



190-216 Arkell Road Guelph, Ontario

Preliminary Stormwater Management Report

Project Location:

190 - 216 Arkell Road
Guelph, Ontario

Prepared for:

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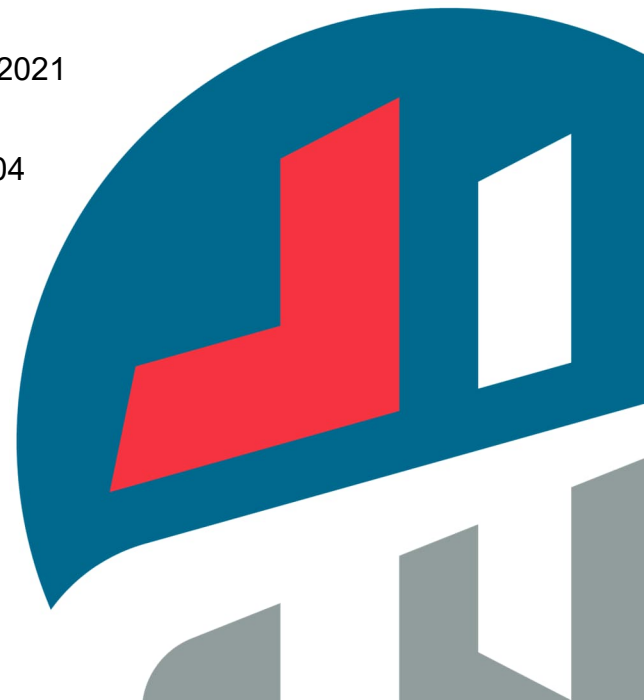
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Contents

1.0	Introduction	1
1.1	Overview.....	1
1.2	Background Information.....	1
1.3	Purpose of Study	1
1.4	Objectives.....	3
2.0	Existing Conditions and Background Information.....	3
2.1	Topographical Information	3
2.2	Pre-Development Conditions	3
2.3	Geotechnical Information	7
2.4	Hydrogeological Information	7
2.4.1	In-Situ Infiltration Testing	7
3.0	Stormwater Management Criteria.....	9
3.1	Water Quality Control.....	9
3.2	Water Quantity and Erosion Control.....	10
3.3	Water Balance	10
3.3.1	Infiltration to Groundwater.....	10
3.3.2	Surface Runoff.....	10
3.4	Monitoring.....	10
3.4.1	Facility Monitoring.....	11
3.4.2	Groundwater Monitoring	11
3.4.3	Wellhead Protection.....	11
4.0	Proposed Development and SWM Strategy	11
4.1	Proposed Area Grading	11
4.2	Post-Development Conditions.....	12
5.0	Stormwater Management Design	16
5.1	Hydrologic Modelling.....	16
5.2	Water Quality.....	16
5.3	Water Quantity.....	22
5.3.1	Future Trail Block to Torrance Creek	25
5.4	Block Level Infiltration Galleries	25
5.5	Flows to Arkell Road	26
5.5.1	Drainage Area 204-1.....	26
5.5.2	Drainage Area 204-2.....	26
5.6	Monthly Water Balance	26

5.6.1	Infiltration to Groundwater.....	26
5.6.2	Surface Runoff to Wetland.....	27
5.7	Erosion Assessment.....	28
5.8	Landscape Design.....	29
5.9	Temperature Mitigation.....	29
6.0	Monitoring Program.....	30
6.1	During Development Monitoring Program.....	30
6.2	Post-Development Monitoring Program.....	30
7.0	Erosion and Sediment Control Measures.....	30
8.0	Conclusions and Recommendations.....	32

Figures

Figure 1.1	– Location Plan.....	2
Figure 2.1	– Existing Conditions Plan.....	5
Figure 2.2	– Pre-Development Catchment Area Plan.....	6
Figure 4.1	– Post-Development Catchment Areas.....	15
Figure 5.1	– SWM Facility Plan.....	19
Figure 5.2	– SWM Facility Details 1.....	20
Figure 5.3	– SWM Facility Details 2.....	21
Figure 5.4	– Pre & Post-Development Monthly Runoff Volume to Wetland Comparison (m ³)....	27
Figure 5.5	– Pre & Post-Development Monthly Runoff Volume to Wetland Comparison (m ³)....	28

Tables

Table 2.1	– Pre-Development Catchment Parameters.....	4
Table 2.2	– Pre-Development Release Rates.....	4
Table 2.3	– Field Saturation (Kfs) Summary (mm/hr).....	8
Table 4.1	– Post-Development Catchment Parameters.....	13
Table 5.1	– Water Quality Control Details.....	18
Table 5.2	– Wet Cell Stage-Storage-Discharge Summary.....	22
Table 5.3	– Infiltration Cell Stage-Storage-Discharge Summary.....	23
Table 5.4	– Summary of Peak Flows and Maximum Ponding Elevations in Wet Cell.....	23
Table 5.5	– Summary of Peak Flows and Maximum Ponding Elevations in Infiltration Cell.....	24
Table 5.6	– Pre and Post-Development Peak Runoff Rates (m ³ /s).....	24

Appendices

Appendix A	Draft Plan of Subdivision (Reduced)
Appendix B	Existing Conditions Catchment Parameters and MIDUSS Modelling
Appendix C	Proposed Conditions Catchment Parameters and MIDUSS Modelling
Appendix D	Proposed SWM Facility Design Calculations
Appendix E	Monthly Water Balance Calculations
Appendix F	Geotechnical Report
Appendix G	Seasonal High Groundwater
Appendix H	In-situ Infiltration Testing Technical Memo

Drawings

MTE Drawing 42063-104-EC1.1 – Existing Conditions Plan	Encl.
MTE Drawing 42063-104-AG1.1 – Area Grading Plan	Encl.

1.0 Introduction

1.1 Overview

MTE Consultants Inc. (MTE) was retained by Crescent Homes to prepare a 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. Refer to **Figure 1.1** for the location of the Subject Lands. The proposed development plans for the site include a residential subdivision with 11 townhouse units fronting onto a municipal right-of-way, two stacked townhouse condominium blocks, and a stormwater management (SWM) block. The proposed right-of-way will connect the existing Dawes Avenue northeast of the Subject Lands and to Arkell Road at its intersection with Summerfield Drive. Refer to the Draft Plan of Subdivision prepared by MHBC, dated April 27, 2022, in **Appendix A** for more details. Approximately one third of the site cannot be developed due to the existing wetland and its setbacks.

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 (May 4, 2023).

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 December 3, 2021. Comments on the revised submission were received from the City on April 1, 2022.

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).

CITY OF
GUELPH

VICTORIA ROAD SOUTH



SUBJECT LANDS

ARKELL ROAD

TORRANCE CREEK
WETLAND COMPLEX

GORDON STREET

FIGURE 1.1

Date: MAR.24/23
Scale: N.T.S.

LOCATION PLAN



Engineers, Scientists, Surveyors

Project No.: 42063-104

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 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 three 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

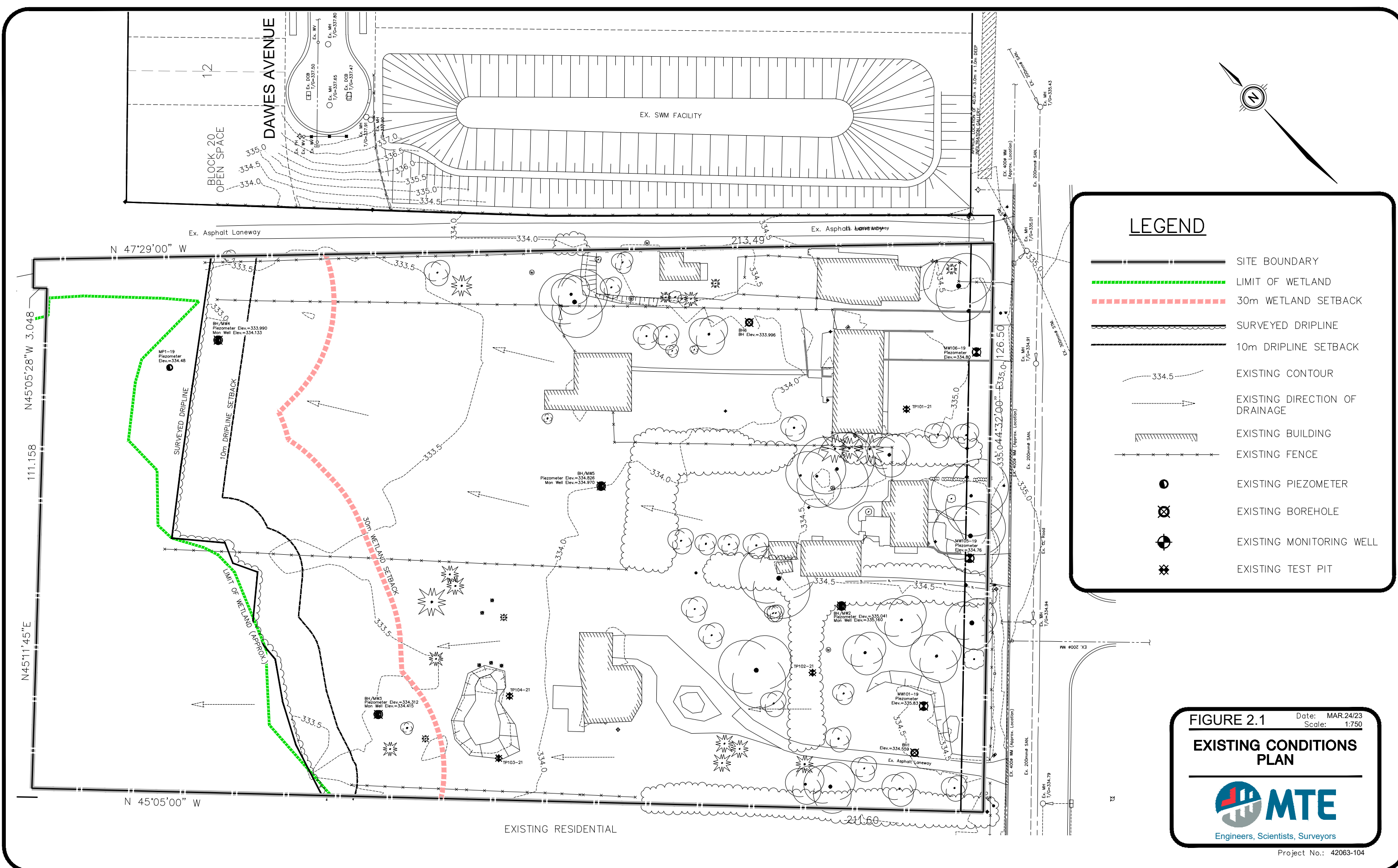
Catchment	Description	Area (ha)	% Impervious	Flow Length (m)	Slope (%)
Within Subject Lands					
101	Existing residential properties and Arkell Road boulevard	1.714	16	150	0.5
102	Existing wetland and setbacks	0.863	0	50	0.5
Outside of Subject Lands					
103	Private laneway adjacent to subject lands	0.240	30	225	0.8
104	Existing SWM facility embankments	0.234	0	8	20
105	Driveway aprons and ditch within Arkell right-of-way	0.057	20	125	0.5
	Total	3.108	11.5	-	-

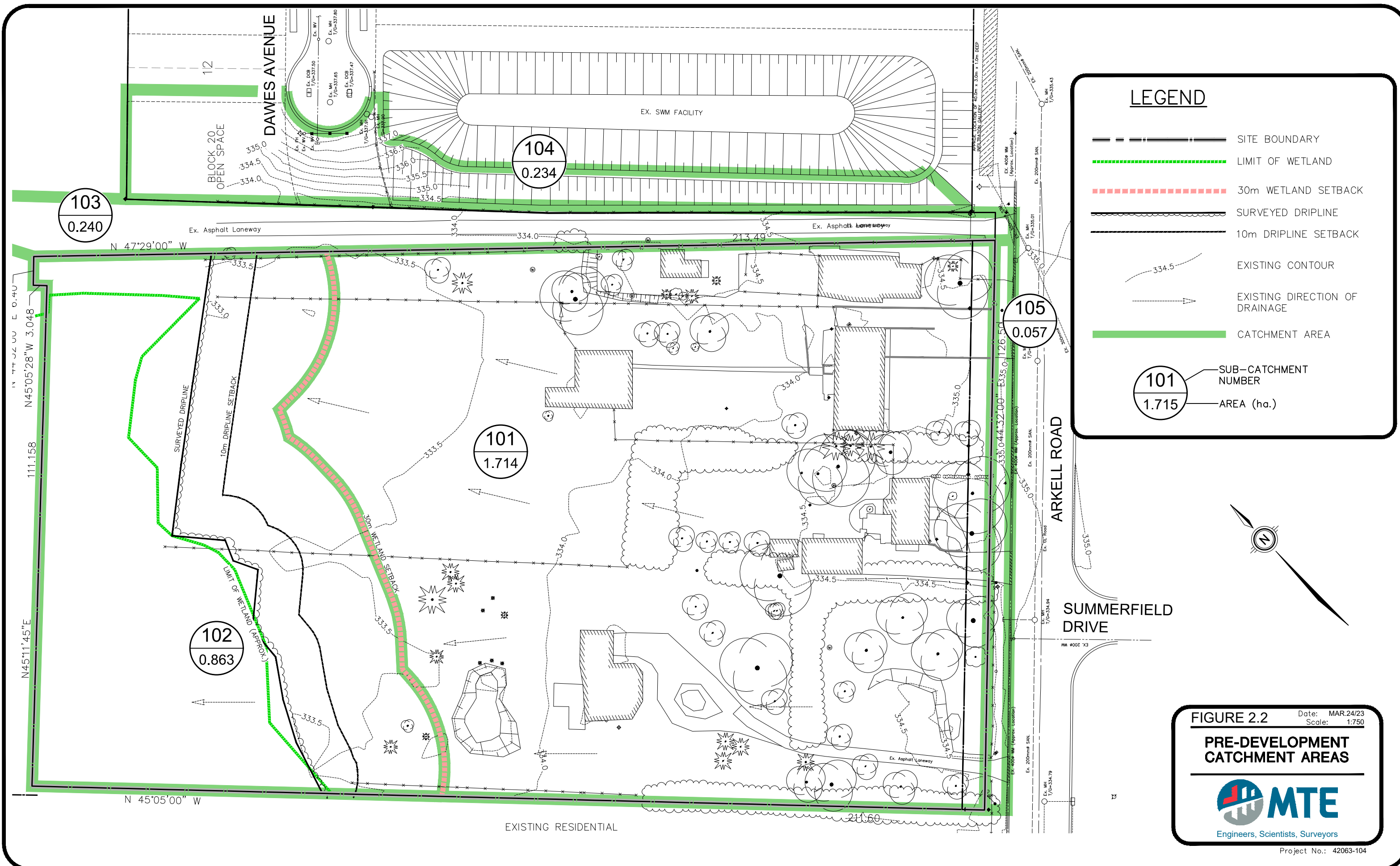
Please note that drainage area 103 is equivalent to drainage area 205 as defined within the Stantec Report *220 Arkell Road Preliminary Servicing, Grading, and Stormwater Management Report* (May 28, 2019). Drainage area 104 represents the existing SWM facility embankment within the adjacent Arkell Meadows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

Drainage Area	25mm	2-year	5-year	10-year	25-year	50-year	100-year	Regional
Pre-Development flow rates (cms)								
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
- EXISTING CONTOUR
- EXISTING DIRECTION OF DRAINAGE
- CATCHMENT AREA

SUB-CATCHMENT NUMBER
 AREA (ha.)

FIGURE 2.2 Date: MAR.24/23
 Scale: 1:750
PRE-DEVELOPMENT CATCHMENT AREAS
MTE
 Engineers, Scientists, Surveyors
 Project No.: 42063-104

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 March 7, 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 (Kfs) Summary (mm/hr)

Test Pit	Depth (mbgs)	Soil Type	Median Kfs ¹ (cm/sec)	Unfactored Infiltration Rate (mm/hr)
TP101-21	1.0	Silty SAND	8.9×10^{-5}	45
TP101-21	1.6	SAND, trace silt, trace gravel	3.5×10^{-4}	64
TP102-21	0.8	SAND and GRAVEL	5.8×10^{-3}	249
TP103-21	0.5	SAND and GRAVEL	5.4×10^{-3}	133
TP104-21	0.9	SAND and GRAVEL	4.3×10^{-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 24.9 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).

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 2 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 2 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 May 4, 2023, 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 (1.344ha) 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 eighteen 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

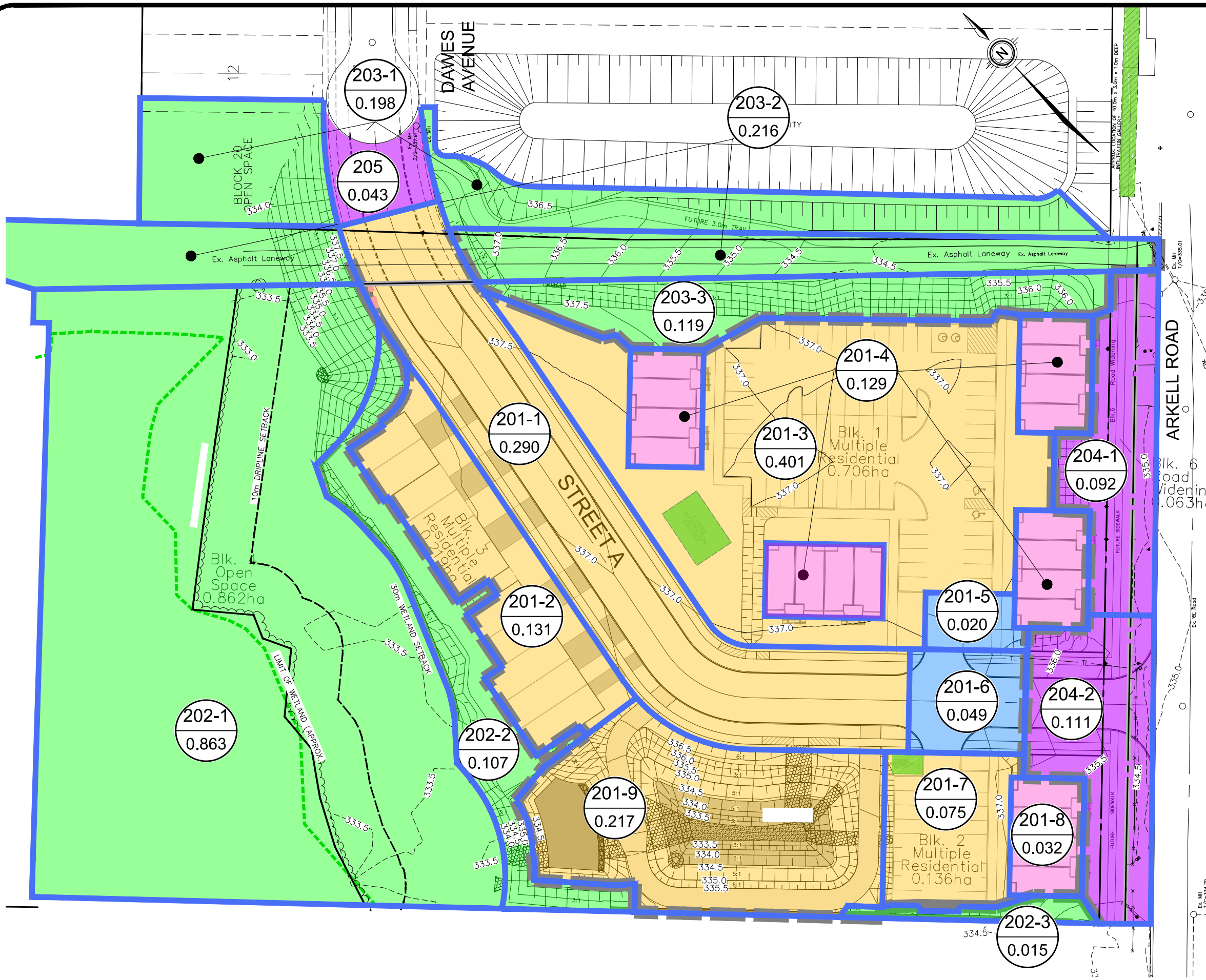
Catchment	Description	Area (ha)	% Impervious	Flow Length (m)	Slope (%)
To SWM Facility					
201-1	Street A to SWMF	0.290	65	60	0.8
201-2	Block 3 to SWMF	0.131	80	10	2.0
201-3	Block 1 to SWMF	0.401	62	80	0.5
201-4	Block 1 Roofs to Gallery	0.129	100	10	2.0
201-5	Block 1 minor to SWMF	0.020	85	10	3.0
201-6	Street A to SWMF	0.049	75	20	3.0
201-7	Block 2 to SWMF	0.075	80	40	0.5
201-8	Block 2 Roofs to Gallery	0.032	100	10	2.0
201-9	Proposed SWMF	0.217	40	15	10
Directly to Torrance Creek (Within Subject Lands)					
202-1	Wetland and buffers	0.863	0	50	0.5
202-2	Block 3 rear yards to Wetland	0.107	0	15	3.0
202-3	Block 2 grassed area to Wetland	0.015	0	205	0.5
To Torrance Creek through future parklands					
203-1	Ex. embankment to future trail	0.198	30	10	20
203-2	Future park trail	0.216	0	180	0.5
203-3	Block 1 embankment to future trail	0.119	0	10	33
To Arkell Road (Ultimately to Torrance Creek)					
204-1	Embankments and right-of-way north to existing infiltration gallery	0.092	12	15	2.0
204-2	Embankment and right-of-ways south to existing stone energy dissipators	0.111	36	25	5.0
To Adjacent Ex. SWM Facility					
205	Street A/Dawes Avenue to ex. SWMF	0.043	70	20	1.3
	Total	3.108	33.6	-	-

For a majority 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**.



LEGEND

- SITE BOUNDARY
- LIMIT OF WETLAND
- SURVEYED DRIPLINE
- 10m DRIPLINE SETBACK
- 30m WETLAND SETBACK
- EXISTING CONTOUR
- PROPOSED CONTOUR
- CATCHMENT AREA

SUB-CATCHMENT NUMBER
 AREA (ha.)

- INFILTRATION GALLERIES
- MINOR+MAJOR FLOWS TO SWMF
- MINOR FLOWS TO SWMF
MAJOR FLOWS TO ARKELL ROAD
- MINOR+MAJOR FLOWS TO WETLAND
- ROOFS TO INFILTRATION GALLERY
OVERFLOW TO SWMF
- MINOR+MAJOR FLOWS TO ARKELL ROAD

FIGURE 4.1 Date: MAR.24/23
 Scale: 1:750

**POST-DEVELOPMENT
 CATCHMENT AREAS**

MTE
 Engineers, Scientists, Surveyors

Project No.: 42063-104

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 the majority of annual rainfall occurs in storms less than or equal to a 25mm event, the majority of water borne 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 $\leq 25\text{mm}$) before releasing flows to the SWM facility. Flows from events greater than the 25mm storm may bypass the OGS unit. Per the City's standards, the proposed OGS (model EF6) unit has been verified by the Canadian Environmental Technology Verification Program. It should be noted that the OGS can provide up to 55% 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 wetcell/forebay design is based on classic particle settling and flow dispersion equations, as presented in the MOE's 2003 *Stormwater Management Planning and Design Manual*. The methodology presented in that document suggests that the design flow for the forebay should be taken as the peak outflow from the facility.

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 should be based on the notion that the flow into the forebay equals the flow through the forebay, which equals the flow out of the forebay. 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 0.0003m/s using the main pond's peak discharge from the 25mm storm event (as per MOE 2003);
- A settling length based on a settling velocity of 0.0055 m/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 1.344ha at 67.2% imperviousness. According to Table 3.2 from MOE's 2003 stormwater management guidelines, the infiltration cell requires 33.1m³/ha infiltration storage; the water quality cell requires 218.5 m³/ha of storage volume. As described in Section 3.1, 40m³/ha of which is extended detention and the remainder of which is permanent pool. As such, the required extended detention volume is 53.8m³, and a permanent pool volume of 239.9m³. Please note that since the infiltration cell is closed for the winter, the attenuation within the main cell is designed for the full drainage area.


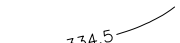
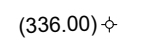



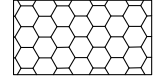


The drainage area towards the proposed SWM facility is considered small (< 8ha), so the minimum detention time required is 12 hours. As described in Section 4.6.2 of the MOE SWM manual, a minimum orifice size of 50mm is acceptable when the primary outlet is a perforated CSP riser. With a 50mm diameter orifice placed at permanent pool, a drawdown time of 15.7 and 24.9 hours is achieved for the MOE extended detention and 25mm-4hr events, respectively.

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	1.344ha
Imperviousness	67.2%
Bottom Elevation (Wet Cell)	333.20m
Storage	
<i>Quantity and Erosion Control</i>	
Drawdown Volume (based on 25mm-4hr event)	132m ³
Approximate Drawdown Time (based on 25mm-4hr event)	24.9 hours
Peak Release Rate (based on 25mm-4hr event)	0.0027m ³ /s
Outlet Controls	
<i>1500mm diameter Perforated CSP Riser Manhole</i>	
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)	1.0m / 10:1
Overflow Weir Elevation	335.30m

LEGEND

-  PROPERTY BOUNDARY
-  EXISTING CONTOURS
-  PROPOSED SPOT ELEVATIONS
-  MAJOR OVERLAND FLOW ROUTE
-  MAINTENANCE ACCESS
-  PERMANENT POOL ELEVATION = 334.40
-  300mm GABION MAT
-  PROPOSED STORM SEWER
-  30m WETLAND SETBACK

