious length"
"       33.000   Pervious slope"
"        0.000   Impervious Area"
"       10.000   Impervious length"
"       33.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.412   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   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"
"                  0.026     0.000     0.014     0.206 c.m/sec"
"             Catchment 2033         Pervious   Impervious Total Area "
"             Surface Area           0.109      0.000      0.109      hectare"
"             Time of concentration  2.680      0.351      2.680      minutes"
"             Time to Centroid       96.408     84.507     96.408     minutes"
"             Rainfall depth         87.263     87.263     87.263     mm"
"             Rainfall volume        95.12      0.00       95.12      c.m"
"             Rainfall losses        51.352     16.110     51.352     mm"
"             Runoff depth           35.911     71.153     35.911     mm"
"             Runoff volume          39.14      0.00       39.14      c.m"
"             Runoff coefficient     0.412      0.000      0.412      "
"             Maximum flow           0.026      0.000      0.026      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.026     0.026     0.014     0.206"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.026     0.026     0.026     0.206"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               Torrance Cree"
"             Maximum flow                  0.224    c.m/sec"
"             Hydrograph volume          1312.453    c.m"
"                  0.026     0.026     0.026     0.224"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                  0.026     0.000     0.026     0.224"
" 33          CATCHMENT 2041"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2041   204-1 Block 1 rear yeards + Arkell Blvd to Arkell"
"       12.000   % Impervious"
"        0.085   Total Area"
"       15.000   Flow length"
"        2.000   Overland Slope"
"        0.075   Pervious Area"
"       15.000   Pervious length"
"        2.000   Pervious slope"
"        0.010   Impervious Area"
"       15.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.418   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.910   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                  0.019     0.000     0.026     0.224 c.m/sec"
"             Catchment 2041         Pervious   Impervious Total Area "
"             Surface Area           0.075      0.010      0.085      hectare"
"             Time of concentration  7.925      1.039      6.349      minutes"
"             Time to Centroid       103.037    85.361     98.993     minutes"
"             Rainfall depth         87.263     87.263     87.263     mm"
"             Rainfall volume        65.27      8.90       74.17      c.m"
"             Rainfall losses        50.764     7.853      45.615     mm"
"             Runoff depth           36.499     79.410     41.649     mm"
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"             Runoff volume          27.30      8.10       35.40      c.m"
"             Runoff coefficient     0.418      0.910      0.477      "
"             Maximum flow           0.015      0.006      0.019      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.019     0.019     0.026     0.224"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.019     0.019     0.019     0.224"
" 40          HYDROGRAPH   Combine    700"
"           6   Combine "
"         700   Node #"
"               Arkell"
"             Maximum flow                0.019    c.m/sec"
"             Hydrograph volume          35.401    c.m"
"                   0.019     0.019     0.019     0.019"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.019     0.000     0.019     0.019"
" 33          CATCHMENT 2042"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2042   204-2 Street A, Block 2 Rear Yars, Blvd to Arkell"
"      36.000   % Impervious"
"       0.111   Total Area"
"      25.000   Flow length"
"       5.000   Overland Slope"
"       0.071   Pervious Area"
"      25.000   Pervious length"
"       5.000   Pervious slope"
"       0.040   Impervious Area"
"      25.000   Impervious length"
"       5.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.418   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.912   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                   0.030     0.000     0.019     0.019 c.m/sec"
"            Catchment 2042          Pervious   Impervious Total Area "
"             Surface Area           0.071      0.040      0.111      hectare"
"             Time of concentration  8.179      1.072      4.265      minutes"
"             Time to Centroid       103.355    85.398     93.465     minutes"
"             Rainfall depth         87.263     87.263     87.263     mm"
"             Rainfall volume        61.99      34.87      96.86      c.m"
"             Rainfall losses        50.750     7.675      35.243     mm"
"             Runoff depth           36.513     79.588     52.020     mm"
"             Runoff volume          25.94      31.80      57.74      c.m"
"             Runoff coefficient     0.418      0.912      0.596      "
"             Maximum flow           0.014      0.023      0.030      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.030     0.030     0.019     0.019"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.030     0.030     0.030     0.019"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               Torrance Cree"
"             Maximum flow                0.253    c.m/sec"
"             Hydrograph volume        1370.196    c.m"
"                   0.030     0.030     0.030     0.253"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.030     0.000     0.030     0.253"
" 33          CATCHMENT 205"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         205   205- Dawes Ave to Ex. SWMF "
"      70.000   % Impervious"
"       0.032   Total Area"
"      20.000   Flow length"
"       1.300   Overland Slope"
"       0.010   Pervious Area"
"      20.000   Pervious length"
"       1.300   Pervious slope"
"       0.022   Impervious Area"
"      20.000   Impervious length"
"       1.300   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.419   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.923   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                   0.013     0.000     0.030     0.253 c.m/sec"
"            Catchment 205          Pervious   Impervious Total Area "
"             Surface Area           0.010      0.022      0.032      hectare"
"             Time of concentration  10.717     1.405      2.920      minutes"
"             Time to Centroid       106.471    85.782     89.148     minutes"
"             Rainfall depth         87.263     87.263     87.263     mm"
"             Rainfall volume        8.38       19.55      27.92      c.m"
"             Rainfall losses        50.721     6.676      19.890     mm"
"             Runoff depth           36.542     80.587     67.373     mm"
"             Runoff volume          3.51       18.05      21.56      c.m"
"             Runoff coefficient     0.419      0.923      0.772      "
"             Maximum flow           0.002      0.013      0.013      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.013     0.013     0.030     0.253"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.013     0.013     0.013     0.253"
" 40          HYDROGRAPH   Combine    600"
"           6   Combine "
"         600   Node #"
"               Dawes Avenue"
"             Maximum flow                0.013    c.m/sec"
"             Hydrograph volume          21.560    c.m"
"                   0.013     0.013     0.013     0.013"
" 38          START/RE-START TOTALS 205"
"           3   Runoff Totals on EXIT"
"             Total Catchment area                    3.108    hectare"
"             Total Impervious area                   1.064    hectare"
"             Total % impervious                     34.232"
" 19          EXIT"
```

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"                MIDUSS Output ----------------------------------------------->"
"                MIDUSS version                          Version 2.25  rev. 473"
"                MIDUSS created                        Sunday, February 7, 2010"
"           10   Units used:                                        ie METRIC"
"                Job folder:                                 Q:\42063\104\SWM\"
"                2024-06-03 - Revised per GRCA Comments (Aug. 17, 2023)\MIDUSS\POST"
"                Output filename:                                    Regional.out"
"                Licensee name:                                               A"
"                Company                                                      "
"                Date & Time last used:                 6/8/2024 at 4:50:01 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"     2880.000   Max. Storm length"
"     9000.000   Max. Hydrograph"
" 32          STORM Mass Curve"
"            3   Mass Curve"
"      285.000   Rainfall depth"
"     2880.000   Duration"
"           63   Q:\42063\104\SWM\november 2023\MIDUSS\Hazel entire 48 hours.mrd   Hurricane Hazel
(entire 48 h)"
"              Maximum intensity            53.012    mm/hr"
"              Total depth                 285.000    mm"
"            8   99999hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 2011"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2011   201-1 - Street A to SWMF"
"       65.000   % Impervious"
"        0.289   Total Area"
"       60.000   Flow length"
"        0.800   Overland Slope"
"        0.101   Pervious Area"
"       60.000   Pervious length"
"        0.750   Pervious slope"
"        0.188   Impervious Area"
"       60.000   Impervious length"
"        0.750   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.732   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.972   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.042     0.000     0.000     0.000 c.m/sec"
"              Catchment 2011         Pervious   Impervious Total Area "
"              Surface Area           0.101      0.188      0.289      hectare"
"              Time of concentration  32.556     5.818      13.532     minutes"
"              Time to Centroid       2531.752   2271.613   2346.668   minutes"
"              Rainfall depth         285.000    285.000    285.000    mm"
"              Rainfall volume        288.28     535.37     823.65     c.m"
"              Rainfall losses        76.442     8.071      32.001     mm"
"              Runoff depth           208.558    276.929    252.999    mm"
"              Runoff volume          210.96     520.21     731.17     c.m"
"              Runoff coefficient     0.732      0.972      0.888      "
"              Maximum flow           0.014      0.029      0.042      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.042     0.042     0.000     0.000"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.042     0.042     0.042     0.000"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"              Maximum flow                  0.042    c.m/sec"
"              Hydrograph volume           731.168    c.m"
"                     0.042     0.042     0.042     0.042"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                     0.042     0.000     0.042     0.042"
" 33          CATCHMENT 2012"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2012   201-2 - Block 2 Front/Roofs to SWMF"
"       84.000   % Impervious"
"        0.137   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.022   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.115   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.730   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.970   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                     0.020     0.000     0.042     0.042 c.m/sec"
"              Catchment 2012         Pervious   Impervious Total Area "
"              Surface Area           0.022      0.115      0.137      hectare"
"              Time of concentration  8.278      1.479      2.332      minutes"
"              Time to Centroid       2497.306   2266.253   2295.213   minutes"
"              Rainfall depth         285.000    285.000    285.000    mm"
"              Rainfall volume        62.47      327.98     390.45     c.m"
"              Rainfall losses        76.932     8.443      19.401     mm"
"              Runoff depth           208.068    276.557    265.599    mm"
"              Runoff volume          45.61      318.26     363.87     c.m"
"              Runoff coefficient     0.730      0.970      0.932      "
"              Maximum flow           0.003      0.017      0.020      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                     0.020     0.020     0.042     0.042"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                     0.020     0.020     0.020     0.042"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"              Maximum flow                  0.061    c.m/sec"
"              Hydrograph volume          1095.039    c.m"
"                     0.020     0.020     0.020     0.061"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
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"                    0.020     0.000     0.020     0.061"
" 33          CATCHMENT 2013"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2013   201-3 - Block 1 to SWMF"
"       65.000   % Impervious"
"        0.418   Total Area"
"       80.000   Flow length"
"        0.500   Overland Slope"
"        0.146   Pervious Area"
"       80.000   Pervious length"
"        0.500   Pervious slope"
"        0.272   Impervious Area"
"       80.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.732   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.977   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.060     0.000     0.020     0.061 c.m/sec"
"             Catchment 2013         Pervious   Impervious Total Area "
"             Surface Area           0.146      0.272      0.418      hectare"
"             Time of concentration  43.694     7.809      18.119     minutes"
"             Time to Centroid       2547.376   2277.148   2354.785   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        416.96     774.34     1191.30    c.m"
"             Rainfall losses        76.458     6.444      30.949     mm"
"             Runoff depth           208.542    278.556    254.051    mm"
"             Runoff volume          305.10     756.84     1061.93    c.m"
"             Runoff coefficient     0.732      0.977      0.891      "
"             Maximum flow           0.021      0.041      0.060      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.060     0.060     0.020     0.061"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.060     0.060     0.060     0.061"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"             Maximum flow                  0.121    c.m/sec"
"             Hydrograph volume          2156.973    c.m"
"                    0.060     0.060     0.060     0.121"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.060     0.000     0.060     0.121"
" 33          CATCHMENT 2014"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2014   201-4 - Block 1 Roofs to SWMF"
"      100.000   % Impervious"
"        0.128   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.000   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.128   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.970   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.018     0.000     0.060     0.121 c.m/sec"
"             Catchment 2014         Pervious   Impervious Total Area "
"             Surface Area           0.000      0.128      0.128      hectare"
"             Time of concentration  8.278      1.479      1.479      minutes"
"             Time to Centroid       2497.307   2266.252   2266.252   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        0.00       364.80     364.80     c.m"
"             Rainfall losses        76.932     8.442      8.442      mm"
"             Runoff depth           208.068    276.558    276.558    mm"
"             Runoff volume          0.00       353.99     353.99     c.m"
"             Runoff coefficient     0.000      0.970      0.970      "
"             Maximum flow           0.000      0.018      0.018      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.018     0.018     0.060     0.121"
" 57          TRENCH Design d/s of 2014"
"        0.018   Peak inflow"
"      353.994   Hydrograph volume"
"      335.600   Ground elevation"
"      334.500   Downstream trench invert"
"        1.000   Trench height"
"      333.400   Water table elevation"
"       12.000   Trench top width"
"       12.000   Trench bottom width"
"       40.000   Voids ratio (%)"
"       43.000   Hydraulic conductivity"
"        0.000   Trench gradient (%)"
"        8.000   Trench length"
"        1.000   Include base width"
"          12.   Number of stages"
"                  Level Discharge    Volume"
"                334.500     0.000       0.0"
"                334.600     0.000       3.8"
"                334.700     0.000       7.7"
"                334.800     0.000      11.5"
"                334.900     0.000      15.4"
"                335.000     0.000      19.2"
"                335.100     0.000      23.0"
"                335.200     0.000      26.9"
"                335.300     0.000      30.7"
"                335.400     0.000      34.6"
"                335.500     0.000      38.4"
"                335.600     1.000      38.5"
"           1.   MANHOLE"
"                 Access"
"                diameter"
"                  1.200"
"             Peak outflow                  0.017    c.m/sec"
"             Outflow volume              158.184    c.m"
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"             Peak exfiltration             0.002    c.m/sec"
"             Exfiltration volume         196.223    c.m"
"             Maximum level               335.502    metre"
"             Maximum storage              38.402    c.m"
"             Centroidal lag               45.173   hours"
"             Infiltration area 2 sides   16.000   sq.metre"
"             Infiltration Base area      96.000   sq.metre"
"                  0.018     0.018     0.017     0.002 c.m/sec"
" 40          HYDROGRAPH   Combine    900"
"           6   Combine "
"         900   Node #"
"               SWMF"
"             Maximum flow                  0.138    c.m/sec"
"             Hydrograph volume          2315.155    c.m"
"                    0.018     0.018     0.017     0.138"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                  0.018     0.000     0.017     0.138"
" 33          CATCHMENT 2015"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2015   201-5 - Block 1 Ramp minor to SWMF/Major to Arkell"
"      85.000   % Impervious"
"       0.020   Total Area"
"      10.000   Flow length"
"       3.000   Overland Slope"
"       0.003   Pervious Area"
"      10.000   Pervious length"
"       3.000   Pervious slope"
"       0.017   Impervious Area"
"      10.000   Impervious length"
"       3.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.728   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.969   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                  0.003     0.000     0.017     0.138 c.m/sec"
"             Catchment 2015         Pervious   Impervious Total Area "
"             Surface Area           0.003      0.017      0.020      hectare"
"             Time of concentration  7.330      1.310      2.015      minutes"
"             Time to Centroid       2495.484   2264.242   2291.314   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        8.55       48.45      57.00      c.m"
"             Rainfall losses        77.569     8.922      19.219     mm"
"             Runoff depth           207.431    276.078    265.781    mm"
"             Runoff volume          6.22       46.93      53.16      c.m"
"             Runoff coefficient     0.728      0.969      0.933      "
"             Maximum flow           0.000      0.002      0.003      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.003     0.003     0.017     0.138"
" 56          DIVERSION"
"        2015   Node number"
"       0.006   Overflow threshold"
"       1.000   Required diverted fraction"
"           0   Conduit type; 1=Pipe;2=Channel"
"             Peak of diverted flow         0.000    c.m/sec"
"             Volume of diverted flow       0.000    c.m"
"             DIV02015.99999hyd"
"             Major flow at 2015"
"                    0.003     0.003     0.003     0.138 c.m/sec"
" 40          HYDROGRAPH Next link "
"           5   Next link "
"                    0.003     0.003     0.003     0.138"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                    0.003     0.003     0.003     0.138"
" 40          HYDROGRAPH   Combine    900"
"           6   Combine "
"         900   Node #"
"               SWMF"
"             Maximum flow                  0.141    c.m/sec"
"             Hydrograph volume          2368.311    c.m"
"                    0.003     0.003     0.003     0.141"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.003     0.000     0.003     0.141"
" 33          CATCHMENT 2016"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2016   201-6 - Street A minor to SWMF/Major to Arkell"
"      75.000   % Impervious"
"       0.057   Total Area"
"      20.000   Flow length"
"       3.000   Overland Slope"
"       0.014   Pervious Area"
"      20.000   Pervious length"
"       3.000   Pervious slope"
"       0.043   Impervious Area"
"      20.000   Impervious length"
"       3.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.730   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.962   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                  0.008     0.000     0.003     0.141 c.m/sec"
"             Catchment 2016         Pervious   Impervious Total Area "
"             Surface Area           0.014      0.043      0.057      hectare"
"             Time of concentration  11.111     1.986      3.827      minutes"
"             Time to Centroid       2501.012   2266.183   2313.573   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        40.61      121.84     162.45     c.m"
"             Rainfall losses        77.039     10.824     27.378     mm"
"             Runoff depth           207.961    274.176    257.622    mm"
"             Runoff volume          29.63      117.21     146.84     c.m"
"             Runoff coefficient     0.730      0.962      0.904      "
"             Maximum flow           0.002      0.006      0.008      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.008     0.008     0.003     0.141"
" 56          DIVERSION"
"        2016   Node number"
"       0.014   Overflow threshold"
"       1.000   Required diverted fraction"
```

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"            0   Conduit type; 1=Pipe;2=Channel"
"             Peak of diverted flow         0.000    c.m/sec"
"             Volume of diverted flow       0.000    c.m"
"             DIV02016.99999hyd"
"             Major flow at 2106"
"                    0.008     0.008     0.008     0.141 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.008     0.008     0.008     0.141"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.008     0.008     0.008     0.141"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"             Maximum flow                  0.149    c.m/sec"
"             Hydrograph volume          2515.157    c.m"
"                    0.008     0.008     0.008     0.149"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.008     0.000     0.008     0.149"
" 33          CATCHMENT 2017"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2017   201-7 - Block 3 to SWMF"
"       80.000   % Impervious"
"        0.075   Total Area"
"       40.000   Flow length"
"        0.500   Overland Slope"
"        0.015   Pervious Area"
"       40.000   Pervious length"
"        0.500   Pervious slope"
"        0.060   Impervious Area"
"       40.000   Impervious length"
"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.732   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.976   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.011     0.000     0.008     0.149 c.m/sec"
"             Catchment 2017         Pervious   Impervious Total Area "
"             Surface Area           0.015      0.060      0.075      hectare"
"             Time of concentration  28.827     5.152      8.889      minutes"
"             Time to Centroid       2526.410   2273.734   2313.623   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        42.75      171.00     213.75     c.m"
"             Rainfall losses        76.518     6.966      20.876     mm"
"             Runoff depth           208.482    278.034    264.124    mm"
"             Runoff volume          31.27      166.82     198.09     c.m"
"             Runoff coefficient     0.732      0.976      0.927      "
"             Maximum flow           0.002      0.009      0.011      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.011     0.011     0.008     0.149"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.011     0.011     0.011     0.149"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"             Maximum flow                  0.160    c.m/sec"
"             Hydrograph volume          2713.249    c.m"
"                    0.011     0.011     0.011     0.160"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                    0.011     0.000     0.011     0.160"
" 33          CATCHMENT 2018"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2018   201-8 - Block 2 Roofs to Gallery"
"      100.000   % Impervious"
"        0.032   Total Area"
"       10.000   Flow length"
"        2.000   Overland Slope"
"        0.000   Pervious Area"
"       10.000   Pervious length"
"        2.000   Pervious slope"
"        0.032   Impervious Area"
"       10.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.000   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.970   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.005     0.000     0.011     0.160 c.m/sec"
"             Catchment 2018         Pervious   Impervious Total Area "
"             Surface Area           0.000      0.032      0.032      hectare"
"             Time of concentration  8.278      1.479      1.479      minutes"
"             Time to Centroid       2497.307   2266.252   2266.252   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        0.00       91.20      91.20      c.m"
"             Rainfall losses        76.932     8.442      8.442      mm"
"             Runoff depth           208.068    276.558    276.558    mm"
"             Runoff volume          0.00       88.50      88.50      c.m"
"             Runoff coefficient     0.000      0.970      0.970      "
"             Maximum flow           0.000      0.005      0.005      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.005     0.005     0.011     0.160"
" 57          TRENCH Design d/s of 2018"
"        0.005   Peak inflow"
"       88.498   Hydrograph volume"
"      335.400   Ground elevation"
"      334.300   Downstream trench invert"
"        1.000   Trench height"
"      333.200   Water table elevation"
"        4.000   Trench top width"
"        4.000   Trench bottom width"
"       40.000   Voids ratio (%)"
"       73.000   Hydraulic conductivity"
"        0.000   Trench gradient (%)"
"        5.000   Trench length"
```

```
"        1.000   Include base width"
"          12.   Number of stages"
"                  Level Discharge    Volume"
"                334.300     0.000       0.0"
"                334.400     0.000       0.8"
"                334.500     0.000       1.6"
"                334.600     0.000       2.4"
"                334.700     0.000       3.2"
"                334.800     0.000       4.0"
"                334.900     0.000       4.8"
"                335.000     0.000       5.6"
"                335.100     0.000       6.4"
"                335.200     0.000       7.2"
"                335.300     0.000       8.0"
"                335.400     1.000       8.1"
"           1.   MANHOLE"
"                 Access"
"               diameter"
"                  1.200"
"              Peak outflow                  0.004    c.m/sec"
"              Outflow volume               28.674    c.m"
"              Peak exfiltration             0.001    c.m/sec"
"              Exfiltration volume          59.827    c.m"
"              Maximum level               335.300    metre"
"              Maximum storage               8.000    c.m"
"              Centroidal lag               45.473   hours"
"              Infiltration area 2 sides   10.000   sq.metre"
"              Infiltration Base area      20.000   sq.metre"
"                  0.005     0.005     0.004     0.001 c.m/sec"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"              Maximum flow                  0.164    c.m/sec"
"              Hydrograph volume          2741.921    c.m"
"                      0.005     0.005     0.004     0.164"
" 40          HYDROGRAPH Start - New Tributary"
"            2   Start - New Tributary"
"                      0.005     0.000     0.004     0.164"
" 33          CATCHMENT 2019"
"            1   Triangular SCS"
"            1   Equal length"
"            1   SCS method"
"         2019   201-9 - SWMF Block"
"       40.000   % Impervious"
"        0.194   Total Area"
"       15.000   Flow length"
"        5.000   Overland Slope"
"        0.116   Pervious Area"
"       15.000   Pervious length"
"        5.000   Pervious slope"
"        0.078   Impervious Area"
"       15.000   Impervious length"
"        5.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.731   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.971   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                    0.027     0.000     0.004     0.164 c.m/sec"
"              Catchment 2019         Pervious   Impervious Total Area "
"              Surface Area           0.116      0.078      0.194      hectare"
"              Time of concentration  8.021      1.433      4.927      minutes"
"              Time to Centroid       2497.130   2265.499   2388.337   minutes"
"              Rainfall depth         285.000    285.000    285.000    mm"
"              Rainfall volume        331.74     221.16     552.90     c.m"
"              Rainfall losses        76.778     8.376      49.417     mm"
"              Runoff depth           208.222    276.624    235.583    mm"
"              Runoff volume          242.37     214.66     457.03     c.m"
"              Runoff coefficient     0.731      0.971      0.827      "
"              Maximum flow           0.016      0.011      0.027      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.027     0.027     0.004     0.164"
" 40          HYDROGRAPH Copy to Outflow"
"            8   Copy to Outflow"
"                    0.027     0.027     0.027     0.164"
" 40          HYDROGRAPH   Combine    900"
"            6   Combine "
"          900   Node #"
"                SWMF"
"              Maximum flow                  0.190    c.m/sec"
"              Hydrograph volume          3198.952    c.m"
"                    0.027     0.027     0.027     0.190"
" 40          HYDROGRAPH   Confluence    900"
"            7   Confluence "
"          900   Node #"
"                SWMF"
"              Maximum flow                  0.190    c.m/sec"
"              Hydrograph volume          3198.952    c.m"
"                    0.027     0.190     0.027     0.000"
" 54          POND DESIGN"
"         0.190   Current peak flow    c.m/sec"
"         0.100   Target outflow    c.m/sec"
"        3199.0   Hydrograph volume    c.m"
"           12.   Number of stages"
"       334.400   Minimum water level    metre"
"       335.500   Maximum water level    metre"
"       334.400   Starting water level    metre"
"             0   Keep Design Data: 1 = True; 0 = False"
"                   Level Discharge    Volume"
"                 334.400     0.000     0.000"
"                 334.500   0.00150    49.000"
"                 334.600   0.00230   103.000"
"                 334.700   0.00290   161.000"
"                 334.800   0.04670   225.000"
"                 334.900   0.06500   295.000"
"                 335.000   0.07920   370.000"
"                 335.100   0.09110   450.000"
"                 335.200    0.1017   534.000"
"                 335.300    0.2368   622.000"
"                 335.400    0.5900   714.000"
"                 335.500     1.190   811.000"
"              Peak outflow                  0.148    c.m/sec"
"              Maximum level               335.234    metre"
"              Maximum storage             563.997    c.m"
"              Centroidal lag               42.559   hours"
"                  0.027     0.190     0.148     0.000 c.m/sec"
" 40          HYDROGRAPH Next link "
"            5   Next link "
"                    0.027     0.148     0.148     0.000"
" 54          POND DESIGN"
"         0.148   Current peak flow    c.m/sec"
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"        0.001   Target outflow    c.m/sec"
"       3199.4   Hydrograph volume    c.m"
"          10.   Number of stages"
"      334.200   Minimum water level    metre"
"      335.100   Maximum water level    metre"
"      334.200   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                334.200     0.000     0.000"
"                334.300   0.00189    15.000"
"                334.400   0.00209    32.000"
"                334.500   0.00231    50.000"
"                334.600   0.00253    70.000"
"                334.700   0.00276    92.000"
"                334.800   0.00300   117.000"
"                334.900    0.1546   143.000"
"                335.000    0.4631   172.000"
"                335.100    0.9063   202.000"
"             Peak outflow                  0.146    c.m/sec"
"             Maximum level               334.895    metre"
"             Maximum storage             141.641    c.m"
"             Centroidal lag               44.365   hours"
"                  0.027     0.148     0.146     0.000 c.m/sec"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               Torrance Cree"
"             Maximum flow                  0.146    c.m/sec"
"             Hydrograph volume          3199.443    c.m"
"                  0.027     0.148     0.146     0.146"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                  0.027     0.000     0.146     0.146"
" 47          FILEI_O Read/Open DIV02015.99999hyd"
"           1   1=read/open; 2=write/save"
"           2   1=rainfall; 2=hydrograph"
"           1   1=runoff; 2=inflow; 3=outflow; 4=junction"
"            DIV02015.99999hyd"
"            Major flow at 2015"
"            Total volume                  0.000    c.m"
"            Maximum flow                  0.000    c.m/sec"
"                0.000     0.000     0.146     0.146 c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.000     0.000     0.146     0.146"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.000     0.000     0.000     0.146"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               Torrance Cree"
"             Maximum flow                  0.146    c.m/sec"
"             Hydrograph volume          3199.443    c.m"
"                  0.000     0.000     0.000     0.146"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                  0.000     0.000     0.000     0.146"
" 47          FILEI_O Read/Open DIV02016.99999hyd"
"           1   1=read/open; 2=write/save"
"           2   1=rainfall; 2=hydrograph"
"           1   1=runoff; 2=inflow; 3=outflow; 4=junction"
"            DIV02016.99999hyd"
"            Major flow at 2106"
"            Total volume                  0.000    c.m"
"            Maximum flow                  0.000    c.m/sec"
"                 0.000     0.000     0.000     0.146 c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.000     0.000     0.000     0.146"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.000     0.000     0.000     0.146"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               Torrance Cree"
"            Maximum flow                  0.146    c.m/sec"
"            Hydrograph volume          3199.443    c.m"
"                 0.000     0.000     0.000     0.146"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                  0.000     0.000     0.000     0.146"
" 33          CATCHMENT 2021"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2021   202-1- wetland directly to Torrance"
"       0.000   % Impervious"
"       0.863   Total Area"
"      50.000   Flow length"
"       0.500   Overland Slope"
"       0.863   Pervious Area"
"      50.000   Pervious length"
"       5.000   Pervious slope"
"       0.000   Impervious Area"
"      50.000   Impervious length"
"       5.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.731   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   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"
"                  0.119     0.000     0.000     0.146 c.m/sec"
"            Catchment 2021         Pervious   Impervious Total Area "
"            Surface Area           0.863      0.000      0.863      hectare"
"            Time of concentration  16.518     2.952      16.518     minutes"
"            Time to Centroid       2508.784   2264.538   2508.783   minutes"
"            Rainfall depth         285.000    285.000    285.000    mm"
"            Rainfall volume        2459.55    0.00       2459.55    c.m"
"            Rainfall losses        76.796     9.748      76.796     mm"
"            Runoff depth           208.204    275.252    208.204    mm"
"            Runoff volume          1796.80    0.00       1796.80    c.m"
"            Runoff coefficient     0.731      0.000      0.731      "
"            Maximum flow           0.119      0.000      0.119      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.119     0.119     0.000     0.146"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.119     0.119     0.119     0.146"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
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"          800   Node #"
"                Torrance Cree"
"             Maximum flow                  0.249    c.m/sec"
"             Hydrograph volume          4996.230    c.m"
"                   0.119     0.119     0.119     0.249"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.119     0.000     0.119     0.249"
" 33          CATCHMENT 2022"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2022   202-2- Block 3 Rear Yards to Torrance"
"       0.000   % Impervious"
"       0.144   Total Area"
"      15.000   Flow length"
"      20.000   Overland Slope"
"       0.144   Pervious Area"
"      15.000   Pervious length"
"      20.000   Pervious slope"
"       0.000   Impervious Area"
"      15.000   Impervious length"
"      20.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.728   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   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     0.119     0.249 c.m/sec"
"             Catchment 2022         Pervious   Impervious Total Area "
"             Surface Area           0.144      0.000      0.144      hectare"
"             Time of concentration  5.292      0.946      5.292      minutes"
"             Time to Centroid       2492.836   2269.142   2492.836   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        410.40     0.00       410.40     c.m"
"             Rainfall losses        77.601     17.328     77.601     mm"
"             Runoff depth           207.399    267.672    207.399    mm"
"             Runoff volume          298.65     0.00       298.65     c.m"
"             Runoff coefficient     0.728      0.000      0.728      "
"             Maximum flow           0.020      0.000      0.020      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.020     0.020     0.119     0.249"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.020     0.020     0.020     0.249"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"          800   Node #"
"                Torrance Cree"
"             Maximum flow                  0.263    c.m/sec"
"             Hydrograph volume          5294.880    c.m"
"                   0.020     0.020     0.020     0.263"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.020     0.000     0.020     0.263"
" 33          CATCHMENT 2031"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2031   203-1 - Arkell Meadows Embankments to Trail"
"       30.000   % Impervious"
"        0.198   Total Area"
"       10.000   Flow length"
"       20.000   Overland Slope"
"        0.139   Pervious Area"
"       10.000   Pervious length"
"       20.000   Pervious slope"
"        0.059   Impervious Area"
"       10.000   Impervious length"
"       20.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.724   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.926   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                   0.026     0.000     0.020     0.263 c.m/sec"
"             Catchment 2031         Pervious   Impervious Total Area "
"             Surface Area           0.139      0.059      0.198      hectare"
"             Time of concentration  4.149      0.741      2.942      minutes"
"             Time to Centroid       2490.064   2248.701   2404.602   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        395.01     169.29     564.30     c.m"
"             Rainfall losses        78.779     21.227     61.514     mm"
"             Runoff depth           206.221    263.773    223.486    mm"
"             Runoff volume          285.82     156.68     442.50     c.m"
"             Runoff coefficient     0.724      0.926      0.784      "
"             Maximum flow           0.018      0.008      0.026      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                   0.026     0.026     0.020     0.263"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                   0.026     0.026     0.026     0.263"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"          800   Node #"
"                Torrance Cree"
"             Maximum flow                  0.281    c.m/sec"
"             Hydrograph volume          5737.383    c.m"
"                   0.026     0.026     0.026     0.281"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                   0.026     0.000     0.026     0.281"
" 33          CATCHMENT 2032"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2032   203-2 Future Park Trail"
"       0.000   % Impervious"
"       0.216   Total Area"
"     180.000   Flow length"
"       0.500   Overland Slope"
"       0.216   Pervious Area"
"     180.000   Pervious length"
"       0.500   Pervious slope"
"       0.000   Impervious Area"
"     180.000   Impervious length"
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"        0.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.732   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   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"
"                  0.027     0.000     0.026     0.281 c.m/sec"
"             Catchment 2032         Pervious   Impervious Total Area "
"             Surface Area           0.216      0.000      0.216      hectare"
"             Time of concentration  71.077     12.702     71.077     minutes"
"             Time to Centroid       2585.967   2283.879   2585.966   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        615.60     0.00       615.60     c.m"
"             Rainfall losses        76.384     6.476      76.384     mm"
"             Runoff depth           208.616    278.524    208.616    mm"
"             Runoff volume          450.61     0.00       450.61     c.m"
"             Runoff coefficient     0.732      0.000      0.732      "
"             Maximum flow           0.027      0.000      0.027      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.027     0.027     0.026     0.281"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.027     0.027     0.027     0.281"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               Torrance Cree"
"             Maximum flow                 0.306    c.m/sec"
"             Hydrograph volume         6187.994    c.m"
"                  0.027     0.027     0.027     0.306"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                  0.027     0.000     0.027     0.306"
" 33          CATCHMENT 2033"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2033   203-3 - Block 1 Embankment to Trail Block"
"        0.000   % Impervious"
"        0.109   Total Area"
"       10.000   Flow length"
"       33.000   Overland Slope"
"        0.109   Pervious Area"
"       10.000   Pervious length"
"       33.000   Pervious slope"
"        0.000   Impervious Area"
"       10.000   Impervious length"
"       33.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.713   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                  0.014     0.000     0.027     0.306 c.m/sec"
"             Catchment 2033         Pervious   Impervious Total Area "
"             Surface Area           0.109      0.000      0.109      hectare"
"             Time of concentration  3.570      0.638      3.570      minutes"
"             Time to Centroid       2485.797   2237.542   2485.796   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        310.65     0.00       310.65     c.m"
"             Rainfall losses        81.898     25.077     81.898     mm"
"             Runoff depth           203.102    259.923    203.102    mm"
"             Runoff volume          221.38     0.00       221.38     c.m"
"             Runoff coefficient     0.713      0.000      0.713      "
"             Maximum flow           0.014      0.000      0.014      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                  0.014     0.014     0.027     0.306"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                  0.014     0.014     0.014     0.306"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               Torrance Cree"
"             Maximum flow                 0.316    c.m/sec"
"             Hydrograph volume         6409.374    c.m"
"                  0.014     0.014     0.014     0.316"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                  0.014     0.000     0.014     0.316"
" 33          CATCHMENT 2041"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2041   204-1 Block 1 rear yeards + Arkell Blvd to Arkell"
"       12.000   % Impervious"
"        0.085   Total Area"
"       15.000   Flow length"
"        2.000   Overland Slope"
"        0.075   Pervious Area"
"       15.000   Pervious length"
"        2.000   Pervious slope"
"        0.010   Impervious Area"
"       15.000   Impervious length"
"        2.000   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       74.000   Pervious SCS Curve No."
"        0.730   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        8.924   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.963   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
"                  0.012     0.000     0.014     0.316 c.m/sec"
"             Catchment 2041         Pervious   Impervious Total Area "
"             Surface Area           0.075      0.010      0.085      hectare"
"             Time of concentration  10.558     1.887      9.237      minutes"
"             Time to Centroid       2500.415   2269.666   2465.252   minutes"
"             Rainfall depth         285.000    285.000    285.000    mm"
"             Rainfall volume        213.18     29.07      242.25     c.m"
"             Rainfall losses        76.931     10.684     68.981     mm"
"             Runoff depth           208.069    274.316    216.019    mm"
"             Runoff volume          155.64     27.98      183.62     c.m"
"             Runoff coefficient     0.730      0.963      0.758      "
```

```
"             Maximum flow           0.010      0.001      0.012      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.012     0.012     0.014     0.316"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                    0.012     0.012     0.012     0.316"
" 40          HYDROGRAPH   Combine    700"
"           6   Combine "
"         700   Node #"
"               Arkell"
"             Maximum flow                  0.012    c.m/sec"
"             Hydrograph volume           183.616    c.m"
"                    0.012     0.012     0.012     0.012"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.012     0.000     0.012     0.012"
" 33          CATCHMENT 2042"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"        2042   204-2 Street A, Block 2 Rear Yars, Blvd to Arkell"
"      36.000   % Impervious"
"       0.111   Total Area"
"      25.000   Flow length"
"       5.000   Overland Slope"
"       0.071   Pervious Area"
"      25.000   Pervious length"
"       5.000   Pervious slope"
"       0.040   Impervious Area"
"      25.000   Impervious length"
"       5.000   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.730   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.962   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                    0.016     0.000     0.012     0.012 c.m/sec"
"            Catchment 2042         Pervious   Impervious Total Area "
"            Surface Area           0.071      0.040      0.111      hectare"
"            Time of concentration  10.898     1.948      7.086      minutes"
"            Time to Centroid       2500.807   2267.411   2401.419   minutes"
"            Rainfall depth         285.000    285.000    285.000    mm"
"            Rainfall volume        202.46     113.89     316.35     c.m"
"            Rainfall losses        76.968     10.709     53.115     mm"
"            Runoff depth           208.032    274.291    231.885    mm"
"            Runoff volume          147.79     109.61     257.39     c.m"
"            Runoff coefficient     0.730      0.962      0.814      "
"            Maximum flow           0.010      0.006      0.016      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.016     0.016     0.012     0.012"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                    0.016     0.016     0.016     0.012"
" 40          HYDROGRAPH   Combine    800"
"           6   Combine "
"         800   Node #"
"               Torrance Cree"
"             Maximum flow                  0.328    c.m/sec"
"             Hydrograph volume          6666.767    c.m"
"                    0.016     0.016     0.016     0.328"
" 40          HYDROGRAPH Start - New Tributary"
"           2   Start - New Tributary"
"                    0.016     0.000     0.016     0.328"
" 33          CATCHMENT 205"
"           1   Triangular SCS"
"           1   Equal length"
"           1   SCS method"
"         205   205- Dawes Ave to Ex. SWMF "
"      70.000   % Impervious"
"       0.032   Total Area"
"      20.000   Flow length"
"       1.300   Overland Slope"
"       0.010   Pervious Area"
"      20.000   Pervious length"
"       1.300   Pervious slope"
"       0.022   Impervious Area"
"      20.000   Impervious length"
"       1.300   Impervious slope"
"       0.250   Pervious Manning 'n'"
"      74.000   Pervious SCS Curve No."
"       0.731   Pervious Runoff coefficient"
"       0.100   Pervious Ia/S coefficient"
"       8.924   Pervious Initial abstraction"
"       0.015   Impervious Manning 'n'"
"      98.000   Impervious SCS Curve No."
"       0.963   Impervious Runoff coefficient"
"       0.100   Impervious Ia/S coefficient"
"       0.518   Impervious Initial abstraction"
"                    0.005     0.000     0.016     0.328 c.m/sec"
"            Catchment 205          Pervious   Impervious Total Area "
"            Surface Area           0.010      0.022      0.032      hectare"
"            Time of concentration  14.279     2.552      5.429      minutes"
"            Time to Centroid       2505.606   2268.010   2326.296   minutes"
"            Rainfall depth         285.000    285.000    285.000    mm"
"            Rainfall volume        27.36      63.84      91.20      c.m"
"            Rainfall losses        76.806     10.504     30.395     mm"
"            Runoff depth           208.194    274.496    254.605    mm"
"            Runoff volume          19.99      61.49      81.47      c.m"
"            Runoff coefficient     0.731      0.963      0.893      "
"            Maximum flow           0.001      0.003      0.005      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"           4   Add Runoff "
"                    0.005     0.005     0.016     0.328"
" 40          HYDROGRAPH Copy to Outflow"
"           8   Copy to Outflow"
"                    0.005     0.005     0.005     0.328"
" 40          HYDROGRAPH   Combine    600"
"           6   Combine "
"         600   Node #"
"               Dawes Avenue"
"             Maximum flow                  0.005    c.m/sec"
"             Hydrograph volume            81.474    c.m"
"                    0.005     0.005     0.005     0.005"
" 38          START/RE-START TOTALS 205"
"           3   Runoff Totals on EXIT"
"             Total Catchment area                      3.108    hectare"
"             Total Impervious area                     1.064    hectare"
"             Total % impervious                       34.232"
" 19          EXIT"
```

Appendix D

Proposed SWM Facility Design Calculations

Arkell Road
STORMWATER MANAGEMENT
Guelph, Ontario

Project Number:	42063-104
Date:	June 7, 2024
Design By:	CVP/CJC
File:	Q:\42063\104\SWM\2024-06-03 - Revised per GRCA Comments (Aug. 17, 2023)\42063-104 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 (%)
1.35	69.0

Interpolated Storage Volume Requirement (m^3/ha)

222.75

Permanent Pool Required (m^3)

246.71

Extended Detention Volume Required (m^3)

54.00

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

Arkell Road
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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	0.00
Invert (m)	334.40	334.70	500.00
Width (m)			
Diameter/Height (m)	0.050	0.250	
Type (H/V)	V	H	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
Invert (m)	335.20
Length (m	2.000
Side Slope	10
Side Slope	1.471

STAGE-DISCHARGE RELATIONSHIP (Active Storage)

Stage	Active Volume	Orifice 1			Orifice 2			Orifice 3			Weir 1 Flow	Weir 2 Flow	Total Flow
		Area	H_o	Flow	Area	H_o	Flow	Area	H_o	Flow			
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
334.40	0	0.00	0.00	0.0000	0.05	0.00	0.0000	0.00	0.00	0.0000	0.0000	0.0000	0.0000
334.50	49	0.00	0.08	0.0015	0.05	0.00	0.0000	0.00	0.00	0.0000	0.0000	0.0000	0.0015
334.60	103	0.00	0.18	0.0023	0.05	0.00	0.0000	0.00	0.00	0.0000	0.0000	0.0000	0.0023
334.70	161	0.00	0.28	0.0029	0.05	0.00	0.0000	0.00	0.00	0.0000	0.0000	0.0000	0.0029
334.80	225	0.00	0.38	0.0034	0.05	0.10	0.0433	0.00	0.00	0.0000	0.0000	0.0000	0.0467
334.90	295	0.00	0.48	0.0038	0.05	0.20	0.0613	0.00	0.00	0.0000	0.0000	0.0000	0.0650
335.00	370	0.00	0.58	0.0042	0.05	0.30	0.0750	0.00	0.00	0.0000	0.0000	0.0000	0.0792
335.10	450	0.00	0.68	0.0045	0.05	0.40	0.0866	0.00	0.00	0.0000	0.0000	0.0000	0.0911
335.20	534	0.00	0.78	0.0048	0.05	0.50	0.0969	0.00	0.00	0.0000	0.0000	0.0000	0.1017
335.30	622	0.00	0.88	0.0000	0.05	0.60	0.1061	0.00	0.00	0.0000	0.1307	0.0000	0.2368
335.40	714	0.00	0.98	0.0000	0.05	0.70	0.1146	0.00	0.00	0.0000	0.4754	0.0000	0.5900
335.50	811	0.00	1.08	0.0000	0.05	0.80	0.1225	0.00	0.00	0.0000	1.0675	0.0000	1.1900

Arkell Road
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STAGE-STORAGE RELATIONSHIP (Active Storage)

Stage	Active Depth	Wet Cell			Active Storage Volume	Comments	Stage
		Area	Volume	Cumulative Volume			
m	*m*	m^2	m^3	m^3	m^3		*m*
333.20		88	0	0		Bottom of Cell	333.20
333.30		108	10	10			333.30
333.40		127	12	22			333.40
333.50		147	14	35			333.50
333.60		167	16	51			333.60
333.70		188	18	69			333.70
333.80		210	20	89			333.80
333.90		248	23	111			333.90
334.00		287	27	138			334.00
334.10		329	31	169			334.10
334.20		372	35	204			334.20
334.30		417	39	244			334.30
334.40	0.00	465	44	288	0	Permanent Pool	334.40
334.50	0.10	513	49	337	49		334.50
334.60	0.20	562	54	390	103	25 mm	334.60
334.70	0.30	614	59	449	161	5-year	334.70
334.80	0.40	667	64	513	225		334.80
334.90	0.50	721	69	583	295	10-year	334.90
335.00	0.60	778	75	657	370	25-year	335.00
335.10	0.70	818	80	737	450	50-year	335.10
335.20	0.80	861	84	821	534	100-year	335.20
335.30	0.90	904	88	909	622		335.30
335.40	1.00	950	93	1002	714		335.40
335.50	1.10	989	97	1099	811		335.50

Arkell Road
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INFILTRATION CELL
STAGE-STORAGE RELATIONSHIP

Stage	Area	Depth	Incremental Volume	Cummulative Volume	Infiltration*	Weir Flow	Total Flow
m	m^2	*m*	m^3	m^3	m^3/s	m^3/s	m^3/s
334.20	142	0.00	0	0	0.00000	0.0000	0.00000
334.30	158	0.10	15	15	0.00189	0.0000	0.00189
334.40	175	0.20	17	32	0.00209	0.0000	0.00209
334.50	193	0.30	18	50	0.00231	0.0000	0.00231
334.60	212	0.40	20	70	0.00253	0.0000	0.00253
334.70	231	0.50	22	92	0.00276	0.0000	0.00276
334.80	251	0.60	24	117	0.00300	0.0000	0.00300
334.90	276	0.70	26	143	0.00330	0.1513	0.15457
335.00	298	0.80	29	172	0.00355	0.4596	0.46313
335.10	319	0.90	31	202	0.00381	0.9025	0.90632

Notes:
* based on Darcy Law , Q=K*A*i
hydraulic conductivity k (mm/hr)= 43.0 PML Geotech, Oct 2018 San/ Sand and Gravel
gradient i (m/m) = 1

A Design Manual for Sizing Infiltration Ponds, Joel A. Massman, Washington State Departent Of Transportation Technical Monitor

Arkell Road
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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	0.211 m^3/s
Flow into forebay during the 25 mm - 4 hour design storm event	0.095 m^3/s
Peak flow from main pond outlet for the 25mm design storm (from MIDUSS)	0.003 m^3/s

Forebay Characteristics

b =	**2.8** *m*	bottom width
y =	1.2 *m*	depth
z =	5 :1	side slope
w =	8.8 *m*	average width
R =	0.70 *m*	hydraulic radius
A =	10.6 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 =	0.10 m^3/s	peak flow rate through forebay	
v_s =	0.0055 *m/s*	settling velocity	
r =	0.18	length-to-width ratio	
L =	1.8 *m*	required settling length	
L =	*1.6 m*	*trial length*	

b) Required Settling Length (assuming Q_p = pond discharge & v_s = 0.000013 m/s)

Q_p =	0.003 m^3/s	peak flow rate through forebay	
v_s =	0.000013 *m/s*	settling velocity	Enhanced treatment settling velocity
r =	2.98	length-to-width ratio	
L =	26.2 *m*	required settling length	
L =	*26.2 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 =	0.21 m^3/s	inlet flow rate	
d =	1.2 *m*	depth of permanent pool in forebay	
V_f =	0.50 *m/s*	desired velocity in forebay (typical value ≤ 0.50 *m/s*)	
L =	2.8 m	required length of dispersion	

Equation 4.6: Dispersion Length

3. Required Forebay Length

L (Required)=	**26.2 *m***	**Required design length**
L (Provided)=	**27.0 *m***	**Provided design length**
r =	3.07	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 =	**0.020 *m/s***	**actual velocity**	OK The actual velocity through the forebay is less than the scour velocity.

5. Weir Flow From Forebay

L =	1 *m*	length of crest of weir	Equation 4.4: Weir Flow
α =	1.65	coefficient	
H =	0.5 *m*	head	
Q =	**0.58 m^3/s**	**discharge**	OK The weir flow from the forebay exceeds the flow entering the forebay

6. Estimated Cleanout Frequencies

a) Forebay

Forebay volume	88	m^3
Estimated TSS removal efficiency	50%	
Impervious level	69%	
Estimated annual sediment loading	2.7	m^3/ha
Contributing area	1.35	*ha*
Annual sediment volume	2	m^3/yr
Cleanout frequency for 33% volume reduction	**15.7**	***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

Notes:
Removal provided by the Forebay is normal, considering a normal settling velocity
Enhanced removal would require a forebay length of 28.0 m, whereas the Forebay is currently sized with 25.0 m

Arkell Road
STORMWATER MANAGEMENT
Guelph, Ontario

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File:	Q:\42063\104\SWM\2024-06-03 - Revised per GRCA Comments (Aug. 17, 2023)\42063-104 Master

FALLING HEAD DRAWDOWN CALCULATION (25mm4hr)
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 =	85607.997	*s*	
		23.8	*hr*	drawdown time
	A_p =	465	m^2	surface area of the pond
	C =	0.63		discharge coefficient
	d =	50	*mm*	diameter of the orifice
	A_O =	0.0019635	m^2	cross-sectional area of the orifice
	g =	9.81	m/s^2	gravitational acceleration constant
	h_1 =	334.65	*m*	starting water elevation above the orifice
	h_2 =	334.40	*m*	ending water elevation above the orifice
	h =	0.25	*m*	maximum water elevation above the orifice
	C_2 =	500		slope coefficient from the area-depth linear regression
	C_3 =	421		intercept from the area-depth linear regression

	ELEVATION *m*	STAGE *m*	AREA m^2	COMMENTS
1	334.400	0	465	Permanent pool
2	334.500	0.1	513	
3	334.600	0.2	562	
4	334.700	0.3	614	
5	334.800	0.4	667	

DRAWDOWN TIME: 85608 *s* / 23.8 *hr*

Regression Output:

m_1 =	504.80	slope coefficient from the area-depth linear regression
b =	463.10	intercept from the area-depth linear regression
se_1 =	5.76	standard error for coefficient m_1
se_b =	1.41	standard error for constant b
R^2 =	0.9996	coefficient of determination
se_y =	1.82	standard error of the *y* estimate
F =	7684.65	F statistic
df =	3	degrees of freedom
ss_{reg} =	25482	regression sum of squares
ss_{resid} =	10	residual sum of squares

Arkell Road
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Project Number:	42063-104
Date:	June 7, 2024
Design By:	CVP/CJC
File:	Q:\42063\104\SWM\2024-06-03 - Revised per GRCA Comments (Aug. 17, 2023)\42063-104 Master SWM

FALLING HEAD DRAWDOWN CALCULATION (MOE EXT DET)
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 =	56558.72631	*s*	
		15.7	*hr*	drawdown time
	A_p =	481	m^2	surface area of the pond
	C =	0.63		discharge coefficient
	d =	50	*mm*	diameter of the orifice
	A_O =	0.001963495	m^2	cross-sectional area of the orifice
	g =	9.81	m/s^2	gravitational acceleration constant
	h_1 =	334.52	*m*	starting water elevation above the orifice
	h_2 =	334.40	*m*	ending water elevation above the orifice
	h =	0.12	*m*	maximum water elevation above the orifice
	C_2 =	500		slope coefficient from the area-depth linear regression
	C_3 =	421		intercept from the area-depth linear regression

	ELEVATION *m*	STAGE *m*	AREA m^2	COMMENTS
1	334.400	0	465	Permanent pool
2	334.500	0.1	513	
3	334.600	0.2	562	
4	334.700	0.3	614	
5	334.800	0.4	667	

DRAWDOWN TIME: 56559 *s* / 15.7 *hr*

Regression Output:

m_1 =	504.80	slope coefficient from the area-depth linear regression
b =	463.10	intercept from the area-depth linear regression
se_1 =	5.76	standard error for coefficient m_1
se_b =	1.41	standard error for constant b
R^2 =	0.9996	coefficient of determination
se_y =	1.82	standard error of the *y* estimate
F =	7684.65	F statistic
df =	3	degrees of freedom
ss_{reg} =	25482	regression sum of squares
ss_{resid} =	10	residual sum of squares

Arkell Road Subdivision
STORMWATER MANAGEMENT
Guelph, Ontario

Project Number: 42063-104
Date: March 25, 2024
Design By: cvp
File: Q:\42063\104\SWM\november 2023\42063-104 Roof Infiltration Galleries.xlsx

ROOF INFILTRATION GALLERIES

	25mm
Rainfall Depth (mm)*	25

Soil	Block 2 (TP102)	Block 1 (TP103/104)
hydraulic conductivity k (m/s)=	5.8X10^(-5)	4.85X10^(-5)
Infiltration Rate (mm/h)	249.0	129
Apply FS of 3	**83**	**43**
Porosity	0.4	0.4

Retention Time (h)	24

	Roof Area	Volume of 25mm Rainfall	Required Trench Bottom Area
	(m^2)	(m^3)	(m^2)
Block 1	1280	32	78
Block 3	320	8	3

Approximate Potential Dimensions

	Depth	Width	Length	Volume of Stone	Volume of Water Stored
	(m)	(m)	(m)	(m^3)	(m^3)
Block 1	1.0	8.0	12.0	96	38
Block 3	1.0	5.0	4.0	20	8

Stormceptor®

FORTERRA

Stormceptor® EF Sizing Report

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

02/28/2023

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

Site Name:	External Drainage 204-2

Drainage Area (ha):	0.11
% Imperviousness:	36.00

Runoff Coefficient 'c': 0.51

Particle Size Distribution:	CA ETV
Target TSS Removal (%):	50.0

Required Water Quality Runoff Volume Capture (%):	
Estimated Water Quality Flow Rate (L/s):	2.15
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Site Sediment Transport Rate (kg/ha/yr):	

Project Name:	190-216 Arkell
Project Number:	42063-104
Designer Name:	Alex Cressman
Designer Company:	MTE Consultants Inc.
Designer Email:	acressman@mte85.com
Designer Phone:	519-743-6500
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	68
EFO6	70
EFO8	70
EFO10	70
EFO12	70

Recommended Stormceptor EFO Model: EFO4

Estimated Net Annual Sediment (TSS) Load Reduction (%): 68

Water Quality Runoff Volume Capture (%): > 90

imbrium

THIRD-PARTY TESTING AND VERIFICATION

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

PERFORMANCE

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

PARTICLE SIZE DISTRIBUTION (PSD)

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

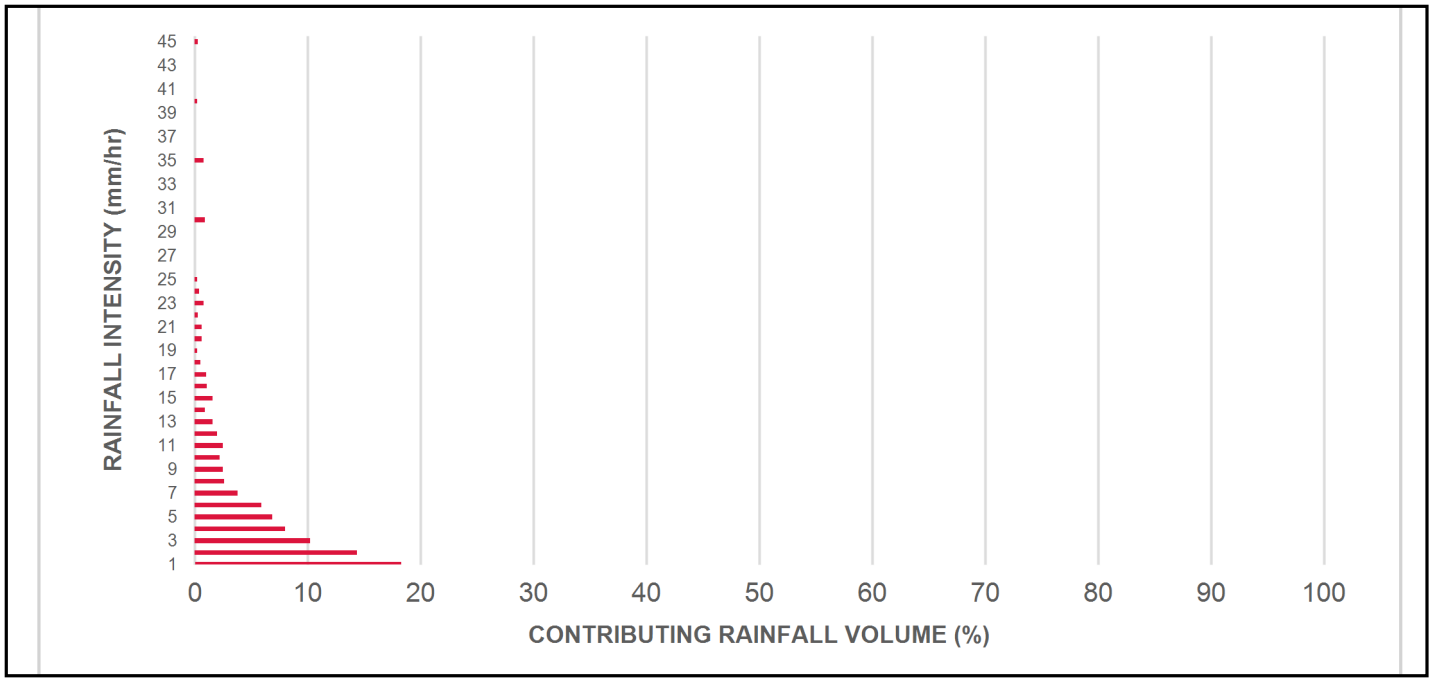
Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

Stormceptor® EF Sizing Report

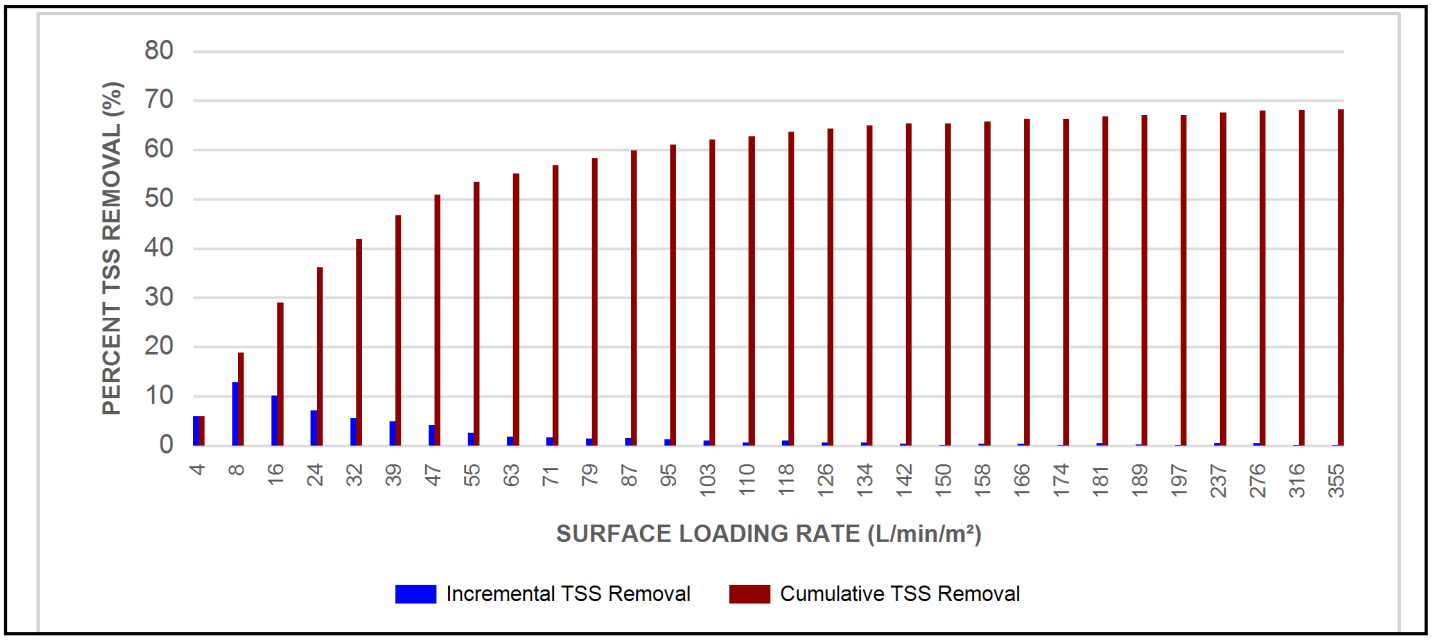
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.5	8.5	8.5	0.08	5.0	4.0	70	6.0	6.0
1	18.3	26.8	0.16	9.0	8.0	70	12.9	18.9
2	14.4	41.3	0.32	19.0	16.0	70	10.2	29.0
3	10.2	51.5	0.47	28.0	24.0	70	7.2	36.2
4	8.0	59.5	0.63	38.0	32.0	70	5.6	41.9
5	6.9	66.4	0.79	47.0	39.0	70	4.9	46.7
6	5.9	72.3	0.95	57.0	47.0	70	4.1	50.9
7	3.8	76.1	1.10	66.0	55.0	69	2.6	53.5
8	2.6	78.7	1.26	76.0	63.0	67	1.7	55.2
9	2.5	81.1	1.42	85.0	71.0	66	1.6	56.9
10	2.2	83.3	1.58	95.0	79.0	66	1.4	58.3
11	2.5	85.8	1.74	104.0	87.0	64	1.6	59.9
12	2.0	87.8	1.89	114.0	95.0	63	1.3	61.1
13	1.6	89.4	2.05	123.0	103.0	62	1.0	62.1
14	0.9	90.4	2.21	133.0	110.0	62	0.6	62.7
15	1.6	91.9	2.37	142.0	118.0	62	1.0	63.7
16	1.1	93.0	2.52	151.0	126.0	61	0.7	64.3
17	1.0	94.0	2.68	161.0	134.0	60	0.6	65.0
18	0.5	94.6	2.84	170.0	142.0	59	0.3	65.3
19	0.2	94.8	3.00	180.0	150.0	58	0.1	65.4
20	0.6	95.4	3.16	189.0	158.0	58	0.4	65.8
21	0.6	96.1	3.31	199.0	166.0	57	0.4	66.2
22	0.3	96.4	3.47	208.0	174.0	57	0.2	66.3
23	0.8	97.2	3.63	218.0	181.0	56	0.5	66.8
24	0.4	97.6	3.79	227.0	189.0	55	0.2	67.0
25	0.2	97.8	3.94	237.0	197.0	55	0.1	67.1
30	0.9	98.7	4.73	284.0	237.0	53	0.5	67.6
35	0.8	99.5	5.52	331.0	276.0	52	0.4	68.0
40	0.2	99.7	6.31	379.0	316.0	51	0.1	68.1
45	0.3	100.0	7.10	426.0	355.0	50	0.1	68.2
							Estimated Net Annual Sediment (TSS) Load Reduction =	**68 %**

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

RAINFALL DATA FROM WATERLOO WELLINGTON AP RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

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

SCOUR PREVENTION AND ONLINE CONFIGURATION

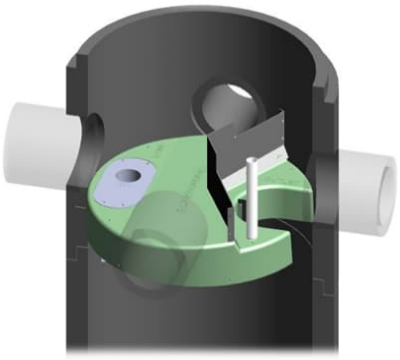
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test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

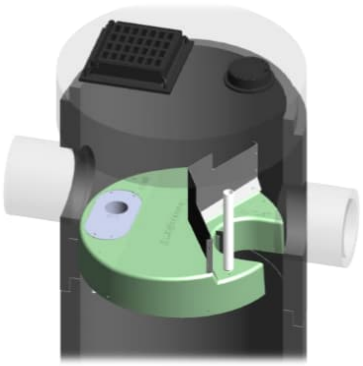
DESIGN FLEXIBILITY

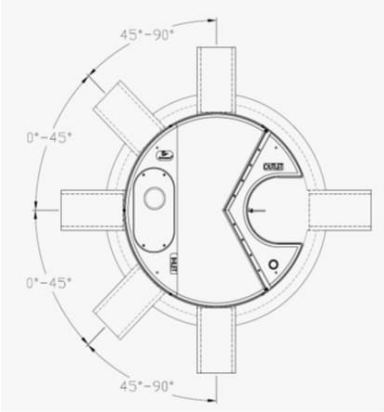
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend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

OIL CAPTURE AND RETENTION

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







INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.