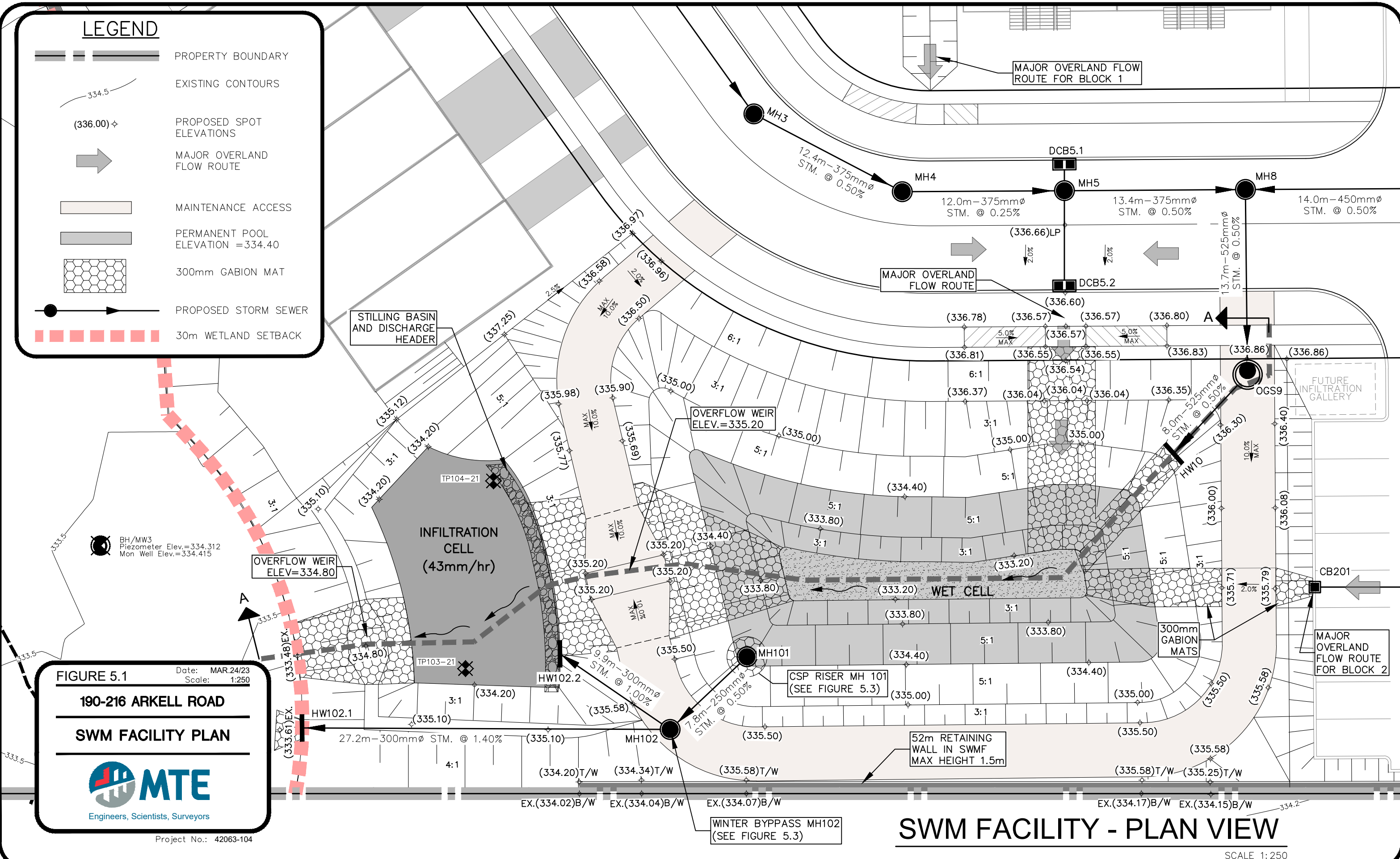


FIGURE 5.1 Date: MAR.24/23 Scale: 1:250

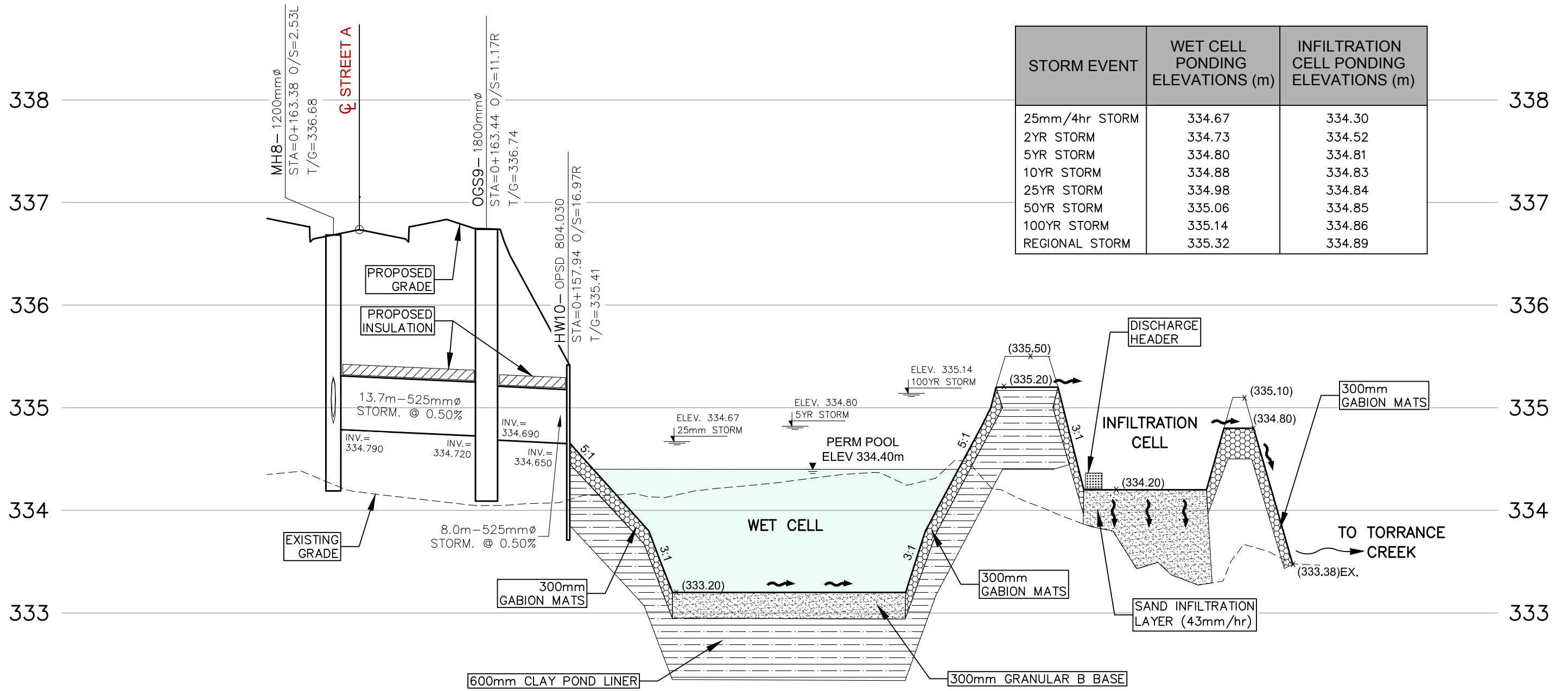
190-216 ARKELL ROAD
SWM FACILITY PLAN



Project No.: 42063-104

SWM FACILITY - PLAN VIEW

SCALE 1: 250



STORM EVENT	WET CELL PONDING ELEVATIONS (m)	INFILTRATION CELL PONDING ELEVATIONS (m)
25mm/4hr STORM	334.67	334.30
2YR STORM	334.73	334.52
5YR STORM	334.80	334.81
10YR STORM	334.88	334.83
25YR STORM	334.98	334.84
50YR STORM	335.06	334.85
100YR STORM	335.14	334.86
REGIONAL STORM	335.32	334.89

STORM OUTLET PROFILE - SECTION A-A

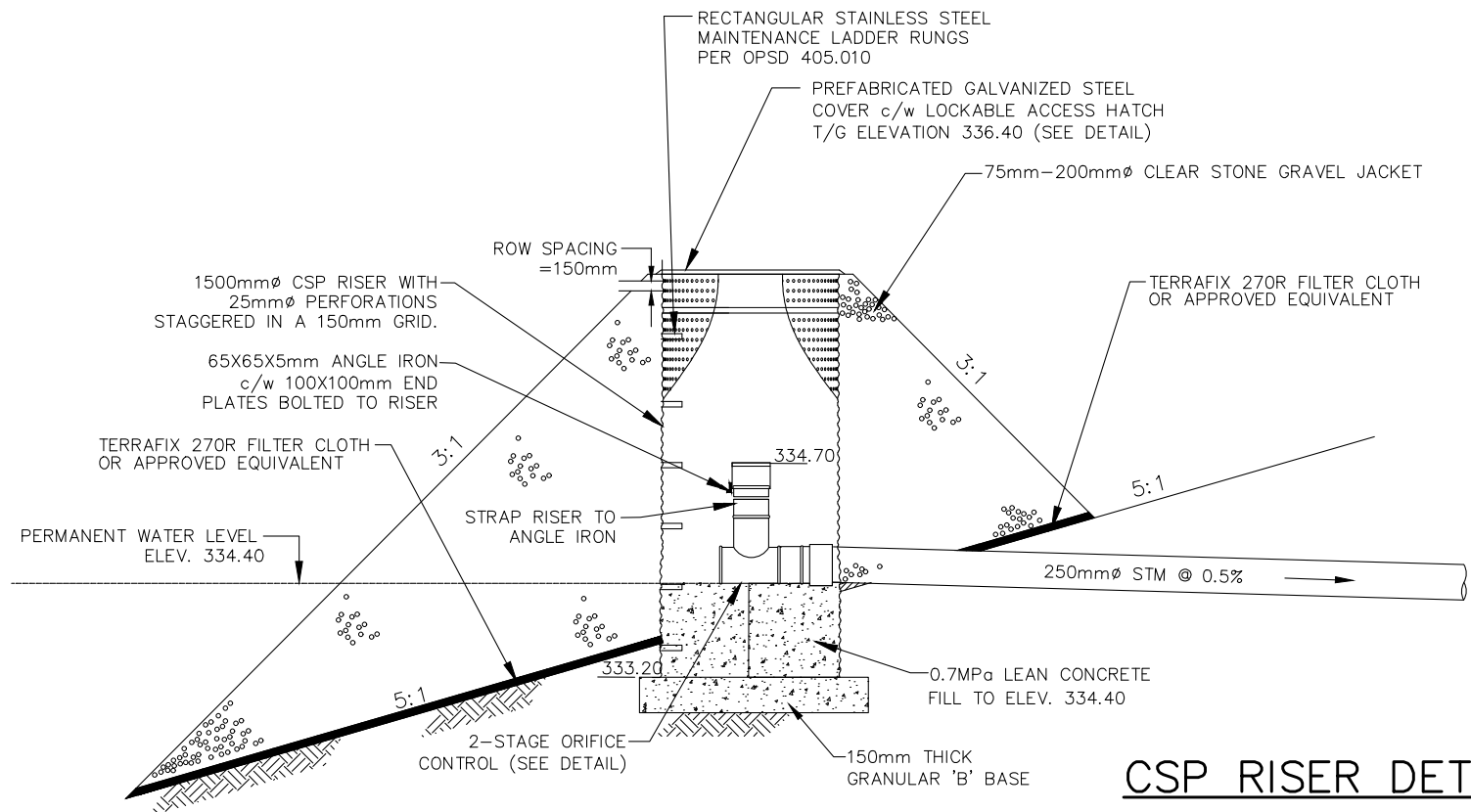
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FIGURE 5.2 Date: MAR.31/23
Scale: AS NOTED

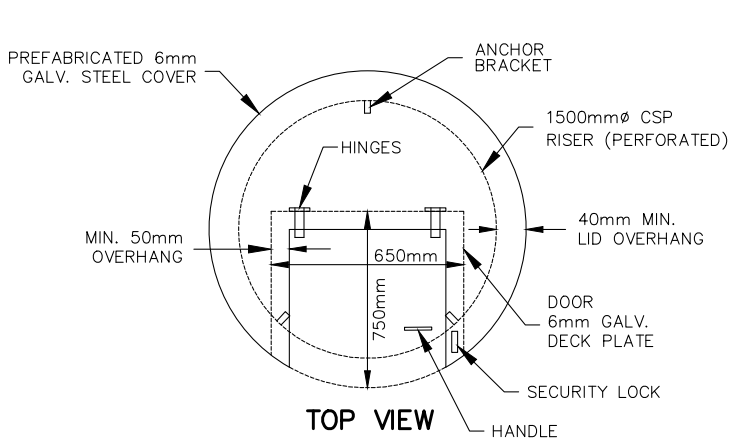
190-216 ARKELL ROAD

SWM FACILITY DETAILS 1

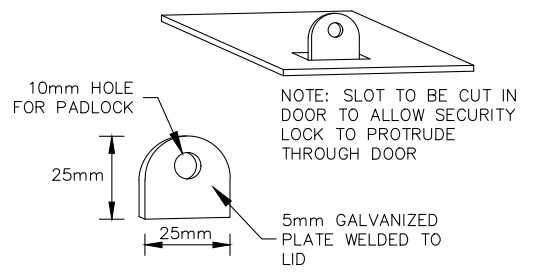
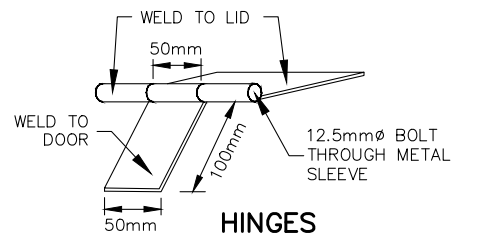
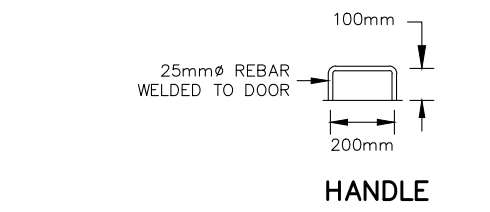
Project No.: 42063-104



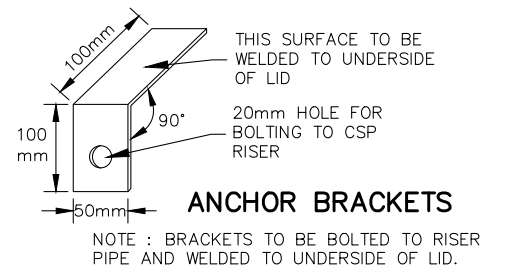
CSP RISER DETAIL
N.T.S.



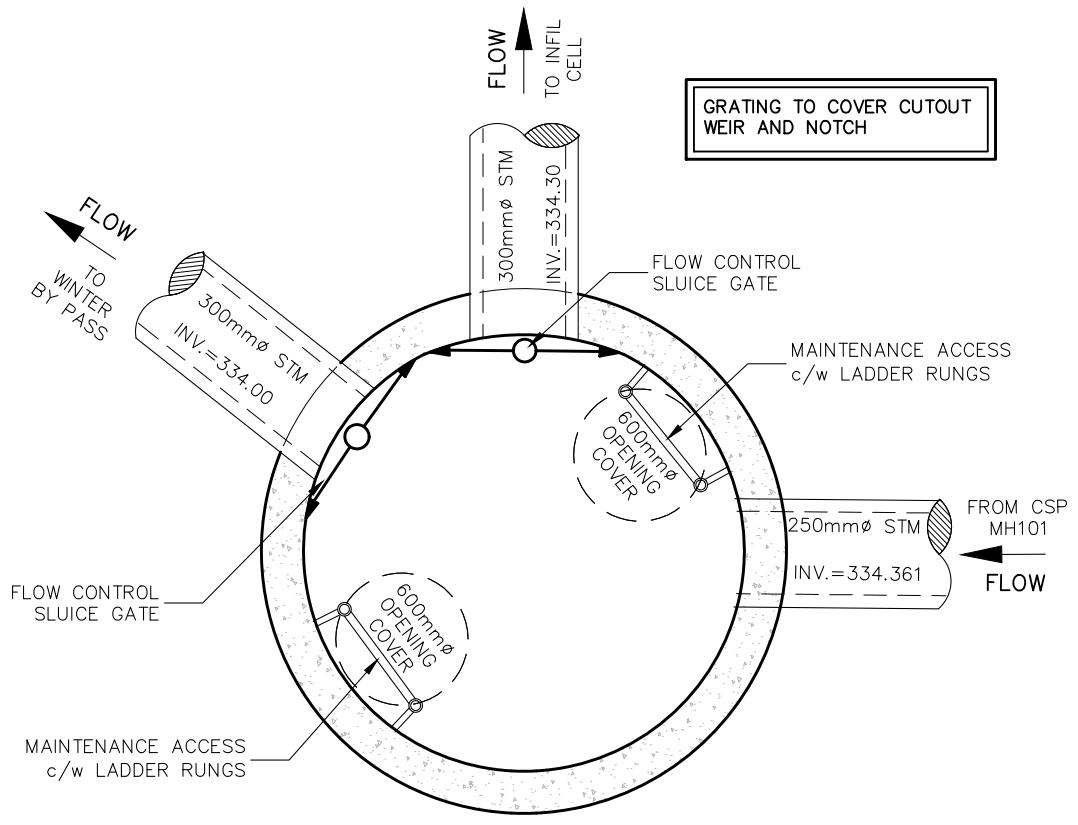
NOTE: CONTRACTOR SHALL SUPPLY A PAD LOCK ON THE STEEL COVER AND PROVIDE THE KEYS TO THE MUNICIPALITY AT THE TIME OF INSTALLATION



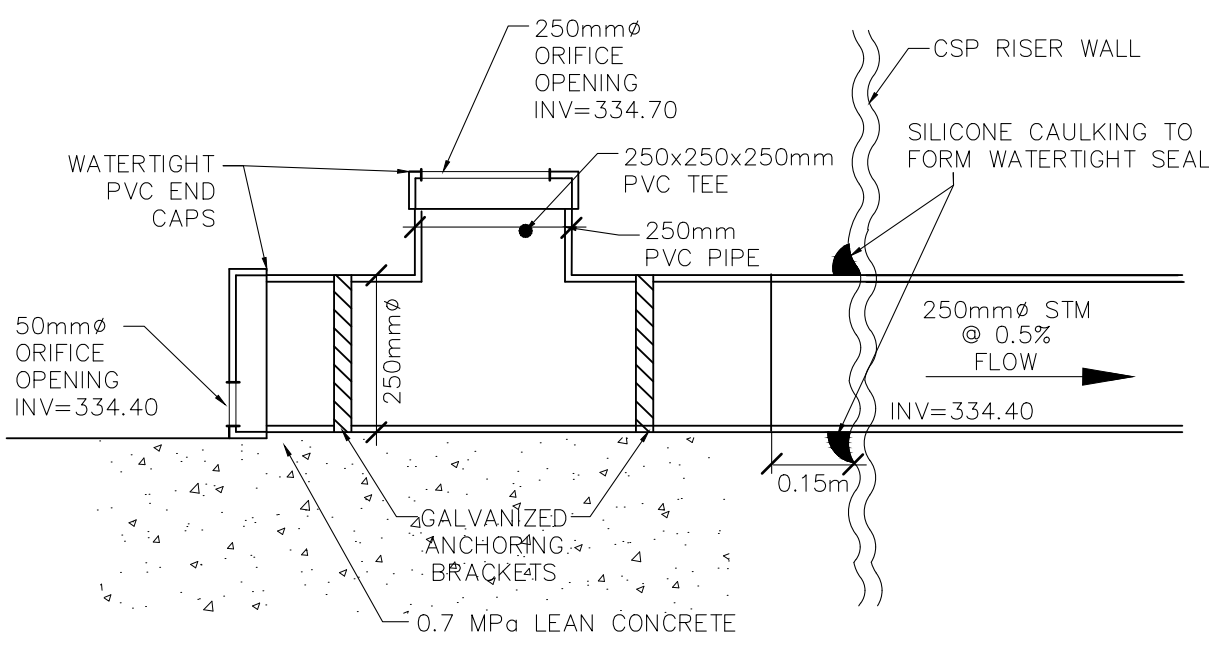
SECURITY LOCK



GALVANIZED STEEL COVER DETAIL FOR 1500mm ϕ CSP RISER
N.T.S.



WINTER BYPASS MH102
N.T.S.



2-STAGE ORIFICE DETAIL FOR CSP RISER
N.T.S.

FIGURE 5.3 Date: MAR.24/23 Scale: N.T.S.

190-216 ARKELL ROAD

SWM FACILITY DETAILS 3

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 a bypass manhole, which ultimately directs flows either to the infiltration cell, or bypasses directly to the wetland during winter months.

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 5.3** below.

Table 5.2 – Wet Cell Stage-Storage-Discharge Summary

Elevation (m)	Discharge (m ³ /s)	Volume (m ³)	Remarks
334.40	0.0000	0	Permanent Pool Elevation / 50mm Orifice Invert
334.50	0.0015	45	Contour
334.60	0.0023	94	Contour
334.70	0.0029	149	250mm Horizontal Orifice
334.80	0.0467	208	Contour
334.90	0.0650	273	Contour
335.00	0.0792	344	Contour
335.10	0.0911	419	Contour
335.20	0.1017	498	Contour
335.30	0.1112	580	Emergency Overflow Weir
335.40	0.2041	666	Contour
335.50	0.4716	756	Contour

Table 5.3 – Infiltration Cell Stage-Storage-Discharge Summary

Elevation (m)	Discharge (m ³ /s)	Volume (m ³)	Remarks
334.20	0.00000	0	Bottom on Infiltration Cell
334.30	0.00238	19	Contour
334.40	0.00258	40	Contour
334.50	0.00278	62	Contour
334.60	0.00300	87	Contour
334.70	0.00323	113	Contour
334.80	0.00345	141	Overflow Weir
334.90	0.155	171	Contour
335.00	0.464	203	Contour
335.10	0.907	237	Contour

The above discharges include an assumed constant infiltration rate of 43.0 mm/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 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 335.14m and 334.86m, respectively.

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

Storm Event	Peak Outflow to INF Cell (m ³ /s)	Maximum Ponding Volume (m ³)	Maximum Ponding Elevation (m)
25mm Storm Event	0.003	131	334.67
2-Year Storm Event	0.015	166	334.73
5-Year Storm Event	0.047	208	334.80
10-Year Storm Event	0.061	259	334.88
25-Year Storm Event	0.076	331	334.98
50-Year Storm Event	0.086	390	335.06
100-Year Storm Event	0.095	452	335.14
Regional Storm Event	0.132	600	335.32

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	-	19	334.30
2-Year Storm Event	0.003	-	66	334.52
5-Year Storm Event	0.003	0.015	144	334.81
10-Year Storm Event	0.003	0.046	150	334.83
25-Year Storm Event	0.003	0.068	154	334.84
50-Year Storm Event	0.003	0.080	157	334.85
100-Year Storm Event	0.003	0.090	159	334.86
Regional Storm Event	0.003	0.129	166	334.89

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 (m³/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
Post-Development								
SWMF Release (201-1 to 201-7)	-	-	0.015	0.046	0.068	0.080	0.090	0.129
<i>Overland flows to Torrance Creek</i>								
202-1	0.002	0.007	0.020	0.034	0.057	0.077	0.101	0.123
202-2	0.001	0.002	0.005	0.009	0.014	0.018	0.023	0.015
202-3	0.000	0.000	0.000	0.000	0.001	0.001	0.001	0.002
203-1	0.001	0.005	0.012	0.020	0.030	0.039	0.048	0.026
203-2	0.006	0.011	0.017	0.023	0.028	0.033	0.038	0.026
203-3	0.001	0.003	0.008	0.013	0.018	0.024	0.029	0.016
Total to Torrance**	0.009	0.022	0.046	0.077	0.124	0.156	0.192	0.306
<i>Overland Flows to Arkell Road</i>								
204-1	0.001	0.002	0.006	0.009	0.013	0.017	0.022	0.013
204-2	0.006	0.009	0.013	0.017	0.020	0.024	0.030	0.016
<i>Overland Flows to Ex. Arkell Meadows SWMF</i>								
205	0.004	0.007	0.009	0.012	0.014	0.016	0.018	0.006

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

In order 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 2 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 3 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 0.11ha, 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 $\leq 25\text{mm}$) 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 **Figures 2.2 & 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.

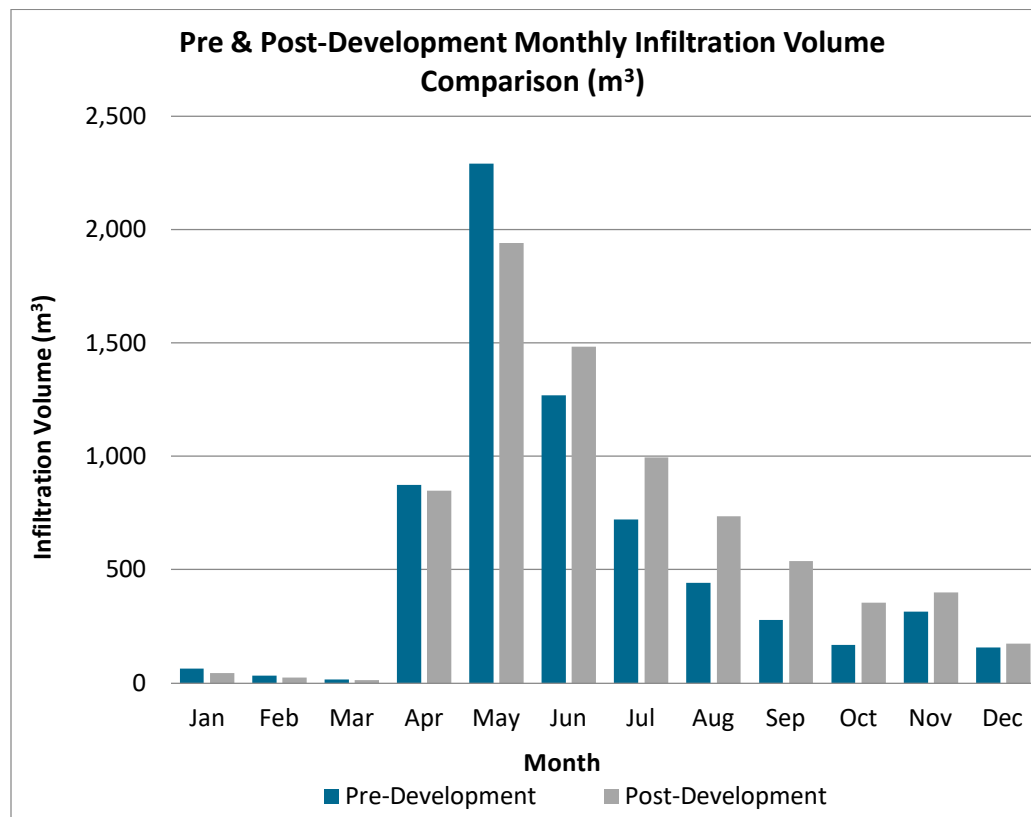
As stated in Section 3, the TCSS divided the subwatershed into three stormwater management areas, with respect to groundwater recharge, and established specific infiltration targets for each area. The Subject Lands fall within Area 2 (Arkell Road to Torrance Creek) and has a minimum infiltration target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

In pre-development conditions, the total drainage area is approximately 3.11 ha 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 6,616m³/year. In post-development conditions, the drainage area to the wetland is reduced to 2.87 ha and the impervious coverage is increased to 45.2 % coverage.

The post-development Site area has a passive infiltration of 4,857m³/year. Through the implementation of the rooftop infiltration galleries and the end-of-pipe infiltration cell operable during non-winter months, the total annual infiltration rate over the Site is increased to 7,544m³/year. This equates to an equivalent infiltration rate across the Subject Lands of 243mm/year, exceeding the TCSS criteria of 150mm/year and providing an annual infiltration surplus.

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 (m³)

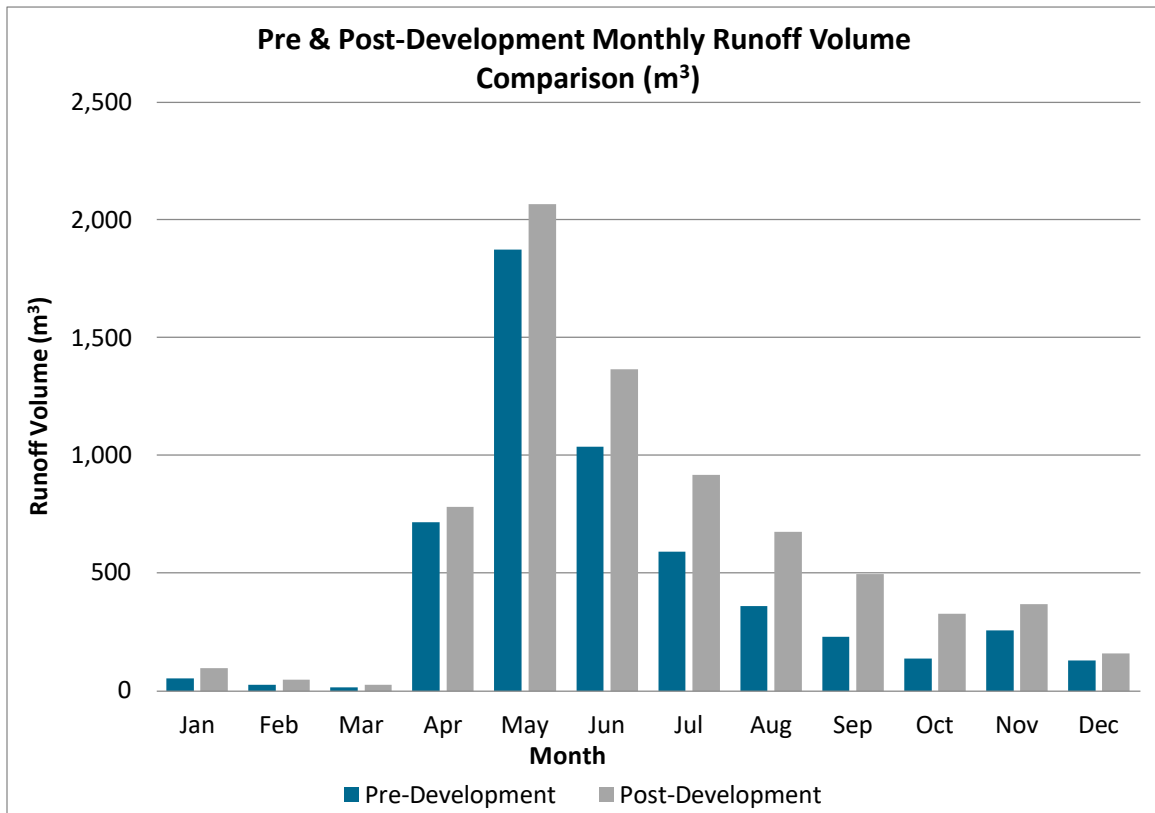


5.6.2 Surface Runoff to Wetland

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 5,413m³/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 2.87ha, and is inclusive of Catchments 201, 202, and 203. Catchments 204 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 7,308m³/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 254 mm/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 (m³)



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 25°C.

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 1-2 L/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.
- 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.
- 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 125m³/ha of live and dead storage respectively (total 250m³/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.



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AJC:VAL:jng

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Appendix A

Draft Plan of Subdivision (Reduced)

DRAFT PLAN OF SUBDIVISION

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

Source: National Road Network (NRN)

SCALE: NTS

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	1.062
Open Space	4		0.862
Stormwater Management	5		0.242
Road Widening	6		0.063
Roads			0.348
Total	6	80	2.577

- Notes**
- All dimensions are in metres unless otherwise shown
 - Drip-line Limits - Natural Resource Solutions Inc. (NRSI) June, 2016
 - Welland Limits - Natural Resource Solutions Inc. (NRSI) August, 2016
 - Property boundary is approximate, based on MTE Existing Conditions Plan and Wellington County Survey plans 61R-773, 61R-2819
 - Surrounding parcel boundaries are approximate taken from Vumap (First Base Solutions) aerial imagery
 - Unit yield based on Conceptual Site Plan prepared by MHBC Planning
 - Building footprints outside of subject lands gathered from City of Guelph open data

Revision No.	Date	Issued / Revision	By
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.
4.	September 12, 2018	Update/ Issued for Review;	G.C.
3.	July 4, 2017	Update/ Issued for Review;	G.C.
2.	March 13, 2017	Issued for Review;	G.C.
1.			

**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
	April 27, 2022
File No.	15246A
Plan Scale	1:400 (36x24)
Drawn By	G.C.
Checked By	D.A.