0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.
45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

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

Pollutant Capacity

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

*Increased sump depth may be added to increase sediment storage capacity
** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

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

STANDARD STORMCEPTOR EF/EFO DRAWINGS

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

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

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

Table of TSS Removal vs Surface Loading Rate Based on Third-Party Test Results
Stormceptor® EFO

SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL
1	70	660	42	1320	35	1980	24
30	70	690	42	1350	35	2010	24
60	67	720	41	1380	34	2040	23
90	63	750	41	1410	34	2070	23
120	61	780	41	1440	33	2100	23
150	58	810	41	1470	32	2130	22
180	56	840	41	1500	32	2160	22
210	54	870	41	1530	31	2190	22
240	53	900	41	1560	31	2220	21
270	52	930	40	1590	30	2250	21
300	51	960	40	1620	29	2280	21
330	50	990	40	1650	29	2310	21
360	49	1020	40	1680	28	2340	20
390	48	1050	39	1710	28	2370	20
420	47	1080	39	1740	27	2400	20
450	47	1110	38	1770	27	2430	20
480	46	1140	38	1800	26	2460	19
510	45	1170	37	1830	26	2490	19
540	44	1200	37	1860	26	2520	19
570	43	1230	37	1890	25	2550	19
600	42	1260	36	1920	25	2580	18
630	42	1290	36	1950	24		

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

PART 1 – GENERAL

1.1 WORK INCLUDED

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

1.2 REFERENCE STANDARDS & PROCEDURES

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

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

1.3 SUBMITTALS

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

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

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

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

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

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

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall

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

3.2 SIZING METHODOLOGY

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

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

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

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

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

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

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

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

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

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to

assess whether light liquids captured after a spill are effectively retained at high flow rates.

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

Stormceptor®

Rinker MATERIALS™

Stormceptor® EF Sizing Report

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

04/11/2024

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

Site Name:	190-216 Arkell Road

Drainage Area (ha):	1.373
% Imperviousness:	68.50

Runoff Coefficient 'c': 0.71

Particle Size Distribution:	CA ETV
Target TSS Removal (%):	60.0

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	36.99
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Influent TSS Concentration (mg/L):	200
Estimated Average Annual Sediment Load (kg/yr):	789
Estimated Average Annual Sediment Volume (L/yr):	642

Project Name:	190-216 Arkell Road
Project Number:	42063-104
Designer Name:	Claire Phelps
Designer Company:	MTE Consultants
Designer Email:	CPhelps@mte85.com
Designer Phone:	151-974-3650
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	46
EFO6	55
EFO8	60
EFO10	63
EFO12	65

Recommended Stormceptor EFO Model: EFO8

Estimated Net Annual Sediment (TSS) Load Reduction (%): 60

Water Quality Runoff Volume Capture (%): > 90

imbrium

THIRD-PARTY TESTING AND VERIFICATION

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

PERFORMANCE

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

PARTICLE SIZE DISTRIBUTION (PSD)

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

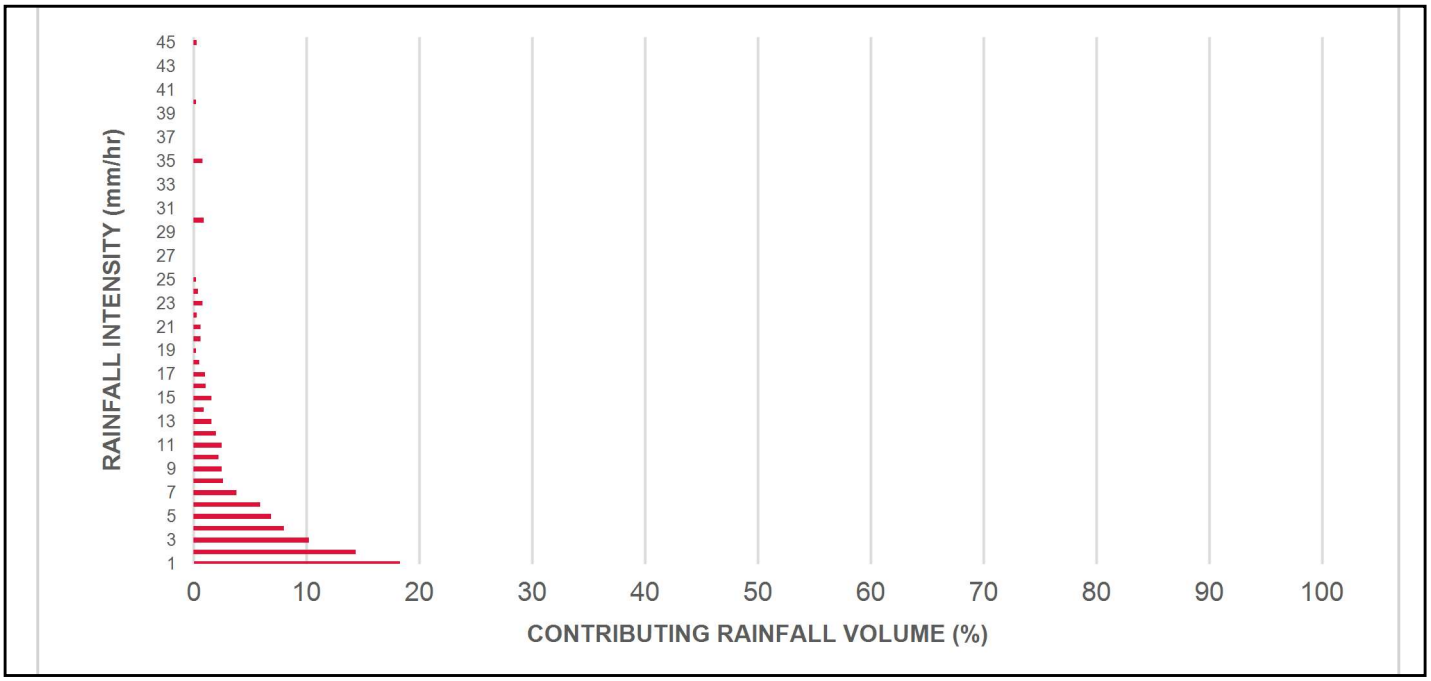
Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

Stormceptor® EF Sizing Report

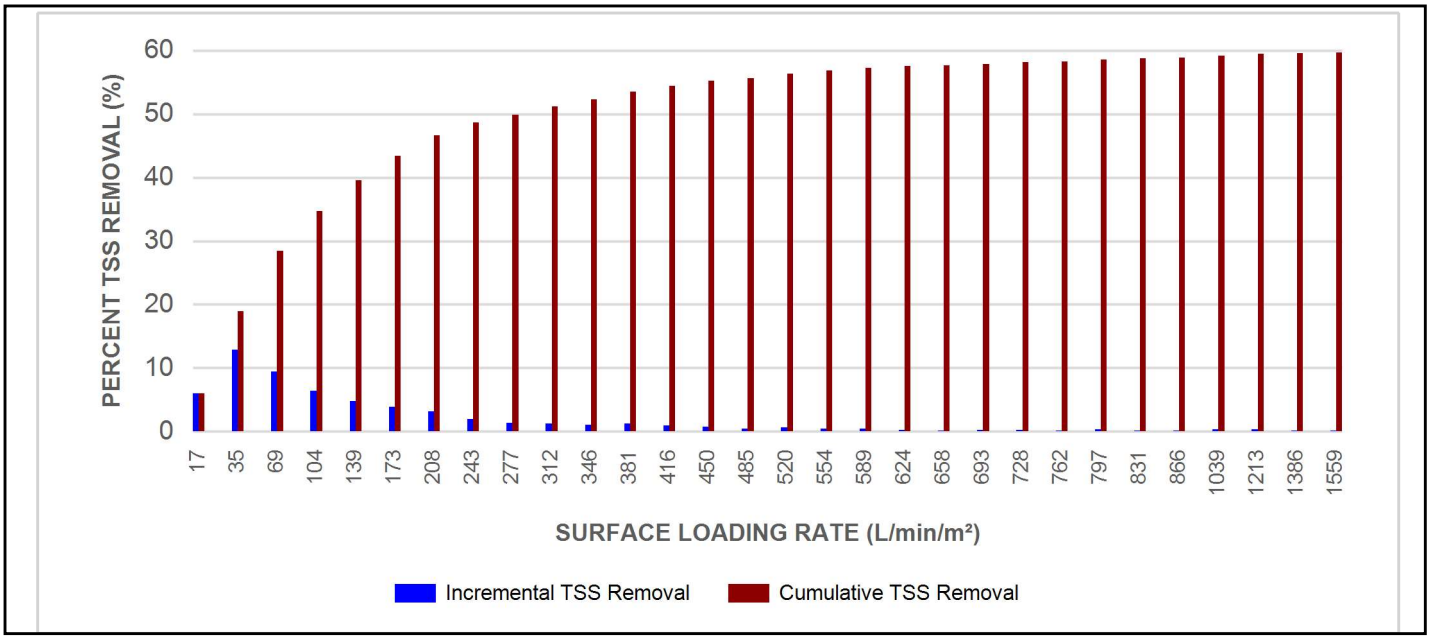
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	8.5	8.5	1.36	81.0	17.0	70	6.0	6.0
1.00	18.3	26.8	2.71	163.0	35.0	70	12.9	18.9
2.00	14.4	41.3	5.43	326.0	69.0	66	9.5	28.4
3.00	10.2	51.5	8.14	488.0	104.0	62	6.4	34.7
4.00	8.0	59.5	10.86	651.0	139.0	60	4.8	39.5
5.00	6.9	66.4	13.57	814.0	173.0	57	3.9	43.4
6.00	5.9	72.3	16.28	977.0	208.0	54	3.2	46.6
7.00	3.8	76.1	19.00	1140.0	243.0	53	2.0	48.6
8.00	2.6	78.7	21.71	1303.0	277.0	52	1.3	49.9
9.00	2.5	81.1	24.42	1465.0	312.0	51	1.3	51.2
10.00	2.2	83.3	27.14	1628.0	346.0	50	1.1	52.3
11.00	2.5	85.8	29.85	1791.0	381.0	49	1.2	53.5
12.00	2.0	87.8	32.57	1954.0	416.0	48	1.0	54.4
13.00	1.6	89.4	35.28	2117.0	450.0	47	0.8	55.2
14.00	0.9	90.4	37.99	2280.0	485.0	46	0.4	55.6
15.00	1.6	91.9	40.71	2442.0	520.0	44	0.7	56.3
16.00	1.1	93.0	43.42	2605.0	554.0	44	0.5	56.8
17.00	1.0	94.0	46.14	2768.0	589.0	43	0.4	57.2
18.00	0.5	94.6	48.85	2931.0	624.0	42	0.2	57.5
19.00	0.2	94.8	51.56	3094.0	658.0	42	0.1	57.6
20.00	0.6	95.4	54.28	3257.0	693.0	42	0.3	57.8
21.00	0.6	96.1	56.99	3419.0	728.0	41	0.3	58.1
22.00	0.3	96.4	59.70	3582.0	762.0	41	0.1	58.2
23.00	0.8	97.2	62.42	3745.0	797.0	41	0.3	58.5
24.00	0.4	97.6	65.13	3908.0	831.0	41	0.2	58.7
25.00	0.2	97.8	67.85	4071.0	866.0	41	0.1	58.8
30.00	0.9	98.7	81.42	4885.0	1039.0	39	0.3	59.1
35.00	0.8	99.5	94.98	5699.0	1213.0	37	0.3	59.4
40.00	0.2	99.7	108.55	6513.0	1386.0	34	0.1	59.5
45.00	0.3	100.0	122.12	7327.0	1559.0	31	0.1	59.6
Estimated Net Annual Sediment (TSS) Load Reduction =								**60 %**

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

RAINFALL DATA FROM WATERLOO WELLINGTON AP RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

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

SCOUR PREVENTION AND ONLINE CONFIGURATION

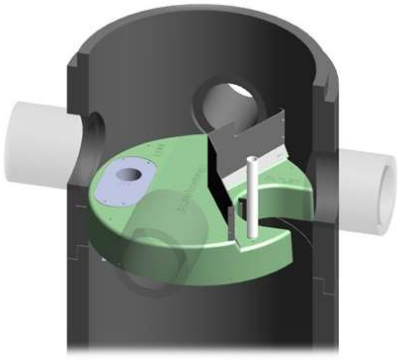
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test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

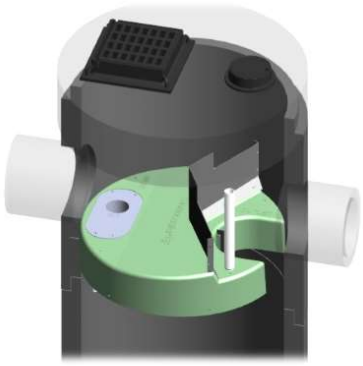
DESIGN FLEXIBILITY

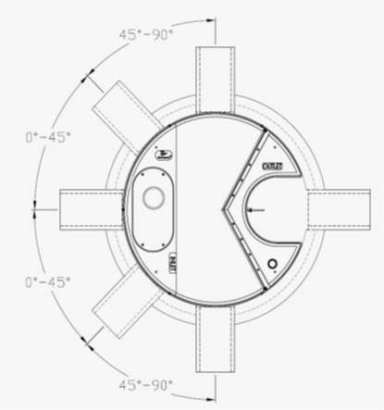
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend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

OIL CAPTURE AND RETENTION

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







INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.
0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.
45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

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

Pollutant Capacity

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

*Increased sump depth may be added to increase sediment storage capacity
** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

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

STANDARD STORMCEPTOR EF/EFO DRAWINGS

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

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

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

Table of TSS Removal vs Surface Loading Rate Based on Third-Party Test Results
Stormceptor® EFO

SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL
1	70	660	42	1320	35	1980	24
30	70	690	42	1350	35	2010	24
60	67	720	41	1380	34	2040	23
90	63	750	41	1410	34	2070	23
120	61	780	41	1440	33	2100	23
150	58	810	41	1470	32	2130	22
180	56	840	41	1500	32	2160	22
210	54	870	41	1530	31	2190	22
240	53	900	41	1560	31	2220	21
270	52	930	40	1590	30	2250	21
300	51	960	40	1620	29	2280	21
330	50	990	40	1650	29	2310	21
360	49	1020	40	1680	28	2340	20
390	48	1050	39	1710	28	2370	20
420	47	1080	39	1740	27	2400	20
450	47	1110	38	1770	27	2430	20
480	46	1140	38	1800	26	2460	19
510	45	1170	37	1830	26	2490	19
540	44	1200	37	1860	26	2520	19
570	43	1230	37	1890	25	2550	19
600	42	1260	36	1920	25	2580	18
630	42	1290	36	1950	24	2600	26

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

PART 1 – GENERAL

1.1 WORK INCLUDED

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

1.2 REFERENCE STANDARDS & PROCEDURES

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

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

1.3 SUBMITTALS

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

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

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

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

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

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

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall

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

3.2 SIZING METHODOLOGY

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

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

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

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

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

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

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

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

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

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to

assess whether light liquids captured after a spill are effectively retained at high flow rates.

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

Appendix E

Monthly Water Balance Calculations

190-216 Arkell Road
SITE WATER BUDGET (INFILTRATION) ANALYSIS
Guelph, Ontario

Project Number: 42063-104
Date: December 8, 2023
Design By: CVP
File: Q:\42063\104\SWM\2024-06-17 Water Balance\42063-104 Water Balance (Thornthwaite-Mather)_june 2024.xlsx

Pre-Development Water Balance Characteristics

Contributing Catchments:	101, 102, 103, 104, 105
Contributing Areas:	3.11 ha
Percent Impervious	13.8 %
Weather Station:	Guelph Arboretum

Soil Type:	Silt,Sand
Vegetation:	Pasture
Topography:	Rolling Hill
Soil Moisture Retention Capacity:	125 mm

Runoff Factor:	0.45
Evapotranspiration Factor for Impervious Surfaces:	0.33

Table 6 - Pre-Development Monthly Water Balance Budget

Month	Daily Average Temperature	Monthly Heat Index	Unadjusted Daily PE	Correction Factor	Adjusted PE	Average Precipitation	P-PE	Accum. Pot. Water Loss	Storage	ΔS	Pervious ET	Actual ET	Moisture Surplus	Water Runoff	Snow Melt Runoff	Total Recharge & Runoff	Total Recharge & Runoff	Total Infiltration Depth	Total Infiltration Volume	Runoff Volume	Actual Runoff
	(C°)		(mm)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(m^3)	(mm)	(m^3)	(m^3)	(mm)
Jan	-7.6	0.00	0.0	24.3	0.0	56.4	56.4	0.0	259.1	0.0	0.0	0.0	0.0	3.7	0.0	3.7	114	2.0	62	51	1.6
Feb	-6.9	0.00	0.0	24.5	0.0	50.8	50.8	0.0	309.9	0.0	0.0	0.0	0.0	1.8	0.0	1.8	57	1.0	31	26	0.8
Mar	-1.3	0.00	0.0	30.6	0.0	72.1	72.1	0.0	382.0	0.0	0.0	0.0	0.0	0.9	0.0	0.9	28	0.5	16	13	0.4
Apr	5.9	1.28	0.9	33.6	31.8	78.3	46.5	0.0	125.0	0.0	31.8	28.9	49.4	25.2	25.9	51.1	1,587	28.1	873	714	23.0
May	12.3	3.91	2.0	38.0	77.2	79.9	2.7	0.0	125.0	0.0	77.2	70.0	9.9	17.5	116.5	134.0	4,166	73.7	2,291	1,875	60.3
Jun	16.9	6.32	2.8	38.6	109.0	76	-33.0	-33.0	47.0	-78.0	154.0	139.7	14.3	15.9	58.3	74.2	2,305	40.8	1,268	1,037	33.4
Jul	19.7	7.97	3.3	38.9	128.8	88.5	-40.3	-73.3	27.0	-20.0	108.5	98.4	10.1	13.0	29.1	42.1	1,309	23.2	720	589	18.9
Aug	18.6	7.31	3.1	36.0	112.3	95.9	-16.4	-89.7	22.0	-5.0	100.9	91.5	9.4	11.2	14.6	25.7	800	14.2	440	360	11.6
Sep	14.1	4.80	2.3	31.2	73.0	92.1	19.1	0.0	41.1	19.1	73.0	66.2	6.8	9.0	7.3	16.2	505	8.9	278	227	7.3
Oct	7.9	2.00	1.3	28.5	36.5	69.2	32.7	0.0	73.8	32.7	36.5	33.2	3.4	6.2	3.6	9.8	305	5.4	168	137	4.4
Nov	2.4	0.33	0.4	24.2	9.0	86.3	77.3	0.0	125.0	51.2	9.0	8.2	26.9	16.5	1.8	18.3	570	10.1	314	257	8.3
Dec	-4	0.00	0.0	23.0	0.0	77.7	77.7	0.0	202.7	0.0	0.0	0.0	0.0	7.3	1.8	9.1	284	5.0	156	128	4.1
Total		33.9	16.2		577.6	**923.2**	**345.6**					**536.2**	**130.0**	**128.1**	**258.9**	**387.0**	**12,029**	**212.9**	**6,616**	**5,413**	**174.2**

Note: P - Precipitation, PE - Potential Evapotranspiration, ΔS- Change in Soil Moisture Storage, ET - Evapotranspiration

190-216 Arkell Road
SITE WATER BUDGET (INFILTRATION) ANALYSIS
Guelph, Ontario

Project Number: 42063-104
Date: June 17, 2024
Design By: CVP
File: Q:\42063\104\SWM\2024-06-17 Water Balance\42063-104 Water Balance (Thornthwaite-Mather)_june 2024.xlsx

Post-Development Water Balance Characteristics

Contributing Catchments:	201, 202, 203, 204, 205	Soil Type:	Silt, Sand	Runoff Factor	0.45
Contributing Areas:	3.11 ha	Vegetation:	Urban Lawn	Evapotranspiration	
Percent Impervious	34.4 %	Topography:	Flat	Factor for Impervious	
Weather Station:	Guelph Arboretum	Soil Moisture Retention Capacity:	125 mm	Surfaces:	0.33

Table 2- Post-Development Monthly Water Balance Budget

Month	Daily Average Temperature	Monthly Heat Index	Unadjusted Daily PE	Correction Factor	Adjusted PE	Average Precipitation	P-PE	Accum. Pot. Water Loss	Storage	ΔS	Pervious ET	Actual ET	Moisture Surplus	Water Runoff	Snow Melt Runoff	Total Recharge & Runoff	Total Recharge & Runoff	Runoff before Enhanced Infiltration	Runoff before Enhanced Infiltration	Total Enhanced Recharge*	Total Enhanced Recharge	Recharge Pervious	Recharge Pervious	Total Recharge	Total Recharge	Actual Runoff Volume	Actual Runoff
	(C°)		(mm)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(m^3)	(mm)	(m^3)	(m^3)	(mm)	(m^3)	(mm)	(m^3)	(mm)	(m^3)	(mm)
Jan	-7.6	0.00	0.0	24.3	0.0	56.4	56.4	0.0	259.1	0.0	0.0	0.0	0.0	4.5	0.0	4.5	141	2.0	64	0	0	51	1.6	115	3.7	90	2.9
Feb	-6.9	0.00	0.0	24.5	0.0	50.8	50.8	0.0	309.9	0.0	0.0	0.0	0.0	2.3	0.0	2.3	71	1.0	32	0	0	25	0.8	25	0.8	45	1.5
Mar	-1.3	0.00	0.0	30.6	0.0	72.1	72.1	0.0	382.0	0.0	0.0	0.0	0.0	1.1	0.0	1.1	35	0.5	16	0	0	13	0.4	13	0.4	23	0.7
Apr	5.9	1.28	0.9	33.6	31.8	78.3	46.5	0.0	125.0	0.0	31.8	24.5	53.8	27.5	26.0	53.5	1,664	24.1	749	0	0	600	19.3	600	19.3	1,063	34.2
May	12.3	3.91	2.0	38.0	77.2	79.9	2.7	0.0	125.0	0.0	77.2	59.4	20.5	24.0	117.1	141.1	4,389	63.5	1,975	0	0	1,583	50.9	1,583	50.9	2,805	90.2
Jun	16.9	6.32	2.8	38.6	109.0	76	-33.0	-33.0	47.0	-78.0	154.0	118.5	35.5	29.7	58.6	88.3	2,746	39.7	1,236	0	0	991	31.9	991	31.9	1,755	56.4
Jul	19.7	7.97	3.3	38.9	128.8	88.5	-40.3	-73.3	27.0	-20.0	108.5	83.5	25.0	27.4	29.3	56.7	1,762	25.5	793	0	0	636	20.4	636	20.4	1,126	36.2
Aug	18.6	7.31	3.1	36.0	112.3	95.9	-16.4	-89.7	22.0	-5.0	100.9	77.6	23.3	25.3	14.6	40.0	1,243	18.0	559	0	0	448	14.4	448	14.4	794	25.5
Sep	14.1	4.80	2.3	31.2	73.0	92.1	19.1	0.0	41.1	19.1	73.0	56.2	16.8	21.1	7.3	28.4	883	12.8	397	0	0	319	10.2	319	10.2	564	18.1
Oct	7.9	2.00	1.3	28.5	36.5	69.2	32.7	0.0	73.8	32.7	36.5	28.1	8.4	14.7	3.7	18.4	572	8.3	258	0	0	207	6.6	207	6.6	366	11.8
Nov	2.4	0.33	0.4	24.2	9.0	86.3	77.3	0.0	125.0	51.2	9.0	6.9	28.1	21.4	1.8	23.3	723	10.5	326	0	0	261	8.4	261	8.4	462	14.9
Dec	-4	0.00	0.0	23.0	0.0	77.7	77.7	0.0	202.7	0.0	0.0	0.0	0.0	9.1	1.8	10.9	340	4.9	153	0	0	123	3.9	123	3.9	217	7.0
Total		33.9	16.2		577.6	**923.2**	**345.6**					**454.7**	**211.5**	**208.2**	**260.3**	**468.5**	**14,569**	**210.8**	**6,556**	**0**	**0**	**5,256**	**169.0**	**5,320**	**171.1**	**9,312**	**299.4**

Note: P - Precipitation, PE - Potential Evapotranspiration, ΔS- Change in Soil Moisture Storage, ET - Evapotranspiration
* Enhanced recharge volume was estimated by a continuous hydrologic model, based on the design of infiltration facility and condition of its contributing areas

190-216 Arkell Road
SITE WATER BUDGET (INFILTRATION) ANALYSIS
Guelph, Ontario

Project Number: 42063-104
Date: June 17, 2024
Design By: CVP
File: Q:\42063\104\SWM\2024-06-17 Water Balance\42063-104 Water Balance (Thornthwaite-Mather)_june 2024.xlsx

Post-Development Water Balance Characteristics

Contributing Catchments:	201, 202, 203, 204-2	Soil Type:	Silt, Sand			Runoff Factor	0.45
Total Contributing Areas Post-Development (201, 202, 203):	2.99 ha	Vegetation:	Urban Lawn			Evapotranspiration	
Percent Impervious	35.0 %	Topography:	Flat			Factor for Impervious	
Weather Station:	Guelph Arboretum	Soil Moisture Retention Capacity:	125	mm		Surfaces:	0.33
Drainage Area to Enhanced Infiltration (201):	1.35 ha						
Percent Impervious Directly to Infiltration Gallery (201):	68.5 %						
Drainage Area Directly to Wetland (202, 203):	1.64 ha						
Percent Impervious Directly to Wetland (202, 203):	4 %						

Table 3- Post-Development Monthly Water Balance Budget to Wetland - Determination of Runoff to the Wetland

Total Drainage to Wetland Characteristics																	**201 Characteristics - Drainage to Enhanced Infiltration Features**						**202 + 203 Characteristics - Uncontrolled Drainage to Wetland**	**Overall Drainage to Wetland Characteristics**		
Month	Daily Average Temperature	Monthly Heat Index	Unadjusted Daily PE	Correction Factor	Adjusted PE	Average Precipitation	P-PE	Accum. Pot. Water Loss	Storage	ΔS	Pervious ET	Actual ET	Moisture Surplus	Water Runoff	Snow Melt Runoff	Total Recharge & Runoff	Total Recharge & Runoff	Recharge & Runoff of 201	Runoff of 201	Recharge Pervious of 201	Recharge Pervious 201	Total Enhanced Recharge*	Total Enhanced Recharge	Recharge & Runoff of 202 + 203	Runoff of 202 + 203	Actual Runoff Volume	Actual Runoff
	(C°)		(mm)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(m^3)	(m^3)	(m^3)	(m^3)	(mm)	(m^3)	(mm)	(m^3)	(m^3)	(m^3)	(mm)
Jan	-7.6	0.00	0.0	24.3	0.0	56.4	56.4	0.0	259.1	0.0	0.0	0.0	0.0	4.6	0.0	4.6	136	61	27.6	11	0.8	0	0	75	33.6	95	3.2
Feb	-6.9	0.00	0.0	24.5	0.0	50.8	50.8	0.0	309.9	0.0	0.0	0.0	0.0	2.3	0.0	2.3	68	31	13.8	5	0.4	0	0	37	16.8	48	1.6
Mar	-1.3	0.00	0.0	30.6	0.0	72.1	72.1	0.0	382.0	0.0	0.0	0.0	0.0	1.1	0.0	1.1	34	15	6.9	3	0.2	0	0	19	8.4	24	0.8
Apr	5.9	1.28	0.9	33.6	31.8	78.3	46.5	0.0	125.0	0.0	31.8	24.4	53.9	27.5	26.0	53.6	1,602	723	325.5	125	9.3	325	24	879	395.6	793	26.5
May	12.3	3.91	2.0	38.0	77.2	79.9	2.7	0.0	125.0	0.0	77.2	59.1	20.8	24.2	117.2	141.4	4,228	1,908	858.7	331	24.5	859	64	2,320	1043.8	2,093	70.0
Jun	16.9	6.32	2.8	38.6	109.0	76	-33.0	-33.0	47.0	-78.0	154.0	117.9	36.1	30.1	58.6	88.7	2,654	1,198	539.1	208	15.4	539	40	1,456	655.3	1,314	43.9
Jul	19.7	7.97	3.3	38.9	128.8	88.5	-40.3	-73.3	27.0	-20.0	108.5	83.1	25.4	27.8	29.3	57.1	1,708	771	346.8	134	9.9	347	26	937	421.6	845	28.3
Aug	18.6	7.31	3.1	36.0	112.3	95.9	-16.4	-89.7	22.0	-5.0	100.9	77.2	23.7	25.7	14.6	40.4	1,208	545	245.3	94	7.0	245	18	663	298.1	598	20.0
Sep	14.1	4.80	2.3	31.2	73.0	92.1	19.1	0.0	41.1	19.1	73.0	55.9	17.1	21.4	7.3	28.7	860	388	174.6	67	5.0	175	13	472	212.3	426	14.2
Oct	7.9	2.00	1.3	28.5	36.5	69.2	32.7	0.0	73.8	32.7	36.5	28.0	8.6	15.0	3.7	18.7	558	252	113.4	44	3.2	113	8	306	137.8	276	9.2
Nov	2.4	0.33	0.4	24.2	9.0	86.3	77.3	0.0	125.0	51.2	9.0	6.9	28.2	21.6	1.8	23.4	700	316	142.2	55	4.1	142	11	384	172.8	347	11.6
Dec	-4	0.00	0.0	23.0	0.0	77.7	77.7	0.0	202.7	0.0	0.0	0.0	0.0	9.1	1.8	10.9	327	148	66.4	26	1.9	66	5	179	80.7	162	5.4
Total		33.9	16.2		577.6	**923.2**	**345.6**					**452.4**	**213.8**	**210.5**	**260.4**	**470.8**	**14,083**	**6,356**	**2860.3**	**1,101**	**81.6**	**2,812**	**208**	**7,726**	**3476.9**	**7,021.2**	**234.7**

Note: P - Precipitation, PE - Potential Evapotranspiration, ΔS- Change in Soil Moisture Storage, ET - Evapotranspiration
* Enhanced recharge volume was estimated by a continuous hydrologic model, based on the design of infiltration facility and condition of its contributing areas (Catchment 201)

190-216 Arkell Road
SITE WATER BUDGET (INFILTRATION) ANALYSIS
Guelph, Ontario

Project Number: 42063-104
Date: June 17, 2024
Design By: CVP
File: Q:\42063\104\SWM\2024-06-17 Water Balance\42063-104 Water Balance (Thornthwaite-Mather)_june 2024.xlsx

Post-Development Water Balance Characteristics

Contributing Catchments:	201, 202, 203, 204, 205
Total Area on Site:	3.11 ha
Percent Impervious	34.4 %
Weather Station:	Guelph Arboretum
Drainage Area to Enhanced Infiltration (201):	1.373 ha
Percent Impervious Directly to Infiltration Gallery (201):	68.5 %
Drainage Area Directly to Wetland (202, 203):	1.52 ha
Percent Impervious Directly to Wetland (202, 203):	4 %
Drainage Area Directly to Arkell Road (204+205):	0.23 ha
Percent Impervious Directly to Arkell Road (204+205):	15 %

Soil Type:	Silt, Sand
Vegetation:	Urban Lawn
Topography:	Flat
Soil Moisture Retention Capacity:	125 mm

Runoff Factor	0.45
Evapotranspiration Factor for Impervious Surfaces:	0.33

Table 4- Post-Development Monthly Water Balance Budget for the Site - Determination of Infiltration on Site

	Total Drainage to Wetland Characteristics																	201 Characteristics - Drainage to Enhanced Infiltration Features						202 + 203 Characteristics - Uncontrolled Drainage to Wetland				204 Characteristics - Uncontrolled Drainage to Arkell Road			Overall Drainage to Wetland Characteristics			
Month	Daily Average Temperature	Monthly Heat Index	Unadjusted Daily PE	Correction Factor	Adjusted PE	Average Precipitation	P-PE	Accum. Pot. Water Loss	Storage	ΔS	Pervious ET	Actual ET	Moisture Surplus	Water Runoff	Snow Melt Runoff	Total Recharge & Runoff	Total Recharge & Runoff	Recharge & Runoff of 201	Runoff of 201	Recharge Pervious of 201	Recharge Pervious 201	Total Enhanced Recharge*	Total Enhanced Recharge	Recharge & Runoff of 202 + 203	Runoff of 202 + 203	Recharge Pervious of 202 + 203	Recharge Pervious 202+203	Recharge & Runoff of 204 + 205	Recharge Pervious of 204+205	Recharge Pervious 204+205	Total Recharge	Total Recharge	Actual Runoff Volume	Actual Runoff
	(C°)		(mm)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(m^3)	(m^3)	(m^3)	(m^3)	(mm)	(m^3)	(mm)	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)	(m^3)	(mm)	(m^3)	(m^3)	(mm)
Jan	-7.6	0.00	0.0	24.3	0.0	56.4	56.4	0.0	259.1	0.0	0.0	0.0	0.0	4.5	0.0	4.5	141	62	28.1	11	0.8	0	0	69	31.0	36	2.4	10	5	2.1	52	1.7	93	3.0
Feb	-6.9	0.00	0.0	24.5	0.0	50.8	50.8	0.0	309.9	0.0	0.0	0.0	0.0	2.3	0.0	2.3	71	31	14.0	5	0.4	0	0	34	15.5	18	1.2	5	2	1.1	26	0.8	47	1.5
Mar	-1.3	0.00	0.0	30.6	0.0	72.1	72.1	0.0	382.0	0.0	0.0	0.0	0.0	1.1	0.0	1.1	35	16	7.0	3	0.2	0	0	17	7.8	9	0.6	3	1	0.5	13	0.4	23	0.8
Apr	5.9	1.28	0.9	33.6	31.8	78.3	46.5	0.0	125.0	0.0	31.8	24.5	53.8	27.5	26.0	53.5	1,664	735	330.5	127	9.3	331	24	812	365.4	429	28.2	123	58	25.0	944	30.4	769	24.7
May	12.3	3.91	2.0	38.0	77.2	79.9	2.7	0.0	125.0	0.0	77.2	59.4	20.5	24.0	117.1	141.1	4,389	1,937	871.9	336	24.4	0	0	2,142	963.9	1,131	74.5	325	152	66.0	1,618	52.0	2,901	93.3
Jun	16.9	6.32	2.8	38.6	109.0	76	-33.0	-33.0	47.0	-78.0	154.0	118.5	35.5	29.7	58.6	88.3	2,746	1,212	545.6	210	15.3	546	40	1,340	603.2	708	46.6	203	95	41.3	1,558	50.1	1,270	40.8
Jul	19.7	7.97	3.3	38.9	128.8	88.5	-40.3	-73.3	27.0	-20.0	108.5	83.5	25.0	27.4	29.3	56.7	1,762	778	350.0	135	9.8	350	25	860	387.0	454	29.9	130	61	26.5	1,000	32.1	815	26.2
Aug	18.6	7.31	3.1	36.0	112.3	95.9	-16.4	-89.7	22.0	-5.0	100.9	77.6	23.3	25.3	14.6	40.0	1,243	549	246.9	95	6.9	247	18	607	272.9	320	21.1	92	43	18.7	705	22.7	575	18.5
Sep	14.1	4.80	2.3	31.2	73.0	92.1	19.1	0.0	41.1	19.1	73.0	56.2	16.8	21.1	7.3	28.4	883	390	175.4	68	4.9	175	13	431	193.9	228	15.0	65	31	13.3	501	16.1	408	13.1
Oct	7.9	2.00	1.3	28.5	36.5	69.2	32.7	0.0	73.8	32.7	36.5	28.1	8.4	14.7	3.7	18.4	572	253	113.7	44	3.2	114	8	279	125.7	148	9.7	42	20	8.6	325	10.4	265	8.5
Nov	2.4	0.33	0.4	24.2	9.0	86.3	77.3	0.0	125.0	51.2	9.0	6.9	28.1	21.4	1.8	23.3	723	319	143.7	55	4.0	144	10	353	158.9	186	12.3	54	25	10.9	411	13.2	335	10.8
Dec	-4	0.00	0.0	23.0	0.0	77.7	77.7	0.0	202.7	0.0	0.0	0.0	0.0	9.1	1.8	10.9	340	150	67.5	26	1.9	67	5	166	74.6	88	5.8	25	12	5.1	193	6.2	157	5.0
Total		33.9	16.2		577.6	**923.2**	**345.6**					**454.7**	**211.5**	**208.2**	**260.3**	**468.5**	**14,569**	**6,432**	**2894.4**	**1,114**	**81.2**	**1,973**	**144**	**7,111**	**3200.0**	**3,755**	**247.3**	**1,077**	**504**	**219.0**	**7,346**	**236.2**	**7,658.5**	**246.3**

Note: P - Precipitation, PE - Potential Evapotranspiration, ΔS- Change in Soil Moisture Storage, ET - Evapotranspiration
* Enhanced recharge volume was estimated by a continuous hydrologic model, based on the design of infiltration facility and condition of its contributing areas (Catchment 201)

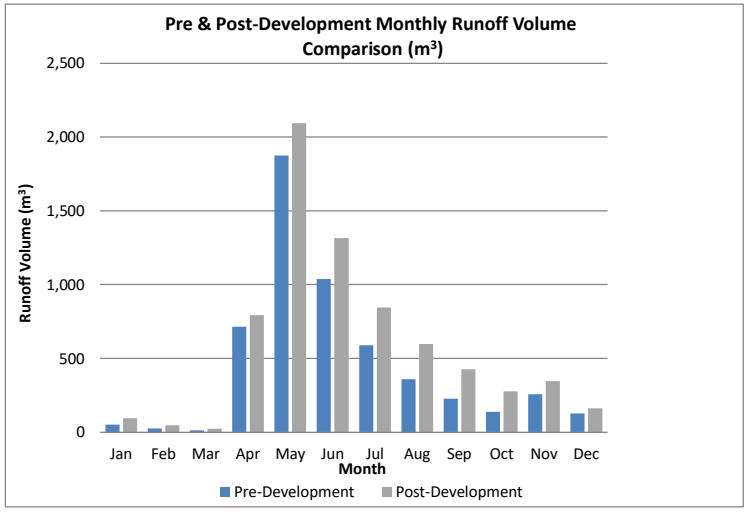
190-216 Arkell Road
SITE WATER BUDGET ANALYSIS
Guelph, Ontario

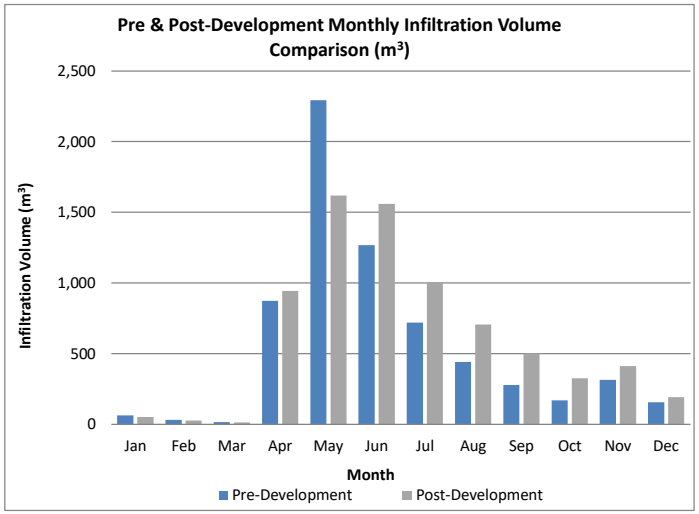
Project Number: 42063-104
Date: June 17, 2024
Design By: CVP
File: Q:\42063\104\SWM\2024-06-17 Water Balance\42063-104 Water Balance (Thornthwaite-Mather)_june 2024.xlsx

Table 5 - Total Runoff and Infiltration Volume to Wetland

Month	Total Runoff Volume to Weland (m^3)				Total Infiltration Volume (m^3)		
	Pre-development	Post-development	Difference	Change %	Pre-development	Post-development	Difference
Jan	51	95	44	86.1	62	52	-10
Feb	26	48	22	86.1	31	26	-5
Mar	13	24	11	86.1	16	13	-3
Apr	714	793	79	11.1	873	944	71
May	1,875	2,093	219	11.7	2,291	1,618	-673
Jun	1,037	1,314	277	26.7	1,268	1,558	291
Jul	589	845	257	43.6	720	1,000	280
Aug	360	598	238	66.2	440	705	265
Sep	227	426	198	87.3	278	501	223
Oct	137	276	139	101.2	168	325	157
Nov	257	347	90	35.1	314	411	97
Dec	128	162	34	26.9	156	193	37
Total	**5,413**	**7,021**	**1,608**	**29.7**	**6,616**	**7,346**	**730**

Note: Negative sign indicate a decrease under post-development conditions.





Appendix F

Geotechnical Report

Peto MacCallum Ltd.
CONSULTING ENGINEERS

GEOTECHNICAL INVESTIGATION
PROPOSED ARKELL ROAD SUBDIVISION
GUELPH, ONTARIO

for

CRESCENT HOMES INC.
c/o MTE CONSULTANTS INC.

PETO MacCALLUM LTD.
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1 cc: PML Kitchener

PML Ref.: 17KF002
Report: 1
September 28, 2018

Peto MacCallum Ltd.
CONSULTING ENGINEERS

September 28, 2018

PML Ref.: 17KF002
Report: 1

Mr. Nitin Jain
Crescent Homes
c/o Mr. Jason Cabral, C.E.T.
MTE Consultants Inc.
520 Bingemans Centre Drive,
Kitchener, Ontario
N2B 3X9

Dear Mr. Jain

Geotechnical Investigation
Proposed Arkell Road Subdivision
Guelph, Ontario

Peto MacCallum Ltd. (PML) is pleased to report the results of the geotechnical investigation recently completed at the above noted project site. Authorization to proceed with this assignment was provided verbally from Mr. Nitin Jain of Crescent Homes Inc., with a signed Engineering Services Agreement to be returned.

The project involves the proposed development of a residential subdivision on the north side of Arkell Road (at Summerfield Drive), in Guelph, Ontario. It is understood that the proposed development site is currently comprised of several residential dwellings, which will be demolished as part of the project. The site is approximately 2.54 ha in size, however, the northern third of the site will not be developed. The development will include 74, three storey town-house units, with associated parked areas as well as one roadway.

The purpose of the geotechnical investigation was to explore the subsurface soil and ground water conditions at the site. Based on the findings, we have prepared an engineering report with geotechnical recommendations pertaining to design and construction of the proposed residential subdivision. Specific considerations to be addressed in this report include:

- A description of the site and the field investigation procedure;
- A summary of the subsurface soil and ground water conditions encountered, including the presence of any topsoil, organic, fill or other anomalous features below grade;
- Log of borehole sheets, a borehole location plan drawing, and geotechnical laboratory test results;

- Foundation design options, including shallow foundation recommendations, bearing resistances, settlement projections and site class for seismic design;
- Slab-on-grade floor recommendations, including compaction requirements, perimeter and underfloor drainage requirements, and geotechnical suitability of onsite soils for re-use;
- Excavation recommendations, including safe side slopes and dewatering requirements,
- Pipe bedding, cover and backfill requirements, including material and compaction requirements, suitability of excavated soils for reuse as backfill;
- Ground water infiltration; and,
- Pavement design recommendations, including component thicknesses, compaction requirements, and drainage requirements.

The comments and recommendations provided in this report are based on the site conditions at the time of the investigation, and are for preliminary design purposes only. Any changes in plans will require review by PML to assess the applicability of the report, and may require modified recommendations, additional analysis and / or investigation. When the project design is complete, the general recommendations given in this report should be reviewed to ensure their applicability.

A limited chemical testing program of select soil samples was also completed. It should be noted that the scope of work did not include a Phase One or Phase Two Environmental Site Assessment (ESA), and the chemical testing program might not have identified all potential or actual occurrences of soil or ground water impairment at the site.

Investigation Procedure

The field work for the geotechnical investigation was completed on February 13 and March 21, 2017. Boreholes were drilled at six locations (BH1 to BH6) as shown on the appended Borehole Location Plan, Drawing 1. The field work included the installation of a total of four monitoring wells in BH2, BH3, BH4 and BH5.

The boreholes were advanced using a Diedrich D50 track mounted drillrig equipped with an automatic hammer and continuous flight hollow stem augers. The drilling equipment was supplied and operated by specialist contractors working under subcontract to PML.

Representative samples of the overburden were recovered at regular intervals throughout the depths explored. Standard penetration tests (SPT) were carried out during sampling operations of the boreholes using conventional split spoon equipment. Ground water observations were made in the boreholes during and upon completion of drilling. The boreholes were backfilled and compacted in accordance with O.Reg.903 upon completion of drilling.

The field work was supervised throughout by a member of PML's engineering staff who directed the drilling and sampling operation, prepared the stratigraphic logs, monitored ground water conditions, and processed the recovered samples.

The borehole and monitoring well locations were established in the field by Peto MacCallum Ltd. The ground surface elevations were surveyed by MTE Consultants Inc., and provided to PML on a borehole location plan.

All soil samples collected during the investigation were returned to PML's laboratory for detailed visual examination and testing. The geotechnical testing program included natural moisture content determinations on all recovered samples and two particle size distribution analyses carried out on samples of the major soil types encountered.

Summarized Site and Subsurface Conditions

The site is currently comprised of several residential dwellings, which will be demolished as part of the project. However, the northern third of the site will not be developed. The total area of the site is approximately 2.54 ha in size and relatively flat, with a gentle slope to the north, to the wetland area adjacent to the site. It is noted that the adjacent development to the east is approximately 5 m higher that the subject site.

Subsurface Conditions

Reference is made to the appended Log of Borehole sheets for details of the field work including soil descriptions, inferred stratigraphy, standard penetration test (SPT) N values, ground water observations and laboratory moisture content determinations.

Due to the soil sampling procedures and the limited size of samples, the depth/elevation demarcations on the borehole logs must be viewed as "transitional" zones, and cannot be construed as exact geologic boundaries between layers.

In general, the subsurface stratigraphy encountered at the borehole locations consists of surficial topsoil and localized fill overlying cohesionless native deposits.

Topsoil / Topsoil Fill

Between 100 and 300 mm (average thickness of 220 mm) of dark brown silt topsoil or topsoil fill was contacted from the surface in all of the boreholes. The topsoil was typically described as damp to moist, dark brown silt, trace sand with rootlets.

Fill

Below the topsoil / topsoil fill in BH1 and BH6, fill was penetrated, extending to depths of 0.46 m to 0.69 m below existing grades. The fill was variable in composition, comprising either sand and gravel or silt. Occasional rootlets were observed within the fill deposits in BH6.

Within the fill, SPT N values typically between 7 and 18 blows per 0.30 m penetration of the split spoon sampler indicate that a variable degree of compaction was used to place the fill soils. The fill soils were described as damp and moist, as demonstrated by laboratory moisture contents in the range of 5 to 20%.

Native Deposits

Native cohesionless deposits encountered below the surficial topsoil and fill were variable and generally comprised silt / sand / sand and gravel extending to the borehole termination depths. A deposit of silt till was also contacted in BH6, extending from 5.8 to 6.6 m. Generally, the encountered native cohesionless soil deposits were compact to very dense, with typical SPT N values ranging from 10 to greater than 50 blows per 0.3 m penetration of the split spoon sampler. Localized loose / very loose zones were contacted in BH1 (between 0.46 to 0.69 m), BH2

(between 0.25 to 0.69 m) and BH3 (between 0.2 to 1.4 m). Moisture contents typically ranging between 3 and 20% were indicative of variable damp to saturated conditions, with depth.

Two soil samples of the sand / sand and gravel were collected and analyzed for particle size distribution analysis, with results presented on Figure 1 and Figure 2 attached. Based on the results, the soil classification was generally consistent with those observed during the field work as included on the appended Log of Borehole sheets.

Ground Water Conditions

Ground water observations carried out during and upon completion of drilling are fully summarized on the appended Log of Borehole Sheets.

Ground water was first contacted at depths of 0.7 to 2.9 m below grade in the boreholes, corresponding to elevations of 333.4 to 331.7 (metric, geodetic), respectively.

An initial water level was also taken within the monitoring wells once installed. Ground water was measured at depths of 0.75 to 3.4 m below grade in the monitoring wells, corresponding to elevations of between 333.38 and 331.8 (metric, geodetic), respectively. Follow up ground water levels by MTE Consultants Inc., completed between March, 2017 and June, 2018 measured ground water at depths of surface level (MW4) to 3.65 m below grade (MW2), corresponding to an elevation range of between 330.38 (MW2 and MW5) to 333.99 (MW4) (metric, geodetic).

Based on the ground water observations, the ground water level appears to generally slope down from north to south, away from the wetland area.

The ground water levels at the site are subject to seasonal fluctuations and precipitation patterns.

Discussion and Recommendations

The site is an approximately 2.54 ha, rectangular shaped piece of land which is relatively flat located on the north side of Arkell Road at Summerfield Drive, Guelph, Ontario.

It is understood that the proposed development site is currently comprised of several residential dwellings, which will be demolished as part of the project. The development will include 74, three storey town-house units, with associated parked areas as well as one roadway. However, the northern third of the site will not be developed.

Once the design details for the proposed development are finalized, the recommendations in this report should be revisited to confirm that they remain applicable.

In general, the subsurface stratigraphy encountered at the borehole locations consist of surficial topsoil and localized fill overlying cohesionless native deposits.

Site Grading

As noted, the site is relatively flat with a total relief of approximately 1 m. The adjacent development to the east is approximately 5 m higher than the subject site. Consideration is being given to infilling the site.

Due to the inherent variability of the existing fill materials and the lack of consistent compactive effort utilized during fill placement, these materials are not considered suitable for support of building foundations, floor slabs, pavements, or other settlement sensitive structures. Also, the loose to very loose native materials (BH1, BH2 and BH3) are not considered suitable for the support of building foundations. In this regard, all existing fill and localized very loose / loose materials should be completely subexcavated from beneath any settlement sensitive structures (i.e., building envelopes, pavements, etc.) and replaced with well compacted, suitable engineered fill materials.

Following the stripping / removal of all surficial topsoil and any other deleterious material, and approval of the subgrade, the grades may then be raised where required. Surficial topsoil / organic thicknesses across the site were typically between 100 and 300 mm. In calculating the approximate quantity of topsoil to be stripped, we recommend that the topsoil thickness shown on the individual borehole logs be increased by 50 mm to account for variations and some stripping of the mineral soil below.

Prior to any fill placement, the subgrade surface should be proofrolled with a heavy vibratory compactor under the full time supervision of qualified geotechnical personnel. Any soft spots encountered during the proofrolling process should be subexcavated to the level of competent soils.

Fill used to raise grades should comprise either on site native inorganic cut soils or approved imported material. All engineered fill materials should be pre-approved by the geotechnical consultant prior to placement. Engineered fill material should be placed in maximum 300 mm thick lifts and compacted to at least 98% standard Proctor maximum dry density (SPMDD) below footings and 95% SPMDD below floors and pavements. Further, generic recommendations for fill subgrade preparation and engineered fill construction are provided in Appendix A.

It is noted that materials generated from grade cuts will generally consist of native cohesionless soil deposits. In general, the native on site cohesionless soils will be suitable for reuse as engineered fill, subject to geotechnical verification during construction, providing all organic, wet or saturated soils, and otherwise deleterious soils are discarded. Silty soils described as wet or saturated on the borehole logs should be dried prior to reuse.

The silty soils (i.e. silt) are frost susceptible and highly susceptible to moisture content variations, and are not well suited for engineering fill construction. Compaction to 98% SPMDD may be difficult to achieve; however, these insitu soils should be acceptable for use as engineered fill where compaction to 95% SPMDD is specified.

Foundations

For preliminary design purposes, conventional strip / spread footings founded at least 0.30 m into the competent compact to dense native deposits, or on engineered structural fill compacted to 98% SPMDD, may be designed for a net bearing resistance of 150 kPa at the serviceability limit state (SLS) and a factored bearing resistance of 225 kPa at the ultimate limit state (ULS). If very loose / loose soils are contacted at the proposed footing level, the loose soils should be subexcavated to the level of competent founding soils.

Accordingly, footings designed in accordance with the Ontario Building Code for residential housing will be satisfactory. The following table summarizes the minimum foundation depths based on the borehole findings:

LOCATION	MINIMUM FOUNDATION DEPTH (m)	CORRESPONDING ELEVATION (METRIC, GEODETIC)
BH1	1.0	333.50
BH2	1.0	334.10
BH3	1.7	332.70
BH4	0.6	333.50
BH5	0.6	334.30
BH6	0.7	333.30

Although in general, footings are anticipated to be placed on native insitu soils, where required the footings may be supported on engineered structural fill, placed in accordance with the generic recommendations for engineered fill construction provided in Appendix A. Prior to placement of engineered fill, all existing fill must be removed and the soils should be subexcavated to the level of competent native overburden soils noted in the table above. For engineered fill supporting footing loads, compaction to a minimum 98% of the materials SPMDD, should be specified as per recommendations outlined in the preceding 'Site Grading' section of this report and in Appendix B.

Footings supported on the structural fill may also be designed using the values for a net factored resistance at ULS and SLS of 225 and 150 kPa, respectively. Full time inspection of any structural fill placement by PML personnel is recommended to approve subgrade conditions, fill materials and to verify that the specified compaction levels are being achieved. Prior to concrete placement, all founding surfaces should be examined by PML personnel to check the competency of the founding surfaces.

Total settlements of footings founded on the approved engineered fill or compact to dense native overburden deposits, designed as outlined above are not expected to exceed 25 mm, with differential settlements between footings being no more than 50% of this value.

All exterior footings should be provided with a minimum 1.2 m of earth cover or the thermal insulation equivalent to provide adequate insulation against potential frost damage. A 25 mm thick layer of polystyrene insulation is thermally equivalent to 600 mm of soil cover.

Prior to concrete placement, all founding surfaces should be examined by PML personnel to check the competency of the founding surfaces.

For earthquake design, a site Class D seismic response classification may be assumed, in accordance with the 2012 Ontario Building Code.

Basement / Slab-on-Grade Floor Slabs

In general, the ground water level at the site was first contacted below depths of 0.7 to 2.9 m (Elevation 333.4 to 331.7) with follow up ground water monitoring showing ground water depths of surface level to 3.65 m below grade (Elevation 330.38 to 333.99). Basements, if any, must be located at least 1.0 m above the high ground water level. Conventional slab-on-grade construction of basement floor slabs is feasible on compact to dense native soil deposits, or on engineered structural fill compacted to 95% SPMDD.

Preparation of the floor slab subgrade should include stripping of the topsoil, and other deleterious material followed by proofrolling of the exposed subgrade with a heavy roller to ensure uniform adequate support. Excessively loose, soft or compressible materials revealed during the proofrolling operations should be subexcavated and replaced with well compacted approved material.

Fill placed under the floor slab to achieve finished subgrade levels or as foundation excavation backfill should comprise approved inorganic material having a moisture content within 3% of the optimum value, placed in maximum 200 mm thick lifts, and compacted to at least 95% of SPMDD.

A minimum 150 mm thick layer of well compacted clear stone (or equivalent) is recommended directly beneath the slab-on-grade. A polyethylene vapour barrier should be placed at the surface of the stone if a moisture sensitive finish is to be placed on the floor.

For slab-on-grade (basement less) structures, exterior grades should be maintained at least 150 mm below the finished floor slab-on-grade level and sloped to promote drainage away from the building.