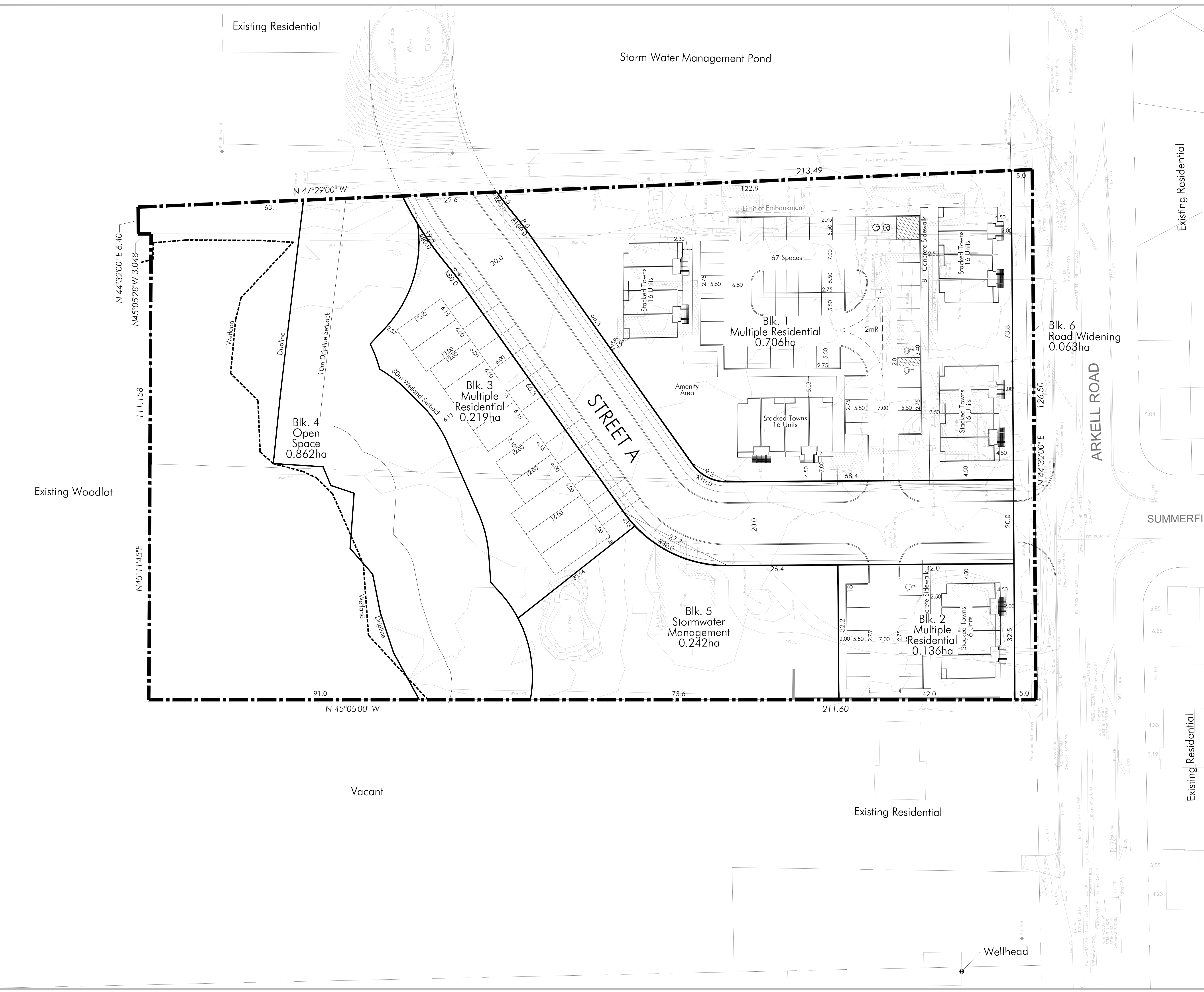
Project Arkell Road - Guelph

Applicant

Crescent Homes
151 Curzon Crescent
Guelph, ON. N1K 0B3
P: 647.523.6487

File Name Draft Plan of Subdivision **Dwg No.** 1 of 1

Scale Bar



DRAFT

Appendix B

Existing Conditions Catchment Parameters and MIDUSS Modelling



**Arkell Road
STORMWATER MANAGEMENT
Guelph, Ontario**

Project Number: 42063-104
 Date: March 3, 2023
 Design By: AJC
 File: Q:\42063\104\SWMM\March 2023\42063-104 Master SWM Facility Design Sheet.xlsx

**HYDROLOGIC PARAMETERS
Pre-Development Conditions**

Sub-Catchment Number	Area (ha)	Overland Slope (%)	Overland Length (m)	SCS Curve Number		Impervious	Percent Impervious (%)	Land Use	Comment
				Pervious (AMC II)	Pervious (AMC III)				
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
	<u>2.577</u>						<u>10.6%</u>		
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 + Embankments
105	0.057	0.5	125	74	87	98	20%	Residential	Driveways + Ditch within Right-of-way
	<u>0.531</u>						<u>15.7%</u>		
Total	<u>3.108</u>						<u>11.5%</u>		

**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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" 0.100 Pervious Ia/S coefficient"
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" 0.806 Impervious Runoff coefficient"
" 0.100 Impervious Ia/S coefficient"
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" Surface Area 1.440 0.274 1.714 hectare"
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" Time to Centroid 347.290 133.825 217.179 minutes"
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" 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"
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" Time to Centroid 248.117 125.802 248.116 minutes"
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" Rainfall volume 215.99 0.00 215.99 c.m"
" Rainfall losses 22.566 4.865 22.566 mm"
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" Rainfall volume 42.05 18.02 60.07 c.m"

" Rainfall losses 22.566 4.828 17.245 mm"

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" 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"
 " 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"
 " 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"

" 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"

```

" 33 0.020 0.000 0.020 0.084"

" 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 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"

```


" 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"
 " 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"
 " 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"

" 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"

```

" 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: 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"

```

" 33 0.057 0.000 0.057 0.140"

" 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"

```

" 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"

```

```

" 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"

```


" 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"
 " 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"
 " 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"

" 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"

```

" 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"

```

" 33 0.101 0.000 0.101 0.211"

" 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 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"

```

" 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"

```

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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: 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"

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"          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: March 3, 2023
 Design By: AJC
 File: Q:\42063\104\SWMM\March 2023\42063-104 Master SWM Facility Design Sheet.xlsx

**HYDROLOGIC PARAMETERS
Post-Development Conditions**

Sub-Catchment Number	Area (ha)	Overland Slope (%)	Overland Length (m)	SCS Curve Number		Impervious	Percent Impervious (%)	Land Use	Comment
				Pervious (AMC II)	Pervious (AMC III)				
To SWMF									
201-1	0.290	0.8	60	74	87	98	65%	Right-of-way	Street A Right-of-way to SWMF
201-2	0.131	2.0	10	74	87	98	80%	Residential	Block 3 to SWMF
201-3	0.401	0.5	80	74	87	98	62%	Residential	Block 1 to SWMF
201-4	0.129	2.0	10	74	87	98	100%	Residential	Block 1 Roofs to Gallery, overflow to SWMF
201-5	0.020	3.0	10	74	87	98	85%	Residential	Block 1 to SWMF, Major flows to Arkell
201-6	0.049	3.0	20	74	87	98	75%	Right-of-way	Street A Right-of-way to SWMF, Major flows to Arkell
201-7	0.075	0.5	40	74	87	98	80%	Residential	Block 2 to SWMF
201-8	0.032	2.0	10	74	87	98	100%	Residential	Block 2 Roofs to Gallery, overflow to SWMF
201-9	0.217	10	15	74	87	98	40%	SWMF	Proposed SWMF
	<u>1.344</u>						<u>67.2%</u>		
Subject Lands to Torrance Creek									
202-1	0.863	0.5	50	74	87	98	0%	Wetland	Wetland/Forested Area/Torrance Creek
202-2	0.107	3.0	15	74	87	98	0%	Residential	Block 3 Rear Yards to Torrance Creek
202-3	0.015	0.5	205	74	87	98	0%	Residential	Block 2 Grassed Area to Torrance Creek
	<u>0.985</u>						<u>0.0%</u>		
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	0.119	33	10	74	87	98	0%	Residential	Block 1 Embankment
	<u>0.533</u>						<u>11.1%</u>		
To Arkell Road									
204-1	0.092	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
	<u>0.203</u>						<u>25.1%</u>		
To Adjacent Ex. SWMF									
205	0.043	1.25	20	74	87	98	70.0%	Residential/RoW	Dawes Avenue to adjacent SWMF
Total	<u>3.108</u>						<u>33.6%</u>		

**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\March 2023\MIDUSS\POST"
"      Output filename:        25mm4hrPost2023.in"
"      Licensee name:          A"
"      Company                  "
"      Date & Time last used:   3/9/2023 at 2:21:21 PM"
" 31 TIME PARAMETERS"
"      5.000 Time Step"
"      240.000 Max. Storm length"
"      1500.000 Max. Hydrograph"
" 32 STORM Chicago storm"
"      1 Chicago storm"
"      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"
"      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"
"      0.290 Total Area"
"      60.000 Flow length"
"      0.750 Overland Slope"
"      0.102 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."
"      0.098 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"
"      0.025 0.000 0.000 0.000 c.m/sec"
"      Catchment 2011 Pervious Impervious Total Area "
"      Surface Area      0.102 0.188 0.290 hectare"
"      Time of concentration 89.369 5.385 10.566 minutes"
"      Time to Centroid  246.824 125.697 133.169 minutes"
"      Rainfall depth    25.028 25.028 25.028 mm"
"      Rainfall volume   25.40 47.18 72.58 c.m"
"      Rainfall losses   22.566 4.867 11.062 mm"
"      Runoff depth      2.461 20.161 13.966 mm"
"      Runoff volume     2.50 38.00 40.50 c.m"
"      Runoff coefficient 0.098 0.806 0.558 "
"      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"

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"      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 40.502 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 3 Front/Roofs to SWMF"
"      80.000 % Impervious"
"      0.131 Total Area"
"      10.000 Flow length"
"      2.000 Overland Slope"
"      0.026 Pervious Area"
"      10.000 Pervious length"
"      2.000 Pervious slope"
"      0.105 Impervious Area"
"      10.000 Impervious length"
"      2.000 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."
"      0.794 Impervious Runoff coefficient"
"      0.100 Impervious Ia/S coefficient"
"      0.518 Impervious Initial abstraction"
"      0.016 0.000 0.025 0.025 c.m/sec"
"      Catchment 2012 Pervious Impervious Total Area "
"      Surface Area      0.026 0.105 0.131 hectare"
"      Time of concentration 22.725 1.369 2.010 minutes"
"      Time to Centroid  168.546 119.217 120.697 minutes"
"      Rainfall depth    25.028 25.028 25.028 mm"
"      Rainfall volume   6.56 26.23 32.79 c.m"
"      Rainfall losses   22.568 5.156 8.638 mm"
"      Runoff depth      2.459 19.872 16.390 mm"
"      Runoff volume     0.64 20.83 21.47 c.m"
"      Runoff coefficient 0.098 0.794 0.655 "
"      Maximum flow     0.000 0.016 0.016 c.m/sec"
" 40 HYDROGRAPH Add Runoff "
"      4 Add Runoff "
"      0.016 0.016 0.025 0.025"
" 40 HYDROGRAPH Copy to Outflow"
"      8 Copy to Outflow"
"      0.016 0.016 0.016 0.025"
" 40 HYDROGRAPH Combine 900"
"      6 Combine "
"      900 Node #"
"      SWMF"
"      Maximum flow      0.036 c.m/sec"
"      Hydrograph volume 61.972 c.m"
"      0.016 0.016 0.016 0.036"
" 40 HYDROGRAPH Start - New Tributary"
"      2 Start - New Tributary"
"      0.016 0.000 0.016 0.036"