Foundation Drainage and Earth Pressure Parameters

Foundation drainage measures should be taken for units with basements. Perforated drainage pipe should be laid around the outside edge of the footings, and connected to a frost free sump system. It is recommended that the drainage pipes be surrounded with a granular filter protected with filter fabric, or alternatively wrapped with filter cloth and surrounded by concrete sand.

A “free draining” granular material, or an equivalent, approved drainage board product must be provided for the basement walls, in accordance with the Ontario Building Code. The onsite native cohesionless deposits may be suitable for use as basement wall backfill. However, it should be noted that soils with high silt content (i.e. silt) are not suitable for use as basement wall backfill unless a drainage board product is provided. Backfilling should not take place until the ground floor has been constructed, in order to provide lateral support for the wall.

In conjunction with the granular material, a weeping tile system should be installed to minimize the build-up of hydrostatic pressure behind the wall. The weeping tile should be surrounded by a properly designed graded granular filter or wrapped with approved geotextile to prevent migration of fines into the system. The drainage pipe should be placed on a positive grade and lead to a frost-free sump or outlet.

The following earth pressure design parameters may be assumed for calculation of backfill materials compacted to 95% SPMDD:

PARAMETER	OPS GRANULAR B	Onsite SAND / SAND AND GRAVEL
Angle of Internal Friction (degrees)	32	30
Unit Weight (kN/m^3)	21	20
Coefficient of Active Earth Pressure (K_a)	0.30	0.33
Coefficient of Earth Pressure At Rest (K_o)	0.47	0.50
Coefficient of Passive Earth Pressure (K_p)	3.23	2.77

Note: Earth pressure coefficients assume Rankin analysis (wall friction ignored, non-sloping backfill)

It is assumed that basement floors will be more than 1.0 m above the ground water table and as such, underfloor drainage systems will not be required.

Excavation and Dewatering

It is assumed that excavations for site grading, footings and service trenches will extend through the surficial topsoil and into the native cohesionless soils, which are classified as Type 3 materials as defined in the Occupational Health and Safety Act (OHSA). Subject to inspection and providing adequate ground water control is achieved, excavations within Type 3 soils that are to be entered by workers should be inclined from the base of the excavation at one horizontal to one vertical (1H:1V) or flatter.

Ground water was first contacted at depths of 0.7 to 2.9 m below grade in the boreholes, corresponding to elevations of 333.4 to 331.7 (metric, geodetic), respectively.

An initial water level was also taken within the monitoring wells once installed. Ground water was measured at depths of 0.75 to 3.4 m below grade in the monitoring wells, corresponding to elevations of between 333.38 and 331.8 (metric, geodetic), respectively. Follow up ground water levels by MTE Consultants Inc., completed between March 2017 and June 2018 showed ground water depths of surface level to 3.65 m below grade (Elevation 330.38 to 333.99). The extent of ground water control will depend on the depth of excavation below the ground water level.

Shallow excavations extending less than 0.5 m below the ground water level can be dewatered using conventional sump pumping techniques. Deeper excavations, extending more than 0.5 m below the ground water level may require extensive ground water control measures such as keg wells or well point dewatering. The actual dewatering methods should be established at the contractor's discretion within the context of a performance specification for the project. Regardless of the dewatering method chosen, the hydraulic head and ground water inflow must be properly controlled to ensure a stable and safe excavation and to facilitate construction. The design of the dewatering system should be specified to maintain and control ground water at least 0.30 m below the excavation base level, in order to provide a stable excavation base throughout construction.

It should be noted that under the Ontario Water Resources Act, the Water Taking and Transfer Regulation 387/04, and in compliance with the Ministry of Environment and Climate Change's (MOECC) policy and Permit to Take Water (PTTW) Manual (April 2005), an application should be filed to the MOECC for the subject project construction dewatering PTTW, if the dewatering discharge is greater than 400,000 L/day, or about 4.6 L/s. If the dewatering discharge is between 50,000 L/day (or about 0.6 L/s) and 400,000 L/day (or about 4.6 L/s), dewatering activities need to be registered on the Environmental Activity and Sector Registry (EASR). Reference is made to the hydrological report by MTE Consultants Inc. for further details.

At the time of tendering, test pits should be excavated on site to allow prospective Contractors to judge the ground water conditions and to determine the appropriate control methods required closer to the time of construction. Ground water conditions are subject to seasonal variations. In this regard, a later summer construction schedule would be preferable.

Pipe Bedding and Backfilling

No bearing problems are anticipated for pipes founded in the native cohesionless soils or structural fill. On stable subgrade, a minimum 150 mm thick bedding course of Granular A material compacted to 95% SPMDD is recommended beneath the pipes. The Granular A material should extend around the pipe to at least 300 mm above the pipe obvert or as set out by Ontario Provincial Standards (OPS), or the local authority.

Backfill below pavements, floor slabs and other settlement sensitive features should be similarly compacted to 95% SPMDD. Backfill should be placed in 300 mm maximum lifts. Material that is too wet for compaction to a minimum of 95% SPMDD should be allocated for use in landscaped / non settlement sensitive locations, and compacted to at least 90% SPMDD.

The trenching and backfilling operations should be carried out in a manner which minimizes the length of trench left open yet accommodates efficient pipe laying and compaction activities.

Pavement Construction

Prior to the construction of the new pavements, surficial topsoil, fill and loose to very loose deposits should be removed. If some settlement is acceptable, the loose to very loose soils can remain in place. Based on the anticipated traffic patterns, frost susceptibility, and strength of the expected subgrade soils, the following pavement component thicknesses are considered suitable for local residential and parking lot traffic categories (no truck / heavy vehicle use).

PAVEMENT COMPONENT	**THICKNESS (mm)**
Asphalt	80
Granular A Base	150
Granular B Subbase	350

The flexible pavement designs provided above consider that construction will be carried out during the drier time of the year and the subgrade is stable, as determined by proofrolling inspected by PML personnel. If the subgrade is wet and unstable, additional granular subbase will be required.

The pavement materials should conform to current OPS specifications. The Granular A base and Granular B subbase courses should be placed in thin lifts and compacted to a minimum of 100% SPMDD, and asphalt should be placed to a minimum of 92% of the material's maximum relative density (MRD). Reference is made to OPS Specification 310, as revised.

During construction, testing should be conducted to confirm the gradation and compactibility characteristics of the granular base and subbase materials and the mix design properties of the asphalt.

Proofrolling procedures and the placement and compaction of all the fill and granular materials and asphalt for the pavement construction and backfilling at the site should be inspected on a continuous basis by PML technicians.

If relatively impermeable silty soils are present at a shallow depth beneath the pavement structure, pavement subdrains should be provided to prevent water accumulation on the pavement subgrade surface. The subgrade should be graded so that water is directed to the catch basin structures or to the pavement edge. Subdrains should be discharged in to the catch basins. The subdrains may consist of filter wrapped, 100 mm diameter perforated plastic pipe, set within the subbase layer at the subgrade surface.

Soil Infiltration

Soil infiltration rates for storm water management (SWM) and roof water infiltration systems were determined for the major near surface soil units and are as follows:

SOIL TYPE	ESTIMATED COEFFICIENT OF PERMEABILITY (cm/sec)	INFILTRATION RATE (mm/hr)
Sand / Sand and Gravel	1×10^{-3}	30

Any SWM ponds should be inspected by PML personnel during construction to verify the presence of a suitable subgrade. In general, the slopes of the storm water management pond should be constructed at 5H:1V or shallower and be provided with vegetation cover to minimize the potential for erosion and sloughing of the side slopes.

Limited Chemical Testing Program

As noted, a limited chemical testing program was completed on samples recovered during geotechnical investigation. PML understands that excess soil may be generated during construction, the volume of which is unknown at this time. The chemical testing program was completed to check the geoenvironmental quality of the site soils at selected sampling locations in order to provide commentary regarding on site or off site re-use and / or disposal options of potentially excess soils.

The soil sampling and testing was conducted as a limited testing program. A Phase One Environmental Site Assessment (ESA) was not within the scope of work for this assignment. Accordingly, soil and ground water impairment that has not been identified by the limited chemical testing program may exist elsewhere at the site. The limited chemical testing program does not constitute an ESA as defined under the Environmental Protection Act and O. Reg. 153/04, as amended.

Chemical Testing Protocol

Representative samples collected during the geotechnical investigation were returned to our laboratory for detailed visual examination. Soil samples were submitted for chemical analysis to AGAT Laboratories Limited (AGAT), a Canadian Association for Laboratory Accreditation Inc. (CALA) accredited laboratory in Mississauga, Ontario. The chemical analyses conducted by AGAT were in accordance with the O. Reg. 153/04, as amended Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act dated March 9, 2004, amended as of July 1, 2011.

As part of the geoenvironmental procedural protocol, all recovered soil samples were examined for visual and olfactory evidence of potential contamination. In addition, soil vapour concentrations (SVCs) were measured in the headspace of the recovered samples. The measured SVCs were typically 0 to 5 parts per million, which are not considered significant.

Five soil samples were submitted for chemical analysis for metals and inorganic parameters, and two samples were submitted for analysis for organochlorine (OC) pesticides. Selection of samples was based on visual and olfactory indications of contamination, SVCs and for general coverage. Details of the samples submitted for chemical testing are as follows:

SAMPLE ID	BOREHOLE	SAMPLE NUMBER	DEPTH (m)	SOIL TYPE	PARAMETERS TESTED
BH4 SS1	1	1	0 to 0.6	Topsoil	M&I and OC pesticides
BH5 SS1	5	1	0 to 0.6	Topsoil	M&I
BH5 SS4	5	4	2.3 to 2.7	Native	M&I
BH6 SS1	6	1	0 to 0.6	Topsoil / Fill	M&I and OC pesticides
BH6 SS3	6	3	1.5 to 2.1	Native	M&I

Site Condition Standards

The Ministry of the Environment, Conservation and Parks (MECP) has developed a set of Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act (April 15, 2011) and O.Reg. 153/04, as amended. The standards consist of nine tables (Table 1 through Table 9) that provide criteria for maximum concentrations of various contaminants. In general, the applicable Table and corresponding Site Condition Standards (SCSs) depend on the site location, land use, soil texture, bedrock depth, soil pH and source of potable water at the site.

The site is currently comprised of several residential dwellings and it is to be developed into a residential subdivision. The site is bordered by the Torrance Creek Wetland Complex to the north, which is a provincially significant wetland as identified by the Ministry of Natural Resources. Based on review of the above factors, PML selected the Generic Criteria of the O.Reg. 153/04, Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act dated April 15, 2011. In particular, the Table 1 (T1) Full Depth Background Site Condition Standards for Residential / Parkland / Institutional / Industrial / Commercial / Community (RPI/ICC) property use would likely apply to the site; however a full evaluation of applicable SCSs in accordance with Sections 41 and 43.1 of O.Reg. 153/04, as amended, was not within the scope of this assignment and further environmental work would be required to confirm this.

For off site re-use with minimal environmental restrictions, the O.Reg. 153/04, as amended, Full Depth Background Table 1 (T1) SCSs for RPI/ICC property uses were utilized. In addition, the Full Depth Generic SCSs (T2) in a Portable Ground Water Condition for ICC property use are also examined.

It is noted that a comparison to the Table 3 SCSs for full depth generic condition, Tables 4 and 5 SCSs for stratified site condition, Tables 6 and 7 SCSs for shallow bedrock condition and Table 8 and Table 9 for use within 30 m of a water body for a non-potable ground water condition were not conducted as part of this assignment. If the potential receiving site for excess soil falls within one of these categories, additional evaluation by PML will be required to confirm conformance.

Analytical Findings and Conclusions

Laboratory certificates of analysis compared to the Table 1 and 2 SCSs are included in Appendix C. The measured values and corresponding Standards (labelled as G/S for Guideline / Standard) are shown on the certificates of analysis. In the event of an exceedance of the SCSs, the level is shown in **bold** text, where applicable.

On Site Re-use

Based on the results of chemical testing, the measured concentrations of the tested parameters met the T1 RPI/ICC SCSs, with the exception of zinc in two samples (BH5 SS1 and BH6 SS3).

It is noted that there is no legal imperative to remove or treat the soil that exceeds the applicable SCSs, provided it is demonstrated that there is no off site impact or adverse effect. However, if contaminated soil is left on site, the landowner assumes liability associated with the contamination. The liability concerns could include potential scrutiny from the MECP, neighbouring property owners and the public; potential for decreased value of the land and issues during potential divesting of the property due to environmental liability concerns on the part of future owners or their financiers/insurers.

Off Site Re-use

As noted, the measured concentrations of the tested parameters met the T1 RPI/ICC SCSs, with the exception of zinc in two samples (BH5 SS1 and BH6 SS3). When compared to the T2 ICC Standards, one sample (BH6 SS3) exceeded the SCS for zinc.

If the soil is to be removed from the site for off site re-use, the following conditions must be met:

- The extent of the material that exceeds the applicable SCSs is delineated;
- All analytical results and environmental assessment reports must be fully disclosed to the receiving site owners / authorities and they have agreed to receive the material;
- The work must be completed in accordance with local by-laws governing soil movement and/or placement at other sites;
- The applicable SCSs for the receiving site have been determined, as confirmed by the environmental consultant and the SCSs are consistent with the chemical quality of the soil originating at the source site;
- Transportation and placement of the excess soil is monitored by the environmental consultant to check the material is appropriately placed at the pre-approved site;
- The excess soil cannot be taken to a property for which a RSC is being filed as outlined in O.Reg. 153/04, as amended, unless the chemical testing program is completed in accordance with the regulation;
- The excess soil cannot be taken to a property for which a RSC has been previously filed unless the soil quality meets the SCSs contained in the RSC;
- The receiving site must be arranged and/or approved well in advance of excavation in order to avoid delays during construction. As well, it is noted the chemical testing requirements for various receiving sites is site-specific and additional testing may be required, beyond that provided in this report; and

- The excavation work should be conducted in accordance with a Soil Management Plan prepared by a qualified professional to ensure that all surplus excavated material is tested and managed appropriately, and that imported fill material is of suitable quality and meets the SCSs applicable to the site. Re-use of excess excavated soil on site is also subject to acceptance for re-use by the geotechnical consultant at the time of construction based on geotechnical considerations.

If landfill disposal of excess soils is considered, PML recommends toxicity characteristic leaching procedure (TCLP) testing be completed in accordance with O. Reg. 347/558, Schedule 4, as amended.

It is recommended that transportation of fill material from the Source Site(s) to the Receiving Site(s) be carried out in accordance with the MECP document Management of Excess Soil – A guideline for Best Management Practices dated January, 2014.

Additional sampling and chemical testing should be carried out during construction to verify the chemical quality of the excess soil to assess the appropriate management/disposal options for the soil leaving the site.

It should be noted that the soil conditions may differ from those encountered during this assignment. PML should be contacted if impacted soil conditions become apparent to further assess and appropriately handle the materials, if any, and to evaluate whether modifications to the conclusions documented in this report are necessary.

Geotechnical Review and Construction Inspection and Testing

It is recommended that the design drawings be submitted to PML for general geotechnical review for compatibility with the site conditions and recommendations of this report.

Earthworks operations should be carried out under the supervision of PML to approve subgrade preparation, backfill materials, placement and compaction procedures, and verify the specified degree of compaction is achieved uniformly throughout fill materials.

The comments and preliminary recommendations provided in this report are based on the information revealed in the boreholes. Conditions away from and between boreholes may vary. Geotechnical review during construction should be on going to confirm the subsurface conditions are substantially similar to those encountered in the boreholes, which may otherwise require modification to the original recommendations.

Closure

This assignment is subject to the Statement of Limitations that is included in Appendix B and must be read in conjunction with this report.

We trust this report has been completed within our terms of reference, and is sufficient for your immediate requirements. If you have any questions or require further information, please do not hesitate to contact our office.

Sincerely

Peto MacCallum Ltd.

Hassen Shinwary, BASc
Project Supervisor
Geotechnical and Geoenvironmental Services

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Gerry Mitchell, MEng, P.Eng.
Vice President

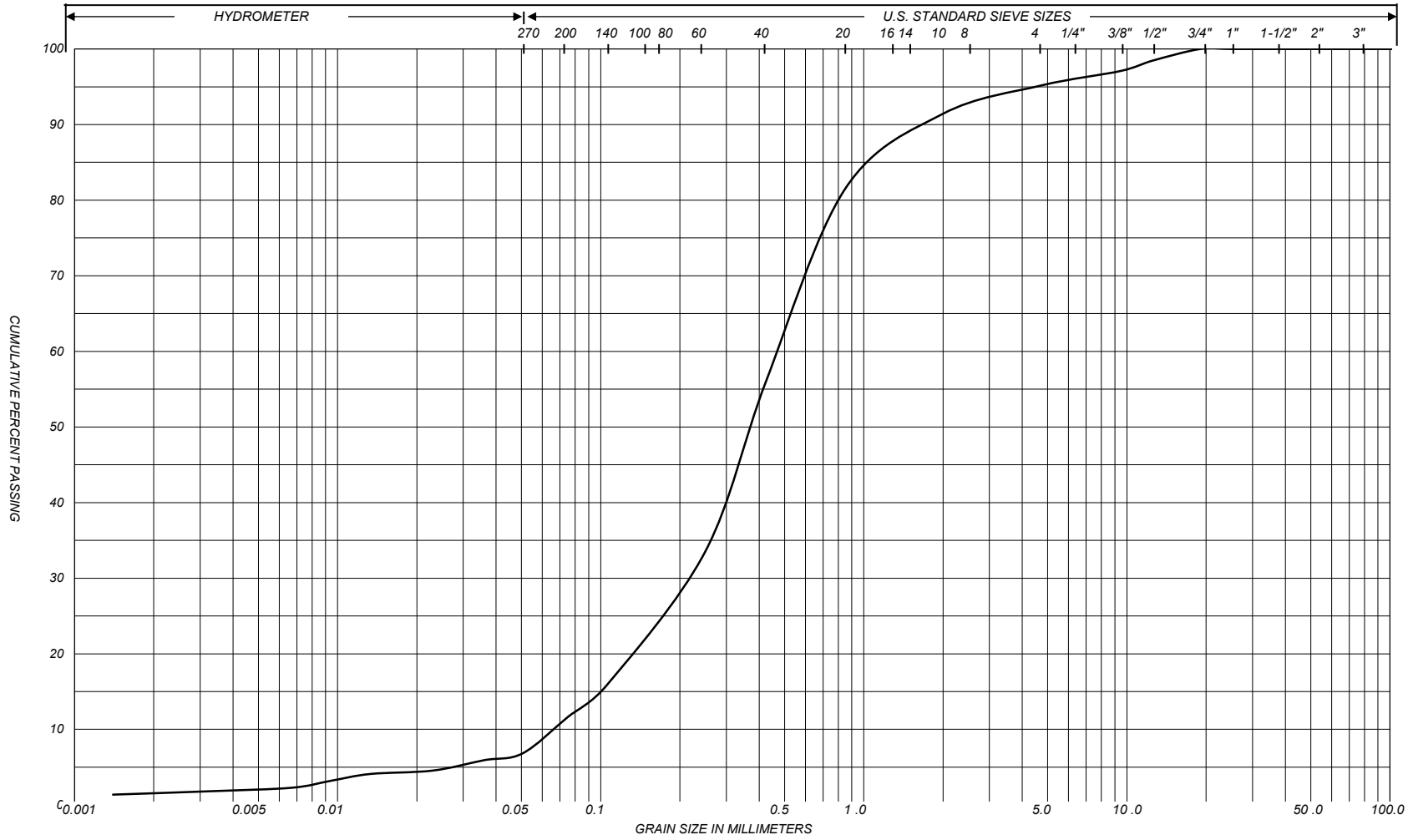
HS/KH:sh

Enclosures:
Figures 1 to 2 – Particle Size Distribution Charts
List of Abbreviations
Log of Boreholes 1 to 6
Drawing 1 – Borehole Location Plan
Appendix A – Engineered Fill
Appendix B – Statement of Limitations
Appendix C – AGAT Certificates of Analysis

Peto MacCallum Ltd.
CONSULTING ENGINEERS

PARTICLE SIZE DISTRIBUTION CHART

PML REF. 17KF002
REPORT NO. 1
FIGURE. 1



SILT & CLAY				FINE	MEDIUM	COARSE	GRAVEL				COBBLES	UNIFIED
				SAND								
CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	GRAVEL				COBBLES	M.I.T.
	SILT			SAND								
CLAY	SILT			VERY FINE	FINE	MEDIUM	COARSE	GRAVEL				U.S. BUREAU
				SAND								

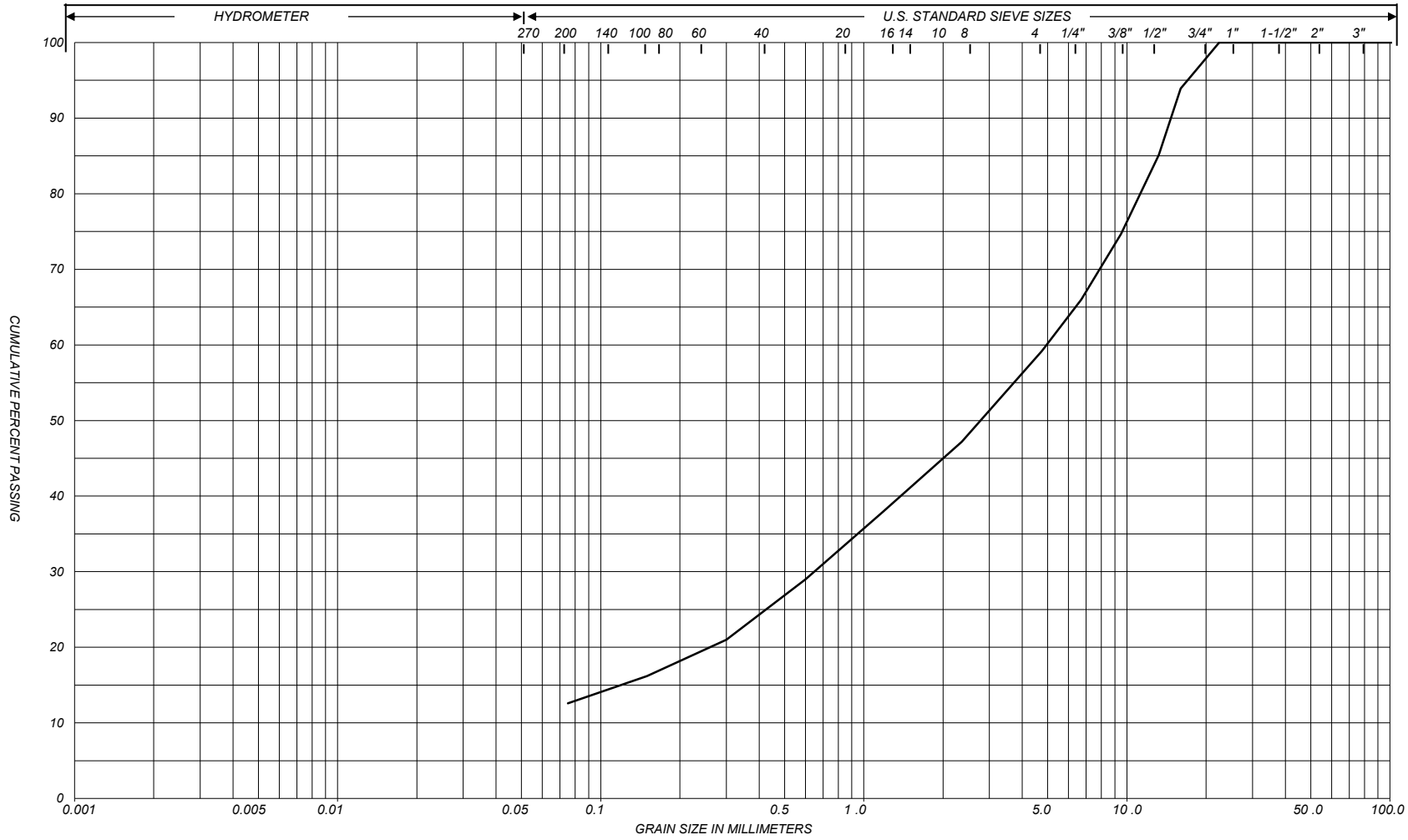
REMARKS Borehole 1, Sample SS6, Depth 4.5 to 5.0 m

SAND, SOME SILT, TRACE GRAVEL

Peto MacCallum Ltd.
CONSULTING ENGINEERS

PARTICLE SIZE DISTRIBUTION CHART

PML REF. 17KF002
REPORT NO. 1
FIGURE. 2



SILT & CLAY			FINE	MEDIUM	COARSE	GRAVEL		COBBLES	UNIFIED		
			SAND								
CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	GRAVEL		COBBLES	M.I.T.	
	SILT			SAND							
CLAY	SILT		VERY FINE	FINE	MEDIUM	COARSE	GRAVEL			U.S. BUREAU	
			SAND								

REMARKS Borehole 2, Sample SS2, Depth 0.7 to 1.2 m

SAND AND GRAVEL, SOME SILT

LIST OF ABBREVIATIONS

PENETRATION RESISTANCE

Standard Penetration Resistance N: - The number of blows required to advance a standard split spoon sampler 0.3 m into the subsoil. - Driven by means of a 63.5 kg hammer falling freely a distance of 0.76 m.

Dynamic Penetration Resistance: The number of blows required to advance a 51 mm, 60 degree cone, fitted to the end of drill rods, 0.3 m into the subsoil. The driving energy being 475 J per blow.