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```
" 33      CATCHMENT 2013"
"          1 Triangular SCS"
"          1 Equal length"
"          1 SCS method"
"          2013 201-3 - Block 1 to SWMF"
"          62.000 % Impervious"
"          0.401 Total Area"
"          80.000 Flow length"
"          0.500 Overland Slope"
"          0.152 Pervious Area"
"          80.000 Pervious length"
"          0.500 Pervious slope"
"          0.249 Impervious Area"
"          80.000 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."
"          0.802 Impervious Runoff coefficient"
"          0.100 Impervious Ia/S coefficient"
"          0.518 Impervious Initial abstraction"
"          0.034 0.000 0.016 0.036 c.m/sec"
"          Catchment 2013 Pervious Impervious Total Area "
"          Surface Area 0.152 0.249 0.401 hectare"
"          Time of concentration 119.944 7.228 15.109 minutes"
"          Time to Centroid 282.740 128.682 139.454 minutes"
"          Rainfall depth 25.028 25.028 25.028 mm"
"          Rainfall volume 38.14 62.22 100.36 c.m"
"          Rainfall losses 22.566 4.960 11.650 mm"
"          Runoff depth 2.462 20.068 13.377 mm"
"          Runoff volume 3.75 49.89 53.64 c.m"
"          Runoff coefficient 0.098 0.802 0.535 "
"          Maximum flow 0.000 0.034 0.034 c.m/sec"
" 40 HYDROGRAPH Add Runoff "
" 4 Add Runoff "
"          0.034 0.034 0.016 0.036"
" 40 HYDROGRAPH Copy to Outflow"
" 8 Copy to Outflow"
"          0.034 0.034 0.034 0.036"
" 40 HYDROGRAPH Combine 900"
" 6 Combine "
" 900 Node #"
"      SWMF"
"          Maximum flow 0.069 c.m/sec"
"          Hydrograph volume 115.615 c.m"
"          0.034 0.034 0.034 0.069"
" 40 HYDROGRAPH Start - New Tributary"
" 2 Start - New Tributary"
"          0.034 0.000 0.034 0.069"
" 33 CATCHMENT 2014"
"          1 Triangular SCS"
"          1 Equal length"
"          1 SCS method"
"          2014 201-4 - Block 1 Roofs to SWMF"
"          100.000 % Impervious"
"          0.129 Total Area"
"          10.000 Flow length"
"          2.000 Overland Slope"
"          0.000 Pervious Area"
"          10.000 Pervious length"
"          2.000 Pervious slope"
"          0.129 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."
"          0.794 Impervious Runoff coefficient"
"          0.100 Impervious Ia/S coefficient"
"          0.518 Impervious Initial abstraction"
"          0.020 0.000 0.034 0.069 c.m/sec"
"          Catchment 2014 Pervious Impervious Total Area "
"          Surface Area 0.000 0.129 0.129 hectare"
"          Time of concentration 22.725 1.369 1.369 minutes"
"          Time to Centroid 168.546 119.217 119.217 minutes"
"          Rainfall depth 25.028 25.028 25.028 mm"
"          Rainfall volume 0.00 32.29 32.29 c.m"
"          Rainfall losses 22.568 5.156 5.156 mm"
"          Runoff depth 2.459 19.872 19.872 mm"
"          Runoff volume 0.00 25.64 25.64 c.m"
"          Runoff coefficient 0.000 0.794 0.794 "
"          Maximum flow 0.000 0.020 0.020 c.m/sec"
" 40 HYDROGRAPH Add Runoff "
" 4 Add Runoff "
"          0.020 0.020 0.034 0.069"
" 57 TRENCH Design d/s of 2014"
" 0.020 Peak inflow"
" 25.635 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 0.000 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 25.626 c.m"
"          Maximum level 334.920 metre"
```


" Maximum storage 16.139 c.m"
 " Centroidal lag 4.159 hours"
 " Infiltration area 2 sides 6.725 sq.metre"
 " Infiltration Base area 96.000 sq.metre"
 " 0.020 0.020 0.000 0.001 c.m/sec"
 " 40 HYDROGRAPH Combine 900"
 " 6 Combine "
 " 900 Node #"
 " SWMF"
 " Maximum flow 0.069 c.m/sec"
 " Hydrograph volume 115.617 c.m"
 " 0.020 0.020 0.000 0.069"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.020 0.000 0.000 0.069"
 " 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."
 " 0.098 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."
 " 0.791 Impervious Runoff coefficient"
 " 0.100 Impervious Ia/S coefficient"
 " 0.518 Impervious Initial abstraction"
 " 0.003 0.000 0.000 0.069 c.m/sec"
 " Catchment 2015 Pervious Impervious Total Area "
 " Surface Area 0.003 0.017 0.020 hectare"
 " Time of concentration 20.122 1.213 1.619 minutes"
 " Time to Centroid 165.475 119.014 120.011 minutes"
 " Rainfall depth 25.028 25.028 25.028 mm"
 " Rainfall volume 0.75 4.25 5.01 c.m"
 " Rainfall losses 22.568 5.241 7.840 mm"
 " Runoff depth 2.460 19.786 17.187 mm"
 " Runoff volume 0.07 3.36 3.44 c.m"
 " Runoff coefficient 0.098 0.791 0.687 "
 " Maximum flow 0.000 0.003 0.003 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.003 0.003 0.000 0.069"
 " 56 DIVERSION"
 " 2015 Node number"
 " 1.000 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 0.069 c.m/sec"

" 40 HYDROGRAPH Combine 900"
 " 6 Combine "
 " 900 Node #"
 " SWMF"
 " Maximum flow 0.071 c.m/sec"
 " Hydrograph volume 119.054 c.m"
 " 0.003 0.003 0.003 0.071"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.003 0.000 0.003 0.071"
 " 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"
 " 0.049 Total Area"
 " 20.000 Flow length"
 " 3.000 Overland Slope"
 " 0.012 Pervious Area"
 " 20.000 Pervious length"
 " 3.000 Pervious slope"
 " 0.037 Impervious Area"
 " 20.000 Impervious length"
 " 3.000 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."
 " 0.798 Impervious Runoff coefficient"
 " 0.100 Impervious Ia/S coefficient"
 " 0.518 Impervious Initial abstraction"
 " 0.005 0.000 0.003 0.071 c.m/sec"
 " Catchment 2016 Pervious Impervious Total Area "
 " Surface Area 0.012 0.037 0.049 hectare"
 " Time of concentration 30.500 1.838 2.968 minutes"
 " Time to Centroid 177.670 119.953 122.230 minutes"
 " Rainfall depth 25.028 25.028 25.028 mm"
 " Rainfall volume 3.07 9.20 12.26 c.m"
 " Rainfall losses 22.567 5.055 9.433 mm"
 " Runoff depth 2.460 19.973 15.595 mm"
 " Runoff volume 0.30 7.34 7.64 c.m"
 " Runoff coefficient 0.098 0.798 0.623 "
 " Maximum flow 0.000 0.005 0.005 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.005 0.005 0.003 0.071"
 " 56 DIVERSION"
 " 2106 Node number"
 " 1.000 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"
 " DIV02106.025hyd"
 " Major flow at 2106"
 " 0.005 0.005 0.005 0.071 c.m/sec"
 " 40 HYDROGRAPH Combine 900"
 " 6 Combine "
 " 900 Node #"
 " SWMF"
 " Maximum flow 0.075 c.m/sec"

" Hydrograph volume 126.696 c.m"
 " 0.005 0.005 0.005 0.075"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.005 0.000 0.005 0.075"
 " 33 CATCHMENT 2017"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2017 201-7 - Block 2 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."
 " 0.098 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."
 " 0.801 Impervious Runoff coefficient"
 " 0.100 Impervious Ia/S coefficient"
 " 0.518 Impervious Initial abstraction"
 " 0.008 0.000 0.005 0.075 c.m/sec"
 " Catchment 2017 Pervious Impervious Total Area "
 " Surface Area 0.015 0.060 0.075 hectare"
 " Time of concentration 79.133 4.769 6.984 minutes"
 " Time to Centroid 234.798 124.751 128.030 minutes"
 " Rainfall depth 25.028 25.028 25.028 mm"
 " Rainfall volume 3.75 15.02 18.77 c.m"
 " Rainfall losses 22.566 4.989 8.504 mm"
 " Runoff depth 2.461 20.039 16.524 mm"
 " Runoff volume 0.37 12.02 12.39 c.m"
 " Runoff coefficient 0.098 0.801 0.660 "
 " Maximum flow 0.000 0.008 0.008 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.008 0.008 0.005 0.075"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.008 0.008 0.008 0.075"
 " 40 HYDROGRAPH Combine 900"
 " 6 Combine "
 " 900 Node #"
 " SWMF"
 " Maximum flow 0.083 c.m/sec"
 " Hydrograph volume 139.088 c.m"
 " 0.008 0.008 0.008 0.083"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.008 0.000 0.008 0.083"
 " 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."
 " 0.794 Impervious Runoff coefficient"
 " 0.100 Impervious Ia/S coefficient"
 " 0.518 Impervious Initial abstraction"
 " 0.005 0.000 0.008 0.083 c.m/sec"
 " Catchment 2018 Pervious Impervious Total Area "
 " Surface Area 0.000 0.032 0.032 hectare"
 " Time of concentration 22.725 1.369 1.369 minutes"
 " Time to Centroid 168.546 119.217 119.217 minutes"
 " Rainfall depth 25.028 25.028 25.028 mm"
 " Rainfall volume 0.00 8.01 8.01 c.m"
 " Rainfall losses 22.568 5.156 5.156 mm"
 " Runoff depth 2.459 19.872 19.872 mm"
 " Runoff volume 0.00 6.36 6.36 c.m"
 " Runoff coefficient 0.000 0.794 0.794 "
 " Maximum flow 0.000 0.005 0.005 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.005 0.005 0.008 0.083"
 " 57 TRENCH Design d/s of 2018"
 " 0.005 Peak inflow"
 " 6.359 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 0.000 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 6.356 c.m"
 " Maximum level 334.733 metre"
 " Maximum storage 3.460 c.m"
 " Centroidal lag 3.178 hours"
 " Infiltration area 2 sides 4.326 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 0.083 c.m/sec"
 " Hydrograph volume 139.090 c.m"
 " 0.005 0.005 0.000 0.083"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.005 0.000 0.000 0.083"
 " 33 CATCHMENT 2019"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2019 201-9 - SWMF Block"
 " 40.000 % Impervious"
 " 0.217 Total Area"
 " 15.000 Flow length"
 " 10.000 Overland Slope"
 " 0.130 Pervious Area"
 " 15.000 Pervious length"
 " 10.000 Pervious slope"
 " 0.087 Impervious Area"
 " 15.000 Impervious length"
 " 10.000 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."
 " 0.785 Impervious Runoff coefficient"
 " 0.100 Impervious Ia/S coefficient"
 " 0.518 Impervious Initial abstraction"
 " 0.014 0.000 0.000 0.083 c.m/sec"
 " Catchment 2019 Pervious Impervious Total Area "
 " Surface Area 0.130 0.087 0.217 hectare"
 " Time of concentration 17.884 1.078 3.733 minutes"
 " Time to Centroid 162.838 118.763 125.726 minutes"
 " Rainfall depth 25.028 25.028 25.028 mm"
 " Rainfall volume 32.59 21.72 54.31 c.m"
 " Rainfall losses 22.569 5.370 15.689 mm"
 " Runoff depth 2.459 19.657 9.338 mm"
 " Runoff volume 3.20 17.06 20.26 c.m"
 " Runoff coefficient 0.098 0.785 0.373 "
 " Maximum flow 0.001 0.014 0.014 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.014 0.014 0.000 0.083"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.014 0.014 0.014 0.083"
 " 40 HYDROGRAPH Combine 900"
 " 6 Combine "

" 900 Node #"
 " SWMF"
 " Maximum flow 0.090 c.m/sec"
 " Hydrograph volume 159.354 c.m"
 " 0.014 0.014 0.014 0.090"
 " 40 HYDROGRAPH Confluence 900"
 " 7 Confluence "
 " 900 Node #"
 " SWMF"
 " Maximum flow 0.090 c.m/sec"
 " Hydrograph volume 159.354 c.m"
 " 0.014 0.090 0.014 0.000"
 " 54 POND DESIGN"
 " 0.090 Current peak flow c.m/sec"
 " 0.051 Target outflow c.m/sec"
 " 159.4 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 45.000"
 " 334.600 0.00230 94.000"
 " 334.700 0.00290 149.000"
 " 334.800 0.04670 208.000"
 " 334.900 0.06500 273.000"
 " 335.000 0.07920 344.000"
 " 335.100 0.09110 419.000"
 " 335.200 0.1017 498.000"
 " 335.300 0.1112 580.000"
 " 335.400 0.2041 666.000"
 " 335.500 0.4716 756.000"
 " Peak outflow 0.003 c.m/sec"
 " Maximum level 334.667 metre"
 " Maximum storage 131.050 c.m"
 " Centroidal lag 12.520 hours"
 " 0.014 0.090 0.003 0.000 c.m/sec"
 " 40 HYDROGRAPH Next link "
 " 5 Next link "
 " 0.014 0.003 0.003 0.000"
 " 54 POND DESIGN"
 " 0.003 Current peak flow c.m/sec"
 " 0.051 Target outflow c.m/sec"
 " 143.9 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 0.00238 19.000"
 " 334.400 0.00258 40.000"
 " 334.500 0.00278 62.000"
 " 334.600 0.00300 87.000"
 " 334.700 0.00323 113.000"
 " 334.800 0.00345 141.000"
 " 334.900 0.1550 171.000"
 " 335.000 0.4636 203.000"
 " 335.100 0.9068 237.000"
 " Peak outflow 0.002 c.m/sec"
 " Maximum level 334.300 metre"
 " Maximum storage 18.917 c.m"

" Centroidal lag 12.778 hours"
 " 0.014 0.003 0.002 0.000 c.m/sec"
 " 40 HYDROGRAPH Combine 800"
 " 6 Combine "
 " 800 Node #"
 " Torrance Creek"
 " Maximum flow 0.002 c.m/sec"
 " Hydrograph volume 138.394 c.m"
 " 0.014 0.003 0.002 0.002"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.014 0.000 0.002 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"
 " 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 0.002 0.002 c.m/sec"
 " Catchment 2021 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 0.002 0.002"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.002 0.002 0.002 0.002"
 " 40 HYDROGRAPH Combine 800"
 " 6 Combine "
 " 800 Node #"
 " Torrance Creek"
 " Maximum flow 0.003 c.m/sec"
 " Hydrograph volume 159.636 c.m"
 " 0.002 0.002 0.002 0.003"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.002 0.000 0.002 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"
 " 0.107 Total Area"
 " 15.000 Flow length"
 " 3.000 Overland Slope"
 " 0.107 Pervious Area"
 " 15.000 Pervious length"
 " 3.000 Pervious slope"
 " 0.000 Impervious Area"
 " 15.000 Impervious length"
 " 3.000 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"
 " 0.001 0.000 0.002 0.003 c.m/sec"
 " Catchment 2022 Pervious Impervious Total Area "
 " Surface Area 0.107 0.000 0.107 hectare"
 " Time of concentration 25.664 1.547 25.664 minutes"
 " Time to Centroid 171.995 119.383 171.994 minutes"
 " Rainfall depth 25.028 25.028 25.028 mm"
 " Rainfall volume 26.78 0.00 26.78 c.m"
 " Rainfall losses 22.568 5.105 22.568 mm"
 " Runoff depth 2.459 19.923 2.460 mm"
 " Runoff volume 2.63 0.00 2.63 c.m"
 " Runoff coefficient 0.098 0.000 0.098 "
 " Maximum flow 0.001 0.000 0.001 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.001 0.001 0.002 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 Creek"
 " Maximum flow 0.003 c.m/sec"
 " Hydrograph volume 162.267 c.m"
 " 0.001 0.001 0.001 0.003"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.001 0.000 0.001 0.003"
 " 33 CATCHMENT 2023"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2023 202-3 - Block 2 Grassed Area to Torrance"
 " 0.000 % Impervious"
 " 0.015 Total Area"
 " 205.000 Flow length"
 " 0.500 Overland Slope"
 " 0.015 Pervious Area"
 " 205.000 Pervious length"
 " 0.500 Pervious slope"

"	0.000	Impervious Area"			
"	205.000	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"			
"	0.000	0.000	0.001	0.003	c.m/sec"
"	Catchment 2023	Pervious	Impervious	Total Area	"
"	Surface Area	0.015	0.000	0.015	hectare"
"	Time of concentration	210.948	12.712	210.946	minutes"
"	Time to Centroid	389.640	137.272	389.638	minutes"
"	Rainfall depth	25.028	25.028	25.028	mm"
"	Rainfall volume	3.75	0.00	3.75	c.m"
"	Rainfall losses	22.566	4.856	22.566	mm"
"	Runoff depth	2.462	20.172	2.462	mm"
"	Runoff volume	0.37	0.00	0.37	c.m"
"	Runoff coefficient	0.098	0.000	0.098	"
"	Maximum flow	0.000	0.000	0.000	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.000	0.000	0.001	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 Creek"				
"	Maximum flow	0.003			c.m/sec"
"	Hydrograph volume	162.637			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 2031"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	1 SCS method"				
"	2031 203-1 - Arkell Meadows Embankments to Trail"				
"	0.000 % Impervious"				
"	0.198 Total Area"				
"	10.000 Flow length"				
"	20.000 Overland Slope"				
"	0.198 Pervious Area"				
"	10.000 Pervious length"				
"	20.000 Pervious slope"				
"	0.000 Impervious Area"				
"	10.000 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."				
"	0.807 Impervious Runoff coefficient"				
"	0.100 Impervious Ia/S coefficient"				
"	0.518 Impervious Initial abstraction"				
"	0.006	0.000	0.001	0.004	c.m/sec"
"	Catchment 2032	Pervious	Impervious	Total Area	"
"	Surface Area	0.151	0.065	0.216	hectare"
"	Time of concentration	195.113	11.758	52.348	minutes"
"	Time to Centroid	371.038	135.753	187.840	minutes"
"	Rainfall depth	25.028	25.028	25.028	mm"
"	Rainfall volume	37.84	16.22	54.06	c.m"
"	Rainfall losses	22.566	4.826	17.244	mm"
"	Runoff depth	2.462	20.201	7.783	mm"
"	Runoff volume	3.72	13.09	16.81	c.m"
"	Runoff coefficient	0.098	0.807	0.311	"

"	0.518	Impervious Initial abstraction"			
"	0.001	0.000	0.000	0.003	c.m/sec"
"	Catchment 2031	Pervious	Impervious	Total Area	"
"	Surface Area	0.198	0.000	0.198	hectare"
"	Time of concentration	11.390	0.686	11.389	minutes"
"	Time to Centroid	155.208	118.677	155.207	minutes"
"	Rainfall depth	25.028	25.028	25.028	mm"
"	Rainfall volume	49.55	0.00	49.55	c.m"
"	Rainfall losses	22.571	5.999	22.571	mm"
"	Runoff depth	2.457	19.029	2.457	mm"
"	Runoff volume	4.86	0.00	4.86	c.m"
"	Runoff coefficient	0.098	0.000	0.098	"
"	Maximum flow	0.001	0.000	0.001	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.001	0.001	0.000	0.003"	
" 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 Creek"				
"	Maximum flow	0.004			c.m/sec"
"	Hydrograph volume	167.501			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 2032"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	1 SCS method"				
"	2032 203-2 - Future Park Trail Block"				
"	30.000 % Impervious"				
"	0.216 Total Area"				
"	180.000 Flow length"				
"	0.500 Overland Slope"				
"	0.151 Pervious Area"				
"	180.000 Pervious length"				
"	0.500 Pervious slope"				
"	0.065 Impervious Area"				
"	180.000 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."				
"	0.807 Impervious Runoff coefficient"				
"	0.100 Impervious Ia/S coefficient"				
"	0.518 Impervious Initial abstraction"				
"	0.006	0.000	0.001	0.004	c.m/sec"
"	Catchment 2032	Pervious	Impervious	Total Area	"
"	Surface Area	0.151	0.065	0.216	hectare"
"	Time of concentration	195.113	11.758	52.348	minutes"
"	Time to Centroid	371.038	135.753	187.840	minutes"
"	Rainfall depth	25.028	25.028	25.028	mm"
"	Rainfall volume	37.84	16.22	54.06	c.m"
"	Rainfall losses	22.566	4.826	17.244	mm"
"	Runoff depth	2.462	20.201	7.783	mm"
"	Runoff volume	3.72	13.09	16.81	c.m"
"	Runoff coefficient	0.098	0.807	0.311	"

"	Maximum flow	0.000	0.006	0.006	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.006	0.006	0.001	0.004"	
" 40	HYDROGRAPH Copy to Outflow"				
"	8 Copy to Outflow"				
"	0.006	0.006	0.006	0.004"	
" 40	HYDROGRAPH Combine 800"				
"	6 Combine "				
"	800 Node #"				
"	Torrance Creek"				
"	Maximum flow	0.009		c.m/sec"	
"	Hydrograph volume	184.313		c.m"	
"	0.006	0.006	0.006	0.009"	
" 40	HYDROGRAPH Start - New Tributary"				
"	2 Start - New Tributary"				
"	0.006	0.000	0.006	0.009"	
" 33	CATCHMENT 2033"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	1 SCS method"				
"	2033 203-3 - Block 1 Embnkament to Trail Block"				
"	0.000 % Impervious"				
"	0.119 Total Area"				
"	10.000 Flow length"				
"	33.000 Overland Slope"				
"	0.119 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."				
"	0.098 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"				
"	0.001	0.000	0.006	0.009 c.m/sec"	
"	Catchment 2033	Pervious	Impervious	Total Area "	
"	Surface Area	0.119	0.000	0.119	hectare"
"	Time of concentration	9.801	0.591	9.801	minutes"
"	Time to Centroid	153.463	118.873	153.462	minutes"
"	Rainfall depth	25.028	25.028	25.028	mm"
"	Rainfall volume	29.78	0.00	29.78	c.m"
"	Rainfall losses	22.581	6.287	22.581	mm"
"	Runoff depth	2.446	18.741	2.446	mm"
"	Runoff volume	2.91	0.00	2.91	c.m"
"	Runoff coefficient	0.098	0.000	0.098	"
"	Maximum flow	0.001	0.000	0.001	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.001	0.001	0.006	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 Creek"				
"	Maximum flow	0.009		c.m/sec"	

"	Hydrograph volume	187.224		c.m"	
"	0.001	0.001	0.001	0.009"	
" 40	HYDROGRAPH Start - New Tributary"				
"	2 Start - New Tributary"				
"	0.001	0.000	0.001	0.009"	
" 33	CATCHMENT 2041"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	1 SCS method"				
"	2041 204-1 - Block 1 rear yards + Arkell Blvd to Arkell"				
"	0.000 % Impervious"				
"	0.092 Total Area"				
"	15.000 Flow length"				
"	12.000 Overland Slope"				
"	0.092 Pervious Area"				
"	15.000 Pervious length"				
"	12.000 Pervious slope"				
"	0.000 Impervious Area"				
"	15.000 Impervious length"				
"	12.000 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"				
"	0.001	0.000	0.001	0.009 c.m/sec"	
"	Catchment 2041	Pervious	Impervious	Total Area "	
"	Surface Area	0.092	0.000	0.092	hectare"
"	Time of concentration	16.932	1.020	16.932	minutes"
"	Time to Centroid	161.730	118.645	161.730	minutes"
"	Rainfall depth	25.028	25.028	25.028	mm"
"	Rainfall volume	23.03	0.00	23.03	c.m"
"	Rainfall losses	22.569	5.443	22.569	mm"
"	Runoff depth	2.458	19.585	2.458	mm"
"	Runoff volume	2.26	0.00	2.26	c.m"
"	Runoff coefficient	0.098	0.000	0.098	"
"	Maximum flow	0.001	0.000	0.001	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.001	0.001	0.001	0.009"	
" 40	HYDROGRAPH Copy to Outflow"				
"	8 Copy to Outflow"				
"	0.001	0.001	0.001	0.009"	
" 40	HYDROGRAPH Combine 700"				
"	6 Combine "				
"	700 Node #"				
"	Arkell Road"				
"	Maximum flow	0.001		c.m/sec"	
"	Hydrograph volume	2.262		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 Yards, 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."
 " 0.098 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."
 " 0.798 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 29.915 1.803 6.855 minutes"
 " Time to Centroid 176.981 119.890 130.151 minutes"
 " Rainfall depth 25.028 25.028 25.028 mm"
 " Rainfall volume 17.78 10.00 27.78 c.m"
 " Rainfall losses 22.567 5.063 16.265 mm"
 " Runoff depth 2.461 19.965 8.762 mm"
 " Runoff volume 1.75 7.98 9.73 c.m"
 " Runoff coefficient 0.098 0.798 0.350 "
 " 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 700"
 " 6 Combine "
 " 700 Node #"
 " Arkell Road"
 " Maximum flow 0.006 c.m/sec"
 " Hydrograph volume 11.988 c.m"
 " 0.006 0.006 0.006 0.006"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.006 0.000 0.006 0.006"
 " 33 CATCHMENT 205"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 205 205 - Dawes Ave to Ex SWMF"
 " 70.000 % Impervious"
 " 0.043 Total Area"
 " 20.000 Flow length"
 " 1.250 Overland Slope"
 " 0.013 Pervious Area"
 " 20.000 Pervious length"
 " 1.250 Pervious slope"
 " 0.030 Impervious Area"
 " 20.000 Impervious length"
 " 1.250 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."
 " 0.798 Impervious Runoff coefficient"
 " 0.100 Impervious Ia/S coefficient"
 " 0.518 Impervious Initial abstraction"
 " 0.004 0.000 0.006 0.006 c.m/sec"
 " Catchment 205 Pervious Impervious Total Area "
 " Surface Area 0.013 0.030 0.043 hectare"
 " Time of concentration 39.661 2.390 4.265 minutes"
 " Time to Centroid 188.432 120.907 124.304 minutes"
 " Rainfall depth 25.028 25.028 25.028 mm"
 " Rainfall volume 3.23 7.53 10.76 c.m"
 " Rainfall losses 22.567 5.124 10.357 mm"
 " Runoff depth 2.461 19.904 14.671 mm"
 " Runoff volume 0.32 5.99 6.31 c.m"
 " Runoff coefficient 0.098 0.795 0.586 "
 " Maximum flow 0.000 0.004 0.004 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.004 0.004 0.006 0.006"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.004 0.004 0.004 0.006"
 " 40 HYDROGRAPH Combine 600"
 " 6 Combine "
 " 600 Node #"
 " Ex. SWMF"
 " Maximum flow 0.004 c.m/sec"
 " Hydrograph volume 6.308 c.m"
 " 0.004 0.004 0.004 0.004"
 " 38 START/RE-START TOTALS 205"
 " 3 Runoff Totals on EXIT"
 " Total Catchment area 3.108 hectare"
 " Total Impervious area 1.038 hectare"
 " Total % impervious 33.408"
 " 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\March 2023\MIDUSS\POST"
"      Output filename:        2yrPost2023.in"
"      Licensee name:          A"
"      Company                 "
"      Date & Time last used:   3/9/2023 at 2:16:37 PM"
" 31 TIME PARAMETERS"
"      5.000 Time Step"
"      180.000 Max. Storm length"
"      1500.000 Max. Hydrograph"
" 32 STORM Chicago storm"
"      1 Chicago storm"
"      743.000 Coefficient A"
"      6.000 Constant B"
"      0.799 Exponent C"
"      0.400 Fraction R"
"      180.000 Duration"
"      1.000 Time step multiplier"
"      Maximum intensity      109.374 mm/hr"
"      Total depth            34.259 mm"
"      6 002hyd Hydrograph extension used in this file"
" 33 CATCHMENT 2011"
"      1 Triangular SCS"
"      1 Equal length"
"      1 SCS method"
"      2011 201-1 - Street A to SWMF"
"      65.000 % Impervious"
"      0.290 Total Area"
"      60.000 Flow length"
"      0.750 Overland Slope"
"      0.102 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      0.102 0.188 0.290 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   34.77 64.58 99.35 c.m"
"      Rainfall losses   28.658 5.300 13.475 mm"
"      Runoff depth      5.600 28.959 20.783 mm"
"      Runoff volume     5.68 54.59 60.27 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"

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"      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 60.271 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 3 Front/Roofs to SWMF"
"      80.000 % Impervious"
"      0.131 Total Area"
"      10.000 Flow length"
"      2.000 Overland Slope"
"      0.026 Pervious Area"
"      10.000 Pervious length"
"      2.000 Pervious slope"
"      0.105 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"
"      0.025 0.000 0.039 0.039 c.m/sec"
"      Catchment 2012 Pervious Impervious Total Area "
"      Surface Area      0.026 0.105 0.131 hectare"
"      Time of concentration 14.261 1.143 1.757 minutes"
"      Time to Centroid  120.965 89.575 91.044 minutes"
"      Rainfall depth    34.259 34.259 34.259 mm"
"      Rainfall volume   8.98 35.90 44.88 c.m"
"      Rainfall losses   28.664 5.776 10.354 mm"
"      Runoff depth      5.594 28.482 23.905 mm"
"      Runoff volume     1.47 29.85 31.32 c.m"
"      Runoff coefficient 0.163 0.831 0.698 "
"      Maximum flow     0.001 0.025 0.025 c.m/sec"
" 40 HYDROGRAPH Add Runoff "
"      4 Add Runoff "
"      0.025 0.025 0.039 0.039"
" 40 HYDROGRAPH Copy to Outflow"
"      8 Copy to Outflow"
"      0.025 0.025 0.025 0.039"
" 40 HYDROGRAPH Combine 900"
"      6 Combine "
"      900 Node #"
"      SWMF"
"      Maximum flow      0.056 c.m/sec"
"      Hydrograph volume 91.586 c.m"
"      0.025 0.025 0.025 0.056"
" 40 HYDROGRAPH Start - New Tributary"
"      2 Start - New Tributary"
"      0.025 0.000 0.025 0.056"

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" 33	CATCHMENT 2013"
"	1 Triangular SCS"
"	1 Equal length"
"	1 SCS method"
"	2013 201-3 - Block 1 to SWMF"
"	62.000 % Impervious"
"	0.401 Total Area"
"	80.000 Flow length"
"	0.500 Overland Slope"
"	0.152 Pervious Area"
"	80.000 Pervious length"
"	0.500 Pervious slope"
"	0.249 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"
"	0.053 0.000 0.025 0.056 c.m/sec"
"	Catchment 2013 Pervious Impervious Total Area "
"	Surface Area 0.152 0.249 0.401 hectare"
"	Time of concentration 75.272 6.033 13.343 minutes"
"	Time to Centroid 193.943 97.070 107.299 minutes"
"	Rainfall depth 34.259 34.259 34.259 mm"
"	Rainfall volume 52.20 85.17 137.38 c.m"
"	Rainfall losses 28.658 5.180 14.102 mm"
"	Runoff depth 5.601 29.079 20.157 mm"
"	Runoff volume 8.53 72.30 80.83 c.m"
"	Runoff coefficient 0.163 0.849 0.588 "
"	Maximum flow 0.001 0.053 0.053 c.m/sec"
" 40	HYDROGRAPH Add Runoff "
"	4 Add Runoff "
"	0.053 0.053 0.025 0.056"
" 40	HYDROGRAPH Copy to Outflow"
"	8 Copy to Outflow"
"	0.053 0.053 0.053 0.056"
" 40	HYDROGRAPH Combine 900"
"	6 Combine "
"	900 Node #"
"	SWMF"
"	Maximum flow 0.108 c.m/sec"
"	Hydrograph volume 172.416 c.m"
"	0.053 0.053 0.053 0.108"
" 40	HYDROGRAPH Start - New Tributary"
"	2 Start - New Tributary"
"	0.053 0.000 0.053 0.108"
" 33	CATCHMENT 2014"
"	1 Triangular SCS"
"	1 Equal length"
"	1 SCS method"
"	2014 201-4 - Block 1 Roofs to SWMF"
"	100.000 % Impervious"
"	0.129 Total Area"
"	10.000 Flow length"
"	2.000 Overland Slope"
"	0.000 Pervious Area"
"	10.000 Pervious length"
"	2.000 Pervious slope"

"	0.129	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"		
"	0.031	0.000	0.053	0.108 c.m/sec"
"	Catchment 2014	Pervious	Impervious	Total Area "
"	Surface Area	0.000	0.129	0.129 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	44.19	44.19 c.m"
"	Rainfall losses	28.664	5.776	5.776 mm"
"	Runoff depth	5.594	28.482	28.482 mm"
"	Runoff volume	0.00	36.74	36.74 c.m"
"	Runoff coefficient	0.000	0.831	0.831 "
"	Maximum flow	0.000	0.031	0.031 c.m/sec"
" 40	HYDROGRAPH Add Runoff "			
"	4 Add Runoff "			
"	0.031	0.031	0.053	0.108"
" 57	TRENCH Design d/s of 2014"			
"	0.031	Peak inflow"		
"	36.742	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	Void 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	0.003	c.m"	
"	Peak exfiltration	0.002	c.m/sec"	
"	Exfiltration volume	36.744	c.m"	
"	Maximum level	335.181	metre"	

" Maximum storage 26.155 c.m"
 " Centroidal lag 4.565 hours"
 " Infiltration area 2 sides 10.898 sq.metre"
 " Infiltration Base area 96.000 sq.metre"
 " 0.031 0.031 0.000 0.002 c.m/sec"
 " 40 HYDROGRAPH Combine 900"
 " 6 Combine "
 " 900 Node #"
 " SWMF"
 " Maximum flow 0.108 c.m/sec"
 " Hydrograph volume 172.419 c.m"
 " 0.031 0.031 0.000 0.108"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.031 0.000 0.000 0.108"
 " 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 0.108 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 0.108"
 " 56 DIVERSION"
 " 2015 Node number"
 " 1.000 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 0.108 c.m/sec"

" 40 HYDROGRAPH Combine 900"
 " 6 Combine "
 " 900 Node #"
 " SWMF"
 " Maximum flow 0.110 c.m/sec"
 " Hydrograph volume 177.392 c.m"
 " 0.004 0.004 0.004 0.110"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.004 0.000 0.004 0.110"
 " 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"
 " 0.049 Total Area"
 " 20.000 Flow length"
 " 3.000 Overland Slope"
 " 0.012 Pervious Area"
 " 20.000 Pervious length"
 " 3.000 Pervious slope"
 " 0.037 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"
 " 0.008 0.000 0.004 0.110 c.m/sec"
 " Catchment 2016 Pervious Impervious Total Area "
 " Surface Area 0.012 0.037 0.049 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 4.20 12.59 16.79 c.m"
 " Rainfall losses 28.666 5.461 11.263 mm"
 " Runoff depth 5.592 28.797 22.996 mm"
 " Runoff volume 0.69 10.58 11.27 c.m"
 " Runoff coefficient 0.163 0.841 0.671 "
 " Maximum flow 0.000 0.008 0.008 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.008 0.008 0.004 0.110"
 " 56 DIVERSION"
 " 2106 Node number"
 " 1.000 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"
 " DIV02106.002hyd"
 " Major flow at 2106"
 " 0.008 0.008 0.008 0.110 c.m/sec"
 " 40 HYDROGRAPH Combine 900"
 " 6 Combine "
 " 900 Node #"
 " SWMF"
 " Maximum flow 0.116 c.m/sec"

" Hydrograph volume 188.660 c.m"
 " 0.008 0.008 0.008 0.116"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.008 0.000 0.008 0.116"
 " 33 CATCHMENT 2017"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2017 201-7 - Block 2 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 0.008 0.116 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 0.008 0.116"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.012 0.012 0.012 0.116"
 " 40 HYDROGRAPH Combine 900"
 " 6 Combine "
 " 900 Node #"
 " SWMF"
 " Maximum flow 0.129 c.m/sec"
 " Hydrograph volume 206.783 c.m"
 " 0.012 0.012 0.012 0.129"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.012 0.000 0.012 0.129"
 " 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 0.129 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 0.129"
 " 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"
 " 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 0.129 c.m/sec"
 " Hydrograph volume 206.784 c.m"
 " 0.008 0.008 0.000 0.129"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.008 0.000 0.000 0.129"
 " 33 CATCHMENT 2019"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2019 201-9 - SWMF Block"
 " 40.000 % Impervious"
 " 0.217 Total Area"
 " 15.000 Flow length"
 " 10.000 Overland Slope"
 " 0.130 Pervious Area"
 " 15.000 Pervious length"
 " 10.000 Pervious slope"
 " 0.087 Impervious Area"
 " 15.000 Impervious length"
 " 10.000 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."
 " 0.819 Impervious Runoff coefficient"
 " 0.100 Impervious Ia/S coefficient"
 " 0.518 Impervious Initial abstraction"
 " 0.021 0.000 0.000 0.129 c.m/sec"
 " Catchment 2019 Pervious Impervious Total Area "
 " Surface Area 0.130 0.087 0.217 hectare"
 " Time of concentration 11.223 0.899 3.276 minutes"
 " Time to Centroid 117.312 89.183 95.658 minutes"
 " Rainfall depth 34.259 34.259 34.259 mm"
 " Rainfall volume 44.60 29.74 74.34 c.m"
 " Rainfall losses 28.667 6.208 19.684 mm"
 " Runoff depth 5.592 28.050 14.575 mm"
 " Runoff volume 7.28 24.35 31.63 c.m"
 " Runoff coefficient 0.163 0.819 0.425 "
 " Maximum flow 0.003 0.021 0.021 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.021 0.021 0.000 0.129"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.021 0.021 0.021 0.129"
 " 40 HYDROGRAPH Combine 900"
 " 6 Combine "

" 900 Node #"
 " SWMF"
 " Maximum flow 0.142 c.m/sec"
 " Hydrograph volume 238.412 c.m"
 " 0.021 0.021 0.021 0.142"
 " 40 HYDROGRAPH Confluence 900"
 " 7 Confluence "
 " 900 Node #"
 " SWMF"
 " Maximum flow 0.142 c.m/sec"
 " Hydrograph volume 238.412 c.m"
 " 0.021 0.142 0.021 0.000"
 " 54 POND DESIGN"
 " 0.142 Current peak flow c.m/sec"
 " 0.051 Target outflow c.m/sec"
 " 238.4 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 45.000"
 " 334.600 0.00230 94.000"
 " 334.700 0.00290 149.000"
 " 334.800 0.04670 208.000"
 " 334.900 0.06500 273.000"
 " 335.000 0.07920 344.000"
 " 335.100 0.09110 419.000"
 " 335.200 0.1017 498.000"
 " 335.300 0.1112 580.000"
 " 335.400 0.2041 666.000"
 " 335.500 0.4716 756.000"
 " Peak outflow 0.015 c.m/sec"
 " Maximum level 334.729 metre"
 " Maximum storage 165.926 c.m"
 " Centroidal lag 9.952 hours"
 " 0.021 0.142 0.015 0.000 c.m/sec"
 " 40 HYDROGRAPH Next link "
 " 5 Next link "
 " 0.021 0.015 0.015 0.000"
 " 54 POND DESIGN"
 " 0.015 Current peak flow c.m/sec"
 " 0.051 Target outflow c.m/sec"
 " 220.5 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 0.00238 19.000"
 " 334.400 0.00258 40.000"
 " 334.500 0.00278 62.000"
 " 334.600 0.00300 87.000"
 " 334.700 0.00323 113.000"
 " 334.800 0.00345 141.000"
 " 334.900 0.1550 171.000"
 " 335.000 0.4636 203.000"
 " 335.100 0.9068 237.000"
 " Peak outflow 0.003 c.m/sec"
 " Maximum level 334.518 metre"
 " Maximum storage 66.404 c.m"

" Centroidal lag 13.133 hours"
 " 0.021 0.015 0.003 0.000 c.m/sec"
 " 40 HYDROGRAPH Combine 800"
 " 6 Combine "
 " 800 Node #"
 " Torrance Creek"
 " Maximum flow 0.003 c.m/sec"
 " Hydrograph volume 211.921 c.m"
 " 0.021 0.015 0.003 0.003"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.021 0.000 0.003 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"
 " 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 0.003 0.003 c.m/sec"
 " Catchment 2021 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 0.003 0.003"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.007 0.007 0.007 0.003"
 " 40 HYDROGRAPH Combine 800"
 " 6 Combine "
 " 800 Node #"
 " Torrance Creek"
 " Maximum flow 0.009 c.m/sec"
 " Hydrograph volume 260.250 c.m"
 " 0.007 0.007 0.007 0.009"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.007 0.000 0.007 0.009"

" 33 CATCHMENT 2022"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2022 202-2 - Block 3 Rear Yards to Torrance"
 " 0.000 % Impervious"
 " 0.107 Total Area"
 " 15.000 Flow length"
 " 3.000 Overland Slope"
 " 0.107 Pervious Area"
 " 15.000 Pervious length"
 " 3.000 Pervious slope"
 " 0.000 Impervious Area"
 " 15.000 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."
 " 0.000 Impervious Runoff coefficient"
 " 0.100 Impervious Ia/S coefficient"
 " 0.518 Impervious Initial abstraction"
 " 0.002 0.000 0.007 0.009 c.m/sec"
 " Catchment 2022 Pervious Impervious Total Area "
 " Surface Area 0.107 0.000 0.107 hectare"
 " Time of concentration 16.106 1.291 16.106 minutes"
 " Time to Centroid 123.204 89.846 123.204 minutes"
 " Rainfall depth 34.259 34.259 34.259 mm"
 " Rainfall volume 36.66 0.00 36.66 c.m"
 " Rainfall losses 28.669 5.599 28.669 mm"
 " Runoff depth 5.589 28.660 5.589 mm"
 " Runoff volume 5.98 0.00 5.98 c.m"
 " Runoff coefficient 0.163 0.000 0.163 "
 " Maximum flow 0.002 0.000 0.002 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.002 0.002 0.007 0.009"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.002 0.002 0.002 0.009"
 " 40 HYDROGRAPH Combine 800"
 " 6 Combine "
 " 800 Node #"
 " Torrance Creek"
 " Maximum flow 0.010 c.m/sec"
 " Hydrograph volume 266.230 c.m"
 " 0.002 0.002 0.002 0.010"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.002 0.000 0.002 0.010"
 " 33 CATCHMENT 2023"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2023 202-3 - Block 2 Grassed Area to Torrance"
 " 0.000 % Impervious"
 " 0.015 Total Area"
 " 205.000 Flow length"
 " 0.500 Overland Slope"
 " 0.015 Pervious Area"
 " 205.000 Pervious length"
 " 0.500 Pervious slope"

" 0.000 Impervious Area"
 " 205.000 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."
 " 0.000 Impervious Runoff coefficient"
 " 0.100 Impervious Ia/S coefficient"
 " 0.518 Impervious Initial abstraction"
 " 0.000 0.000 0.002 0.010 c.m/sec"
 " Catchment 2023 Pervious Impervious Total Area "
 " Surface Area 0.015 0.000 0.015 hectare"
 " Time of concentration 132.382 10.610 132.382 minutes"
 " Time to Centroid 262.271 103.920 262.270 minutes"
 " Rainfall depth 34.259 34.259 34.259 mm"
 " Rainfall volume 5.14 0.00 5.14 c.m"
 " Rainfall losses 28.657 5.095 28.657 mm"
 " Runoff depth 5.602 29.164 5.602 mm"
 " Runoff volume 0.84 0.00 0.84 c.m"
 " Runoff coefficient 0.164 0.000 0.164 "
 " Maximum flow 0.000 0.000 0.000 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.000 0.000 0.002 0.010"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.000 0.000 0.000 0.010"
 " 40 HYDROGRAPH Combine 800"
 " 6 Combine "
 " 800 Node #"
 " Torrance Creek"
 " Maximum flow 0.010 c.m/sec"
 " Hydrograph volume 267.070 c.m"
 " 0.000 0.000 0.000 0.010"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.000 0.000 0.000 0.010"
 " 33 CATCHMENT 2031"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2031 203-1 - Arkell Meadows Embankments to Trail"
 " 0.000 % Impervious"
 " 0.198 Total Area"
 " 10.000 Flow length"
 " 20.000 Overland Slope"
 " 0.198 Pervious Area"
 " 10.000 Pervious length"
 " 20.000 Pervious slope"
 " 0.000 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."
 " 0.000 Impervious Runoff coefficient"
 " 0.100 Impervious Ia/S coefficient"

" 0.518 Impervious Initial abstraction"
 " 0.005 0.000 0.000 0.010 c.m/sec"
 " Catchment 2031 Pervious Impervious Total Area "
 " Surface Area 0.198 0.000 0.198 hectare"
 " Time of concentration 7.148 0.573 7.148 minutes"
 " Time to Centroid 112.573 89.401 112.573 minutes"
 " Rainfall depth 34.259 34.259 34.259 mm"
 " Rainfall volume 67.83 0.00 67.83 c.m"
 " Rainfall losses 28.696 7.347 28.696 mm"
 " Runoff depth 5.563 26.911 5.563 mm"
 " Runoff volume 11.01 0.00 11.01 c.m"
 " Runoff coefficient 0.162 0.000 0.162 "
 " Maximum flow 0.005 0.000 0.005 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.005 0.005 0.000 0.010"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.005 0.005 0.005 0.010"
 " 40 HYDROGRAPH Combine 800"
 " 6 Combine "
 " 800 Node #"
 " Torrance Creek"
 " Maximum flow 0.011 c.m/sec"
 " Hydrograph volume 278.085 c.m"
 " 0.005 0.005 0.005 0.011"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.005 0.000 0.005 0.011"
 " 33 CATCHMENT 2032"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2032 203-2 - Future Park Trail Block"
 " 30.000 % Impervious"
 " 0.216 Total Area"
 " 180.000 Flow length"
 " 0.500 Overland Slope"
 " 0.151 Pervious Area"
 " 180.000 Pervious length"
 " 0.500 Pervious slope"
 " 0.065 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."
 " 0.848 Impervious Runoff coefficient"
 " 0.100 Impervious Ia/S coefficient"
 " 0.518 Impervious Initial abstraction"
 " 0.011 0.000 0.005 0.011 c.m/sec"
 " Catchment 2032 Pervious Impervious Total Area "
 " Surface Area 0.151 0.065 0.216 hectare"
 " Time of concentration 122.445 9.813 44.752 minutes"
 " Time to Centroid 250.381 102.744 148.542 minutes"
 " Rainfall depth 34.259 34.259 34.259 mm"
 " Rainfall volume 51.80 22.20 74.00 c.m"
 " Rainfall losses 28.657 5.196 21.619 mm"
 " Runoff depth 5.601 29.062 12.640 mm"
 " Runoff volume 8.47 18.83 27.30 c.m"
 " Runoff coefficient 0.163 0.848 0.369 "

"	Maximum flow	0.001	0.011	0.011	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.011	0.011	0.005	0.011"	
" 40	HYDROGRAPH Copy to Outflow"				
"	8 Copy to Outflow"				
"	0.011	0.011	0.011	0.011"	
" 40	HYDROGRAPH Combine 800"				
"	6 Combine "				
"	800 Node #"				
"	Torrance Creek"				
"	Maximum flow	0.019		c.m/sec"	
"	Hydrograph volume	305.386		c.m"	
"	0.011	0.011	0.011	0.019"	
" 40	HYDROGRAPH Start - New Tributary"				
"	2 Start - New Tributary"				
"	0.011	0.000	0.011	0.019"	
" 33	CATCHMENT 2033"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	1 SCS method"				
"	2033 203-3 - Block 1 Embnkament to Trail Block"				
"	0.000 % Impervious"				
"	0.119 Total Area"				
"	10.000 Flow length"				
"	33.000 Overland Slope"				
"	0.119 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	0.011	0.019 c.m/sec"	
"	Catchment 2033	Pervious	Impervious	Total Area "	
"	Surface Area	0.119	0.000	0.119 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	40.77	0.00	40.77 c.m"	
"	Rainfall losses	28.713	7.785	28.713 mm"	
"	Runoff depth	5.545	26.473	5.545 mm"	
"	Runoff volume	6.60	0.00	6.60 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	0.011	0.019"	
" 40	HYDROGRAPH Copy to Outflow"				
"	8 Copy to Outflow"				
"	0.003	0.003	0.003	0.019"	
" 40	HYDROGRAPH Combine 800"				
"	6 Combine "				
"	800 Node #"				
"	Torrance Creek"				
"	Maximum flow	0.022		c.m/sec"	

"	Hydrograph volume	311.985	c.m"
"	0.003	0.003	0.003 0.022"
" 40	HYDROGRAPH Start - New Tributary"		
"	2 Start - New Tributary"		
"	0.003	0.000	0.003 0.022"
" 33	CATCHMENT 2041"		
"	1 Triangular SCS"		
"	1 Equal length"		
"	1 SCS method"		
"	2041 204-1 - Block 1 rear yards + Arkell Blvd to Arkell"		
"	0.000 % Impervious"		
"	0.092 Total Area"		
"	15.000 Flow length"		
"	12.000 Overland Slope"		
"	0.092 Pervious Area"		
"	15.000 Pervious length"		
"	12.000 Pervious slope"		
"	0.000 Impervious Area"		
"	15.000 Impervious length"		
"	12.000 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"		
"	0.002	0.000	0.003 0.022 c.m/sec"
"	Catchment 2041	Pervious	Impervious Total Area "
"	Surface Area	0.092	0.000 0.092 hectare"
"	Time of concentration	10.626	0.852 10.626 minutes"
"	Time to Centroid	116.606	89.188 116.605 minutes"
"	Rainfall depth	34.259	34.259 34.259 mm"
"	Rainfall volume	31.52	0.00 31.52 c.m"
"	Rainfall losses	28.671	6.307 28.671 mm"
"	Runoff depth	5.588	27.951 5.588 mm"
"	Runoff volume	5.14	0.00 5.14 c.m"
"	Runoff coefficient	0.163	0.000 0.163 "
"	Maximum flow	0.002	0.000 0.002 c.m/sec"
" 40	HYDROGRAPH Add Runoff "		
"	4 Add Runoff "		
"	0.002	0.002	0.003 0.022"
" 40	HYDROGRAPH Copy to Outflow"		
"	8 Copy to Outflow"		
"	0.002	0.002	0.002 0.022"
" 40	HYDROGRAPH Combine 700"		
"	6 Combine "		
"	700 Node #"		
"	Arkell Road"		
"	Maximum flow	0.002	c.m/sec"
"	Hydrograph volume	5.141	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 Yards, 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 700"
 " 6 Combine "
 " 700 Node #"
 " Arkell Road"
 " Maximum flow 0.010 c.m/sec"
 " Hydrograph volume 20.622 c.m"
 " 0.009 0.009 0.009 0.010"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.009 0.000 0.009 0.010"
 " 33 CATCHMENT 205"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 205 205 - Dawes Ave to Ex SWMF"
 " 70.000 % Impervious"
 " 0.043 Total Area"
 " 20.000 Flow length"
 " 1.250 Overland Slope"
 " 0.013 Pervious Area"
 " 20.000 Pervious length"
 " 1.250 Pervious slope"
 " 0.030 Impervious Area"
 " 20.000 Impervious length"
 " 1.250 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"
 " 0.007 0.000 0.009 0.010 c.m/sec"
 " Catchment 205 Pervious Impervious Total Area "
 " Surface Area 0.013 0.030 0.043 hectare"
 " Time of concentration 24.889 1.995 3.753 minutes"
 " Time to Centroid 133.685 90.906 94.190 minutes"
 " Rainfall depth 34.259 34.259 34.259 mm"
 " Rainfall volume 4.42 10.31 14.73 c.m"
 " Rainfall losses 28.660 5.410 12.385 mm"
 " Runoff depth 5.598 28.848 21.873 mm"
 " Runoff volume 0.72 8.68 9.41 c.m"
 " Runoff coefficient 0.163 0.842 0.638 "
 " Maximum flow 0.000 0.007 0.007 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.007 0.007 0.009 0.010"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.007 0.007 0.007 0.010"
 " 40 HYDROGRAPH Combine 600"
 " 6 Combine "
 " 600 Node #"
 " Ex. SWMF"
 " Maximum flow 0.007 c.m/sec"
 " Hydrograph volume 9.406 c.m"
 " 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 1.038 hectare"
 " Total % impervious 33.408"
 " 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\March 2023\MIDUSS\POST"
"      Output filename:        SyrPost2023.in"
"      Licensee name:          A"
"      Company                  "
"      Date & Time last used:   3/9/2023 at 2:10:33 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 2011"
"      1 Triangular SCS"
"      1 Equal length"
"      1 SCS method"
"      2011 201-1 - Street A to SWMF"
"      65.000 % Impervious"
"      0.290 Total Area"
"      60.000 Flow length"
"      0.750 Overland Slope"
"      0.102 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      0.102 0.188 0.290 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   47.95 89.05 137.00 c.m"
"      Rainfall losses   35.735 5.740 16.238 mm"
"      Runoff depth      11.505 41.499 31.001 mm"
"      Runoff volume     11.68 78.23 89.90 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"

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"      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 89.904 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 3 Front/Roofs to SWMF"
"      80.000 % Impervious"
"      0.131 Total Area"
"      10.000 Flow length"
"      2.000 Overland Slope"
"      0.026 Pervious Area"
"      10.000 Pervious length"
"      2.000 Pervious slope"
"      0.105 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"
"      0.034 0.000 0.054 0.054 c.m/sec"
"      Catchment 2012 Pervious Impervious Total Area "
"      Surface Area      0.026 0.105 0.131 hectare"
"      Time of concentration 10.211 1.025 1.628 minutes"
"      Time to Centroid  111.096 87.416 88.971 minutes"
"      Rainfall depth    47.240 47.240 47.240 mm"
"      Rainfall volume   12.38 49.51 61.88 c.m"
"      Rainfall losses   35.782 6.504 12.359 mm"
"      Runoff depth      11.458 40.736 34.880 mm"
"      Runoff volume     3.00 42.69 45.69 c.m"
"      Runoff coefficient 0.243 0.862 0.738 "
"      Maximum flow      0.001 0.034 0.034 c.m/sec"
" 40 HYDROGRAPH Add Runoff "
"      4 Add Runoff "
"      0.034 0.034 0.054 0.054"
" 40 HYDROGRAPH Copy to Outflow"
"      8 Copy to Outflow"
"      0.034 0.034 0.034 0.054"
" 40 HYDROGRAPH Combine 900"
"      6 Combine "
"      900 Node #"
"      SWMF"
"      Maximum flow      0.082 c.m/sec"
"      Hydrograph volume 135.597 c.m"
"      0.034 0.034 0.034 0.082"
" 40 HYDROGRAPH Start - New Tributary"
"      2 Start - New Tributary"
"      0.034 0.000 0.034 0.082"

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" 33	CATCHMENT 2013"								
"	1	Triangular SCS"							
"	1	Equal length"							
"	1	SCS method"							
"	2013	201-3 - Block 1 to SWMF"							
"	62.000	% Impervious"							
"	0.401	Total Area"							
"	80.000	Flow length"							
"	0.500	Overland Slope"							
"	0.152	Pervious Area"							
"	80.000	Pervious length"							
"	0.500	Pervious slope"							
"	0.249	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"							
"		0.073	0.000	0.034	0.082	c.m/sec"			
"	Catchment 2013	Pervious	Impervious	Total Area					
"	Surface Area	0.152	0.249	0.401	hectare"				
"	Time of concentration	53.896	5.407	12.404	minutes"				
"	Time to Centroid	164.535	93.831	104.034	minutes"				
"	Rainfall depth	47.240	47.240	47.240	mm"				
"	Rainfall volume	71.98	117.45	189.43	c.m"				
"	Rainfall losses	35.734	5.418	16.938	mm"				
"	Runoff depth	11.506	41.822	30.302	mm"				
"	Runoff volume	17.53	103.98	121.51	c.m"				
"	Runoff coefficient	0.244	0.885	0.641	"				
"	Maximum flow	0.003	0.073	0.073	c.m/sec"				
" 40	HYDROGRAPH Add Runoff "								
"	4	Add Runoff "							
"		0.073	0.073	0.034	0.082"				
" 40	HYDROGRAPH Copy to Outflow"								
"	8	Copy to Outflow"							
"		0.073	0.073	0.073	0.082"				
" 40	HYDROGRAPH Combine	Combine	900"						
"	6	Combine "							
"	900	Node #"							
"		SWMF"							
"		Maximum flow	0.150	c.m/sec"					
"		Hydrograph volume	257.108	c.m"					
"		0.073	0.073	0.073	0.150"				
" 40	HYDROGRAPH Start - New Tributary"								
"	2	Start - New Tributary"							
"		0.073	0.000	0.073	0.150"				
" 33	CATCHMENT 2014"								
"	1	Triangular SCS"							
"	1	Equal length"							
"	1	SCS method"							
"	2014	201-4 - Block 1 Roofs to SWMF"							
"	100.000	% Impervious"							
"	0.129	Total Area"							
"	10.000	Flow length"							
"	2.000	Overland Slope"							
"	0.000	Pervious Area"							
"	10.000	Pervious length"							
"	2.000	Pervious slope"							
"		0.129	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	0.073	0.150	c.m/sec"		
"		Catchment 2014	Pervious	Impervious	Total Area				
"		Surface Area	0.000	0.129	0.129	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	60.94	60.94	c.m"			
"		Rainfall losses	35.782	6.504	6.504	mm"			
"		Runoff depth	11.458	40.736	40.736	mm"			
"		Runoff volume	0.00	52.55	52.55	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	0.073	0.150"			
" 57	TRENCH Design d/s of 2014"								
"	0.041	Peak inflow"							
"	52.550	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	Void 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	0.003	c.m/sec"					
"		Outflow volume	1.804	c.m"					
"		Peak exfiltration	0.002	c.m/sec"					
"		Exfiltration volume	50.700	c.m"					
"		Maximum level	335.500	metre"					

" Maximum storage 38.400 c.m"
 " Centroidal lag 1.871 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 0.150 c.m/sec"
 " Hydrograph volume 258.912 c.m"
 " 0.041 0.041 0.003 0.150"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.041 0.000 0.003 0.150"
 " 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 0.150 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 0.150"
 " 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 0.150 c.m/sec"

" 40 HYDROGRAPH Combine 900"
 " 6 Combine "
 " 900 Node #"
 " SWMF"
 " Maximum flow 0.153 c.m/sec"
 " Hydrograph volume 266.114 c.m"
 " 0.006 0.006 0.006 0.153"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.006 0.000 0.006 0.153"
 " 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"
 " 0.049 Total Area"
 " 20.000 Flow length"
 " 3.000 Overland Slope"
 " 0.012 Pervious Area"
 " 20.000 Pervious length"
 " 3.000 Pervious slope"
 " 0.037 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"
 " 0.012 0.000 0.006 0.153 c.m/sec"
 " Catchment 2016 Pervious Impervious Total Area "
 " Surface Area 0.012 0.037 0.049 hectare"
 " Time of concentration 13.705 1.375 2.420 minutes"
 " Time to Centroid 115.360 87.892 90.220 minutes"
 " Rainfall depth 47.240 47.240 47.240 mm"
 " Rainfall volume 5.79 17.36 23.15 c.m"
 " Rainfall losses 35.749 5.888 13.353 mm"
 " Runoff depth 11.491 41.352 33.887 mm"
 " Runoff volume 1.41 15.20 16.60 c.m"
 " Runoff coefficient 0.243 0.875 0.717 "
 " Maximum flow 0.001 0.012 0.012 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.012 0.012 0.006 0.153"
 " 56 DIVERSION"
 " 2106 Node number"
 " 0.012 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"
 " DIV02106.005hyd"
 " Major flow at 2106"
 " 0.012 0.012 0.012 0.153 c.m/sec"
 " 40 HYDROGRAPH Combine 900"
 " 6 Combine "
 " 900 Node #"
 " SWMF"
 " Maximum flow 0.162 c.m/sec"

" Hydrograph volume 282.719 c.m"
 " 0.012 0.012 0.012 0.162"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.012 0.000 0.012 0.162"
 " 33 CATCHMENT 2017"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2017 201-7 - Block 2 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 0.012 0.162 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 0.012 0.162"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.017 0.017 0.017 0.162"
 " 40 HYDROGRAPH Combine 900"
 " 6 Combine "
 " 900 Node #"
 " SWMF"
 " Maximum flow 0.179 c.m/sec"
 " Hydrograph volume 309.156 c.m"
 " 0.017 0.017 0.017 0.179"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.017 0.000 0.017 0.179"
 " 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 0.179 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 0.179"
 " 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"
 " 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 0.179 c.m/sec"
 " Hydrograph volume 309.729 c.m"
 " 0.010 0.010 0.001 0.179"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.010 0.000 0.001 0.179"
 " 33 CATCHMENT 2019"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2019 201-9 - SWMF Block"
 " 40.000 % Impervious"
 " 0.217 Total Area"
 " 15.000 Flow length"
 " 10.000 Overland Slope"
 " 0.130 Pervious Area"
 " 15.000 Pervious length"
 " 10.000 Pervious slope"
 " 0.087 Impervious Area"
 " 15.000 Impervious length"
 " 10.000 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."
 " 0.845 Impervious Runoff coefficient"
 " 0.100 Impervious Ia/S coefficient"
 " 0.518 Impervious Initial abstraction"
 " 0.029 0.000 0.001 0.179 c.m/sec"
 " Catchment 2019 Pervious Impervious Total Area "
 " Surface Area 0.130 0.087 0.217 hectare"
 " Time of concentration 8.036 0.806 2.984 minutes"
 " Time to Centroid 108.449 87.178 93.586 minutes"
 " Rainfall depth 47.240 47.240 47.240 mm"
 " Rainfall volume 61.51 41.00 102.51 c.m"
 " Rainfall losses 35.762 7.306 24.380 mm"
 " Runoff depth 11.478 39.934 22.860 mm"
 " Runoff volume 14.94 34.66 49.61 c.m"
 " Runoff coefficient 0.243 0.845 0.484 "
 " Maximum flow 0.008 0.028 0.029 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.029 0.029 0.001 0.179"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.029 0.029 0.029 0.179"
 " 40 HYDROGRAPH Combine 900"
 " 6 Combine "

" 900 Node #"
 " SWMF"
 " Maximum flow 0.202 c.m/sec"
 " Hydrograph volume 359.335 c.m"
 " 0.029 0.029 0.029 0.202"
 " 40 HYDROGRAPH Confluence 900"
 " 7 Confluence "
 " 900 Node #"
 " SWMF"
 " Maximum flow 0.202 c.m/sec"
 " Hydrograph volume 359.335 c.m"
 " 0.029 0.202 0.029 0.000"
 " 54 POND DESIGN"
 " 0.202 Current peak flow c.m/sec"
 " 0.051 Target outflow c.m/sec"
 " 359.3 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 45.000"
 " 334.600 0.00230 94.000"
 " 334.700 0.00290 149.000"
 " 334.800 0.04670 208.000"
 " 334.900 0.06500 273.000"
 " 335.000 0.07920 344.000"
 " 335.100 0.09110 419.000"
 " 335.200 0.1017 498.000"
 " 335.300 0.1112 580.000"
 " 335.400 0.2041 666.000"
 " 335.500 0.4716 756.000"
 " Peak outflow 0.047 c.m/sec"
 " Maximum level 334.801 metre"
 " Maximum storage 208.506 c.m"
 " Centroidal lag 7.328 hours"
 " 0.029 0.202 0.047 0.000 c.m/sec"
 " 40 HYDROGRAPH Next link "
 " 5 Next link "
 " 0.029 0.047 0.047 0.000"
 " 54 POND DESIGN"
 " 0.047 Current peak flow c.m/sec"
 " 0.051 Target outflow c.m/sec"
 " 341.3 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 0.00238 19.000"
 " 334.400 0.00258 40.000"
 " 334.500 0.00278 62.000"
 " 334.600 0.00300 87.000"
 " 334.700 0.00323 113.000"
 " 334.800 0.00345 141.000"
 " 334.900 0.1550 171.000"
 " 335.000 0.4636 203.000"
 " 335.100 0.9068 237.000"
 " Peak outflow 0.018 c.m/sec"
 " Maximum level 334.810 metre"
 " Maximum storage 144.000 c.m"

" Centroidal lag 13.406 hours"
 " 0.029 0.047 0.018 0.000 c.m/sec"
 " 40 HYDROGRAPH Combine 800"
 " 6 Combine "
 " 800 Node #"
 " Torrance Creek"
 " Maximum flow 0.018 c.m/sec"
 " Hydrograph volume 302.359 c.m"
 " 0.029 0.047 0.018 0.018"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.029 0.000 0.018 0.018"
 " 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"
 " 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 0.018 0.018 c.m/sec"
 " Catchment 2021 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 0.018 0.018"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.020 0.020 0.020 0.018"
 " 40 HYDROGRAPH Combine 800"
 " 6 Combine "
 " 800 Node #"
 " Torrance Creek"
 " Maximum flow 0.026 c.m/sec"
 " Hydrograph volume 401.628 c.m"
 " 0.020 0.020 0.020 0.026"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.020 0.000 0.020 0.026"

" 33 CATCHMENT 2022"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2022 202-2 - Block 3 Rear Yards to Torrance"
 " 0.000 % Impervious"
 " 0.107 Total Area"
 " 15.000 Flow length"
 " 3.000 Overland Slope"
 " 0.107 Pervious Area"
 " 15.000 Pervious length"
 " 3.000 Pervious slope"
 " 0.000 Impervious Area"
 " 15.000 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."
 " 0.000 Impervious Runoff coefficient"
 " 0.100 Impervious Ia/S coefficient"
 " 0.518 Impervious Initial abstraction"
 " 0.005 0.000 0.020 0.026 c.m/sec"
 " Catchment 2022 Pervious Impervious Total Area "
 " Surface Area 0.107 0.000 0.107 hectare"
 " Time of concentration 11.532 1.157 11.532 minutes"
 " Time to Centroid 112.675 87.616 112.675 minutes"
 " Rainfall depth 47.240 47.240 47.240 mm"
 " Rainfall volume 50.55 0.00 50.55 c.m"
 " Rainfall losses 35.755 6.181 35.755 mm"
 " Runoff depth 11.484 41.059 11.485 mm"
 " Runoff volume 12.29 0.00 12.29 c.m"
 " Runoff coefficient 0.243 0.000 0.243 "
 " Maximum flow 0.005 0.000 0.005 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.005 0.005 0.020 0.026"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.005 0.005 0.005 0.026"
 " 40 HYDROGRAPH Combine 800"
 " 6 Combine "
 " 800 Node #"
 " Torrance Creek"
 " Maximum flow 0.027 c.m/sec"
 " Hydrograph volume 413.916 c.m"
 " 0.005 0.005 0.005 0.027"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.005 0.000 0.005 0.027"
 " 33 CATCHMENT 2023"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2023 202-3 - Block 2 Grassed Area to Torrance"
 " 0.000 % Impervious"
 " 0.015 Total Area"
 " 205.000 Flow length"
 " 0.500 Overland Slope"
 " 0.015 Pervious Area"
 " 205.000 Pervious length"
 " 0.500 Pervious slope"

" 0.000 Impervious Area"
 " 205.000 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"
 " 0.000 0.000 0.005 0.027 c.m/sec"
 " Catchment 2023 Pervious Impervious Total Area "
 " Surface Area 0.015 0.000 0.015 hectare"
 " Time of concentration 94.788 9.510 94.788 minutes"
 " Time to Centroid 214.560 99.647 214.559 minutes"
 " Rainfall depth 47.240 47.240 47.240 mm"
 " Rainfall volume 7.09 0.00 7.09 c.m"
 " Rainfall losses 35.732 5.409 35.732 mm"
 " Runoff depth 11.508 41.831 11.508 mm"
 " Runoff volume 1.73 0.00 1.73 c.m"
 " Runoff coefficient 0.244 0.000 0.244 "
 " Maximum flow 0.000 0.000 0.000 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.000 0.000 0.005 0.027"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.000 0.000 0.000 0.027"
 " 40 HYDROGRAPH Combine 800"
 " 6 Combine "
 " 800 Node #"
 " Torrance Creek"
 " Maximum flow 0.027 c.m/sec"
 " Hydrograph volume 415.643 c.m"
 " 0.000 0.000 0.000 0.027"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.000 0.000 0.000 0.027"
 " 33 CATCHMENT 2031"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2031 203-1 - Arkell Meadows Embankments to Trail"
 " 0.000 % Impervious"
 " 0.198 Total Area"
 " 10.000 Flow length"
 " 20.000 Overland Slope"
 " 0.198 Pervious Area"
 " 10.000 Pervious length"
 " 20.000 Pervious slope"
 " 0.000 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."
 " 0.889 Impervious Runoff coefficient"
 " 0.100 Impervious Ia/S coefficient"
 " 0.518 Impervious Initial abstraction"

" 0.518 Impervious Initial abstraction"
 " 0.012 0.000 0.000 0.027 c.m/sec"
 " Catchment 2031 Pervious Impervious Total Area "
 " Surface Area 0.198 0.000 0.198 hectare"
 " Time of concentration 5.118 0.513 5.118 minutes"
 " Time to Centroid 104.854 87.231 104.854 minutes"
 " Rainfall depth 47.240 47.240 47.240 mm"
 " Rainfall volume 93.53 0.00 93.53 c.m"
 " Rainfall losses 35.800 9.346 35.800 mm"
 " Runoff depth 11.440 37.894 11.440 mm"
 " Runoff volume 22.65 0.00 22.65 c.m"
 " Runoff coefficient 0.242 0.000 0.242 "
 " Maximum flow 0.012 0.000 0.012 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.012 0.012 0.000 0.027"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.012 0.012 0.012 0.027"
 " 40 HYDROGRAPH Combine 800"
 " 6 Combine "
 " 800 Node #"
 " Torrance Creek"
 " Maximum flow 0.029 c.m/sec"
 " Hydrograph volume 438.295 c.m"
 " 0.012 0.012 0.012 0.029"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.012 0.000 0.012 0.029"
 " 33 CATCHMENT 2032"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2032 203-2 - Future Park Trail Block"
 " 30.000 % Impervious"
 " 0.216 Total Area"
 " 180.000 Flow length"
 " 0.500 Overland Slope"
 " 0.151 Pervious Area"
 " 180.000 Pervious length"
 " 0.500 Pervious slope"
 " 0.065 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."
 " 0.889 Impervious Runoff coefficient"
 " 0.100 Impervious Ia/S coefficient"
 " 0.518 Impervious Initial abstraction"
 " 0.017 0.000 0.012 0.029 c.m/sec"
 " Catchment 2032 Pervious Impervious Total Area "
 " Surface Area 0.151 0.065 0.216 hectare"
 " Time of concentration 87.673 8.796 39.568 minutes"
 " Time to Centroid 205.857 98.611 140.451 minutes"
 " Rainfall depth 47.240 47.240 47.240 mm"
 " Rainfall volume 71.43 30.61 102.04 c.m"
 " Rainfall losses 35.732 5.263 26.591 mm"
 " Runoff depth 11.508 41.977 20.649 mm"
 " Runoff volume 17.40 27.20 44.60 c.m"
 " Runoff coefficient 0.244 0.889 0.437 "

"	Maximum flow	0.002	0.016	0.017	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.017	0.017	0.012	0.029"	
" 40	HYDROGRAPH Copy to Outflow"				
"	8 Copy to Outflow"				
"	0.017	0.017	0.017	0.029"	
" 40	HYDROGRAPH Combine 800"				
"	6 Combine "				
"	800 Node #"				
"	Torrance Creek"				
"	Maximum flow	0.040		c.m/sec"	
"	Hydrograph volume	482.896		c.m"	
"	0.017	0.017	0.017	0.040"	
" 40	HYDROGRAPH Start - New Tributary"				
"	2 Start - New Tributary"				
"	0.017	0.000	0.017	0.040"	
" 33	CATCHMENT 2033"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	1 SCS method"				
"	2033 203-3 - Block 1 Embkament to Trail Block"				
"	0.000 % Impervious"				
"	0.119 Total Area"				
"	10.000 Flow length"				
"	33.000 Overland Slope"				
"	0.119 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"				
"	0.008	0.000	0.017	0.040 c.m/sec"	
"	Catchment 2033	Pervious	Impervious	Total Area "	
"	Surface Area	0.119	0.000	0.119 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	56.22	0.00	56.22 c.m"	
"	Rainfall losses	35.831	9.835	35.831 mm"	
"	Runoff depth	11.408	37.405	11.408 mm"	
"	Runoff volume	13.58	0.00	13.58 c.m"	
"	Runoff coefficient	0.242	0.000	0.242 "	
"	Maximum flow	0.008	0.000	0.008 c.m/sec"	
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.008	0.008	0.017	0.040"	
" 40	HYDROGRAPH Copy to Outflow"				
"	8 Copy to Outflow"				
"	0.008	0.008	0.008	0.040"	
" 40	HYDROGRAPH Combine 800"				
"	6 Combine "				
"	800 Node #"				
"	Torrance Creek"				
"	Maximum flow	0.046		c.m/sec"	

"	Hydrograph volume	496.472	c.m"
"	0.008	0.008	0.008 0.046"
" 40	HYDROGRAPH Start - New Tributary"		
"	2 Start - New Tributary"		
"	0.008	0.000	0.008 0.046"
" 33	CATCHMENT 2041"		
"	1 Triangular SCS"		
"	1 Equal length"		
"	1 SCS method"		
"	2041 204-1 - Block 1 rear yards + Arkell Blvd to Arkell"		
"	0.000 % Impervious"		
"	0.092 Total Area"		
"	15.000 Flow length"		
"	12.000 Overland Slope"		
"	0.092 Pervious Area"		
"	15.000 Pervious length"		
"	12.000 Pervious slope"		
"	0.000 Impervious Area"		
"	15.000 Impervious length"		
"	12.000 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"		
"	0.006	0.000	0.008 0.046 c.m/sec"
"	Catchment 2041	Pervious	Impervious Total Area "
"	Surface Area	0.092	0.000 0.092 hectare"
"	Time of concentration	7.608	0.763 7.608 minutes"
"	Time to Centroid	107.990	87.194 107.990 minutes"
"	Rainfall depth	47.240	47.240 47.240 mm"
"	Rainfall volume	43.46	0.00 43.46 c.m"
"	Rainfall losses	35.785	7.504 35.785 mm"
"	Runoff depth	11.455	39.736 11.455 mm"
"	Runoff volume	10.54	0.00 10.54 c.m"
"	Runoff coefficient	0.242	0.000 0.242 "
"	Maximum flow	0.006	0.000 0.006 c.m/sec"
" 40	HYDROGRAPH Add Runoff "		
"	4 Add Runoff "		
"	0.006	0.006	0.008 0.046"
" 40	HYDROGRAPH Copy to Outflow"		
"	8 Copy to Outflow"		
"	0.006	0.006	0.006 0.046"
" 40	HYDROGRAPH Combine 700"		
"	6 Combine "		
"	700 Node #"		
"	Arkell Road"		
"	Maximum flow	0.006	c.m/sec"
"	Hydrograph volume	10.539	c.m"
"	0.006	0.006	0.006 0.006"
" 40	HYDROGRAPH Start - New Tributary"		
"	2 Start - New Tributary"		
"	0.006	0.000	0.006 0.006"
" 33	CATCHMENT 2042"		
"	1 Triangular SCS"		
"	1 Equal length"		
"	1 SCS method"		
"	2042 204-2 - Street A, Block 2 Rear Yards, 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 0.006 0.006 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 0.006 0.006"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.013 0.013 0.013 0.006"
 " 40 HYDROGRAPH Combine 700"
 " 6 Combine "
 " 700 Node #"
 " Arkell Road"
 " Maximum flow 0.015 c.m/sec"
 " Hydrograph volume 35.214 c.m"
 " 0.013 0.013 0.013 0.015"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.013 0.000 0.013 0.015"
 " 33 CATCHMENT 205"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 205 205 - Dawes Ave to Ex SWMF"
 " 70.000 % Impervious"
 " 0.043 Total Area"
 " 20.000 Flow length"
 " 1.250 Overland Slope"
 " 0.013 Pervious Area"
 " 20.000 Pervious length"
 " 1.250 Pervious slope"
 " 0.030 Impervious Area"
 " 20.000 Impervious length"
 " 1.250 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"
 " 0.009 0.000 0.013 0.015 c.m/sec"
 " Catchment 205 Pervious Impervious Total Area "
 " Surface Area 0.013 0.030 0.043 hectare"
 " Time of concentration 17.821 1.788 3.489 minutes"
 " Time to Centroid 120.385 88.491 91.875 minutes"
 " Rainfall depth 47.240 47.240 47.240 mm"
 " Rainfall volume 6.09 14.22 20.31 c.m"
 " Rainfall losses 35.749 5.749 14.749 mm"
 " Runoff depth 11.491 41.491 32.491 mm"
 " Runoff volume 1.48 12.49 13.97 c.m"
 " Runoff coefficient 0.243 0.878 0.688 "
 " Maximum flow 0.001 0.009 0.009 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.009 0.009 0.013 0.015"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.009 0.009 0.009 0.015"
 " 40 HYDROGRAPH Combine 600"
 " 6 Combine "
 " 600 Node #"
 " Ex. SWMF"
 " Maximum flow 0.009 c.m/sec"
 " Hydrograph volume 13.971 c.m"
 " 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 1.038 hectare"
 " Total % impervious 33.408"
 " 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\March 2023\MIDUSS\POST"
" Output filename: 10yrPost2023.in"
" Licensee name: A"
" Company:"
" Date & Time last used: 3/9/2023 at 2:04:54 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 2011"
" 1 Triangular SCS"
" 1 Equal length"
" 1 SCS method"
" 2011 201-1 - Street A to SWMF"
" 65.000 % Impervious"
" 0.290 Total Area"
" 60.000 Flow length"
" 0.750 Overland Slope"
" 0.102 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 0.102 0.188 0.290 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 57.13 106.11 163.24 c.m"
" Rainfall losses 39.872 6.269 18.030 mm"
" Runoff depth 16.418 50.021 38.260 mm"
" Runoff volume 16.66 94.29 110.95 c.m"
" Runoff coefficient 0.292 0.889 0.680 "
" Maximum flow 0.004 0.066 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"

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" 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 110.955 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 3 Front/Roofs to SWMF"
" 80.000 % Impervious"
" 0.131 Total Area"
" 10.000 Flow length"
" 2.000 Overland Slope"
" 0.026 Pervious Area"
" 10.000 Pervious length"
" 2.000 Pervious slope"
" 0.105 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"
" 0.042 0.000 0.066 0.066 c.m/sec"
" Catchment 2012 Pervious Impervious Total Area "
" Surface Area 0.026 0.105 0.131 hectare"
" Time of concentration 8.564 0.942 1.528 minutes"
" Time to Centroid 106.793 86.363 87.934 minutes"
" Rainfall depth 56.290 56.290 56.290 mm"
" Rainfall volume 14.75 58.99 73.74 c.m"
" Rainfall losses 39.928 7.184 13.733 mm"
" Runoff depth 16.362 49.106 42.558 mm"
" Runoff volume 4.29 51.46 55.75 c.m"
" Runoff coefficient 0.291 0.872 0.756 "
" Maximum flow 0.002 0.042 0.042 c.m/sec"
" 40 HYDROGRAPH Add Runoff "
" 4 Add Runoff "
" 0.042 0.042 0.066 0.066"
" 40 HYDROGRAPH Copy to Outflow"
" 8 Copy to Outflow"
" 0.042 0.042 0.042 0.066"
" 40 HYDROGRAPH Combine 900"
" 6 Combine "
" 900 Node #"
" SWMF"
" Maximum flow 0.104 c.m/sec"
" Hydrograph volume 166.705 c.m"
" 0.042 0.042 0.042 0.104"
" 40 HYDROGRAPH Start - New Tributary"
" 2 Start - New Tributary"
" 0.042 0.000 0.042 0.104"