DESCRIPTION OF SOIL

The consistency of cohesive soils and the relative density or denseness of cohesionless soils are described in the following terms:

CONSISTENCY	N (blows/0.3 m)	c (kPa)	DENSENESS	N (blows/0.3 m)
Very Soft	0 - 2	0 - 12	Very Loose	0 - 4
Soft	2 - 4	12 - 25	Loose	4 - 10
Firm	4 - 8	25 - 50	Compact	10 - 30
Stiff	8 - 15	50 - 100	Dense	30 - 50
Very Stiff	15 - 30	100 - 200	Very Dense	> 50
Hard	> 30	> 200		

WTPL	Wetter Than Plastic Limit
APL	About Plastic Limit
DTPL	Drier Than Plastic Limit

TYPE OF SAMPLE

SS	Split Spoon	TW	Thinwall Open
WS	Washed Sample	TP	Thinwall Piston
SB	Scraper Bucket Sample	OS	Oesterberg Sample
AS	Auger Sample	FS	Foil Sample
CS	Chunk Sample	RC	Rock Core
ST	Slotted Tube Sample	USS	Undisturbed Shear Strength
PH	Sample Advanced Hydraulically	RSS	Remoulded Shear Strength
PM	Sample Advanced Manually		

SOIL TESTS

Qu	Unconfined Compression	LV	Laboratory Vane
Q	Undrained Triaxial	FV	Field Vane
Qcu	Consolidated Undrained Triaxial	C	Consolidation
Qd	Drained Triaxial		

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 1

PROJECT Proposed Arkell Road Subdivision
LOCATION Arkell Road, Guelph, Ontario
BORING METHOD Continuous Flight Hollow Stem Augers
BORING DATE: 2017 02 13
PML REF.: 17KF002
ENGINEER K. Hanes
TECHNICIAN H. Shinwary

DEPTH in METRES	DESCRIPTION	LEGEND	NUMBER	TYPE	BLOWS/0.3m N - VALUES	ELEVATION SCALE
	GROUND ELEVATION 334.56					
0.10	TOPSOIL: Dark brown silt, trace sand, numerous rootlets, damp		1	SS	7	
0.46						
0.69	FILL: Brown sand and gravel, trace silt, moist					
333.87			2	SS	42	
	SILT: Loose brown silt, trace sand, occasional rootlets, damp					
	SAND AND GRAVEL: Dense to very dense brown sand and gravel, trace to some silt, numerous cobbles, damp		3	SS	50/150mm	
2.1						
332.5	becoming moist		4	SS	39	
2.9						
331.7	becoming compact, no cobbles, saturated, contains saturated silt layers		5	SS	23	
4.0						
330.6	SAND: Compact brown sand, trace to some silt, trace gravel, saturated		6	SS	12	
6.6			7	SS	16	
328.0	BOREHOLE TERMINATED AT 6.6 m					

SHEAR STRENGTH C_u (kPa) 50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M 20 40 60 80

LIQUID LIMIT _____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ___ W
W_P W W_L
WATER CONTENT % 10 20 30

UNIT WEIGHT γ kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

GR SA SI&CL

Sampler wet from SS5

Upon completion of augering
Wet cave to 3.1 m

NOTES: Headspace: SS1 0ppm, SS2 0ppm, SS3 0ppm, SS4 0ppm, SS5 0ppm, SS6 0ppm, SS7 0ppm

WATER LEVEL OBSERVED DURING / UPON COMPLETION OF DRILLING
WATER LEVEL MEASURED IN MONITORING WELL

UNDISTURBED FIELD VANE
REMOLDED FIELD VANE
LAB SHEAR TEST
POCKET PENETROMETER
POCKET TORVANE

CHECKED BY KH

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 2

PROJECT Proposed Arkell Road Subdivision
LOCATION Arkell Road, Guelph, Ontario
BORING METHOD Continuous Flight Hollow Stem Augers
BORING DATE: 2017 02 13
PML REF.: 17KF002
ENGINEER K. Hanes
TECHNICIAN H. Shinwary

GROUND ELEVATION 335.16

DEPTH in METRES	DESCRIPTION	NUMBER	TYPE	BLOWS/0.3m N - VALUES
0.25 / 334.91	TOPSOIL: Dark brown silt, trace sand, numerous rootlets, damp	1	SS	3
0.69 / 334.47	SILT: Loose dark brown silt, some sand, trace gravel, occasional rootlets, damp	2	SS	57
	SAND AND GRAVEL: Very dense sand and gravel, trace to some silt, numerous cobbles, damp	3	SS	64
2.1 / 333.1	SAND: Compact to dense brown sand, trace to some silt, trace gravel, occasional cobbles, saturated	4	SS	34
		5	SS	31
		6	SS	30
		7	SS	26
7.7 / 8.1 / 327.1	SILT: Dense brown silt, trace sand, trace gravel, wet BOREHOLE TERMINATED AT 8.1 m	8	SS	39

SHEAR STRENGTH C_u (kPa) 50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M 20 40 60 80

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ___ W
W_P W W_L
WATER CONTENT % 10 20 30

UNIT WEIGHT γ kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

Stick up
GR SA SI&CL
Concrete
Sampler wet from SS4
Bentonite Seal
50 mm Plastic Riser
FIlter Sand
Screen

Water Level Readings:
Initial: 3.40 m
Elevation: 331.76

2017-04: 2.51 m
Elevation: 332.45

NOTES: Headspace: SS1 0ppm, SS2 0ppm, SS3 0ppm, SS4 0ppm, SS5 5ppm, SS6 0ppm, SS7 0ppm, SS8 0ppm

WATER LEVEL OBSERVED DURING / UPON COMPLETION OF DRILLING
WATER LEVEL MEASURED IN MONITORING WELL

UNDISTURBED FIELD VANE
REMOLDED FIELD VANE
LAB SHEAR TEST
POCKET PENETROMETER
POCKET TORVANE

CHECKED BY KH

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 3

PROJECT Proposed Arkell Road Subdivision
LOCATION Arkell Road, Guelph, Ontario
BORING METHOD Continuous Flight Hollow Stem Augers
BORING DATE: 2017 02 13
PML REF.: 17KF002
ENGINEER K. Hanes
TECHNICIAN H. Shinwary

DEPTH in METRES	DESCRIPTION	LEGEND	NUMBER	TYPE	BLOWS/0.3m N - VALUES	ELEVATION SCALE
	GROUND ELEVATION 334.42					
0.20	TOPSOIL: Dark brown silt, trace sand, numerous rootlets, moist		1	SS	5	334
0.51 / 333.91	SILT: Loose dark brown silt, some sand, occasional rootlets		2	SS	3	
1.4 / 333.1	SAND AND GRAVEL: Very loose brown sand and gravel, trace to some silt, occasional cobbles, damp becoming compact, saturated		3	SS	35	333
			4	SS	31	332
2.9 / 331.5	SAND: Compact to dense brown sand, trace to some silt, trace gravel, occasional cobbles, saturated		5	SS	24	331
			6	SS	42	330
			7	SS	27	329
7.8			8	SS	21	328
8.0 / 326.4	SILT: Compact brown silt, trace sand, trace gravel, wet BOREHOLE TERMINATED AT 8.0 m					327

SHEAR STRENGTH C_u (kPa) 50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M 20 40 60 80

LIQUID LIMIT _____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ___ W
W_P W W_L
WATER CONTENT % 10 20 30

UNIT WEIGHT γ kN/m^3

GROUND WATER OBSERVATIONS AND REMARKS

Stick up
Concrete
Sampler wet from SS3
Bentonite Seal
50 mm Plastic Riser
FIlter Sand
Screen

Water Level Readings:
Initial: 1.95 m
Elevation: 332.47

2017-04: 1.86 m
Elevation: 332.56

NOTES: Headspace: SS1 0ppm, SS2 0ppm, SS3 0ppm, SS4 0ppm, SS5 5ppm, SS6 0ppm, SS7 5ppm, SS8 0ppm

WATER LEVEL OBSERVED DURING / UPON COMPLETION OF DRILLING
WATER LEVEL MEASURED IN MONITORING WELL

+ UNDISTURBED FIELD VANE
⊕ REMOLDED FIELD VANE
⊛ LAB SHEAR TEST
▲ POCKET PENETROMETER
◆ POCKET TORVANE

CHECKED BY KH

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 4

PROJECT Proposed Arkell Road Subdivision
LOCATION Arkell Road, Guelph, Ontario
BORING METHOD Continuous Flight Hollow Stem Augers
BORING DATE: 2017 03 21
PML REF.: 17KF002
ENGINEER K. Hanes
TECHNICIAN H. Shinwary

DEPTH in METRES	DESCRIPTION	NUMBER	TYPE	BLOWS/0.3m N - VALUES	ELEVATION SCALE
	GROUND ELEVATION 334.13				
0.30	TOPSOIL: Dark brown silt, trace sand, numerous rootlets, moist	1	SS	6	334
0.69 / 333.44	SAND AND GRAVEL: Compact brown sand and gravel, trace to some silt, occasional cobbles, moist	2	SS	13	333
1.5	becoming saturated				
332.7	SAND: Compact brown sand, trace to some silt, trace gravel, saturated	3	SS	14	332
		4	SS	11	
		5	SS	12	331
		6	SS	18	330
		7	SS	10	329
		8	SS	25	328
8.1 / 326.0	BOREHOLE TERMINATED AT 8.1 m				327

SHEAR STRENGTH C_u (kPa) 50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M 20 40 60 80

LIQUID LIMIT _____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ___ W
W_P W W_L
WATER CONTENT % 10 20 30

UNIT WEIGHT γ kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

Stick up
GR SA SI&CL
Concrete
Sampler wet from SS2
Bentonite Seal
FIlter Sand
Screen

Water Level Readings:
Initial: 0.75 m
Elevation: 333.38

2017-04: 0.44 m
Elevation: 333.55

NOTES: Headspace: SS1 0ppm, SS2 5ppm, SS3 0ppm, SS4 5ppm, SS5 0ppm, SS6 0ppm, SS7 0ppm, SS8 0ppm

WATER LEVEL OBSERVED DURING / UPON COMPLETION OF DRILLING
WATER LEVEL MEASURED IN MONITORING WELL

UNDISTURBED FIELD VANE
REMOLDED FIELD VANE
LAB SHEAR TEST
POCKET PENETROMETER
POCKET TORVANE

CHECKED BY KH

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 5

PROJECT Proposed Arkell Road Subdivision
LOCATION Arkell Road, Guelph, Ontario
BORING METHOD Continuous Flight Hollow Stem Augers
BORING DATE: 2017 03 21
PML REF.: 17KF002
ENGINEER K. Hanes
TECHNICIAN H. Shinwary

DEPTH in METRES	DESCRIPTION	NUMBER	TYPE	BLOWS/0.3m N - VALUES	ELEVATION SCALE
	GROUND ELEVATION 334.97				
0.25 / 334.72	TOPSOIL: Dark brown silt, trace sand, trace gravel, numerous rootlets, damp	1	SS	13	
	SAND AND GRAVEL: Dense brown sand and gravel, trace to some silt, numerous cobbles, damp	2	SS	49	334
		3	SS	31	
2.2 / 332.8	SAND: Compact brown sand, some gravel, trace to some silt, occasional cobbles, saturated	4	SS	24	333
		5	SS	27	332
		6	SS	14	331
5.6 / 329.4	becoming very dense	7	SS	51	330
7.1 / 327.9	SAND AND GRAVEL: Very dense brown sand and gravel, trace silt, numerous cobbles, saturated	8	SS	52	329
8.1 / 326.9	BOREHOLE TERMINATED AT 8.1 m				328
					327

SHEAR STRENGTH C_u (kPa) 50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M 20 40 60 80

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ___ W
W_P W W_L
WATER CONTENT % 10 20 30

UNIT WEIGHT γ kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

Stick up
GR SA SI&CL
Concrete
Sampler wet from SS4
Bentonite Seal
FIlter Sand
Screen

Water Level Readings:
Initial: 2.3 m
Elevation: 332.67

2017-04: 2.18 m
Elevation: 332.65

NOTES: Headspace: SS1 0ppm, SS2 0ppm, SS3 5ppm, SS4 5ppm, SS5 0ppm, SS6 0ppm, SS7 0ppm, SS8 0ppm

WATER LEVEL OBSERVED DURING / UPON COMPLETION OF DRILLING
WATER LEVEL MEASURED IN MONITORING WELL

UNDISTURBED FIELD VANE
REMOLDED FIELD VANE
LAB SHEAR TEST
POCKET PENETROMETER
POCKET TORVANE

CHECKED BY KH

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 6

PROJECT Proposed Arkell Road Subdivision
LOCATION Arkell Road, Guelph, Ontario
BORING METHOD Continuous Flight Hollow Stem Augers
BORING DATE: 2017 03 21
PML REF.: 17KF002
ENGINEER K. Hanes
TECHNICIAN H. Shinwary

DEPTH in METRES	DESCRIPTION	LEGEND	NUMBER	TYPE	BLOWS/0.3m N - VALUES	ELEVATION SCALE
	GROUND ELEVATION 334.0					
0.20	TOPSOIL: Dark brown silt, trace sand, numerous rootlets, damp		1	SS	18	
0.41						
0.69	FILL: Dark brown silt, some sand, trace gravel, occasional rootlets, damp					
333.31			2	SS	45	333
1.5	SAND AND GRAVEL: Dense brown sand and gravel, trace to some silt, numerous cobbles, damp					
332.6	becoming moist		3	SS	36	
2.2	becoming saturated					332
331.8	SILT: Compact brown silt, trace sand, trace gravel, trace clay, wet to saturated		4	SS	12	
			5	SS	10	331
						330
			6	SS	16	
5.8						329
328.2	SILT TILL: Very dense brown silt, some sand, some gravel, occasional cobbles, damp		7	SS	50/75mm	328
6.6						
327.4	BOREHOLE TERMINATED AT 6.6 m					

SHEAR STRENGTH C_u (kPa) 50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M 20 40 60 80

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ___ W
W_P W W_L
WATER CONTENT % 10 20 30

UNIT WEIGHT γ kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

GR SA SI&CL

Sampler wet from SS3

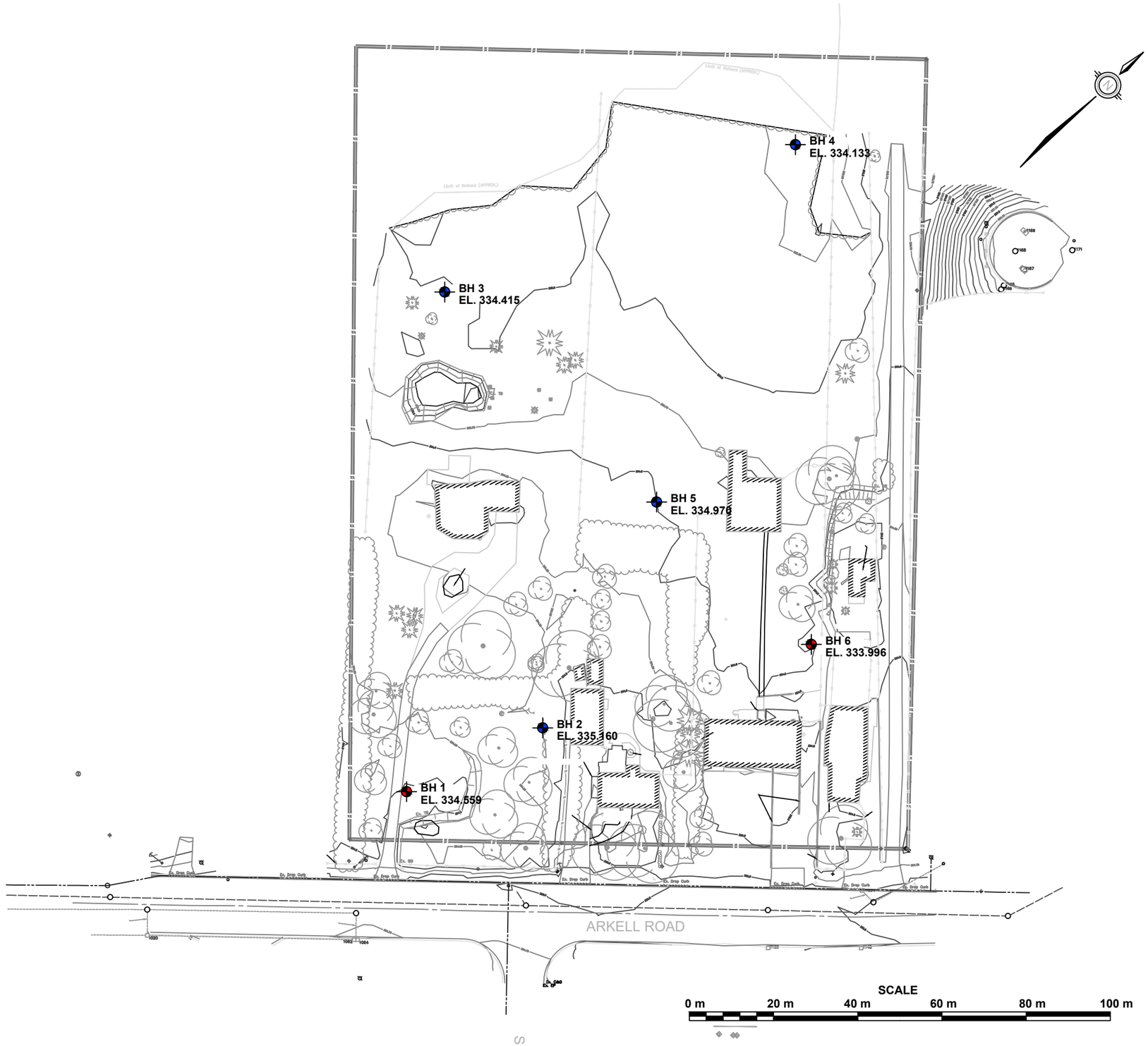
Upon completion of augering
Cave to 2.0 m
Free water at 1.83 m

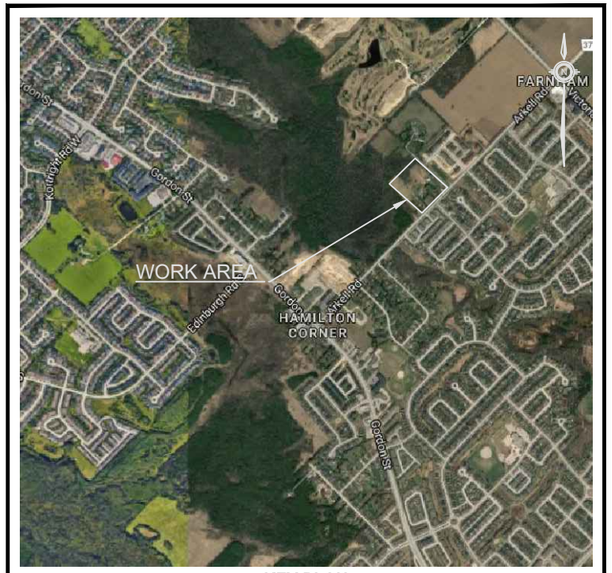
NOTES: Headspace: SS1 0ppm, SS2 0ppm, SS3 0ppm, SS4 5ppm, SS5 0ppm, SS6 0ppm, SS7 0ppm

WATER LEVEL OBSERVED DURING / UPON COMPLETION OF DRILLING
WATER LEVEL MEASURED IN MONITORING WELL

UNDISTURBED FIELD VANE
REMOLDED FIELD VANE
LAB SHEAR TEST
POCKET PENETROMETER
POCKET TORVANE

CHECKED BY KH





KEY PLAN

LEGEND:

- BOREHOLE
- BOREHOLE WITH MONITORING WELL

REFERENCE:

BOREHOLE LOCATION PLAN REPRODUCED FROM DRAWING SUPPLIED BY CLIENT.

NOTE:

THE INFERRED STRATIGRAPHY REFERRED TO IN THE REPORT IS BASED ON THE DATA FROM THESE BOREHOLES SUPPLEMENTED BY GEOLOGICAL EVIDENCE. THE ACTUAL STRATIGRAPHY BETWEEN THE BOREHOLES MAY VARY.

CRESCENT HOMES

PROPOSED ARKELL ROAD SUBDIVISION

ARKELL ROAD

GUELPH, ONTARIO

BOREHOLE LOCATION PLAN

PML Peto MacCallum Ltd.
CONSULTING ENGINEERS

DRAWN	D. BRICE	DATE	SCALE	PML REF.	DWG. NO.
CHECKED	H. SHINWARY	SEPTEMBER 2018	AS SHOWN	17KF002	1
APPROVED	W. LOGHRIN				

APPENDIX A

ENGINEERED FILL

ENGINEERED FILL

The information presented in this appendix is intended for general guidance only. Site specific conditions and prevailing weather may require modification of compaction standards, backfill type or procedures. Each site must be discussed, and procedures agreed with Peto MacCallum Ltd. prior to the start of the earthworks and must be subject to ongoing review during construction. This appendix is not intended to apply to embankments. Steeply sloping ravine residential lots require special consideration.

For fill to be classified as engineered fill suitable for supporting structural loads, a number of conditions must be satisfied, including but not necessarily limited to the following:

1. Purpose

The site specific purpose of the engineered fill must be recognized. In advance of construction, all parties should discuss the project and its requirements and agree on an appropriate set of standards and procedures.

2. Minimum Extent

The engineered fill envelope must extend beyond the footprint of the structure to be supported. The minimum extent of the envelope should be defined from a geotechnical perspective by:

- at founding level, extend a minimum 1.0 m beyond the outer edge of the foundations, greater if adequate layout has not yet been completed as noted below; and
- extend downward and outward at a slope no greater than 45° to meet the subgrade

All fill within the envelope established above must meet the requirements of engineered fill in order to support the structure safely. Other considerations such as survey control, or construction methods may require an envelope that is larger, as noted in the following sections.

Once the minimum envelope has been established, structures must not be moved or extended without consultation with Peto MacCallum Ltd. Similarly, Peto MacCallum Ltd. should be consulted prior to any excavation within the minimum envelope.

3. Survey Control

Accurate survey control is essential to the success of an engineered fill project. The boundaries of the engineered fill must be laid out by a surveyor in consultation with engineering staff from Peto MacCallum Ltd. Careful consideration of the maximum building envelope is required.

During construction it is necessary to have a qualified surveyor provide total station control on the three dimensional extent of filling.

4. Subsurface Preparation

Prior to placement of fill, the subgrade must be prepared to the satisfaction of Peto MacCallum Ltd. All deleterious material must be removed and in some cases, excavation of native mineral soils may be required.

Particular attention must be paid to wet subgrades and possible additional measures required to achieve sufficient compaction. Where fill is placed against a slope, benching may be necessary and natural drainage paths must not be blocked.

5. Suitable Fill Materials

All material to be used as fill must be approved by Peto MacCallum Ltd. Such approval will be influenced by many factors and must be site and project specific. External fill sources must be sampled, tested and approved prior to material being hauled to site.

6. Test Section

In advance of the start of construction of the engineered fill pad, the Contractor should conduct a test section. The compaction criterion will be assessed in consultation with Peto MacCallum Ltd. for the various fill material types using different lift thicknesses and number of passes for the compaction equipment proposed by the Contractor.

Additional test sections may be required throughout the course of the project to reflect changes in fill sources, natural moisture content of the material and weather conditions.

The Contractor should be particularly aware of changes in the moisture content of fill material. Site review by Peto MacCallum Ltd. is required to ensure the desired lift thickness is maintained and that each lift is systematically compacted, tested and approved before a subsequent lift is commenced.

7. Inspection and Testing

Uniform, thorough compaction is crucial to the performance of the engineered fill and the supported structure. Hence, all subgrade preparation, filling and compacting must be carried out under the full time inspection by Peto MacCallum Ltd.

All founding surfaces for all buildings and residential dwellings or any part thereof (including but not limited to footings and floor slabs) on structural fill or native soils must be inspected and approved by PML engineering personnel prior to placement of the base/subbase granular material and/or concrete. The purpose of the inspection is to ensure the subgrade soils are capable of supporting the building/house foundation and floor slab loads and to confirm the building/house envelope does not extend beyond the limits of any structural fill pads.

8. Protection of Fill

Fill is generally more susceptible to the effects of weather than natural soil. Fill placed and approved to the level at which structural support is required must be protected from excessive wetting, drying, erosion or freezing. Where adequate protection has not been provided, it may be necessary to provide deeper footings or to strip and recompact some of the fill.

9. Construction Delay Time Considerations

The integrity of the fill pad can deteriorate due to the harsh effects of our Canadian weather. Hence, particular care must be taken if the fill pad is constructed over a long time period.

It is necessary therefore, that all fill sources are tested to ensure the material compactability prior to the soil arriving at site. When there has been a lengthy delay between construction periods of the fill pad, it is necessary to conduct subgrade proof rolling, test pits or boreholes to verify the adequacy of the exposed subgrade to accept new fill material.

When the fill pad will be constructed over a lengthy period of time, a field survey should be completed at the end of each construction season to verify the areal extent and the level at which the compacted fill has been brought up to, tested and approved.

In the following spring, subexcavation may be necessary if the fill pad has been softened attributable to ponded surface water or freeze/thaw cycles.

A new survey is required at the beginning of the next construction season to verify that random dumping and/or spreading of fill has not been carried out at the site.

10. Approved Fill Pad Surveillance

It should be appreciated that once the fill pad has been brought to final grade and documented by field survey, there must be ongoing surveillance to ensure that the integrity of the fill pad is not threatened.

Grading operations adjacent to fill pads can often take place several months or years after completion of the fill pad.

It is imperative that all site management and supervision staff, the staff of Contractors and earthwork operators be fully aware of the boundaries of all approved engineered fill pads.

Excavation into an approved engineered fill pad should never be contemplated without the full knowledge, approval and documentation by the geotechnical consultant.

If the fill pad is knowingly built several years in advance of ultimate construction, the areal limits of the fill pad should be substantially overbuilt laterally to allow for changes in possible structure location and elevation and other earthwork operations and competing interests on the site. The overbuilt distance required is project and/or site specified.

Iron bars should be placed at the corner/intermediate points of the fill pad as a permanent record of the approved limits of the work for record keeping purposes.

11. Unusual Working Conditions

Construction of fill pads may at times take place at night and/or during periods of freezing weather conditions because of the requirements of the project schedule. It should be appreciated therefore, that both situations present more difficult working conditions. The Owner, Contractor, Design Consultant and Geotechnical Engineer must be willing to work together to revise site construction procedures, enhance field testing and surveillance, and incorporate design modifications as necessary to suit site conditions.

When working at night there must be sufficient artificial light to properly illuminate the fill pad and borrow areas.

Placement of material to form an engineered fill pad during winter and freezing temperatures has its own special conditions that must be addressed. It is imperative that each day prior to placement of new fill, the exposed subgrade must be inspected and any overnight snow or frozen material removed. Particular attention should be given to the borrow source inspection to ensure only nonfrozen fill is brought to the site.

The Contractor must continually assess the work program and have the necessary spreading and compacting equipment to ensure that densification of the fill material takes place in a minimum amount of time. Changes may be required to the spreading methods, lift thickness, and compaction techniques to ensure the desired compaction is achieved uniformly throughout each fill lift.

The Contractor should adequately protect the subgrade at the end of each shift to minimize frost penetration overnight. Since water cannot be added to the fill material to facilitate compaction, it is imperative that densification of the fill be achieved by additional compaction effort and an appropriate reduced lift thickness. Once the fill pad has been completed, it must be properly protected from freezing temperatures and ponding of water during the spring thaw period.

If the pad is unusually thick or if the fill thickness varies dramatically across the width or length of the fill pad, Peto MacCallum Ltd. should be consulted for additional recommendations. In this case, alternative special provisions may be recommended, such as providing a surcharge preload for a limited time or increase the degree of compaction of the fill.

APPENDIX B

STATEMENT OF LIMITATIONS

STATEMENT OF LIMITATIONS

This report is prepared for and made available for the sole use of the client named. Peto MacCallum Ltd. (PML) hereby disclaims any liability or responsibility to any person or entity, other than those for whom this report is specifically issued, for any loss, damage, expenses, or penalties that may arise or result from the use of any information or recommendations contained in this report. The contents of this report may not be used or relied upon by any other person without the express written consent and authorization of PML.

This report shall not be relied upon for any purpose other than as agreed with the client named without the written consent of PML. It shall not be used to express or imply warranty as to the fitness of the property for a particular purpose. A portion of this report may not be used as a separate entity: that is to say the report is to be read in its entirety at all times.

The report is based solely on the scope of services which are specifically referred to in this report. No physical or intrusive testing has been performed, except as specifically referenced in this report. This report is not a certification of compliance with past or present regulations, codes, guidelines and policies.

The scope of services carried out by PML is based on details of the proposed development and land use to address certain issues, purposes and objectives with respect to the specific site as identified by the client. Services not expressly set forth in writing are expressly excluded from the services provided by PML. In other words, PML has not performed any observations, investigations, study analysis, engineering evaluation or testing that is not specifically listed in the scope of services in this report. PML assumes no responsibility or duty to the client for any such services and shall not be liable for failing to discover any condition, whose discovery would require the performance of services not specifically referred to in this report.

The findings an comments made by PML in this report are based on the conditions observed at the time of PML's site reconnaissance. No assurances can be made and no assurances are given with respect to any potential changes in site conditions following the time of completion of PML's field work. Furthermore, regulations, codes and guidelines may change at any time subsequent to the date of this report and these changes may effect the validity of the findings and recommendations given in this report.

STATEMENT OF LIMITATIONS

The results and conclusions with respect to site conditions are therefore in no way intended to be taken as a guarantee or representation, expressed or implied, that the site is free from any contaminants from past or current land use activities or that the conditions in all areas of the site and beneath or within structures are the same as those areas specifically sampled.

Any investigation, examination, measurements or sampling explorations at a particular location may not be representative of conditions between sampled locations. Soil, ground water, surface water, or building material conditions between and beyond the sampled locations may differ from those encountered at the sampling locations and conditions may become apparent during construction which could not be detected or anticipated at the time of the intrusive sampling investigation.

Budget estimates contained in this report are to be viewed as an engineering estimate of probable costs and provided solely for the purposes of assisting the client in its budgeting process. It is understood and agreed that PML will not in any way be held liable as a result of any budget figures provided by it.

The Client expressly waives its right to withhold PML's fees, either in whole or in part, or to make any claim or commence any action or bring any other proceedings, whether in contract, tort, or otherwise against PML in anyway connected with advice or information given by PML relating to the cost estimate or Environmental Remediation/Cleanup and Restoration or Soil and Ground Water Management Plan Cost Estimate.

APPENDIX C

AGAT CERTIFICATES OF ANALYSIS

O.Reg. 153/04, As Amended, Table 1 Standards (Soil)

(Residential / Parkland / Institutional / Industrial / Commercial / Community Property Use)

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: PETO MACCALLUM LIMITED
16 FRANKLIN STREET SOUTH
KITCHENER, ON N2C1R4
(519) 893-7500

ATTENTION TO: Ken Hanes

PROJECT: 17KF002

AGAT WORK ORDER: 17T199091

SOIL ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Coordinator

TRACE ORGANICS REVIEWED BY: Neli Popnikolova, Senior Chemist

DATE REPORTED: Apr 18, 2017

PAGES (INCLUDING COVER): 7

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 17T199091

PROJECT: 17KF002

CLIENT NAME: PETO MACCALLUM LIMITED

ATTENTION TO: Ken Hanes

SAMPLING SITE:

SAMPLED BY:

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2017-03-23

DATE REPORTED: 2017-04-18

		SAMPLE DESCRIPTION:		BH4-SS1	BH5-SS1	BH6-SS1
		SAMPLE TYPE:		Soil	Soil	Soil
		DATE SAMPLED:		2017-03-21	2017-03-21	2017-03-21
Parameter	Unit	G / S	RDL	8276142	8276150	8276151
Antimony	µg/g	1.3	0.8	<0.8	<0.8	<0.8
Arsenic	µg/g	18	1	3	5	6
Barium	µg/g	220	2	15	45	48
Beryllium	µg/g	2.5	0.5	<0.5	<0.5	<0.5
Boron	µg/g	36	5	6	6	<5
Boron (Hot Water Soluble)	µg/g	NA	0.10	0.17	0.23	0.27
Cadmium	µg/g	1.2	0.5	<0.5	0.7	0.6
Chromium	µg/g	70	2	8	13	13
Cobalt	µg/g	21	0.5	1.9	4.4	4.9
Copper	µg/g	92	1	8	11	11
Lead	µg/g	120	1	40	62	53
Molybdenum	µg/g	2	0.5	0.6	0.9	0.5
Nickel	µg/g	82	1	5	10	10
Selenium	µg/g	1.5	0.4	<0.4	0.4	0.5
Silver	µg/g	0.5	0.2	<0.2	<0.2	<0.2
Thallium	µg/g	1	0.4	<0.4	<0.4	<0.4
Uranium	µg/g	2.5	0.5	0.5	0.5	0.5
Vanadium	µg/g	86	1	11	22	24
Zinc	µg/g	290	5	182	313	254
Chromium VI	µg/g	0.66	0.2	<0.2	<0.2	<0.2
Cyanide	µg/g	0.051	0.040	<0.040	<0.040	<0.040
Mercury	µg/g	0.27	0.10	<0.10	<0.10	<0.10
Electrical Conductivity	mS/cm	0.57	0.005	0.177	0.233	0.173
Sodium Adsorption Ratio	NA	2.4	NA	0.125	0.142	0.053
pH, 2:1 CaCl2 Extraction	pH Units		NA	6.74	6.90	7.07

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use

8276142-8276151 EC & SAR were determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio.