```

" 33	CATCHMENT 2013"	"	"	"	0.129	Impervious Area"	"	"	
"	1 Triangular SCS"	"	"	"	10.000	Impervious length"	"	"	
"	1 Equal length"	"	"	"	2.000	Impervious slope"	"	"	
"	1 SCS method"	"	"	"	0.250	Pervious Manning 'n'"	"	"	
"	2013 201-3 - Block 1 to SWMF"	"	"	"	74.000	Pervious SCS Curve No."	"	"	
"	62.000 % Impervious"	"	"	"	0.000	Pervious Runoff coefficient"	"	"	
"	0.401 Total Area"	"	"	"	0.100	Pervious Ia/S coefficient"	"	"	
"	80.000 Flow length"	"	"	"	8.924	Pervious Initial abstraction"	"	"	
"	0.500 Overland Slope"	"	"	"	0.015	Impervious Manning 'n'"	"	"	
"	0.152 Pervious Area"	"	"	"	98.000	Impervious SCS Curve No."	"	"	
"	80.000 Pervious length"	"	"	"	0.872	Impervious Runoff coefficient"	"	"	
"	0.500 Pervious slope"	"	"	"	0.100	Impervious Ia/S coefficient"	"	"	
"	0.249 Impervious Area"	"	"	"	0.518	Impervious Initial abstraction"	"	"	
"	80.000 Impervious length"	"	"	"	0.051	0.000	0.091	0.185 c.m/sec"	
"	0.500 Impervious slope"	"	"	"	0.000	0.000	0.000	0.000	
"	0.250 Pervious Manning 'n'"	"	"	"	Catchment 2014	Pervious	Impervious	Total Area "	
"	74.000 Pervious SCS Curve No."	"	"	"	Surface Area	0.000	0.129	0.129	hectare"
"	0.292 Pervious Runoff coefficient"	"	"	"	Time of concentration	8.564	0.942	0.942	minutes"
"	0.100 Pervious Ia/S coefficient"	"	"	"	Time to Centroid	106.793	86.363	86.363	minutes"
"	8.924 Pervious Initial abstraction"	"	"	"	Rainfall depth	56.290	56.290	56.290	mm"
"	0.015 Impervious Manning 'n'"	"	"	"	Rainfall volume	0.00	72.61	72.61	c.m"
"	98.000 Impervious SCS Curve No."	"	"	"	Rainfall losses	39.928	7.184	7.184	mm"
"	0.899 Impervious Runoff coefficient"	"	"	"	Runoff depth	16.362	49.106	49.106	mm"
"	0.100 Impervious Ia/S coefficient"	"	"	"	Runoff volume	0.00	63.35	63.35	c.m"
"	0.518 Impervious Initial abstraction"	"	"	"	Runoff coefficient	0.000	0.872	0.872	"
"	0.091 0.000 0.042 0.104 c.m/sec"	"	"	"	Maximum flow	0.000	0.051	0.051	c.m/sec"
"	Catchment 2013 Pervious Impervious Total Area "	"	"	" 40	HYDROGRAPH Add Runoff "	"	"	"	
"	Surface Area 0.152 0.249 0.401 hectare"	"	"	"	4 Add Runoff "	"	"	"	
"	Time of concentration 45.199 4.974 11.646 minutes"	"	"	"	0.051 0.051 0.091 0.185"	"	"	"	
"	Time to Centroid 152.590 92.233 102.244 minutes"	"	"	" 57	TRENCH Design d/s of 2014"	"	"	"	
"	Rainfall depth 56.290 56.290 56.290 mm"	"	"	"	0.051 Peak inflow"	"	"	"	
"	Rainfall volume 85.77 139.95 225.72 c.m"	"	"	"	63.347 Hydrograph volume"	"	"	"	
"	Rainfall losses 39.873 5.688 18.678 mm"	"	"	"	335.600 Ground elevation"	"	"	"	
"	Runoff depth 16.417 50.602 37.612 mm"	"	"	"	334.500 Downstream trench invert"	"	"	"	
"	Runoff volume 25.02 125.81 150.82 c.m"	"	"	"	1.000 Trench height"	"	"	"	
"	Runoff coefficient 0.292 0.899 0.668 "	"	"	"	333.400 Water table elevation"	"	"	"	
"	Maximum flow 0.005 0.090 0.091 c.m/sec"	"	"	"	12.000 Trench top width"	"	"	"	
" 40	HYDROGRAPH Add Runoff "	"	"	"	12.000 Trench bottom width"	"	"	"	
"	4 Add Runoff "	"	"	"	40.000 Voids ratio (%)"	"	"	"	
"	0.091 0.091 0.042 0.104"	"	"	"	43.000 Hydraulic conductivity"	"	"	"	
" 40	HYDROGRAPH Copy to Outflow"	"	"	"	0.000 Trench gradient (%)"	"	"	"	
"	8 Copy to Outflow"	"	"	"	8.000 Trench length"	"	"	"	
"	0.091 0.091 0.091 0.104"	"	"	"	1.000 Include base width"	"	"	"	
" 40	HYDROGRAPH Combine 900"	"	"	"	12. Number of stages"	"	"	"	
"	6 Combine "	"	"	"	Level Discharge	Volume"	"	"	
"	900 Node #"	"	"	"	334.500 0.000 0.0"	"	"	"	
"	SWMF"	"	"	"	334.600 0.000 3.8"	"	"	"	
"	Maximum flow 0.185 c.m/sec"	"	"	"	334.700 0.000 7.7"	"	"	"	
"	Hydrograph volume 317.528 c.m"	"	"	"	334.800 0.000 11.5"	"	"	"	
"	0.091 0.091 0.091 0.185"	"	"	"	334.900 0.000 15.4"	"	"	"	
" 40	HYDROGRAPH Start - New Tributary"	"	"	"	335.000 0.000 19.2"	"	"	"	
"	2 Start - New Tributary"	"	"	"	335.100 0.000 23.0"	"	"	"	
"	0.091 0.000 0.091 0.185"	"	"	"	335.200 0.000 26.9"	"	"	"	
" 33	CATCHMENT 2014"	"	"	"	335.300 0.000 30.7"	"	"	"	
"	1 Triangular SCS"	"	"	"	335.400 0.000 34.6"	"	"	"	
"	1 Equal length"	"	"	"	335.500 0.000 38.4"	"	"	"	
"	1 SCS method"	"	"	"	335.600 1.000 38.5"	"	"	"	
"	2014 201-4 - Block 1 Roofs to SWMF"	"	"	"	1. MANHOLE"	"	"	"	
"	100.000 % Impervious"	"	"	"	Access"	"	"	"	
"	0.129 Total Area"	"	"	"	diameter"	"	"	"	
"	10.000 Flow length"	"	"	"	1.200"	"	"	"	
"	2.000 Overland Slope"	"	"	"	Peak outflow	0.020	c.m/sec"	"	
"	0.000 Pervious Area"	"	"	"	Outflow volume	11.723	c.m"	"	
"	10.000 Pervious length"	"	"	"	Peak exfiltration	0.002	c.m/sec"	"	
"	2.000 Pervious slope"	"	"	"	Exfiltration volume	51.271	c.m"	"	
"		"	"	"	Maximum level	335.503	metre"	"	

" Maximum storage 38.403 c.m"
 " Centroidal lag 1.615 hours"
 " Infiltration area 2 sides 16.000 sq.metre"
 " Infiltration Base area 96.000 sq.metre"
 " 0.051 0.051 0.020 0.002 c.m/sec"
 " 40 HYDROGRAPH Combine 900"
 " 6 Combine "
 " 900 Node #"
 " SWMF"
 " Maximum flow 0.185 c.m/sec"
 " Hydrograph volume 329.251 c.m"
 " 0.051 0.051 0.020 0.185"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.051 0.000 0.020 0.185"
 " 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 0.020 0.185 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"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.007 0.007 0.020 0.185"
 " 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"
 " DIV02015.010hyd"
 " Major flow at 2015"
 " 0.007 0.007 0.006 0.185 c.m/sec"

" 40 HYDROGRAPH Combine 900"
 " 6 Combine "
 " 900 Node #"
 " SWMF"
 " Maximum flow 0.189 c.m/sec"
 " Hydrograph volume 337.757 c.m"
 " 0.007 0.007 0.006 0.189"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.007 0.000 0.006 0.189"
 " 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"
 " 0.049 Total Area"
 " 20.000 Flow length"
 " 3.000 Overland Slope"
 " 0.012 Pervious Area"
 " 20.000 Pervious length"
 " 3.000 Pervious slope"
 " 0.037 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"
 " 0.015 0.000 0.006 0.189 c.m/sec"
 " Catchment 2016 Pervious Impervious Total Area "
 " Surface Area 0.012 0.037 0.049 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 6.90 20.69 27.58 c.m"
 " Rainfall losses 39.908 6.254 14.667 mm"
 " Runoff depth 16.382 50.036 41.623 mm"
 " Runoff volume 2.01 18.39 20.40 c.m"
 " Runoff coefficient 0.291 0.889 0.739 "
 " Maximum flow 0.001 0.014 0.015 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.015 0.015 0.006 0.189"
 " 56 DIVERSION"
 " 2106 Node number"
 " 0.012 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 0.782 c.m"
 " DIV02106.010hyd"
 " Major flow at 2106"
 " 0.015 0.015 0.012 0.189 c.m/sec"
 " 40 HYDROGRAPH Combine 900"
 " 6 Combine "
 " 900 Node #"
 " SWMF"
 " Maximum flow 0.200 c.m/sec"

" Hydrograph volume 357.370 c.m"
 " 0.015 0.015 0.012 0.200"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.015 0.000 0.012 0.200"
 " 33 CATCHMENT 2017"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2017 201-7 - Block 2 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 0.012 0.200 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 0.012 0.200"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.020 0.020 0.020 0.200"
 " 40 HYDROGRAPH Combine 900"
 " 6 Combine "
 " 900 Node #"
 " SWMF"
 " Maximum flow 0.220 c.m/sec"
 " Hydrograph volume 389.878 c.m"
 " 0.020 0.020 0.020 0.220"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.020 0.000 0.020 0.220"
 " 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 0.220 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 0.220"
 " 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 0.220 c.m/sec"
 " Hydrograph volume 392.258 c.m"
 " 0.013 0.013 0.004 0.220"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.013 0.000 0.004 0.220"
 " 33 CATCHMENT 2019"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2019 201-9 - SWMF Block"
 " 40.000 % Impervious"
 " 0.217 Total Area"
 " 15.000 Flow length"
 " 10.000 Overland Slope"
 " 0.130 Pervious Area"
 " 15.000 Pervious length"
 " 10.000 Pervious slope"
 " 0.087 Impervious Area"
 " 15.000 Impervious length"
 " 10.000 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."
 " 0.853 Impervious Runoff coefficient"
 " 0.100 Impervious Ia/S coefficient"
 " 0.518 Impervious Initial abstraction"
 " 0.038 0.000 0.004 0.220 c.m/sec"
 " Catchment 2019 Pervious Impervious Total Area "
 " Surface Area 0.130 0.087 0.217 hectare"
 " Time of concentration 6.739 0.742 2.761 minutes"
 " Time to Centroid 104.700 86.174 92.411 minutes"
 " Rainfall depth 56.290 56.290 56.290 mm"
 " Rainfall volume 73.29 48.86 122.15 c.m"
 " Rainfall losses 40.049 8.294 27.347 mm"
 " Runoff depth 16.241 47.996 28.943 mm"
 " Runoff volume 21.15 41.66 62.81 c.m"
 " Runoff coefficient 0.289 0.853 0.514 "
 " Maximum flow 0.012 0.034 0.038 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.038 0.038 0.004 0.220"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.038 0.038 0.038 0.220"
 " 40 HYDROGRAPH Combine 900"
 " 6 Combine "

" 900 Node #"
 " SWMF"
 " Maximum flow 0.251 c.m/sec"
 " Hydrograph volume 455.064 c.m"
 " 0.038 0.038 0.038 0.251"
 " 40 HYDROGRAPH Confluence 900"
 " 7 Confluence "
 " 900 Node #"
 " SWMF"
 " Maximum flow 0.251 c.m/sec"
 " Hydrograph volume 455.064 c.m"
 " 0.038 0.251 0.038 0.000"
 " 54 POND DESIGN"
 " 0.251 Current peak flow c.m/sec"
 " 0.051 Target outflow c.m/sec"
 " 455.1 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 45.000"
 " 334.600 0.00230 94.000"
 " 334.700 0.00290 149.000"
 " 334.800 0.04670 208.000"
 " 334.900 0.06500 273.000"
 " 335.000 0.07920 344.000"
 " 335.100 0.09110 419.000"
 " 335.200 0.1017 498.000"
 " 335.300 0.1112 580.000"
 " 335.400 0.2041 666.000"
 " 335.500 0.4716 756.000"
 " Peak outflow 0.061 c.m/sec"
 " Maximum level 334.878 metre"
 " Maximum storage 258.943 c.m"
 " Centroidal lag 6.256 hours"
 " 0.038 0.251 0.061 0.000 c.m/sec"
 " 40 HYDROGRAPH Next link "
 " 5 Next link "
 " 0.038 0.061 0.061 0.000"
 " 54 POND DESIGN"
 " 0.061 Current peak flow c.m/sec"
 " 0.051 Target outflow c.m/sec"
 " 436.9 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 0.00238 19.000"
 " 334.400 0.00258 40.000"
 " 334.500 0.00278 62.000"
 " 334.600 0.00300 87.000"
 " 334.700 0.00323 113.000"
 " 334.800 0.00345 141.000"
 " 334.900 0.1550 171.000"
 " 335.000 0.4636 203.000"
 " 335.100 0.9068 237.000"
 " Peak outflow 0.049 c.m/sec"
 " Maximum level 334.830 metre"
 " Maximum storage 150.095 c.m"

" Centroidal lag 11.060 hours"
 " 0.038 0.061 0.049 0.000 c.m/sec"
 " 40 HYDROGRAPH Combine 800"
 " 6 Combine "
 " 800 Node #"
 " Torrance Creek"
 " Maximum flow 0.049 c.m/sec"
 " Hydrograph volume 397.281 c.m"
 " 0.038 0.061 0.049 0.049"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.038 0.000 0.049 0.049"
 " 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"
 " 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 0.049 0.049 c.m/sec"
 " Catchment 2021 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 0.049 0.049"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.034 0.034 0.034 0.049"
 " 40 HYDROGRAPH Combine 800"
 " 6 Combine "
 " 800 Node #"
 " Torrance Creek"
 " Maximum flow 0.067 c.m/sec"
 " Hydrograph volume 538.938 c.m"
 " 0.034 0.034 0.034 0.067"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.034 0.000 0.034 0.067"

" 33 CATCHMENT 2022"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2022 202-2 - Block 3 Rear Yards to Torrance"
 " 0.000 % Impervious"
 " 0.107 Total Area"
 " 15.000 Flow length"
 " 3.000 Overland Slope"
 " 0.107 Pervious Area"
 " 15.000 Pervious length"
 " 3.000 Pervious slope"
 " 0.000 Impervious Area"
 " 15.000 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."
 " 0.000 Impervious Runoff coefficient"
 " 0.100 Impervious Ia/S coefficient"
 " 0.518 Impervious Initial abstraction"
 " 0.009 0.000 0.034 0.067 c.m/sec"
 " Catchment 2022 Pervious Impervious Total Area "
 " Surface Area 0.107 0.000 0.107 hectare"
 " Time of concentration 9.671 1.064 9.671 minutes"
 " Time to Centroid 108.220 86.540 108.220 minutes"
 " Rainfall depth 56.290 56.290 56.290 mm"
 " Rainfall volume 60.23 0.00 60.23 c.m"
 " Rainfall losses 39.968 6.725 39.968 mm"
 " Runoff depth 16.323 49.565 16.323 mm"
 " Runoff volume 17.47 0.00 17.47 c.m"
 " Runoff coefficient 0.290 0.000 0.290 "
 " Maximum flow 0.009 0.000 0.009 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.009 0.009 0.034 0.067"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.009 0.009 0.009 0.067"
 " 40 HYDROGRAPH Combine 800"
 " 6 Combine "
 " 800 Node #"
 " Torrance Creek"
 " Maximum flow 0.068 c.m/sec"
 " Hydrograph volume 556.403 c.m"
 " 0.009 0.009 0.009 0.068"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.009 0.000 0.009 0.068"
 " 33 CATCHMENT 2023"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2023 202-3 - Block 2 Grassed Area to Torrance"
 " 0.000 % Impervious"
 " 0.015 Total Area"
 " 205.000 Flow length"
 " 0.500 Overland Slope"
 " 0.015 Pervious Area"
 " 205.000 Pervious length"
 " 0.500 Pervious slope"

" 0.000 Impervious Area"
 " 205.000 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"
 " 0.000 0.000 0.009 0.068 c.m/sec"
 " Catchment 2023 Pervious Impervious Total Area "
 " Surface Area 0.015 0.000 0.015 hectare"
 " Time of concentration 79.493 8.748 79.493 minutes"
 " Time to Centroid 195.455 97.509 195.454 minutes"
 " Rainfall depth 56.290 56.290 56.290 mm"
 " Rainfall volume 8.44 0.00 8.44 c.m"
 " Rainfall losses 39.869 5.344 39.869 mm"
 " Runoff depth 16.421 50.946 16.421 mm"
 " Runoff volume 2.46 0.00 2.46 c.m"
 " Runoff coefficient 0.292 0.000 0.292 "
 " Maximum flow 0.000 0.000 0.000 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.000 0.000 0.009 0.068"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.000 0.000 0.000 0.068"
 " 40 HYDROGRAPH Combine 800"
 " 6 Combine "
 " 800 Node #"
 " Torrance Creek"
 " Maximum flow 0.069 c.m/sec"
 " Hydrograph volume 558.866 c.m"
 " 0.000 0.000 0.000 0.069"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.000 0.000 0.000 0.069"
 " 33 CATCHMENT 2031"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2031 203-1 - Arkell Meadows Embankments to Trail"
 " 0.000 % Impervious"
 " 0.198 Total Area"
 " 10.000 Flow length"
 " 20.000 Overland Slope"
 " 0.198 Pervious Area"
 " 10.000 Pervious length"
 " 20.000 Pervious slope"
 " 0.000 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."
 " 0.904 Impervious Runoff coefficient"
 " 0.100 Impervious Ia/S coefficient"
 " 0.100 Impervious Initial abstraction"

" 0.518 Impervious Initial abstraction"
 " 0.020 0.000 0.000 0.069 c.m/sec"
 " Catchment 2031 Pervious Impervious Total Area "
 " Surface Area 0.198 0.000 0.198 hectare"
 " Time of concentration 4.292 0.472 4.292 minutes"
 " Time to Centroid 101.544 86.116 101.544 minutes"
 " Rainfall depth 56.290 56.290 56.290 mm"
 " Rainfall volume 111.45 0.00 111.45 c.m"
 " Rainfall losses 40.026 10.725 40.026 mm"
 " Runoff depth 16.264 45.565 16.264 mm"
 " Runoff volume 32.20 0.00 32.20 c.m"
 " Runoff coefficient 0.289 0.000 0.289 "
 " Maximum flow 0.020 0.000 0.020 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.020 0.020 0.000 0.069"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.020 0.020 0.020 0.069"
 " 40 HYDROGRAPH Combine 800"
 " 6 Combine "
 " 800 Node #"
 " Torrance Creek"
 " Maximum flow 0.071 c.m/sec"
 " Hydrograph volume 591.070 c.m"
 " 0.020 0.020 0.020 0.071"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.020 0.000 0.020 0.071"
 " 33 CATCHMENT 2032"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2032 203-2 - Future Park Trail Block"
 " 30.000 % Impervious"
 " 0.216 Total Area"
 " 180.000 Flow length"
 " 0.500 Overland Slope"
 " 0.151 Pervious Area"
 " 180.000 Pervious length"
 " 0.500 Pervious slope"
 " 0.065 Impervious Area"
 " 180.000 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."
 " 0.904 Impervious Runoff coefficient"
 " 0.100 Impervious Ia/S coefficient"
 " 0.518 Impervious Initial abstraction"
 " 0.023 0.000 0.020 0.071 c.m/sec"
 " Catchment 2032 Pervious Impervious Total Area "
 " Surface Area 0.151 0.065 0.216 hectare"
 " Time of concentration 73.526 8.091 36.199 minutes"
 " Time to Centroid 187.999 96.658 135.893 minutes"
 " Rainfall depth 56.290 56.290 56.290 mm"
 " Rainfall volume 85.11 36.48 121.59 c.m"
 " Rainfall losses 39.869 5.406 29.530 mm"
 " Runoff depth 16.421 50.884 26.760 mm"
 " Runoff volume 24.83 32.97 57.80 c.m"
 " Runoff coefficient 0.292 0.904 0.475 "

"	Maximum flow	0.003	0.023	0.023	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.023	0.023	0.020	0.071"	
" 40	HYDROGRAPH Copy to Outflow"				
"	8 Copy to Outflow"				
"	0.023	0.023	0.023	0.071"	
" 40	HYDROGRAPH Combine	800"			
"	6 Combine "				
"	800 Node #"				
"	Torrance Creek"				
"	Maximum flow	0.076		c.m/sec"	
"	Hydrograph volume	648.871		c.m"	
"	0.023	0.023	0.023	0.076"	
" 40	HYDROGRAPH Start - New Tributary"				
"	2 Start - New Tributary"				
"	0.023	0.000	0.023	0.076"	
" 33	CATCHMENT 2033"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	1 SCS method"				
"	2033 203-3 - Block 1 Embkament to Trail Block"				
"	0.000 % Impervious"				
"	0.119 Total Area"				
"	10.000 Flow length"				
"	33.000 Overland Slope"				
"	0.119 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"				
"	0.013	0.000	0.023	0.076 c.m/sec"	
"	Catchment 2033	Pervious	Impervious	Total Area "	
"	Surface Area	0.119	0.000	0.119	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	66.99	0.00	66.99	c.m"
"	Rainfall losses	40.243	11.359	40.243	mm"
"	Runoff depth	16.047	44.931	16.047	mm"
"	Runoff volume	19.10	0.00	19.10	c.m"
"	Runoff coefficient	0.285	0.000	0.285	"
"	Maximum flow	0.013	0.000	0.013	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.013	0.013	0.023	0.076"	
" 40	HYDROGRAPH Copy to Outflow"				
"	8 Copy to Outflow"				
"	0.013	0.013	0.013	0.076"	
" 40	HYDROGRAPH Combine	800"			
"	6 Combine "				
"	800 Node #"				
"	Torrance Creek"				
"	Maximum flow	0.077		c.m/sec"	

"	Hydrograph volume	667.968		c.m"	
"	0.013	0.013	0.013	0.077"	
" 40	HYDROGRAPH Start - New Tributary"				
"	2 Start - New Tributary"				
"	0.013	0.000	0.013	0.077"	
" 33	CATCHMENT 2041"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	1 SCS method"				
"	2041 204-1 - Block 1 rear yards + Arkell Blvd to Arkell"				
"	0.000 % Impervious"				
"	0.092 Total Area"				
"	15.000 Flow length"				
"	12.000 Overland Slope"				
"	0.092 Pervious Area"				
"	15.000 Pervious length"				
"	12.000 Pervious slope"				
"	0.000 Impervious Area"				
"	15.000 Impervious length"				
"	12.000 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."				
"	0.000 Impervious Runoff coefficient"				
"	0.100 Impervious Ia/S coefficient"				
"	0.518 Impervious Initial abstraction"				
"	0.009	0.000	0.013	0.077 c.m/sec"	
"	Catchment 2041	Pervious	Impervious	Total Area "	
"	Surface Area	0.092	0.000	0.092	hectare"
"	Time of concentration	6.381	0.702	6.381	minutes"
"	Time to Centroid	104.210	86.191	104.210	minutes"
"	Rainfall depth	56.290	56.290	56.290	mm"
"	Rainfall volume	51.79	0.00	51.79	c.m"
"	Rainfall losses	40.048	8.570	40.048	mm"
"	Runoff depth	16.242	47.720	16.242	mm"
"	Runoff volume	14.94	0.00	14.94	c.m"
"	Runoff coefficient	0.289	0.000	0.289	"
"	Maximum flow	0.009	0.000	0.009	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.009	0.009	0.013	0.077"	
" 40	HYDROGRAPH Copy to Outflow"				
"	8 Copy to Outflow"				
"	0.009	0.009	0.009	0.077"	
" 40	HYDROGRAPH Combine	700"			
"	6 Combine "				
"	700 Node #"				
"	Arkell Road"				
"	Maximum flow	0.009		c.m/sec"	
"	Hydrograph volume	14.943		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 2042"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	1 SCS method"				
"	2042 204-2 - Street A, Block 2 Rear Yards, 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 0.009 0.009 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 0.009 0.009"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.017 0.017 0.017 0.009"
 " 40 HYDROGRAPH Combine 700"
 " 6 Combine "
 " 700 Node #"
 " Arkell Road"
 " Maximum flow 0.023 c.m/sec"
 " Hydrograph volume 46.564 c.m"
 " 0.017 0.017 0.017 0.023"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.017 0.000 0.017 0.023"
 " 33 CATCHMENT 205"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 205 205 - Dawes Ave to Ex SWMF"
 " 70.000 % Impervious"
 " 0.043 Total Area"
 " 20.000 Flow length"
 " 1.250 Overland Slope"
 " 0.013 Pervious Area"
 " 20.000 Pervious length"
 " 1.250 Pervious slope"
 " 0.030 Impervious Area"
 " 20.000 Impervious length"
 " 1.250 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"
 " 0.012 0.000 0.017 0.023 c.m/sec"
 " Catchment 205 Pervious Impervious Total Area "
 " Surface Area 0.013 0.030 0.043 hectare"
 " Time of concentration 14.946 1.645 3.273 minutes"
 " Time to Centroid 114.808 87.294 90.663 minutes"
 " Rainfall depth 56.290 56.290 56.290 mm"
 " Rainfall volume 7.26 16.94 24.20 c.m"
 " Rainfall losses 39.897 5.940 16.127 mm"
 " Runoff depth 16.393 50.350 40.163 mm"
 " Runoff volume 2.11 15.16 17.27 c.m"
 " Runoff coefficient 0.291 0.894 0.714 "
 " Maximum flow 0.001 0.011 0.012 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.012 0.012 0.017 0.023"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.012 0.012 0.012 0.023"
 " 40 HYDROGRAPH Combine 600"
 " 6 Combine "
 " 600 Node #"
 " Ex. SWMF"
 " Maximum flow 0.012 c.m/sec"
 " Hydrograph volume 17.270 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 1.038 hectare"
 " Total % impervious 33.408"
 " 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\March 2023\MIDUSS\POST"
"      Output filename:        25yrPost2023.in"
"      Licensee name:          A"
"      Company                  "
"      Date & Time last used:   3/9/2023 at 2:00:10 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"
" 33  6 025hyd Hydrograph extension used in this file"
"      CATCHMENT 2011"
"      1  Triangular SCS"
"      1  Equal length"
"      1  SCS method"
"      2011 201-1 - Street A to SWMF"
"      65.000 % Impervious"
"      0.290 Total Area"
"      60.000 Flow length"
"      0.750 Overland Slope"
"      0.102 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      0.102 0.188 0.290  hectare"
"      Time of concentration 29.417 3.518 7.950  minutes"
"      Time to Centroid 131.370 89.616 96.762  minutes"
"      Rainfall depth      68.087 68.087 68.087  mm"
"      Rainfall volume     69.11 128.34 197.45  c.m"
"      Rainfall losses     44.516 6.617 19.882  mm"
"      Runoff depth        23.571 61.469 48.205  mm"
"      Runoff volume       23.92 115.87 139.79  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"

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"      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 139.794  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 3 Front/Roofs to SWMF"
"      80.000 % Impervious"
"      0.131 Total Area"
"      10.000 Flow length"
"      2.000 Overland Slope"
"      0.026 Pervious Area"
"      10.000 Pervious length"
"      2.000 Pervious slope"
"      0.105 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"
"      0.049 0.000 0.077 0.077 c.m/sec"
"      Catchment 2012 Pervious Impervious Total Area "
"      Surface Area      0.026 0.105 0.131  hectare"
"      Time of concentration 7.480 0.894 1.480  minutes"
"      Time to Centroid 104.266 85.842 87.479  minutes"
"      Rainfall depth      68.087 68.087 68.087  mm"
"      Rainfall volume     17.84 71.35 89.19  c.m"
"      Rainfall losses     44.633 7.961 15.295  mm"
"      Runoff depth        23.454 60.125 52.791  mm"
"      Runoff volume       6.14 63.01 69.16  c.m"
"      Runoff coefficient  0.344 0.883 0.775  "
"      Maximum flow        0.004 0.048 0.049  c.m/sec"
" 40  HYDROGRAPH Add Runoff "
"      4  Add Runoff "
"      0.049 0.049 0.077 0.077"
" 40  HYDROGRAPH Copy to Outflow"
"      8  Copy to Outflow"
"      0.049 0.049 0.049 0.077"
" 40  HYDROGRAPH Combine 900"
"      6  Combine "
"      900 Node #"
"      SWMF"
"      Maximum flow      0.123  c.m/sec"
"      Hydrograph volume 208.950  c.m"
"      0.049 0.049 0.049 0.123"
" 40  HYDROGRAPH Start - New Tributary"
"      2  Start - New Tributary"
"      0.049 0.000 0.049 0.123"

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" 33 CATCHMENT 2013"
" 1 Triangular SCS"
" 1 Equal length"
" 1 SCS method"
" 2013 201-3 - Block 1 to SWMF"
" 62.000 % Impervious"
" 0.401 Total Area"
" 80.000 Flow length"
" 0.500 Overland Slope"
" 0.152 Pervious Area"
" 80.000 Pervious length"
" 0.500 Pervious slope"
" 0.249 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"
" 0.106 0.000 0.049 0.123 c.m/sec"
" Catchment 2013 Pervious Impervious Total Area "
" Surface Area 0.152 0.249 0.401 hectare"
" Time of concentration 39.482 4.721 11.266 minutes"
" Time to Centroid 143.857 91.254 101.158 minutes"
" Rainfall depth 68.087 68.087 68.087 mm"
" Rainfall volume 103.75 169.28 273.03 c.m"
" Rainfall losses 44.507 5.784 20.498 mm"
" Runoff depth 23.580 62.303 47.588 mm"
" Runoff volume 35.93 154.90 190.83 c.m"
" Runoff coefficient 0.346 0.915 0.699 "
" Maximum flow 0.008 0.105 0.106 c.m/sec"
" 40 HYDROGRAPH Add Runoff "
" 4 Add Runoff "
" 0.106 0.106 0.049 0.123"
" 40 HYDROGRAPH Copy to Outflow"
" 8 Copy to Outflow"
" 0.106 0.106 0.106 0.123"
" 40 HYDROGRAPH Combine 900"
" 6 Combine "
" 900 Node #"
" SWMF"
" Maximum flow 0.216 c.m/sec"
" Hydrograph volume 399.778 c.m"
" 0.106 0.106 0.106 0.216"
" 40 HYDROGRAPH Start - New Tributary"
" 2 Start - New Tributary"
" 0.106 0.000 0.106 0.216"
" 33 CATCHMENT 2014"
" 1 Triangular SCS"
" 1 Equal length"
" 1 SCS method"
" 2014 201-4 - Block 1 Roofs to SWMF"
" 100.000 % Impervious"
" 0.129 Total Area"
" 10.000 Flow length"
" 2.000 Overland Slope"
" 0.000 Pervious Area"
" 10.000 Pervious length"
" 2.000 Pervious slope"

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" 0.129 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"
" 0.059 0.000 0.106 0.216 c.m/sec"
" Catchment 2014 Pervious Impervious Total Area "
" Surface Area 0.000 0.129 0.129 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 87.83 87.83 c.m"
" Rainfall losses 44.633 7.961 7.961 mm"
" Runoff depth 23.454 60.125 60.125 mm"
" Runoff volume 0.00 77.56 77.56 c.m"
" Runoff coefficient 0.000 0.883 0.883 "
" Maximum flow 0.000 0.059 0.059 c.m/sec"
" 40 HYDROGRAPH Add Runoff "
" 4 Add Runoff "
" 0.059 0.059 0.106 0.216"
" 57 TRENCH Design d/s of 2014"
" 0.059 Peak inflow"
" 77.562 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 0.044 c.m/sec"
" Outflow volume 27.065 c.m"
" Peak exfiltration 0.002 c.m/sec"
" Exfiltration volume 52.130 c.m"
" Maximum level 335.506 metre"

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" Maximum storage 38.407 c.m"
 " Centroidal lag 1.535 hours"
 " Infiltration area 2 sides 16.000 sq.metre"
 " Infiltration Base area 96.000 sq.metre"
 " 0.059 0.059 0.044 0.002 c.m/sec"
 " 40 HYDROGRAPH Combine 900"
 " 6 Combine "
 " 900 Node #"
 " SWMF"
 " Maximum flow 0.226 c.m/sec"
 " Hydrograph volume 426.843 c.m"
 " 0.059 0.059 0.044 0.226"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.059 0.000 0.044 0.226"
 " 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 0.044 0.226 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 0.044 0.226"
 " 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"
 " DIV02015.025hyd"
 " Major flow at 2015"
 " 0.008 0.008 0.006 0.226 c.m/sec"

" 40 HYDROGRAPH Combine 900"
 " 6 Combine "
 " 900 Node #"
 " SWMF"
 " Maximum flow 0.231 c.m/sec"
 " Hydrograph volume 437.088 c.m"
 " 0.008 0.008 0.006 0.231"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.008 0.000 0.006 0.231"
 " 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"
 " 0.049 Total Area"
 " 20.000 Flow length"
 " 3.000 Overland Slope"
 " 0.012 Pervious Area"
 " 20.000 Pervious length"
 " 3.000 Pervious slope"
 " 0.037 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"
 " 0.017 0.000 0.006 0.231 c.m/sec"
 " Catchment 2016 Pervious Impervious Total Area "
 " Surface Area 0.012 0.037 0.049 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 8.34 25.02 33.36 c.m"
 " Rainfall losses 44.633 6.669 16.160 mm"
 " Runoff depth 23.453 61.417 51.926 mm"
 " Runoff volume 2.87 22.57 25.44 c.m"
 " Runoff coefficient 0.344 0.902 0.763 "
 " Maximum flow 0.001 0.017 0.017 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.017 0.017 0.006 0.231"
 " 56 DIVERSION"
 " 2106 Node number"
 " 0.012 Overflow threshold"
 " 1.000 Required diverted fraction"
 " 0 Conduit type; 1=Pipe;2=Channel"
 " Peak of diverted flow 0.005 c.m/sec"
 " Volume of diverted flow 1.758 c.m"
 " DIV02106.025hyd"
 " Major flow at 2106"
 " 0.017 0.017 0.012 0.231 c.m/sec"
 " 40 HYDROGRAPH Combine 900"
 " 6 Combine "
 " 900 Node #"
 " SWMF"
 " Maximum flow 0.243 c.m/sec"

" Hydrograph volume 460.774 c.m"
 " 0.017 0.017 0.012 0.243"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.017 0.000 0.012 0.243"
 " 33 CATCHMENT 2017"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2017 201-7 - Block 2 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 0.012 0.243 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 0.012 0.243"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.024 0.024 0.024 0.243"
 " 40 HYDROGRAPH Combine 900"
 " 6 Combine "
 " 900 Node #"
 " SWMF"
 " Maximum flow 0.266 c.m/sec"
 " Hydrograph volume 501.217 c.m"
 " 0.024 0.024 0.024 0.266"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.024 0.000 0.024 0.266"
 " 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 0.266 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 0.266"
 " 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"
 " 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 0.266 c.m/sec"
 " Hydrograph volume 505.913 c.m"
 " 0.015 0.015 0.010 0.266"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.015 0.000 0.010 0.266"
 " 33 CATCHMENT 2019"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2019 201-9 - SWMF Block"
 " 40.000 % Impervious"
 " 0.217 Total Area"
 " 15.000 Flow length"
 " 10.000 Overland Slope"
 " 0.130 Pervious Area"
 " 15.000 Pervious length"
 " 10.000 Pervious slope"
 " 0.087 Impervious Area"
 " 15.000 Impervious length"
 " 10.000 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."
 " 0.861 Impervious Runoff coefficient"
 " 0.100 Impervious Ia/S coefficient"
 " 0.518 Impervious Initial abstraction"
 " 0.047 0.000 0.010 0.266 c.m/sec"
 " Catchment 2019 Pervious Impervious Total Area "
 " Surface Area 0.130 0.087 0.217 hectare"
 " Time of concentration 5.887 0.704 2.643 minutes"
 " Time to Centroid 102.261 85.719 91.909 minutes"
 " Rainfall depth 68.087 68.087 68.087 mm"
 " Rainfall volume 88.65 59.10 147.75 c.m"
 " Rainfall losses 44.704 9.431 30.595 mm"
 " Runoff depth 23.382 58.655 37.491 mm"
 " Runoff volume 30.44 50.91 81.36 c.m"
 " Runoff coefficient 0.343 0.861 0.551 "
 " Maximum flow 0.017 0.039 0.047 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.047 0.047 0.010 0.266"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.047 0.047 0.047 0.266"
 " 40 HYDROGRAPH Combine 900"
 " 6 Combine "

" 900 Node #"
 " SWMF"
 " Maximum flow 0.306 c.m/sec"
 " Hydrograph volume 587.269 c.m"
 " 0.047 0.047 0.047 0.306"
 " 40 HYDROGRAPH Confluence 900"
 " 7 Confluence "
 " 900 Node #"
 " SWMF"
 " Maximum flow 0.306 c.m/sec"
 " Hydrograph volume 587.269 c.m"
 " 0.047 0.306 0.047 0.000"
 " 54 POND DESIGN"
 " 0.306 Current peak flow c.m/sec"
 " 0.051 Target outflow c.m/sec"
 " 587.3 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 45.000"
 " 334.600 0.00230 94.000"
 " 334.700 0.00290 149.000"
 " 334.800 0.04670 208.000"
 " 334.900 0.06500 273.000"
 " 335.000 0.07920 344.000"
 " 335.100 0.09110 419.000"
 " 335.200 0.1017 498.000"
 " 335.300 0.1112 580.000"
 " 335.400 0.2041 666.000"
 " 335.500 0.4716 756.000"
 " Peak outflow 0.076 c.m/sec"
 " Maximum level 334.981 metre"
 " Maximum storage 330.398 c.m"
 " Centroidal lag 5.364 hours"
 " 0.047 0.306 0.076 0.000 c.m/sec"
 " 40 HYDROGRAPH Next link "
 " 5 Next link "
 " 0.047 0.076 0.076 0.000"
 " 54 POND DESIGN"
 " 0.076 Current peak flow c.m/sec"
 " 0.051 Target outflow c.m/sec"
 " 569.5 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 0.00238 19.000"
 " 334.400 0.00258 40.000"
 " 334.500 0.00278 62.000"
 " 334.600 0.00300 87.000"
 " 334.700 0.00323 113.000"
 " 334.800 0.00345 141.000"
 " 334.900 0.1550 171.000"
 " 335.000 0.4636 203.000"
 " 335.100 0.9068 237.000"
 " Peak outflow 0.071 c.m/sec"
 " Maximum level 334.844 metre"
 " Maximum storage 154.343 c.m"

" Centroidal lag 9.069 hours"
 " 0.047 0.076 0.071 0.000 c.m/sec"
 " 40 HYDROGRAPH Combine 800"
 " 6 Combine "
 " 800 Node #"
 " Torrance Creek"
 " Maximum flow 0.071 c.m/sec"
 " Hydrograph volume 530.018 c.m"
 " 0.047 0.076 0.071 0.071"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.047 0.000 0.071 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"
 " 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 0.071 0.071 c.m/sec"
 " Catchment 2021 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 0.071 0.071"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.057 0.057 0.057 0.071"
 " 40 HYDROGRAPH Combine 800"
 " 6 Combine "
 " 800 Node #"
 " Torrance Creek"
 " Maximum flow 0.107 c.m/sec"
 " Hydrograph volume 733.503 c.m"
 " 0.057 0.057 0.057 0.107"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.057 0.000 0.057 0.107"

" 33 CATCHMENT 2022"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2022 202-2 - Block 3 Rear Yards to Torrance"
 " 0.000 % Impervious"
 " 0.107 Total Area"
 " 15.000 Flow length"
 " 3.000 Overland Slope"
 " 0.107 Pervious Area"
 " 15.000 Pervious length"
 " 3.000 Pervious slope"
 " 0.000 Impervious Area"
 " 15.000 Impervious length"
 " 3.000 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."
 " 0.000 Impervious Runoff coefficient"
 " 0.100 Impervious Ia/S coefficient"
 " 0.518 Impervious Initial abstraction"
 " 0.014 0.000 0.057 0.107 c.m/sec"
 " Catchment 2022 Pervious Impervious Total Area "
 " Surface Area 0.107 0.000 0.107 hectare"
 " Time of concentration 8.448 1.010 8.448 minutes"
 " Time to Centroid 105.332 85.994 105.332 minutes"
 " Rainfall depth 68.087 68.087 68.087 mm"
 " Rainfall volume 72.85 0.00 72.85 c.m"
 " Rainfall losses 44.578 7.340 44.578 mm"
 " Runoff depth 23.509 60.747 23.509 mm"
 " Runoff volume 25.15 0.00 25.15 c.m"
 " Runoff coefficient 0.345 0.000 0.345 "
 " Maximum flow 0.014 0.000 0.014 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.014 0.014 0.057 0.107"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.014 0.014 0.014 0.107"
 " 40 HYDROGRAPH Combine 800"
 " 6 Combine "
 " 800 Node #"
 " Torrance Creek"
 " Maximum flow 0.110 c.m/sec"
 " Hydrograph volume 758.657 c.m"
 " 0.014 0.014 0.014 0.110"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.014 0.000 0.014 0.110"
 " 33 CATCHMENT 2023"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2023 202-3 - Block 2 Grassed Area to Torrance"
 " 0.000 % Impervious"
 " 0.015 Total Area"
 " 205.000 Flow length"
 " 0.500 Overland Slope"
 " 0.015 Pervious Area"
 " 205.000 Pervious length"
 " 0.500 Pervious slope"

" 0.000 Impervious Area"
 " 205.000 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"
 " 0.001 0.000 0.014 0.110 c.m/sec"
 " Catchment 2023 Pervious Impervious Total Area "
 " Surface Area 0.015 0.000 0.015 hectare"
 " Time of concentration 69.437 8.303 69.437 minutes"
 " Time to Centroid 180.985 96.247 180.985 minutes"
 " Rainfall depth 68.087 68.087 68.087 mm"
 " Rainfall volume 10.21 0.00 10.21 c.m"
 " Rainfall losses 44.506 5.520 44.506 mm"
 " Runoff depth 23.580 62.567 23.580 mm"
 " Runoff volume 3.54 0.00 3.54 c.m"
 " Runoff coefficient 0.346 0.000 0.346 "
 " Maximum flow 0.001 0.000 0.001 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.001 0.001 0.014 0.110"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.001 0.001 0.001 0.110"
 " 40 HYDROGRAPH Combine 800"
 " 6 Combine "
 " 800 Node #"
 " Torrance Creek"
 " Maximum flow 0.110 c.m/sec"
 " Hydrograph volume 762.194 c.m"
 " 0.001 0.001 0.001 0.110"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.001 0.000 0.001 0.110"
 " 33 CATCHMENT 2031"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2031 203-1 - Arkell Meadows Embankments to Trail"
 " 0.000 % Impervious"
 " 0.198 Total Area"
 " 10.000 Flow length"
 " 20.000 Overland Slope"
 " 0.198 Pervious Area"
 " 10.000 Pervious length"
 " 20.000 Pervious slope"
 " 0.000 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."
 " 0.000 Impervious Runoff coefficient"
 " 0.100 Impervious Ia/S coefficient"

" 0.518 Impervious Initial abstraction"
 " 0.030 0.000 0.001 0.110 c.m/sec"
 " Catchment 2031 Pervious Impervious Total Area "
 " Surface Area 0.198 0.000 0.198 hectare"
 " Time of concentration 3.749 0.448 3.749 minutes"
 " Time to Centroid 99.741 85.556 99.741 minutes"
 " Rainfall depth 68.087 68.087 68.087 mm"
 " Rainfall volume 134.81 0.00 134.81 c.m"
 " Rainfall losses 45.019 12.492 45.019 mm"
 " Runoff depth 23.067 55.594 23.067 mm"
 " Runoff volume 45.67 0.00 45.67 c.m"
 " Runoff coefficient 0.339 0.000 0.339 "
 " Maximum flow 0.030 0.000 0.030 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.030 0.030 0.001 0.110"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.030 0.030 0.030 0.110"
 " 40 HYDROGRAPH Combine 800"
 " 6 Combine "
 " 800 Node #"
 " Torrance Creek"
 " Maximum flow 0.114 c.m/sec"
 " Hydrograph volume 807.867 c.m"
 " 0.030 0.030 0.030 0.114"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.030 0.000 0.030 0.114"
 " 33 CATCHMENT 2032"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2032 203-2 - Future Park Trail Block"
 " 30.000 % Impervious"
 " 0.216 Total Area"
 " 180.000 Flow length"
 " 0.500 Overland Slope"
 " 0.151 Pervious Area"
 " 180.000 Pervious length"
 " 0.500 Pervious slope"
 " 0.065 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."
 " 0.917 Impervious Runoff coefficient"
 " 0.100 Impervious Ia/S coefficient"
 " 0.518 Impervious Initial abstraction"
 " 0.028 0.000 0.030 0.114 c.m/sec"
 " Catchment 2032 Pervious Impervious Total Area "
 " Surface Area 0.151 0.065 0.216 hectare"
 " Time of concentration 64.225 7.680 34.171 minutes"
 " Time to Centroid 174.527 95.380 132.460 minutes"
 " Rainfall depth 68.087 68.087 68.087 mm"
 " Rainfall volume 102.95 44.12 147.07 c.m"
 " Rainfall losses 44.504 5.659 32.850 mm"
 " Runoff depth 23.583 62.428 35.236 mm"
 " Runoff volume 35.66 40.45 76.11 c.m"
 " Runoff coefficient 0.346 0.917 0.518 "

"	Maximum flow	0.005	0.028	0.028	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.028	0.028	0.030	0.114"	
" 40	HYDROGRAPH Copy to Outflow"				
"	8 Copy to Outflow"				
"	0.028	0.028	0.028	0.114"	
" 40	HYDROGRAPH Combine 800"				
"	6 Combine "				
"	800 Node #"				
"	Torrance Creek"				
"	Maximum flow	0.122		c.m/sec"	
"	Hydrograph volume	883.977		c.m"	
"	0.028	0.028	0.028	0.122"	
" 40	HYDROGRAPH Start - New Tributary"				
"	2 Start - New Tributary"				
"	0.028	0.000	0.028	0.122"	
" 33	CATCHMENT 2033"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	1 SCS method"				
"	2033 203-3 - Block 1 Embkament to Trail Block"				
"	0.000 % Impervious"				
"	0.119 Total Area"				
"	10.000 Flow length"				
"	33.000 Overland Slope"				
"	0.119 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"				
"	0.018	0.000	0.028	0.122 c.m/sec"	
"	Catchment 2033	Pervious	Impervious	Total Area "	
"	Surface Area	0.119	0.000	0.119	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	81.02	0.00	81.02	c.m"
"	Rainfall losses	45.081	13.216	45.081	mm"
"	Runoff depth	23.006	54.870	23.006	mm"
"	Runoff volume	27.38	0.00	27.38	c.m"
"	Runoff coefficient	0.338	0.000	0.338	"
"	Maximum flow	0.018	0.000	0.018	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.018	0.018	0.028	0.122"	
" 40	HYDROGRAPH Copy to Outflow"				
"	8 Copy to Outflow"				
"	0.018	0.018	0.018	0.122"	
" 40	HYDROGRAPH Combine 800"				
"	6 Combine "				
"	800 Node #"				
"	Torrance Creek"				
"	Maximum flow	0.124		c.m/sec"	

"	Hydrograph volume	911.354	c.m"
"	0.018	0.018	0.124"
" 40	HYDROGRAPH Start - New Tributary"		
"	2 Start - New Tributary"		
"	0.018	0.000	0.018 0.124"
" 33	CATCHMENT 2041"		
"	1 Triangular SCS"		
"	1 Equal length"		
"	1 SCS method"		
"	2041 204-1 - Block 1 rear yards + Arkell Blvd to Arkell"		
"	0.000 % Impervious"		
"	0.092 Total Area"		
"	15.000 Flow length"		
"	12.000 Overland Slope"		
"	0.092 Pervious Area"		
"	15.000 Pervious length"		
"	12.000 Pervious slope"		
"	0.000 Impervious Area"		
"	15.000 Impervious length"		
"	12.000 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"		
"	0.013	0.000	0.018 c.m/sec"
"	Catchment 2041	Pervious	Impervious Total Area "
"	Surface Area	0.092	0.000 0.092
"	Time of concentration	5.574	0.666 5.574
"	Time to Centroid	101.840	85.728 101.840
"	Rainfall depth	68.087	68.087 68.087
"	Rainfall volume	62.64	0.00 62.64
"	Rainfall losses	44.664	9.802 44.664
"	Runoff depth	23.422	58.285 23.422
"	Runoff volume	21.55	0.00 21.55
"	Runoff coefficient	0.344	0.000 0.344
"	Maximum flow	0.013	0.000 0.013
" 40	HYDROGRAPH Add Runoff "		
"	4 Add Runoff "		
"	0.013	0.013	0.018 0.124"
" 40	HYDROGRAPH Copy to Outflow"		
"	8 Copy to Outflow"		
"	0.013	0.013	0.013 0.124"
" 40	HYDROGRAPH Combine 700"		
"	6 Combine "		
"	700 Node #"		
"	Arkell Road"		
"	Maximum flow	0.013	c.m/sec"
"	Hydrograph volume	21.548	c.m"
"	0.013	0.013	0.013 0.013"
" 40	HYDROGRAPH Start - New Tributary"		
"	2 Start - New Tributary"		
"	0.013	0.000	0.013 0.013"
" 33	CATCHMENT 2042"		
"	1 Triangular SCS"		
"	1 Equal length"		
"	1 SCS method"		
"	2042 204-2 - Street A, Block 2 Rear Yards, 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 0.013 0.013 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 0.013 0.013"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.020 0.020 0.020 0.013"
 " 40 HYDROGRAPH Combine 700"
 " 6 Combine "
 " 700 Node #"
 " Arkell Road"
 " Maximum flow 0.032 c.m/sec"
 " Hydrograph volume 62.712 c.m"
 " 0.020 0.020 0.020 0.032"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.020 0.000 0.020 0.032"
 " 33 CATCHMENT 205"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 205 205 - Dawes Ave to Ex SWMF"
 " 70.000 % Impervious"
 " 0.043 Total Area"
 " 20.000 Flow length"
 " 1.250 Overland Slope"
 " 0.013 Pervious Area"
 " 20.000 Pervious length"
 " 1.250 Pervious slope"
 " 0.030 Impervious Area"
 " 20.000 Impervious length"
 " 1.250 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"
 " 0.014 0.000 0.020 0.032 c.m/sec"
 " Catchment 205 Pervious Impervious Total Area "
 " Surface Area 0.013 0.030 0.043 hectare"
 " Time of concentration 13.055 1.561 3.170 minutes"
 " Time to Centroid 111.092 86.686 90.102 minutes"
 " Rainfall depth 68.087 68.087 68.087 mm"
 " Rainfall volume 8.78 20.49 29.28 c.m"
 " Rainfall losses 44.589 6.207 17.722 mm"
 " Runoff depth 23.497 61.880 50.365 mm"
 " Runoff volume 3.03 18.63 21.66 c.m"
 " Runoff coefficient 0.345 0.909 0.740 "
 " Maximum flow 0.001 0.013 0.014 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.014 0.014 0.020 0.032"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.014 0.014 0.014 0.032"
 " 40 HYDROGRAPH Combine 600"
 " 6 Combine "
 " 600 Node #"
 " Ex. SWMF"
 " Maximum flow 0.014 c.m/sec"
 " Hydrograph volume 21.657 c.m"
 " 0.014 0.014 0.014 0.014"
 " 38 START/RE-START TOTALS 205"
 " 3 Runoff Totals on EXIT"
 " Total Catchment area 3.108 hectare"
 " Total Impervious area 1.038 hectare"
 " Total % impervious 33.408"
 " 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\March 2023\MIDUSS\POST"
"      Output filename:        50yrPost2023.in"
"      Licensee name:          A"
"      Company                  "
"      Date & Time last used:   3/9/2023 at 1:55:14 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 05hyd 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"
"      0.290 Total Area"
"      60.000 Flow length"
"      0.750 Overland Slope"
"      0.102 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      0.102 0.188 0.290 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   78.60 145.98 224.58 c.m"
"      Rainfall losses   47.699 6.760 21.089 mm"
"      Runoff depth      29.744 70.683 56.354 mm"
"      Runoff volume     30.19 133.24 163.43 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"

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"      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 163.427 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 3 Front/Roofs to SWMF"
"      80.000 % Impervious"
"      0.131 Total Area"
"      10.000 Flow length"
"      2.000 Overland Slope"
"      0.026 Pervious Area"
"      10.000 Pervious length"
"      2.000 Pervious slope"
"      0.105 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"
"      0.056 0.000 0.087 0.087 c.m/sec"
"      Catchment 2012 Pervious Impervious Total Area "
"      Surface Area      0.026 0.105 0.131 hectare"
"      Time of concentration 6.771 0.851 1.424 minutes"
"      Time to Centroid  102.464 85.418 87.067 minutes"
"      Rainfall depth    77.443 77.443 77.443 mm"
"      Rainfall volume   20.29 81.16 101.45 c.m"
"      Rainfall losses   48.008 8.731 16.586 mm"
"      Runoff depth      29.434 68.712 60.856 mm"
"      Runoff volume     7.71 72.01 79.72 c.m"
"      Runoff coefficient 0.380 0.887 0.786 "
"      Maximum flow      0.005 0.054 0.056 c.m/sec"
" 40 HYDROGRAPH Add Runoff "
"      4 Add Runoff "
"      0.056 0.056 0.087 0.087"
" 40 HYDROGRAPH Copy to Outflow"
"      8 Copy to Outflow"
"      0.056 0.056 0.056 0.087"
" 40 HYDROGRAPH Combine 900"
"      6 Combine "
"      900 Node #"
"      SWMF"
"      Maximum flow      0.142 c.m/sec"
"      Hydrograph volume 243.148 c.m"
"      0.056 0.056 0.056 0.142"
" 40 HYDROGRAPH Start - New Tributary"
"      2 Start - New Tributary"
"      0.056 0.000 0.056 0.142"