Certified By: Amanjot Bhela

AGAT Laboratories

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http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 17T199091
PROJECT: 17KF002

CLIENT NAME: PETO MACCALLUM LIMITED
SAMPLING SITE:

ATTENTION TO: Ken Hanes
SAMPLED BY:

O. Reg. 153(511) - OC Pesticides (Soil)

DATE RECEIVED: 2017-03-23

DATE REPORTED: 2017-04-18

		SAMPLE DESCRIPTION:		BH4-SS1	BH6-SS1
		SAMPLE TYPE:		Soil	Soil
		DATE SAMPLED:		2017-03-21	2017-03-21
Parameter	Unit	G / S	RDL	8276142	8276151
Hexachloroethane	µg/g	0.01	0.01	<0.01	<0.01
Gamma-Hexachlorocyclohexane	µg/g	0.01	0.005	<0.005	<0.005
Heptachlor	µg/g	0.05	0.005	<0.005	<0.005
Aldrin	µg/g	0.05	0.005	<0.005	<0.005
Heptachlor Epoxide	µg/g	0.05	0.005	<0.005	<0.005
Endosulfan	µg/g	0.04	0.005	<0.005	<0.005
Chlordane	µg/g	0.05	0.007	<0.007	<0.007
DDE	µg/g	0.05	0.007	<0.007	<0.007
DDD	µg/g	0.05	0.007	<0.007	<0.007
DDT	µg/g	1.4	0.007	<0.007	<0.007
Dieldrin	µg/g	0.05	0.005	<0.005	<0.005
Endrin	µg/g	0.04	0.005	<0.005	<0.005
Methoxychlor	µg/g	0.05	0.005	<0.005	<0.005
Hexachlorobenzene	µg/g	0.01	0.005	<0.005	<0.005
Hexachlorobutadiene	µg/g	0.01	0.01	<0.01	<0.01
Moisture Content	%		0.1	33.0	6.7
Surrogate	Unit	Acceptable Limits			
TCMX	%	50-140		70	66
Decachlorobiphenyl	%	60-130		72	88

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use

8276142-8276151 Results are based on the dry weight of the soil.
Note: DDT applies to the total of op'DDT and pp'DDT, DDD applies to the total of op'DDD and pp'DDD and DDE applies to the total of op'DDE and pp'DDE. Endosulfan applies to the total of Endosulfan I and Endosulfan II.
Chlordane applies to the total of Alpha-Chlordane and Gamma-Chlordane.

Certified By: NPopowich

AGAT Laboratories

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Guideline Violation

AGAT WORK ORDER: 17T199091

PROJECT: 17KF002

CLIENT NAME: PETO MACCALLUM LIMITED

ATTENTION TO: Ken Hanes

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
8276150	BH5-SS1	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Zinc	µg/g	290	313

AGAT Laboratories

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http://www.agatlabs.com

Quality Assurance

CLIENT NAME: PETO MACCALLUM LIMITED

AGAT WORK ORDER: 17T199091

PROJECT: 17KF002

ATTENTION TO: Ken Hanes

SAMPLING SITE:

SAMPLED BY:

Soil Analysis

RPT Date: Apr 18, 2017			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	8272855		3.6	3.6	NA	< 0.8	126%	70%	130%	105%	80%	120%	96%	70%	130%
Arsenic	8272855		9	7	25.0%	< 1	108%	70%	130%	105%	80%	120%	103%	70%	130%
Barium	8272855		76	75	1.3%	< 2	101%	70%	130%	98%	80%	120%	101%	70%	130%
Beryllium	8272855		<0.5	<0.5	NA	< 0.5	83%	70%	130%	105%	80%	120%	89%	70%	130%
Boron	8272855		6	6	NA	< 5	82%	70%	130%	107%	80%	120%	93%	70%	130%
Boron (Hot Water Soluble)	8272855		0.41	0.42	NA	< 0.10	112%	60%	140%	103%	70%	130%	99%	60%	140%
Cadmium	8272855		0.8	0.8	NA	< 0.5	110%	70%	130%	106%	80%	120%	105%	70%	130%
Chromium	8272855		18	18	0.0%	< 2	96%	70%	130%	114%	80%	120%	112%	70%	130%
Cobalt	8272855		5.5	5.5	0.0%	< 0.5	102%	70%	130%	110%	80%	120%	99%	70%	130%
Copper	8272855		63	62	1.6%	< 1	101%	70%	130%	117%	80%	120%	85%	70%	130%
Lead	8272855		190	197	3.6%	< 1	105%	70%	130%	101%	80%	120%	70%	70%	130%
Molybdenum	8272855		1.3	1.3	NA	< 0.5	107%	70%	130%	103%	80%	120%	105%	70%	130%
Nickel	8272855		24	25	4.1%	< 1	103%	70%	130%	112%	80%	120%	100%	70%	130%
Selenium	8272855		0.9	1.0	NA	< 0.4	128%	70%	130%	99%	80%	120%	106%	70%	130%
Silver	8272855		<0.2	<0.2	NA	< 0.2	98%	70%	130%	115%	80%	120%	110%	70%	130%
Thallium	8272855		<0.4	<0.4	NA	< 0.4	103%	70%	130%	104%	80%	120%	98%	70%	130%
Uranium	8272855		<0.5	<0.5	NA	< 0.5	98%	70%	130%	93%	80%	120%	95%	70%	130%
Vanadium	8272855		20	20	0.0%	< 1	99%	70%	130%	109%	80%	120%	109%	70%	130%
Zinc	8272855		205	199	3.0%	< 5	102%	70%	130%	117%	80%	120%	84%	70%	130%
Chromium VI	8277762		<0.2	<0.2	NA	< 0.2	93%	70%	130%	98%	80%	120%	100%	70%	130%
Cyanide	8278916		<0.040	<0.040	NA	< 0.040	102%	70%	130%	108%	80%	120%	94%	70%	130%
Mercury	8272855		0.15	0.17	NA	< 0.10	100%	70%	130%	88%	80%	120%	93%	70%	130%
Electrical Conductivity	8277893		0.376	0.369	1.9%	< 0.005	93%	90%	110%	NA			NA		
Sodium Adsorption Ratio	8276363		0.057	0.053	7.3%	NA	NA			NA			NA		
pH, 2:1 CaCl2 Extraction	8277854		7.37	7.42	0.7%	NA	101%	80%	120%	NA			NA		

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Amanjot Bhela

AGAT Laboratories

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Quality Assurance

CLIENT NAME: PETO MACCALLUM LIMITED

AGAT WORK ORDER: 17T199091

PROJECT: 17KF002

ATTENTION TO: Ken Hanes

SAMPLING SITE:

SAMPLED BY:

Trace Organics Analysis

RPT Date: Apr 18, 2017			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - OC Pesticides (Soil)															
Hexachloroethane	8267227		< 0.01	< 0.01	NA	< 0.01	82%	50%	140%	96%	50%	140%	64%	50%	140%
Gamma-Hexachlorocyclohexane	8267227		< 0.005	< 0.005	NA	< 0.005	92%	50%	140%	78%	50%	140%	66%	50%	140%
Heptachlor	8267227		< 0.005	< 0.005	NA	< 0.005	80%	50%	140%	90%	50%	140%	80%	50%	140%
Aldrin	8267227		< 0.005	< 0.005	NA	< 0.005	109%	50%	140%	94%	50%	140%	68%	50%	140%
Heptachlor Epoxide	8267227		< 0.005	< 0.005	NA	< 0.005	90%	50%	140%	96%	50%	140%	82%	50%	140%
Endosulfan	8267227		< 0.005	< 0.005	NA	< 0.005	89%	50%	140%	88%	50%	140%	69%	50%	140%
Chlordane	8267227		< 0.007	< 0.007	NA	< 0.007	87%	50%	140%	91%	50%	140%	78%	50%	140%
DDE	8267227		< 0.007	< 0.007	NA	< 0.007	88%	50%	140%	98%	50%	140%	78%	50%	140%
DDD	8267227		< 0.007	< 0.007	NA	< 0.007	94%	50%	140%	94%	50%	140%	84%	50%	140%
DDT	8267227		< 0.007	< 0.007	NA	< 0.007	88%	50%	140%	87%	50%	140%	78%	50%	140%
Dieldrin	8267227		< 0.005	< 0.005	NA	< 0.005	84%	50%	140%	90%	50%	140%	80%	50%	140%
Endrin	8267227		< 0.005	< 0.005	NA	< 0.005	84%	50%	140%	76%	50%	140%	82%	50%	140%
Methoxychlor	8267227		< 0.005	< 0.005	NA	< 0.005	76%	50%	140%	82%	50%	140%	96%	50%	140%
Hexachlorobenzene	8267227		< 0.005	< 0.005	NA	< 0.005	92%	50%	140%	100%	50%	140%	92%	50%	140%
Hexachlorobutadiene	8267227		< 0.01	< 0.01	NA	< 0.01	93%	50%	140%	100%	50%	140%	68%	50%	140%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By: N Popnikolof

AGAT Laboratories

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Method Summary

CLIENT NAME: PETO MACCALLUM LIMITED

AGAT WORK ORDER: 17T199091

PROJECT: 17KF002

ATTENTION TO: Ken Hanes

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Barium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron (Hot Water Soluble)	MET-93-6104	EPA SW 846 6010C; MSA, Part 3, Ch.21	ICP/OES
Cadmium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Copper	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Lead	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Molybdenum	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Nickel	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Selenium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Silver	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Thallium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Uranium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Vanadium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Zinc	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium VI	INOR-93-6029	SM 3500 B; MSA Part 3, Ch. 25	SPECTROPHOTOMETER
Cyanide	INOR-93-6052	MOE CN-3015 & E 3009 A;SM 4500 CN	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Electrical Conductivity	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Sodium Adsorption Ratio	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010B	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	PH METER
Trace Organics Analysis			
Hexachloroethane	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Gamma-Hexachlorocyclohexane	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Heptachlor	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Aldrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Heptachlor Epoxide	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Endosulfan	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Chlordane	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
DDE	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
DDD	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
DDT	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Dieldrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Endrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Methoxychlor	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Hexachlorobenzene	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Hexachlorobutadiene	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
TCMX	ORG-91-5112	EPA SW-846 3541,3620 & 8081	GC/ECD
Decachlorobiphenyl	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Moisture Content		MOE E3139	BALANCE

AGAT Laboratories

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CLIENT NAME: PETO MACCALLUM LIMITED
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(519) 893-7500

ATTENTION TO: Ken Hanes

PROJECT: 17KF002

AGAT WORK ORDER: 17W201248

SOIL ANALYSIS REVIEWED BY: Sofka Pehlyova, Senior Analyst

DATE REPORTED: Apr 10, 2017

PAGES (INCLUDING COVER): 5

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 17W201248

PROJECT: 17KF002

CLIENT NAME: PETO MACCALLUM LIMITED

ATTENTION TO: Ken Hanes

SAMPLING SITE:

SAMPLED BY:H. Shinwary

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2017-03-30

DATE REPORTED: 2017-04-10

		SAMPLE DESCRIPTION:		BH5-SS4	BH6-SS3
		SAMPLE TYPE:		Soil	Soil
		DATE SAMPLED:		2017-03-21	2017-03-21
Parameter	Unit	G / S	RDL	8288805	8288806
Antimony	µg/g	1.3	0.8	<0.8	<0.8
Arsenic	µg/g	18	1	3	4
Barium	µg/g	220	2	9	13
Beryllium	µg/g	2.5	0.5	<0.5	<0.5
Boron	µg/g	36	5	<5	<5
Boron (Hot Water Soluble)	µg/g	NA	0.10	<0.10	<0.10
Cadmium	µg/g	1.2	0.5	<0.5	0.6
Chromium	µg/g	70	2	5	8
Cobalt	µg/g	21	0.5	1.8	4.0
Copper	µg/g	92	1	8	15
Lead	µg/g	120	1	18	43
Molybdenum	µg/g	2	0.5	<0.5	0.8
Nickel	µg/g	82	1	4	8
Selenium	µg/g	1.5	0.4	<0.4	<0.4
Silver	µg/g	0.5	0.2	<0.2	<0.2
Thallium	µg/g	1	0.4	<0.4	<0.4
Uranium	µg/g	2.5	0.5	<0.5	<0.5
Vanadium	µg/g	86	1	11	19
Zinc	µg/g	290	5	180	370
Chromium VI	µg/g	0.66	0.2	<0.2	<0.2
Cyanide	µg/g	0.051	0.040	<0.040	<0.040
Mercury	µg/g	0.27	0.10	<0.10	<0.10
Electrical Conductivity	mS/cm	0.57	0.005	0.098	0.174
Sodium Adsorption Ratio	NA	2.4	NA	0.303	0.509
pH, 2:1 CaCl2 Extraction	pH Units		NA	7.94	8.16

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use

8288805-8288806 EC & SAR were determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio.

Certified By: Sofiya Pehlyova

AGAT Laboratories

Guideline Violation

AGAT WORK ORDER: 17W201248

PROJECT: 17KF002

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CLIENT NAME: PETO MACCALLUM LIMITED

ATTENTION TO: Ken Hanes

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
8288806	BH6-SS3	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Zinc	µg/g	290	370

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Quality Assurance

CLIENT NAME: PETO MACCALLUM LIMITED

AGAT WORK ORDER: 17W201248

PROJECT: 17KF002

ATTENTION TO: Ken Hanes

SAMPLING SITE:

SAMPLED BY:H. Shinwary

Soil Analysis

RPT Date: Apr 10, 2017			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	8287941		<0.8	<0.8	NA	< 0.8	116%	70%	130%	100%	80%	120%	92%	70%	130%
Arsenic	8287941		4	4	NA	< 1	107%	70%	130%	98%	80%	120%	104%	70%	130%
Barium	8287941		48	47	2.6%	< 2	98%	70%	130%	96%	80%	120%	101%	70%	130%
Beryllium	8287941		<0.5	<0.5	NA	< 0.5	78%	70%	130%	108%	80%	120%	89%	70%	130%
Boron	8287941		<5	<5	NA	< 5	89%	70%	130%	108%	80%	120%	91%	70%	130%
Boron (Hot Water Soluble)	8287941		0.34	0.36	NA	< 0.10	112%	60%	140%	100%	70%	130%	101%	60%	140%
Cadmium	8287941		<0.5	<0.5	NA	< 0.5	89%	70%	130%	100%	80%	120%	103%	70%	130%
Chromium	8287941		13	13	0.0%	< 2	95%	70%	130%	106%	80%	120%	120%	70%	130%
Cobalt	8287941		6.0	6.2	3.3%	< 0.5	102%	70%	130%	108%	80%	120%	108%	70%	130%
Copper	8287941		32	33	3.1%	< 1	94%	70%	130%	110%	80%	120%	115%	70%	130%
Lead	8287941		10	10	0.0%	< 1	101%	70%	130%	101%	80%	120%	99%	70%	130%
Molybdenum	8287941		<0.5	<0.5	NA	< 0.5	101%	70%	130%	103%	80%	120%	103%	70%	130%
Nickel	8287941		13	13	0.0%	< 1	105%	70%	130%	107%	80%	120%	108%	70%	130%
Selenium	8287941		<0.4	<0.4	NA	< 0.4	107%	70%	130%	103%	80%	120%	102%	70%	130%
Silver	8287941		<0.2	<0.2	NA	< 0.2	93%	70%	130%	106%	80%	120%	105%	70%	130%
Thallium	8287941		<0.4	<0.4	NA	< 0.4	86%	70%	130%	102%	80%	120%	103%	70%	130%
Uranium	8287941		<0.5	<0.5	NA	< 0.5	90%	70%	130%	92%	80%	120%	95%	70%	130%
Vanadium	8287941		22	22	0.0%	< 1	100%	70%	130%	106%	80%	120%	124%	70%	130%
Zinc	8287941		53	49	7.8%	< 5	103%	70%	130%	118%	80%	120%	116%	70%	130%
Chromium VI	8284952		<0.2	<0.2	NA	< 0.2	92%	70%	130%	96%	80%	120%	98%	70%	130%
Cyanide	8288805	8288805	<0.040	<0.040	NA	< 0.040	102%	70%	130%	103%	80%	120%	104%	70%	130%
Mercury	8287941		<0.10	<0.10	NA	< 0.10	102%	70%	130%	95%	80%	120%	102%	70%	130%
Electrical Conductivity	8291645		0.428	0.431	0.7%	< 0.005	94%	90%	110%	NA			NA		
Sodium Adsorption Ratio	8287941		0.751	0.761	1.3%	NA	NA			NA			NA		
pH, 2:1 CaCl2 Extraction	8285504		7.26	7.23	0.4%	NA	100%	80%	120%	NA			NA		

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Sofiya Pehlyova

AGAT Laboratories

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Method Summary

CLIENT NAME: PETO MACCALLUM LIMITED

AGAT WORK ORDER: 17W201248

PROJECT: 17KF002

ATTENTION TO: Ken Hanes

SAMPLING SITE:

SAMPLED BY:H. Shinwary

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Barium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron (Hot Water Soluble)	MET-93-6104	EPA SW 846 6010C; MSA, Part 3, Ch.21	ICP/OES
Cadmium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Copper	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Lead	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Molybdenum	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Nickel	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Selenium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Silver	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Thallium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Uranium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Vanadium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Zinc	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium VI	INOR-93-6029	SM 3500 B; MSA Part 3, Ch. 25	SPECTROPHOTOMETER
Cyanide	INOR-93-6052	MOE CN-3015 & E 3009 A;SM 4500 CN	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Electrical Conductivity	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Sodium Adsorption Ratio	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010B	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	PH METER

O.Reg. 153/04, As Amended, Table 2 Standards (Soil)

(Industrial / Commercial / Community Property Use)

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CLIENT NAME: PETO MACCALLUM LIMITED
16 FRANKLIN STREET SOUTH
KITCHENER, ON N2C1R4
(519) 893-7500

ATTENTION TO: Ken Hanes

PROJECT: 17KF002

AGAT WORK ORDER: 17T199091

SOIL ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Coordinator

TRACE ORGANICS REVIEWED BY: Neli Popnikolova, Senior Chemist

DATE REPORTED: Apr 18, 2017

PAGES (INCLUDING COVER): 6

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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Certificate of Analysis

AGAT WORK ORDER: 17T199091
PROJECT: 17KF002

CLIENT NAME: PETO MACCALLUM LIMITED
SAMPLING SITE:

ATTENTION TO: Ken Hanes
SAMPLED BY:

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2017-03-23

DATE REPORTED: 2017-04-18

		SAMPLE DESCRIPTION:		BH4-SS1	BH5-SS1	BH6-SS1
		SAMPLE TYPE:		Soil	Soil	Soil
		DATE SAMPLED:		2017-03-21	2017-03-21	2017-03-21
Parameter	Unit	G / S	RDL	8276142	8276150	8276151
Antimony	µg/g	40	0.8	<0.8	<0.8	<0.8
Arsenic	µg/g	18	1	3	5	6
Barium	µg/g	670	2	15	45	48
Beryllium	µg/g	8	0.5	<0.5	<0.5	<0.5
Boron	µg/g	120	5	6	6	<5
Boron (Hot Water Soluble)	µg/g	2	0.10	0.17	0.23	0.27
Cadmium	µg/g	1.9	0.5	<0.5	0.7	0.6
Chromium	µg/g	160	2	8	13	13
Cobalt	µg/g	80	0.5	1.9	4.4	4.9
Copper	µg/g	230	1	8	11	11
Lead	µg/g	120	1	40	62	53
Molybdenum	µg/g	40	0.5	0.6	0.9	0.5
Nickel	µg/g	270	1	5	10	10
Selenium	µg/g	5.5	0.4	<0.4	0.4	0.5
Silver	µg/g	40	0.2	<0.2	<0.2	<0.2
Thallium	µg/g	3.3	0.4	<0.4	<0.4	<0.4
Uranium	µg/g	33	0.5	0.5	0.5	0.5
Vanadium	µg/g	86	1	11	22	24
Zinc	µg/g	340	5	182	313	254
Chromium VI	µg/g	8	0.2	<0.2	<0.2	<0.2
Cyanide	µg/g	0.051	0.040	<0.040	<0.040	<0.040
Mercury	µg/g	3.9	0.10	<0.10	<0.10	<0.10
Electrical Conductivity	mS/cm	1.4	0.005	0.177	0.233	0.173
Sodium Adsorption Ratio	NA	12	NA	0.125	0.142	0.053
pH, 2:1 CaCl2 Extraction	pH Units		NA	6.74	6.90	7.07

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to ON T2 S ICC CT

8276142-8276151 EC & SAR were determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio.

Certified By: Amanjot Bhela

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AGAT WORK ORDER: 17T199091
PROJECT: 17KF002

CLIENT NAME: PETO MACCALLUM LIMITED
SAMPLING SITE:

ATTENTION TO: Ken Hanes
SAMPLED BY:

O. Reg. 153(511) - OC Pesticides (Soil)

DATE RECEIVED: 2017-03-23

DATE REPORTED: 2017-04-18

		SAMPLE DESCRIPTION:		BH4-SS1	BH6-SS1
		SAMPLE TYPE:		Soil	Soil
		DATE SAMPLED:		2017-03-21	2017-03-21
Parameter	Unit	G / S	RDL	8276142	8276151
Hexachloroethane	µg/g	0.21	0.01	<0.01	<0.01
Gamma-Hexachlorocyclohexane	µg/g	0.056	0.005	<0.005	<0.005
Heptachlor	µg/g	0.19	0.005	<0.005	<0.005
Aldrin	µg/g	0.088	0.005	<0.005	<0.005
Heptachlor Epoxide	µg/g	0.05	0.005	<0.005	<0.005
Endosulfan	µg/g	0.3	0.005	<0.005	<0.005
Chlordane	µg/g	0.05	0.007	<0.007	<0.007
DDE	µg/g	0.52	0.007	<0.007	<0.007
DDD	µg/g	4.6	0.007	<0.007	<0.007
DDT	µg/g	1.4	0.007	<0.007	<0.007
Dieldrin	µg/g	0.088	0.005	<0.005	<0.005
Endrin	µg/g	0.04	0.005	<0.005	<0.005
Methoxychlor	µg/g	1.6	0.005	<0.005	<0.005
Hexachlorobenzene	µg/g	0.66	0.005	<0.005	<0.005
Hexachlorobutadiene	µg/g	0.031	0.01	<0.01	<0.01
Moisture Content	%		0.1	33.0	6.7
Surrogate	Unit	Acceptable Limits			
TCMX	%	50-140		70	66
Decachlorobiphenyl	%	60-130		72	88

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to ON T2 S ICC CT

8276142-8276151 Results are based on the dry weight of the soil.
Note: DDT applies to the total of op'DDT and pp'DDT, DDD applies to the total of op'DDD and pp'DDD and DDE applies to the total of op'DDE and pp'DDE. Endosulfan applies to the total of Endosulfan I and Endosulfan II.
Chlordane applies to the total of Alpha-Chlordane and Gamma-Chlordane.

Certified By: N Popnikolof

AGAT Laboratories

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Quality Assurance

CLIENT NAME: PETO MACCALLUM LIMITED

AGAT WORK ORDER: 17T199091

PROJECT: 17KF002

ATTENTION TO: Ken Hanes

SAMPLING SITE:

SAMPLED BY:

Soil Analysis

RPT Date: Apr 18, 2017			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	8272855		3.6	3.6	NA	< 0.8	126%	70%	130%	105%	80%	120%	96%	70%	130%
Arsenic	8272855		9	7	25.0%	< 1	108%	70%	130%	105%	80%	120%	103%	70%	130%
Barium	8272855		76	75	1.3%	< 2	101%	70%	130%	98%	80%	120%	101%	70%	130%
Beryllium	8272855		<0.5	<0.5	NA	< 0.5	83%	70%	130%	105%	80%	120%	89%	70%	130%
Boron	8272855		6	6	NA	< 5	82%	70%	130%	107%	80%	120%	93%	70%	130%
Boron (Hot Water Soluble)	8272855		0.41	0.42	NA	< 0.10	112%	60%	140%	103%	70%	130%	99%	60%	140%
Cadmium	8272855		0.8	0.8	NA	< 0.5	110%	70%	130%	106%	80%	120%	105%	70%	130%
Chromium	8272855		18	18	0.0%	< 2	96%	70%	130%	114%	80%	120%	112%	70%	130%
Cobalt	8272855		5.5	5.5	0.0%	< 0.5	102%	70%	130%	110%	80%	120%	99%	70%	130%
Copper	8272855		63	62	1.6%	< 1	101%	70%	130%	117%	80%	120%	85%	70%	130%
Lead	8272855		190	197	3.6%	< 1	105%	70%	130%	101%	80%	120%	70%	70%	130%
Molybdenum	8272855		1.3	1.3	NA	< 0.5	107%	70%	130%	103%	80%	120%	105%	70%	130%
Nickel	8272855		24	25	4.1%	< 1	103%	70%	130%	112%	80%	120%	100%	70%	130%
Selenium	8272855		0.9	1.0	NA	< 0.4	128%	70%	130%	99%	80%	120%	106%	70%	130%
Silver	8272855		<0.2	<0.2	NA	< 0.2	98%	70%	130%	115%	80%	120%	110%	70%	130%
Thallium	8272855		<0.4	<0.4	NA	< 0.4	103%	70%	130%	104%	80%	120%	98%	70%	130%
Uranium	8272855		<0.5	<0.5	NA	< 0.5	98%	70%	130%	93%	80%	120%	95%	70%	130%
Vanadium	8272855		20	20	0.0%	< 1	99%	70%	130%	109%	80%	120%	109%	70%	130%
Zinc	8272855		205	199	3.0%	< 5	102%	70%	130%	117%	80%	120%	84%	70%	130%
Chromium VI	8277762		<0.2	<0.2	NA	< 0.2	93%	70%	130%	98%	80%	120%	100%	70%	130%
Cyanide	8278916		<0.040	<0.040	NA	< 0.040	102%	70%	130%	108%	80%	120%	94%	70%	130%
Mercury	8272855		0.15	0.17	NA	< 0.10	100%	70%	130%	88%	80%	120%	93%	70%	130%
Electrical Conductivity	8277893		0.376	0.369	1.9%	< 0.005	93%	90%	110%	NA			NA		
Sodium Adsorption Ratio	8276363		0.057	0.053	7.3%	NA	NA			NA			NA		
pH, 2:1 CaCl2 Extraction	8277854		7.37	7.42	0.7%	NA	101%	80%	120%	NA			NA		

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Amanjot Bhela

AGAT Laboratories

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Quality Assurance

CLIENT NAME: PETO MACCALLUM LIMITED

AGAT WORK ORDER: 17T199091

PROJECT: 17KF002

ATTENTION TO: Ken Hanes

SAMPLING SITE:

SAMPLED BY:

Trace Organics Analysis

RPT Date: Apr 18, 2017			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - OC Pesticides (Soil)															
Hexachloroethane	8267227		< 0.01	< 0.01	NA	< 0.01	82%	50%	140%	96%	50%	140%	64%	50%	140%
Gamma-Hexachlorocyclohexane	8267227		< 0.005	< 0.005	NA	< 0.005	92%	50%	140%	78%	50%	140%	66%	50%	140%
Heptachlor	8267227		< 0.005	< 0.005	NA	< 0.005	80%	50%	140%	90%	50%	140%	80%	50%	140%
Aldrin	8267227		< 0.005	< 0.005	NA	< 0.005	109%	50%	140%	94%	50%	140%	68%	50%	140%
Heptachlor Epoxide	8267227		< 0.005	< 0.005	NA	< 0.005	90%	50%	140%	96%	50%	140%	82%	50%	140%
Endosulfan	8267227		< 0.005	< 0.005	NA	< 0.005	89%	50%	140%	88%	50%	140%	69%	50%	140%
Chlordane	8267227		< 0.007	< 0.007	NA	< 0.007	87%	50%	140%	91%	50%	140%	78%	50%	140%
DDE	8267227		< 0.007	< 0.007	NA	< 0.007	88%	50%	140%	98%	50%	140%	78%	50%	140%
DDD	8267227		< 0.007	< 0.007	NA	< 0.007	94%	50%	140%	94%	50%	140%	84%	50%	140%
DDT	8267227		< 0.007	< 0.007	NA	< 0.007	88%	50%	140%	87%	50%	140%	78%	50%	140%
Dieldrin	8267227		< 0.005	< 0.005	NA	< 0.005	84%	50%	140%	90%	50%	140%	80%	50%	140%
Endrin	8267227		< 0.005	< 0.005	NA	< 0.005	84%	50%	140%	76%	50%	140%	82%	50%	140%
Methoxychlor	8267227		< 0.005	< 0.005	NA	< 0.005	76%	50%	140%	82%	50%	140%	96%	50%	140%
Hexachlorobenzene	8267227		< 0.005	< 0.005	NA	< 0.005	92%	50%	140%	100%	50%	140%	92%	50%	140%
Hexachlorobutadiene	8267227		< 0.01	< 0.01	NA	< 0.01	93%	50%	140%	100%	50%	140%	68%	50%	140%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By: N Popnikolof

AGAT Laboratories

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Method Summary

CLIENT NAME: PETO MACCALLUM LIMITED

AGAT WORK ORDER: 17T199091

PROJECT: 17KF002

ATTENTION TO: Ken Hanes

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Barium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron (Hot Water Soluble)	MET-93-6104	EPA SW 846 6010C; MSA, Part 3, Ch.21	ICP/OES
Cadmium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Copper	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Lead	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Molybdenum	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Nickel	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Selenium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Silver	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Thallium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Uranium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Vanadium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Zinc	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium VI	INOR-93-6029	SM 3500 B; MSA Part 3, Ch. 25	SPECTROPHOTOMETER
Cyanide	INOR-93-6052	MOE CN-3015 & E 3009 A;SM 4500 CN	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Electrical Conductivity	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Sodium Adsorption Ratio	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010B	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	PH METER
Trace Organics Analysis			
Hexachloroethane	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Gamma-Hexachlorocyclohexane	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Heptachlor	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Aldrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Heptachlor Epoxide	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Endosulfan	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Chlordane	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
DDE	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
DDD	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
DDT	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Dieldrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Endrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Methoxychlor	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Hexachlorobenzene	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Hexachlorobutadiene	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
TCMX	ORG-91-5112	EPA SW-846 3541,3620 & 8081	GC/ECD
Decachlorobiphenyl	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Moisture Content		MOE E3139	BALANCE

AGAT Laboratories

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CLIENT NAME: PETO MACCALLUM LIMITED
16 FRANKLIN STREET SOUTH
KITCHENER, ON N2C1R4
(519) 893-7500

ATTENTION TO: Ken Hanes

PROJECT: 17KF002

AGAT WORK ORDER: 17W201248

SOIL ANALYSIS REVIEWED BY: Sofka Pehlyova, Senior Analyst

DATE REPORTED: Apr 10, 2017

PAGES (INCLUDING COVER): 5

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 17W201248

PROJECT: 17KF002

CLIENT NAME: PETO MACCALLUM LIMITED

ATTENTION TO: Ken Hanes

SAMPLING SITE:

SAMPLED BY:H. Shinwary

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2017-03-30

DATE REPORTED: 2017-04-10

		SAMPLE DESCRIPTION:		BH5-SS4	BH6-SS3
		SAMPLE TYPE:		Soil	Soil
		DATE SAMPLED:		2017-03-21	2017-03-21
Parameter	Unit	G / S	RDL	8288805	8288806
Antimony	µg/g	40	0.8	<0.8	<0.8
Arsenic	µg/g	18	1	3	4
Barium	µg/g	670	2	9	13
Beryllium	µg/g	8	0.5	<0.5	<0.5
Boron	µg/g	120	5	<5	<5
Boron (Hot Water Soluble)	µg/g	2	0.10	<0.10	<0.10
Cadmium	µg/g	1.9	0.5	<0.5	0.6
Chromium	µg/g	160	2	5	8
Cobalt	µg/g	80	0.5	1.8	4.0
Copper	µg/g	230	1	8	15
Lead	µg/g	120	1	18	43
Molybdenum	µg/g	40	0.5	<0.5	0.8
Nickel	µg/g	270	1	4	8
Selenium	µg/g	5.5	0.4	<0.4	<0.4
Silver	µg/g	40	0.2	<0.2	<0.2
Thallium	µg/g	3.3	0.4	<0.4	<0.4
Uranium	µg/g	33	0.5	<0.5	<0.5
Vanadium	µg/g	86	1	11	19
Zinc	µg/g	340	5	180	370
Chromium VI	µg/g	8	0.2	<0.2	<0.2
Cyanide	µg/g	0.051	0.040	<0.040	<0.040
Mercury	µg/g	3.9	0.10	<0.10	<0.10
Electrical Conductivity	mS/cm	1.4	0.005	0.098	0.174
Sodium Adsorption Ratio	NA	12	NA	0.303	0.509
pH, 2:1 CaCl2 Extraction	pH Units		NA	7.94	8.16

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to ON T2 S ICC CT

8288805-8288806 EC & SAR were determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio.

Certified By: Sofiya Pehlyova

AGAT Laboratories

Guideline Violation

AGAT WORK ORDER: 17W201248

PROJECT: 17KF002

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CLIENT NAME: PETO MACCALLUM LIMITED

ATTENTION TO: Ken Hanes

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
8288806	BH6-SS3	ON T2 S ICC CT	O. Reg. 153(511) - Metals & Inorganics (Soil)	Zinc	µg/g	340	370

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Quality Assurance

CLIENT NAME: PETO MACCALLUM LIMITED

AGAT WORK ORDER: 17W201248

PROJECT: 17KF002

ATTENTION TO: Ken Hanes

SAMPLING SITE:

SAMPLED BY:H. Shinwary

Soil Analysis

RPT Date: Apr 10, 2017			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	8287941		<0.8	<0.8	NA	< 0.8	116%	70%	130%	100%	80%	120%	92%	70%	130%
Arsenic	8287941		4	4	NA	< 1	107%	70%	130%	98%	80%	120%	104%	70%	130%
Barium	8287941		48	47	2.6%	< 2	98%	70%	130%	96%	80%	120%	101%	70%	130%
Beryllium	8287941		<0.5	<0.5	NA	< 0.5	78%	70%	130%	108%	80%	120%	89%	70%	130%
Boron	8287941		<5	<5	NA	< 5	89%	70%	130%	108%	80%	120%	91%	70%	130%
Boron (Hot Water Soluble)	8287941		0.34	0.36	NA	< 0.10	112%	60%	140%	100%	70%	130%	101%	60%	140%
Cadmium	8287941		<0.5	<0.5	NA	< 0.5	89%	70%	130%	100%	80%	120%	103%	70%	130%
Chromium	8287941		13	13	0.0%	< 2	95%	70%	130%	106%	80%	120%	120%	70%	130%
Cobalt	8287941		6.0	6.2	3.3%	< 0.5	102%	70%	130%	108%	80%	120%	108%	70%	130%
Copper	8287941		32	33	3.1%	< 1	94%	70%	130%	110%	80%	120%	115%	70%	130%
Lead	8287941		10	10	0.0%	< 1	101%	70%	130%	101%	80%	120%	99%	70%	130%
Molybdenum	8287941		<0.5	<0.5	NA	< 0.5	101%	70%	130%	103%	80%	120%	103%	70%	130%
Nickel	8287941		13	13	0.0%	< 1	105%	70%	130%	107%	80%	120%	108%	70%	130%
Selenium	8287941		<0.4	<0.4	NA	< 0.4	107%	70%	130%	103%	80%	120%	102%	70%	130%
Silver	8287941		<0.2	<0.2	NA	< 0.2	93%	70%	130%	106%	80%	120%	105%	70%	130%
Thallium	8287941		<0.4	<0.4	NA	< 0.4	86%	70%	130%	102%	80%	120%	103%	70%	130%
Uranium	8287941		<0.5	<0.5	NA	< 0.5	90%	70%	130%	92%	80%	120%	95%	70%	130%
Vanadium	8287941		22	22	0.0%	< 1	100%	70%	130%	106%	80%	120%	124%	70%	130%
Zinc	8287941		53	49	7.8%	< 5	103%	70%	130%	118%	80%	120%	116%	70%	130%
Chromium VI	8284952		<0.2	<0.2	NA	< 0.2	92%	70%	130%	96%	80%	120%	98%	70%	130%
Cyanide	8288805	8288805	<0.040	<0.040	NA	< 0.040	102%	70%	130%	103%	80%	120%	104%	70%	130%
Mercury	8287941		<0.10	<0.10	NA	< 0.10	102%	70%	130%	95%	80%	120%	102%	70%	130%
Electrical Conductivity	8291645		0.428	0.431	0.7%	< 0.005	94%	90%	110%	NA			NA		
Sodium Adsorption Ratio	8287941		0.751	0.761	1.3%	NA	NA			NA			NA		
pH, 2:1 CaCl2 Extraction	8285504		7.26	7.23	0.4%	NA	100%	80%	120%	NA			NA		

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Sofiya Pehlyova

AGAT Laboratories

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FAX (905)712-5122
http://www.agatlabs.com

Method Summary

CLIENT NAME: PETO MACCALLUM LIMITED

AGAT WORK ORDER: 17W201248

PROJECT: 17KF002

ATTENTION TO: Ken Hanes

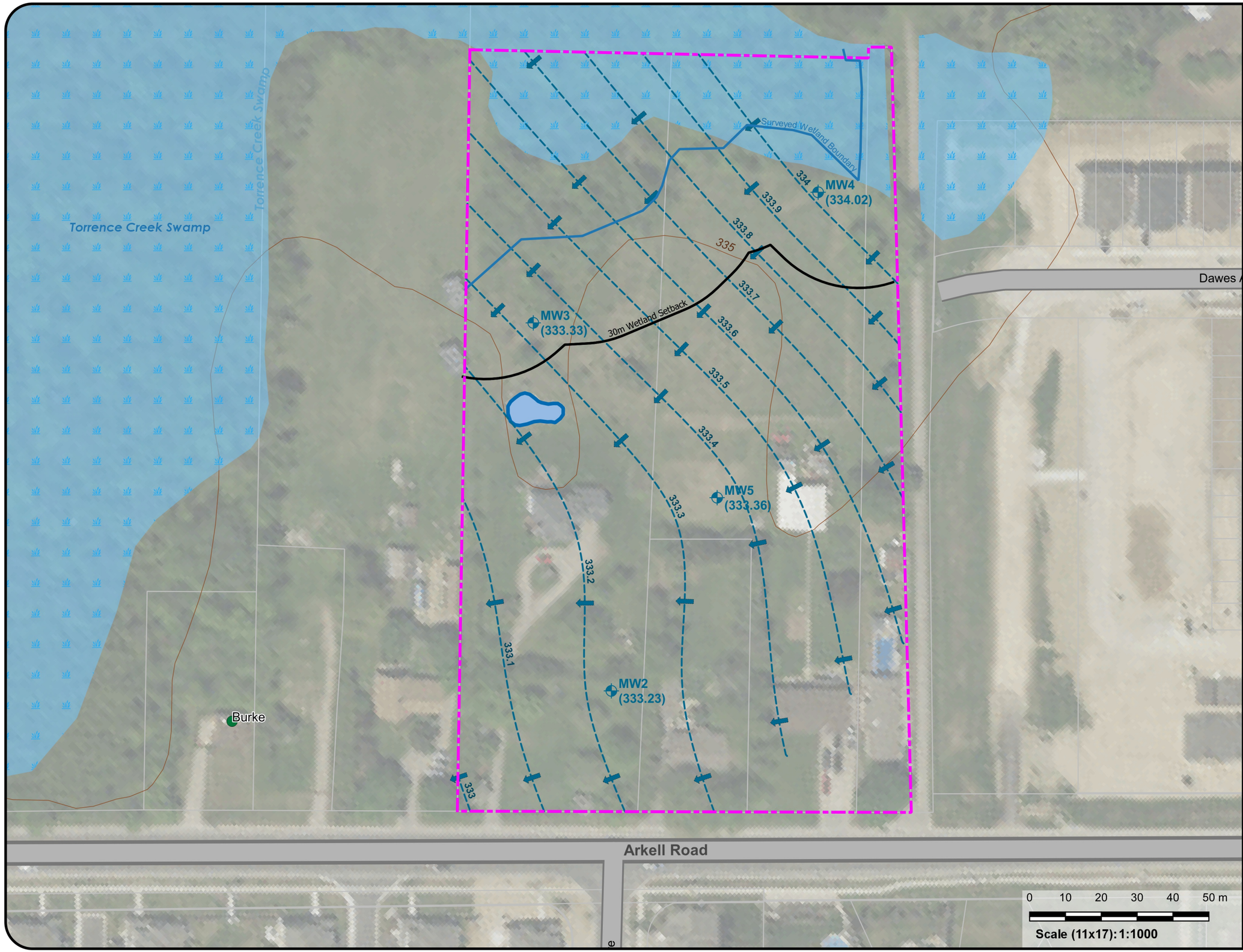
SAMPLING SITE:

SAMPLED BY:H. Shinwary

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Barium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron (Hot Water Soluble)	MET-93-6104	EPA SW 846 6010C; MSA, Part 3, Ch.21	ICP/OES
Cadmium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Copper	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Lead	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Molybdenum	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Nickel	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Selenium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Silver	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Thallium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Uranium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Vanadium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Zinc	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium VI	INOR-93-6029	SM 3500 B; MSA Part 3, Ch. 25	SPECTROPHOTOMETER
Cyanide	INOR-93-6052	MOE CN-3015 & E 3009 A;SM 4500 CN	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Electrical Conductivity	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Sodium Adsorption Ratio	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010B	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	PH METER

Appendix G

Seasonal High Groundwater



NORTH

PROJECT NORTH

Legend

- Subject Lands
- Study Area (500m)
- Municipal Well (GRCA)
- Monitoring Well (Groundwater Elevation (mamsl))
- Seasonal High Groundwater Elevation Contour (mamsl) & Flow Direction (May 6, 2017)

Surface Water

- Surface Water Body
- Watercourse
- Provincally Significant Wetland (GRCA)

Ground Surface Elevation Contour (mamsl)

- Major Contour (10m)
- Minor Contour (5m)

Data Sources:

Contains information licensed under the Open Government License Ontario.

Contains Information made available under Grand River Conservation Authority's Open Data Licence v2.0

South Central Ontario Orthophotography Project (2018). Source: Data provided by Ontario Ministry of Natural Resources and Forestry. ©

Project CRS: NAD83 / UTM zone 17N

MTE
Engineers,Scientists, Surveyors
Ph. (519) 743-6500

Client: Crescent Homes Ltd.

Project: Hydrogeological Assessment

Site: 190-216 Arkell Road, Guelph

Title: Seasonal High Groundwater Flow Interpretation (May 6, 2017)

Reviewed By	PAG		
Prepared By	KLW	Project No	42063-200
Drawn By	KLW	Figure No	9B
Date	November 2021		

Project No: 42063-200 Q:\42063\1041Hydrogeology\42063-104 QGIS.qgs
GWR2.9B
November 08, 2021 - 09:27 - Plotted By: KWallace

Appendix H

In-Situ Infiltration Testing Technical Memo

Technical Memorandum

Project Name: 190-216 Arkell Road

MTE File No.: 42063-100

To: Jim Hall, P.Eng, City of Guelph

Date: May 4, 2023

cc: Ken Hanes, P.Eng., MTE

From: A. Bingeman, C.E.T.
P. Gray, P.Geo, QP_{ESA}

RE: 190-216 Arkell Road Guelph Infiltration Testing and Rates

In December 2021, MTE Consultants prepared a Hydrogeological Investigation for a proposed residential property located at 190-216 Arkell Road in Guelph, ON (the "Site"). This infiltration testing and rates technical memorandum should be read in conjunction with our December 3, 2021, Hydrogeological Assessment Report. The scope of work completed consisted of in-situ infiltration testing at proposed infiltration facilities on the Site. The location of the proposed infiltration facilities and invert depths were based on MTE's stormwater design report dated May 4, 2023. The in-situ infiltration testing was completed at multiple depths including the invert of the proposed infiltration depth and 1.5m below the proposed infiltration depth. Several trials were conducted at each location and depth to produce a median Field Saturated Hydraulic Conductivity (kfs in cm/sec). The in-situ infiltration testing was carried out using a Guelph Permeameter infiltrometer along with testing methods referenced in the City of Guelph Design Engineering Manual.

Utilizing Credit Valley Conservation (CVC) July 2022 Stormwater Management Guideline for computing an infiltration rate which is based on the 1997 Ontario Building Code Supplemental Guidelines SG-6 method, the following unfactored infiltration rates are provided in the table below.

Test Pit	Depth (mbgs)	Soil Type	Median Kfs (cm/sec)	Median Infiltration Rate, Unfactored (mm/hr)
TP101-21	1.0	Silty SAND	$8.9x10^{-5}$	45
TP101-21	1.6	SAND, trace silt, trace gravel	$3.5x10^{-4}$	64
TP102-21	0.8	SAND and GRAVEL	$5.8x10^{-3}$	249
TP103-21	0.5	SAND and GRAVEL	$5.4x10^{-3}$	133
TP104-21	0.9	SAND and GRAVEL	$4.3x10^{-3}$	125

The CVC method is appropriate for this application as the infiltration results are based on actual field tests utilizing a Guelph Permeameter over a number of trials for each depth and location tested. The method used to determine infiltration in the report is using the theory of Kfs being directly related to infiltration rate. The CVC Stormwater Management Guideline used in this revised assessment is based on a co-relation summary from Supplementary Guideline SG-6 of the 1997 Ontario Building Code.

The results listed in the table above are based on measured field conditions and may be used as design infiltration rates. It should be noted that infiltration rates provided do not have a factor of safety applied to them. Recommendations for applying a factor of safety are provided in Section 7.1.3 of our

December 3, 2021 Hydrogeological Assessment and assigning appropriate infiltration rate factors of safety are ultimately at the discretion of the Civil Designer.

Based on a review of available published literature, outlined below is a recommended guideline for selecting a factor of safety to apply to infiltration rates depending on sensitivity and varying field conditions. The method below provides suggested safety factors that are risk based or based on variability of site conditions.

Risk and Variability Method

Lower Value (Closer to 2x)	Higher Value (Closer to 3x)
Catchment <100m^2	Catchment >100m^2
Permeameter or percolation test onsite	Double ring infiltrometer or grainsize used
Loamy or sandy soil texture	Clayey soil texture
No variation in geologic formation, soil texture or bulk density within 1.5 meters below the proposed bottom of the practice.	Variation in geologic formation, soil texture or bulk density within 1.5 meters below the proposed bottom of the practice.
No nearby sensitive receptors	Sensitive receptors in near proximity (e.g., septic systems, building foundations).

Notes: Table obtained from STEP Low Impact Development Guide.

The 2022 CVC Guideline suggests a safety factor based on the ratio of median infiltration rates at a particular location (based on the infiltration depth and 1.5 m below). Below is a summary of suggested factors of safety.

Ratio of Median Infiltration Rates Method

Ratio of Mean Measured Infiltration Rates	Suggested Safety Factor
<1	2.5
1.1 – 4.0	3.5
4.1 – 8.0	4.5
8.1 – 16.0	6.5
16.1 and >	8.5

Notes: Table obtained from July 2022 CVC Stormwater Management Guide.

The suggested factor of safety using median infiltration ratios is between 2.5 and 3.5 based on the contacted soil stratigraphy, which are similar results compared to the risk and variability method recommended by STEP. However, the median infiltration ratios method is not recommended for this application, since some of the proposed infiltration areas are to be filled with engineered fill as part of the development process.

Accordingly, any soils brought to the Site for grading below the proposed infiltration depths are required to have the same or better (i.e., higher) infiltration rates as current conditions – thus maintaining a low factor of safety. In addition, base elevations of the proposed infiltration galleries should be located a minimum of 1.0m above the seasonal high water table.

It is noted that based on the two methods of calculating Safety Factors described above, the Civil Designer has selected a conservative Safety Factor of 3 for infiltration gallery design.

We trust that the information provided in this memorandum is suitable for your requirements. Please feel free to contact us if you require anything further.

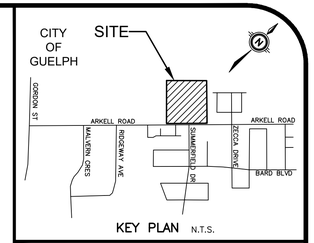
Drawings

MTE FILE PATH: P:\P\42063\104\42063-104-EC1

July 30, 2025 – 2:03:40 PM – Plotted By: Bob Schaefer

LEGEND

- SITE BOUNDARY
- WETLAND BOUNDARY
- 30m WETLAND SETBACK
- SURVEYED DRIPLINE
- 10m DRIPLINE SETBACK
- 326 — EXISTING CONTOURS
- Ex. Drop Curb — EXISTING CURB
- EXISTING DIRECTION OF DRAINAGE/SWALE
- EXISTING BUILDING
- (TOP) / (BOTTOM) — EXISTING EMBANKMENT (SLOPE AS NOTED)
- Ex. 300mmø SAN. / Ex. MH — EXISTING SANITARY SEWER
- Ex. 200mmø WTM. / Ex. HYD. SET — EXISTING WATERMAIN
- Ex. 375mmø STM. / Ex. MH — EXISTING STORM SEWER
- EXISTING RETAINING WALL
- EXISTING FENCE
- MP1–19 — EXISTING PIEZOMETER
- BH1 — EXISTING BOREHOLE
- MW105–19 — EXISTING MONITORING WELL
- TP101–21 — EXISTING TEST PIT



GEODETIC BM ELEV. = 335.455m
CITY OF GUELPH
#255 BURKE WELL PUMP HOUSE

SITE BENCHMARK ELEV. = 335.455m
SEE ABOVE

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No.	REVISION	BY	DATE
8.			
7.			
6.	REISSUED FOR DRAFT PLAN APPROVAL	KDH	JUL.31/25
5.	REISSUED FOR DRAFT PLAN APPROVAL	KDH	FEB.07/25
4.	REISSUED FOR DRAFT PLAN APPROVAL	KDH	JUN.28/24
3.	REISSUED FOR DRAFT PLAN APPROVAL	KDH	MAY 4/23
2.	REISSUED FOR DRAFT PLAN APPROVAL	DFH	DEC.03/21
1.	ISSUED FOR DRAFT PLAN APPROVAL	IKC	APR.3/20

MTE
Engineers, Scientists, Surveyors
519-743-6500

OWNER
CRESCENT HAVEN HOMES INC.
180 FROBISHER DRIVE UNIT 3 WATERLOO

PROJECT
ARKELL ROAD PROPERTIES
216 ARKELL ROAD GUELPH

DRAWING
EXISTING CONDITIONS PLAN

Project Manager: K.HANES	Project No.: 42063-104
Design By: CJC/AJC	Checked By: VAL
Drawn By: SXP/KAT	Checked By: CVP
Surveyed By: MTE	Drawing No.: EC1.1
Date: Dec.04/19	
Scale: 1:400	Sheet 1 of 3

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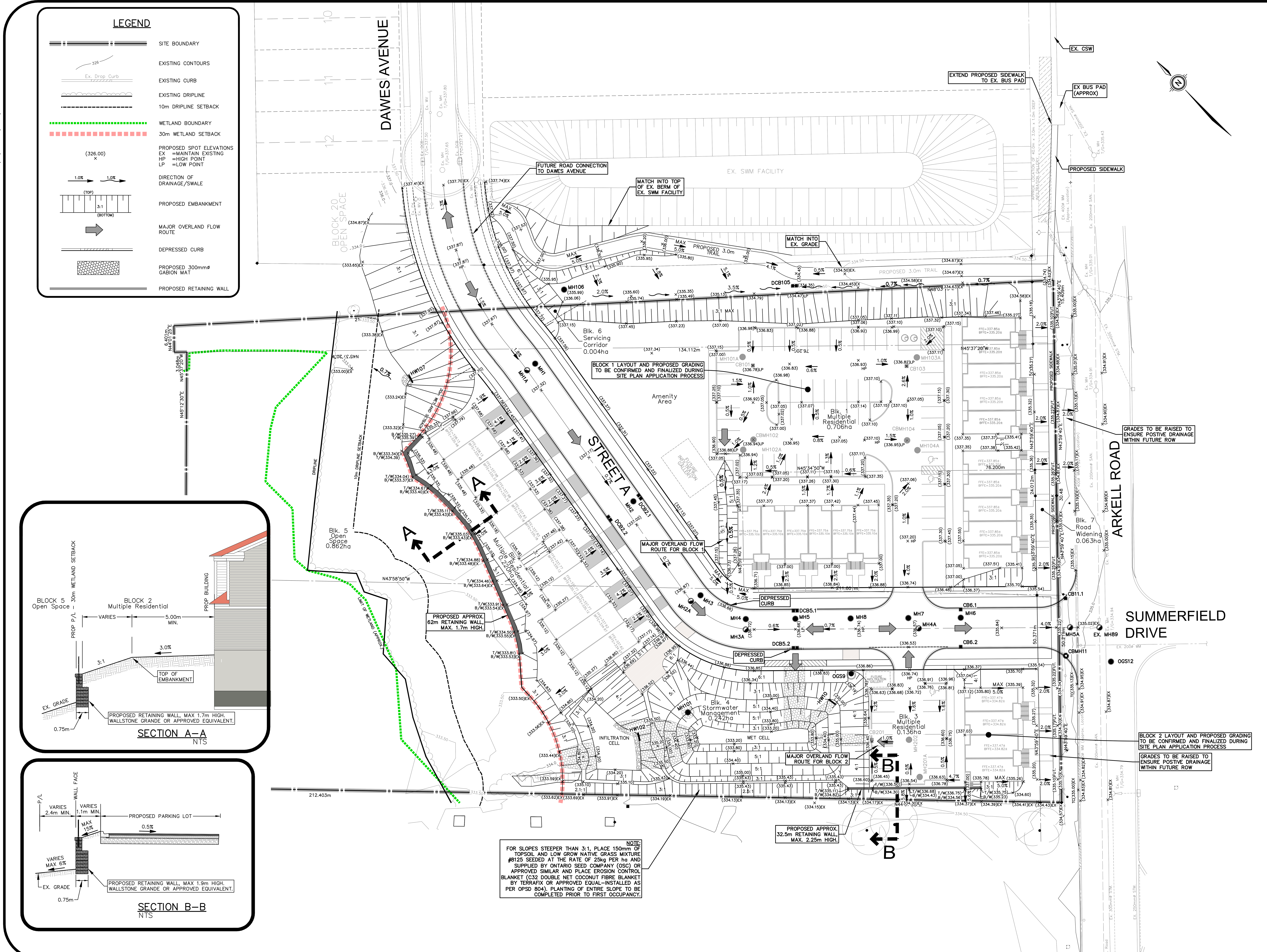
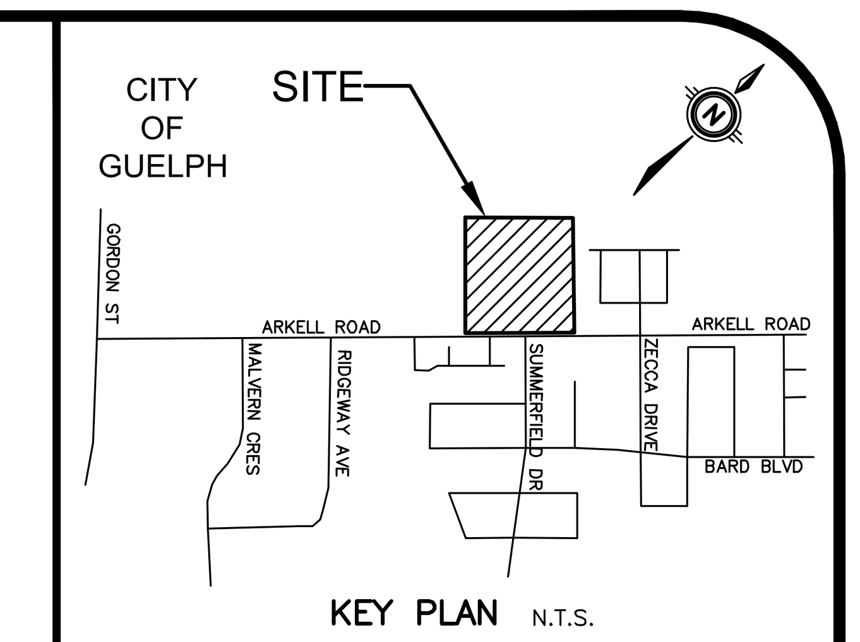
MTE FILE PATH:

July 30, 2025 - 2:29:33 PM - Plotted By: Bob Schaefer



LEGEND
SITE BOUNDARY
EXISTING CONTOURS
EXISTING CURB
EXISTING DRIPLINE
10m DRIPLINE SETBACK
WETLAND BOUNDARY
30m WETLAND SETBACK
PROPOSED SPOT ELEVATIONS
EX =MAINTAIN EXISTING
HP =HIGH POINT
LP =LOW POINT
DIRECTION OF DRAINAGE/SWALE
PROPOSED EMBANKMENT
MAJOR OVERLAND FLOW ROUTE
DEPRESSED CURB
PROPOSED 300mmø GABION MAT
PROPOSED RETAINING WALL
DAWES AVENUE
STREET A
ARKELL ROAD
SUMMERFIELD DRIVE
EX. SWM FACILITY
FUTURE ROAD CONNECTION TO DAWES AVENUE
MATCH INTO TOP OF EX. BERM OF EX. SWM FACILITY
MATCH INTO EX. GRADE
EXTEND PROPOSED SIDEWALK TO EX. BUS PAD
EX BUS PAD (APPROX)
EX. CSW
PROPOSED SIDEWALK
BLOCK 20 OPEN SPACE
Blk. 6 Servicing Corridor 0.004ha
BLOCK 1 LAYOUT AND PROPOSED GRADING TO BE CONFIRMED AND FINALIZED DURING SITE PLAN APPLICATION PROCESS
Amenity Area
Blk. 1 Multiple Residential 0.706ha
GRADES TO BE RAISED TO ENSURE POSITIVE DRAINAGE WITHIN FUTURE ROW
Blk. 7 Road Widening 0.063ha
Blk. 5 Open Space 0.862ha
Blk. 2 Multiple Residential
MAJOR OVERLAND FLOW ROUTE FOR BLOCK 1
DEPRESSED CURB
PROPOSED APPROX. 62m RETAINING WALL, MAX. 1.7m HIGH.
Blk. 4 Stormwater Management 0.242ha
INFILTRATION CELL
WET CELL
Blk. 3 Multiple Residential 0.136ha
BLOCK 2 LAYOUT AND PROPOSED GRADING TO BE CONFIRMED AND FINALIZED DURING SITE PLAN APPLICATION PROCESS
MAJOR OVERLAND FLOW ROUTE FOR BLOCK 2
PROPOSED APPROX. 32.5m RETAINING WALL, MAX. 2.25m HIGH.
NOTE:
FOR SLOPES STEEPER THAN 3:1, PLACE 150mm OF TOPSOIL AND LOW GROW NATIVE GRASS MIXTURE #8125 SEEDED AT THE RATE OF 25kg PER ha AND SUPPLIED BY ONTARIO SEED COMPANY (OSC) OR APPROVED SIMILAR AND PLACE EROSION CONTROL BLANKET (C32 DOUBLE NET COCONUT FIBRE BLANKET BY TERRAFIX OR APPROVED EQUAL-INSTALLED AS PER OPSD 804). PLANTING OF ENTIRE SLOPE TO BE COMPLETED PRIOR TO FIRST OCCUPANCY.
BLOCK 5 Open Space
BLOCK 2 Multiple Residential
30m WETLAND SETBACK
PROP P/L
PROP BUILDING
VARIES
5.00m MIN.
3.0%
TOP OF EMBANKMENT
EX. GRADE
PROPOSED RETAINING WALL, MAX 1.7m HIGH. WALLSTONE GRANDE OR APPROVED EQUIVALENT.
0.75m
SECTION A–A
NTS
P/L
WALL FACE
VARIES 2.4m MIN.
VARIES 1.1m MIN.
PROPOSED PARKING LOT
0.5%
MAX 15%
VARIES MAX 6%
EX. GRADE
PROPOSED RETAINING WALL, MAX 1.9m HIGH. WALLSTONE GRANDE OR APPROVED EQUIVALENT.
0.75m
SECTION B–B
NTS



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AREA GRADING PLAN

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