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" 33	CATCHMENT 2013"	"	0.129	Impervious Area"	"
"	1 Triangular SCS"	"	10.000	Impervious length"	"
"	1 Equal length"	"	2.000	Impervious slope"	"
"	1 SCS method"	"	0.250	Pervious Manning 'n'"	"
"	2013 201-3 - Block 1 to SWMF"	"	74.000	Pervious SCS Curve No."	"
"	62.000 % Impervious"	"	0.000	Pervious Runoff coefficient"	"
"	0.401 Total Area"	"	0.100	Pervious Ia/S coefficient"	"
"	80.000 Flow length"	"	8.924	Pervious Initial abstraction"	"
"	0.500 Overland Slope"	"	0.015	Impervious Manning 'n'"	"
"	0.152 Pervious Area"	"	98.000	Impervious SCS Curve No."	"
"	80.000 Pervious length"	"	0.887	Impervious Runoff coefficient"	"
"	0.500 Pervious slope"	"	0.100	Impervious Ia/S coefficient"	"
"	0.249 Impervious Area"	"	0.518	Impervious Initial abstraction"	"
"	80.000 Impervious length"	"	0.066	0.000	0.120
"	0.500 Impervious slope"	"	0.246	c.m/sec"	"
"	0.250 Pervious Manning 'n'"	"	Catchment 2014	Pervious	Impervious Total Area "
"	74.000 Pervious SCS Curve No."	"	Surface Area	0.000	0.129
"	0.384 Pervious Runoff coefficient"	"	Time of concentration	6.771	0.129
"	0.100 Pervious Ia/S coefficient"	"	Time to Centroid	102.464	85.418
"	8.924 Pervious Initial abstraction"	"	Rainfall depth	77.443	77.443
"	0.015 Impervious Manning 'n'"	"	Rainfall volume	0.00	99.90
"	98.000 Impervious SCS Curve No."	"	Rainfall losses	48.008	8.731
"	0.923 Impervious Runoff coefficient"	"	Runoff depth	29.434	68.712
"	0.100 Impervious Ia/S coefficient"	"	Runoff volume	0.00	88.64
"	0.518 Impervious Initial abstraction"	"	Runoff coefficient	0.000	0.887
"	0.120	0.000	Maximum flow	0.000	0.066
"	0.056	0.142	HYDROGRAPH Add Runoff "		
"	0.142 c.m/sec"	" 40	4 Add Runoff "		
"	Catchment 2013	Pervious	0.066	0.066	0.120
"	Surface Area	0.152	0.066	0.066	0.246"
"	Time of concentration	35.739	0.066	0.066	0.120
"	Time to Centroid	138.439	0.066	0.066	0.120
"	Rainfall depth	77.443	0.066	0.066	0.120
"	Rainfall volume	118.01	0.066	0.066	0.120
"	Rainfall losses	47.694	0.066	0.066	0.120
"	Runoff depth	29.749	0.066	0.066	0.120
"	Runoff volume	45.33	0.066	0.066	0.120
"	Runoff coefficient	0.384	0.066	0.066	0.120
"	Maximum flow	0.011	0.066	0.066	0.120
" 40	HYDROGRAPH Add Runoff "	"	57	TRENCH Design d/s of 2014"	"
"	4 Add Runoff "	"	0.066	Peak inflow"	"
"	0.120	0.120	0.056	88.638	Hydrograph volume"
"	0.142"	"	43.000	335.600	Ground elevation"
" 40	HYDROGRAPH Copy to Outflow"	"	0.000	334.500	Downstream trench invert"
"	8 Copy to Outflow"	"	8.000	1.000	Trench height"
"	0.120	0.120	0.120	333.400	Water table elevation"
"	0.142"	"	12.000	12.000	Trench top width"
" 40	HYDROGRAPH Combine	900"	40.000	12.000	Trench bottom width"
"	6 Combine "	"	43.000	40.000	Void ratio (%)"
"	900 Node #"	"	0.000	43.000	Hydraulic conductivity"
"	SWMF"	"	8.000	8.000	Trench gradient (%)"
"	Maximum flow	0.246	1.000	1.000	Trench length"
"	Hydrograph volume	466.269	12.	12.	Number of stages"
"	0.120	0.120	0.120	0.246"	Level Discharge
"	0.246"	"	334.500	0.000	Volume"
" 40	HYDROGRAPH Start - New Tributary"	"	334.600	0.000	0.0"
"	2 Start - New Tributary"	"	334.700	0.000	3.8"
"	0.120	0.000	0.120	0.246"	7.7"
" 33	CATCHMENT 2014"	"	334.800	0.000	11.5"
"	1 Triangular SCS"	"	334.900	0.000	15.4"
"	1 Equal length"	"	335.000	0.000	19.2"
"	1 SCS method"	"	335.100	0.000	23.0"
"	2014 201-4 - Block 1 Roofs to SWMF"	"	335.200	0.000	26.9"
"	100.000 % Impervious"	"	335.300	0.000	30.7"
"	0.129 Total Area"	"	335.400	0.000	34.6"
"	10.000 Flow length"	"	335.500	0.000	38.4"
"	2.000 Overland Slope"	"	335.600	1.000	38.5"
"	0.000 Pervious Area"	"	1.	MANHOLE"	"
"	10.000 Pervious length"	"		Access"	"
"	2.000 Pervious slope"	"		diameter"	"
"		"		1.200"	"
"		"		Peak outflow	0.040
"		"		Outflow volume	32.878
"		"		Peak exfiltration	0.002
"		"		Exfiltration volume	52.578
"		"		Maximum level	335.506
"		"			metre"

" Maximum storage 38.407 c.m"
 " Centroidal lag 1.533 hours"
 " Infiltration area 2 sides 16.000 sq.metre"
 " Infiltration Base area 96.000 sq.metre"
 " 0.066 0.066 0.040 0.002 c.m/sec"
 " 40 HYDROGRAPH Combine 900"
 " 6 Combine "
 " 900 Node #"
 " SWMF"
 " Maximum flow 0.270 c.m/sec"
 " Hydrograph volume 499.147 c.m"
 " 0.066 0.066 0.040 0.270"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.066 0.000 0.040 0.270"
 " 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 0.040 0.270 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 0.040 0.270"
 " 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 0.270 c.m/sec"

" 40 HYDROGRAPH Combine 900"
 " 6 Combine "
 " 900 Node #"
 " SWMF"
 " Maximum flow 0.276 c.m/sec"
 " Hydrograph volume 510.679 c.m"
 " 0.009 0.009 0.006 0.276"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.009 0.000 0.006 0.276"
 " 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"
 " 0.049 Total Area"
 " 20.000 Flow length"
 " 3.000 Overland Slope"
 " 0.012 Pervious Area"
 " 20.000 Pervious length"
 " 3.000 Pervious slope"
 " 0.037 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"
 " 0.020 0.000 0.006 0.276 c.m/sec"
 " Catchment 2016 Pervious Impervious Total Area "
 " Surface Area 0.012 0.037 0.049 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 9.49 28.46 37.95 c.m"
 " Rainfall losses 47.833 7.102 17.284 mm"
 " Runoff depth 29.610 70.341 60.158 mm"
 " Runoff volume 3.63 25.85 29.48 c.m"
 " Runoff coefficient 0.382 0.908 0.777 "
 " Maximum flow 0.002 0.019 0.020 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.020 0.020 0.006 0.276"
 " 56 DIVERSION"
 " 2106 Node number"
 " 0.012 Overflow threshold"
 " 1.000 Required diverted fraction"
 " 0 Conduit type; 1=Pipe;2=Channel"
 " Peak of diverted flow 0.008 c.m/sec"
 " Volume of diverted flow 3.101 c.m"
 " DIV02106.050hyd"
 " Major flow at 2106"
 " 0.020 0.020 0.012 0.276 c.m/sec"
 " 40 HYDROGRAPH Combine 900"
 " 6 Combine "
 " 900 Node #"
 " SWMF"
 " Maximum flow 0.288 c.m/sec"

" Hydrograph volume 537.056 c.m"
 " 0.020 0.020 0.012 0.288"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.020 0.000 0.012 0.288"
 " 33 CATCHMENT 2017"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2017 201-7 - Block 2 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 0.012 0.288 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 0.012 0.288"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.028 0.028 0.028 0.288"
 " 40 HYDROGRAPH Combine 900"
 " 6 Combine "
 " 900 Node #"
 " SWMF"
 " Maximum flow 0.314 c.m/sec"
 " Hydrograph volume 583.787 c.m"
 " 0.028 0.028 0.028 0.314"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.028 0.000 0.028 0.314"
 " 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 0.314 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 0.314"
 " 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"
 " 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 0.317 c.m/sec"
 " Hydrograph volume 590.235 c.m"
 " 0.016 0.016 0.012 0.317"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.016 0.000 0.012 0.317"
 " 33 CATCHMENT 2019"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2019 201-9 - SWMF Block"
 " 40.000 % Impervious"
 " 0.217 Total Area"
 " 15.000 Flow length"
 " 10.000 Overland Slope"
 " 0.130 Pervious Area"
 " 15.000 Pervious length"
 " 10.000 Pervious slope"
 " 0.087 Impervious Area"
 " 15.000 Impervious length"
 " 10.000 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."
 " 0.864 Impervious Runoff coefficient"
 " 0.100 Impervious Ia/S coefficient"
 " 0.518 Impervious Initial abstraction"
 " 0.056 0.000 0.012 0.317 c.m/sec"
 " Catchment 2019 Pervious Impervious Total Area "
 " Surface Area 0.130 0.087 0.217 hectare"
 " Time of concentration 5.329 0.670 2.527 minutes"
 " Time to Centroid 100.560 85.320 91.396 minutes"
 " Rainfall depth 77.443 77.443 77.443 mm"
 " Rainfall volume 100.83 67.22 168.05 c.m"
 " Rainfall losses 47.857 10.512 32.919 mm"
 " Runoff depth 29.586 66.931 44.524 mm"
 " Runoff volume 38.52 58.10 96.62 c.m"
 " Runoff coefficient 0.382 0.864 0.575 "
 " Maximum flow 0.024 0.044 0.056 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.056 0.056 0.012 0.317"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.056 0.056 0.056 0.317"
 " 40 HYDROGRAPH Combine 900"
 " 6 Combine "

" 900 Node #"
 " SWMF"
 " Maximum flow 0.366 c.m/sec"
 " Hydrograph volume 686.852 c.m"
 " 0.056 0.056 0.056 0.366"
 " 40 HYDROGRAPH Confluence 900"
 " 7 Confluence "
 " 900 Node #"
 " SWMF"
 " Maximum flow 0.366 c.m/sec"
 " Hydrograph volume 686.852 c.m"
 " 0.056 0.366 0.056 0.000"
 " 54 POND DESIGN"
 " 0.366 Current peak flow c.m/sec"
 " 0.051 Target outflow c.m/sec"
 " 686.9 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 45.000"
 " 334.600 0.00230 94.000"
 " 334.700 0.00290 149.000"
 " 334.800 0.04670 208.000"
 " 334.900 0.06500 273.000"
 " 335.000 0.07920 344.000"
 " 335.100 0.09110 419.000"
 " 335.200 0.1017 498.000"
 " 335.300 0.1112 580.000"
 " 335.400 0.2041 666.000"
 " 335.500 0.4716 756.000"
 " Peak outflow 0.086 c.m/sec"
 " Maximum level 335.061 metre"
 " Maximum storage 389.714 c.m"
 " Centroidal lag 5.111 hours"
 " 0.056 0.366 0.086 0.000 c.m/sec"
 " 40 HYDROGRAPH Next link "
 " 5 Next link "
 " 0.056 0.086 0.086 0.000"
 " 54 POND DESIGN"
 " 0.086 Current peak flow c.m/sec"
 " 0.051 Target outflow c.m/sec"
 " 666.1 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 0.00238 19.000"
 " 334.400 0.00258 40.000"
 " 334.500 0.00278 62.000"
 " 334.600 0.00300 87.000"
 " 334.700 0.00323 113.000"
 " 334.800 0.00345 141.000"
 " 334.900 0.1550 171.000"
 " 335.000 0.4636 203.000"
 " 335.100 0.9068 237.000"
 " Peak outflow 0.083 c.m/sec"
 " Maximum level 334.852 metre"
 " Maximum storage 156.719 c.m"

" Centroidal lag 8.174 hours"
 " 0.056 0.086 0.083 0.000 c.m/sec"
 " 40 HYDROGRAPH Combine 800"
 " 6 Combine "
 " 800 Node #"
 " Torrance Creek"
 " Maximum flow 0.083 c.m/sec"
 " Hydrograph volume 625.868 c.m"
 " 0.056 0.086 0.083 0.083"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.056 0.000 0.083 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"
 " 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 0.083 0.083 c.m/sec"
 " Catchment 2021 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 0.083 0.083"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.077 0.077 0.077 0.083"
 " 40 HYDROGRAPH Combine 800"
 " 6 Combine "
 " 800 Node #"
 " Torrance Creek"
 " Maximum flow 0.133 c.m/sec"
 " Hydrograph volume 882.613 c.m"
 " 0.077 0.077 0.077 0.133"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.077 0.000 0.077 0.133"

" 33 CATCHMENT 2022"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2022 202-2 - Block 3 Rear Yards to Torrance"
 " 0.000 % Impervious"
 " 0.107 Total Area"
 " 15.000 Flow length"
 " 3.000 Overland Slope"
 " 0.107 Pervious Area"
 " 15.000 Pervious length"
 " 3.000 Pervious slope"
 " 0.000 Impervious Area"
 " 15.000 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."
 " 0.000 Impervious Runoff coefficient"
 " 0.100 Impervious Ia/S coefficient"
 " 0.518 Impervious Initial abstraction"
 " 0.018 0.000 0.077 0.133 c.m/sec"
 " Catchment 2022 Pervious Impervious Total Area "
 " Surface Area 0.107 0.000 0.107 hectare"
 " Time of concentration 7.647 0.961 7.647 minutes"
 " Time to Centroid 103.457 85.554 103.457 minutes"
 " Rainfall depth 77.443 77.443 77.443 mm"
 " Rainfall volume 82.86 0.00 82.86 c.m"
 " Rainfall losses 47.826 7.958 47.826 mm"
 " Runoff depth 29.617 69.485 29.617 mm"
 " Runoff volume 31.69 0.00 31.69 c.m"
 " Runoff coefficient 0.382 0.000 0.382 "
 " Maximum flow 0.018 0.000 0.018 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.018 0.018 0.077 0.133"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.018 0.018 0.018 0.133"
 " 40 HYDROGRAPH Combine 800"
 " 6 Combine "
 " 800 Node #"
 " Torrance Creek"
 " Maximum flow 0.136 c.m/sec"
 " Hydrograph volume 914.303 c.m"
 " 0.018 0.018 0.018 0.136"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.018 0.000 0.018 0.136"
 " 33 CATCHMENT 2023"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2023 202-3 - Block 2 Grassed Area to Torrance"
 " 0.000 % Impervious"
 " 0.015 Total Area"
 " 205.000 Flow length"
 " 0.500 Overland Slope"
 " 0.015 Pervious Area"
 " 205.000 Pervious length"
 " 0.500 Pervious slope"

" 0.000 Impervious Area"
 " 205.000 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"
 " 0.001 0.000 0.018 0.136 c.m/sec"
 " Catchment 2023 Pervious Impervious Total Area "
 " Surface Area 0.015 0.000 0.015 hectare"
 " Time of concentration 62.855 7.900 62.855 minutes"
 " Time to Centroid 172.258 95.243 172.258 minutes"
 " Rainfall depth 77.443 77.443 77.443 mm"
 " Rainfall volume 11.62 0.00 11.62 c.m"
 " Rainfall losses 47.691 5.723 47.691 mm"
 " Runoff depth 29.752 71.720 29.752 mm"
 " Runoff volume 4.46 0.00 4.46 c.m"
 " Runoff coefficient 0.384 0.000 0.384 "
 " Maximum flow 0.001 0.000 0.001 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.001 0.001 0.018 0.136"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.001 0.001 0.001 0.136"
 " 40 HYDROGRAPH Combine 800"
 " 6 Combine "
 " 800 Node #"
 " Torrance Creek"
 " Maximum flow 0.137 c.m/sec"
 " Hydrograph volume 918.766 c.m"
 " 0.001 0.001 0.001 0.137"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.001 0.000 0.001 0.137"
 " 33 CATCHMENT 2031"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2031 203-1 - Arkell Meadows Embankments to Trail"
 " 0.000 % Impervious"
 " 0.198 Total Area"
 " 10.000 Flow length"
 " 20.000 Overland Slope"
 " 0.198 Pervious Area"
 " 10.000 Pervious length"
 " 20.000 Pervious slope"
 " 0.000 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."
 " 0.924 Impervious Runoff coefficient"
 " 0.100 Impervious Ia/S coefficient"
 " 0.100 Impervious Initial abstraction"

" 0.518 Impervious Initial abstraction"
 " 0.039 0.000 0.001 0.137 c.m/sec"
 " Catchment 2031 Pervious Impervious Total Area "
 " Surface Area 0.198 0.000 0.198 hectare"
 " Time of concentration 3.394 0.427 3.394 minutes"
 " Time to Centroid 98.270 85.091 98.270 minutes"
 " Rainfall depth 77.443 77.443 77.443 mm"
 " Rainfall volume 153.34 0.00 153.34 c.m"
 " Rainfall losses 48.415 13.993 48.415 mm"
 " Runoff depth 29.028 63.450 29.028 mm"
 " Runoff volume 57.48 0.00 57.48 c.m"
 " Runoff coefficient 0.375 0.000 0.375 "
 " Maximum flow 0.039 0.000 0.039 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.039 0.039 0.001 0.137"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.039 0.039 0.039 0.137"
 " 40 HYDROGRAPH Combine 800"
 " 6 Combine "
 " 800 Node #"
 " Torrance Creek"
 " Maximum flow 0.142 c.m/sec"
 " Hydrograph volume 976.241 c.m"
 " 0.039 0.039 0.039 0.142"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.039 0.000 0.039 0.142"
 " 33 CATCHMENT 2032"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2032 203-2 - Future Park Trail Block"
 " 30.000 % Impervious"
 " 0.216 Total Area"
 " 180.000 Flow length"
 " 0.500 Overland Slope"
 " 0.151 Pervious Area"
 " 180.000 Pervious length"
 " 0.500 Pervious slope"
 " 0.065 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."
 " 0.924 Impervious Runoff coefficient"
 " 0.100 Impervious Ia/S coefficient"
 " 0.518 Impervious Initial abstraction"
 " 0.033 0.000 0.039 0.142 c.m/sec"
 " Catchment 2032 Pervious Impervious Total Area "
 " Surface Area 0.151 0.065 0.216 hectare"
 " Time of concentration 58.137 7.307 32.343 minutes"
 " Time to Centroid 166.376 94.438 129.870 minutes"
 " Rainfall depth 77.443 77.443 77.443 mm"
 " Rainfall volume 117.09 50.18 167.28 c.m"
 " Rainfall losses 47.686 5.906 35.152 mm"
 " Runoff depth 29.757 71.537 42.291 mm"
 " Runoff volume 44.99 46.36 91.35 c.m"
 " Runoff coefficient 0.384 0.924 0.546 "

"	Maximum flow	0.008	0.032	0.033	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.033	0.039	0.142"		
" 40	HYDROGRAPH Copy to Outflow"				
"	8 Copy to Outflow"				
"	0.033	0.033	0.142"		
" 40	HYDROGRAPH Combine	800"			
"	6 Combine "				
"	800 Node #"				
"	Torrance Creek"				
"	Maximum flow	0.153		c.m/sec"	
"	Hydrograph volume	1067.590		c.m"	
"	0.033	0.033	0.033	0.153"	
" 40	HYDROGRAPH Start - New Tributary"				
"	2 Start - New Tributary"				
"	0.033	0.000	0.033	0.153"	
" 33	CATCHMENT 2033"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	1 SCS method"				
"	2033 203-3 - Block 1 Embnkament to Trail Block"				
"	0.000 % Impervious"				
"	0.119 Total Area"				
"	10.000 Flow length"				
"	33.000 Overland Slope"				
"	0.119 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"				
"	0.024	0.000	0.033	0.153 c.m/sec"	
"	Catchment 2033	Pervious	Impervious	Total Area "	
"	Surface Area	0.119	0.000	0.119	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	92.16	0.00	92.16	c.m"
"	Rainfall losses	48.296	14.614	48.295	mm"
"	Runoff depth	29.147	62.828	29.147	mm"
"	Runoff volume	34.69	0.00	34.69	c.m"
"	Runoff coefficient	0.376	0.000	0.376	"
"	Maximum flow	0.024	0.000	0.024	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.024	0.024	0.033	0.153"	
" 40	HYDROGRAPH Copy to Outflow"				
"	8 Copy to Outflow"				
"	0.024	0.024	0.024	0.153"	
" 40	HYDROGRAPH Combine	800"			
"	6 Combine "				
"	800 Node #"				
"	Torrance Creek"				
"	Maximum flow	0.156		c.m/sec"	

"	Hydrograph volume	1102.276		c.m"	
"	0.024	0.024	0.024	0.156"	
" 40	HYDROGRAPH Start - New Tributary"				
"	2 Start - New Tributary"				
"	0.024	0.000	0.024	0.156"	
" 33	CATCHMENT 2041"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	1 SCS method"				
"	2041 204-1 - Block 1 rear yards + Arkell Blvd to Arkell"				
"	0.000 % Impervious"				
"	0.092 Total Area"				
"	15.000 Flow length"				
"	12.000 Overland Slope"				
"	0.092 Pervious Area"				
"	15.000 Pervious length"				
"	12.000 Pervious slope"				
"	0.000 Impervious Area"				
"	15.000 Impervious length"				
"	12.000 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."				
"	0.000 Impervious Runoff coefficient"				
"	0.100 Impervious Ia/S coefficient"				
"	0.518 Impervious Initial abstraction"				
"	0.017	0.000	0.024	0.156 c.m/sec"	
"	Catchment 2041	Pervious	Impervious	Total Area "	
"	Surface Area	0.092	0.000	0.092	hectare"
"	Time of concentration	5.045	0.634	5.045	minutes"
"	Time to Centroid	100.185	85.323	100.185	minutes"
"	Rainfall depth	77.443	77.443	77.443	mm"
"	Rainfall volume	71.25	0.00	71.25	c.m"
"	Rainfall losses	47.861	10.967	47.861	mm"
"	Runoff depth	29.582	66.475	29.582	mm"
"	Runoff volume	27.22	0.00	27.22	c.m"
"	Runoff coefficient	0.382	0.000	0.382	"
"	Maximum flow	0.017	0.000	0.017	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.017	0.017	0.024	0.156"	
" 40	HYDROGRAPH Copy to Outflow"				
"	8 Copy to Outflow"				
"	0.017	0.017	0.017	0.156"	
" 40	HYDROGRAPH Combine	700"			
"	6 Combine "				
"	700 Node #"				
"	Arkell Road"				
"	Maximum flow	0.017		c.m/sec"	
"	Hydrograph volume	27.215		c.m"	
"	0.017	0.017	0.017	0.017"	
" 40	HYDROGRAPH Start - New Tributary"				
"	2 Start - New Tributary"				
"	0.017	0.000	0.017	0.017"	
" 33	CATCHMENT 2042"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	1 SCS method"				
"	2042 204-2 - Street A, Block 2 Rear Yards, 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 0.017 0.017 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 0.017 0.017"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.024 0.024 0.024 0.017"
 " 40 HYDROGRAPH Combine 700"
 " 6 Combine "
 " 700 Node #"
 " Arkell Road"
 " Maximum flow 0.041 c.m/sec"
 " Hydrograph volume 76.324 c.m"
 " 0.024 0.024 0.024 0.041"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.024 0.000 0.024 0.041"
 " 33 CATCHMENT 205"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 205 205 - Dawes Ave to Ex SWMF"
 " 70.000 % Impervious"
 " 0.043 Total Area"
 " 20.000 Flow length"
 " 1.250 Overland Slope"
 " 0.013 Pervious Area"
 " 20.000 Pervious length"
 " 1.250 Pervious slope"
 " 0.030 Impervious Area"
 " 20.000 Impervious length"
 " 1.250 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"
 " 0.016 0.000 0.024 0.041 c.m/sec"
 " Catchment 205 Pervious Impervious Total Area "
 " Surface Area 0.013 0.030 0.043 hectare"
 " Time of concentration 11.818 1.485 3.054 minutes"
 " Time to Centroid 108.607 86.190 89.592 minutes"
 " Rainfall depth 77.443 77.443 77.443 mm"
 " Rainfall volume 9.99 23.31 33.30 c.m"
 " Rainfall losses 47.777 6.393 18.808 mm"
 " Runoff depth 29.666 71.050 58.635 mm"
 " Runoff volume 3.83 21.39 25.21 c.m"
 " Runoff coefficient 0.383 0.917 0.757 "
 " Maximum flow 0.002 0.015 0.016 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.016 0.016 0.024 0.041"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.016 0.016 0.016 0.041"
 " 40 HYDROGRAPH Combine 600"
 " 6 Combine "
 " 600 Node #"
 " Ex. SWMF"
 " Maximum flow 0.016 c.m/sec"
 " Hydrograph volume 25.213 c.m"
 " 0.016 0.016 0.016 0.016"
 " 38 START/RE-START TOTALS 205"
 " 3 Runoff Totals on EXIT"
 " Total Catchment area 3.108 hectare"
 " Total Impervious area 1.038 hectare"
 " Total % impervious 33.408"
 " 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\March 2023\MIDUSS\POST"
" Output filename: 100yrPost2023.in"
" Licensee name: A"
" Company:"
" Date & Time last used: 3/9/2023 at 1:46:34 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"
" 0.290 Total Area"
" 60.000 Flow length"
" 0.750 Overland Slope"
" 0.102 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 0.102 0.188 0.290 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 88.57 164.49 253.06 c.m"
" Rainfall losses 50.658 7.047 22.311 mm"
" Runoff depth 36.605 80.217 64.953 mm"
" Runoff volume 37.15 151.21 188.36 c.m"
" Runoff coefficient 0.419 0.919 0.744 "
" Maximum flow 0.012 0.097 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"

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" 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 188.363 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 3 Front/Roofs to SWMF"
" 80.000 % Impervious"
" 0.131 Total Area"
" 10.000 Flow length"
" 2.000 Overland Slope"
" 0.026 Pervious Area"
" 10.000 Pervious length"
" 2.000 Pervious slope"
" 0.105 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"
" 0.063 0.000 0.098 0.098 c.m/sec"
" Catchment 2012 Pervious Impervious Total Area "
" Surface Area 0.026 0.105 0.131 hectare"
" Time of concentration 6.214 0.814 1.378 minutes"
" Time to Centroid 100.974 85.085 86.744 minutes"
" Rainfall depth 87.263 87.263 87.263 mm"
" Rainfall volume 22.86 91.45 114.32 c.m"
" Rainfall losses 51.029 9.575 17.866 mm"
" Runoff depth 36.234 77.688 69.398 mm"
" Runoff volume 9.49 81.42 90.91 c.m"
" Runoff coefficient 0.415 0.890 0.795 "
" Maximum flow 0.006 0.060 0.063 c.m/sec"
" 40 HYDROGRAPH Add Runoff "
" 4 Add Runoff "
" 0.063 0.063 0.098 0.098"
" 40 HYDROGRAPH Copy to Outflow"
" 8 Copy to Outflow"
" 0.063 0.063 0.063 0.098"
" 40 HYDROGRAPH Combine 900"
" 6 Combine "
" 900 Node #"
" SWMF"
" Maximum flow 0.161 c.m/sec"
" Hydrograph volume 279.274 c.m"
" 0.063 0.063 0.063 0.161"
" 40 HYDROGRAPH Start - New Tributary"
" 2 Start - New Tributary"
" 0.063 0.000 0.063 0.161"

```


" 33	CATCHMENT 2013"	"	0.129	Impervious Area"	"		
"	1 Triangular SCS"	"	10.000	Impervious length"	"		
"	1 Equal length"	"	2.000	Impervious slope"	"		
"	1 SCS method"	"	0.250	Pervious Manning 'n'"	"		
"	2013 201-3 - Block 1 to SWMF"	"	74.000	Pervious SCS Curve No."	"		
"	62.000 % Impervious"	"	0.000	Pervious Runoff coefficient"	"		
"	0.401 Total Area"	"	0.100	Pervious Ia/S coefficient"	"		
"	80.000 Flow length"	"	8.924	Pervious Initial abstraction"	"		
"	0.500 Overland Slope"	"	0.015	Impervious Manning 'n'"	"		
"	0.152 Pervious Area"	"	98.000	Impervious SCS Curve No."	"		
"	80.000 Pervious length"	"	0.890	Impervious Runoff coefficient"	"		
"	0.500 Pervious slope"	"	0.100	Impervious Ia/S coefficient"	"		
"	0.249 Impervious Area"	"	0.518	Impervious Initial abstraction"	"		
"	80.000 Impervious length"	"			"		
"	0.500 Impervious slope"	"			"		
"	0.250 Pervious Manning 'n'"	"	0.074	0.000	0.135	0.279 c.m/sec"	
"	74.000 Pervious SCS Curve No."	"	Catchment 2014	Pervious	Impervious	Total Area "	
"	0.419 Pervious Runoff coefficient"	"	Surface Area	0.000	0.129	0.129	hectare"
"	0.100 Pervious Ia/S coefficient"	"	Time of concentration	6.214	0.814	0.814	minutes"
"	8.924 Pervious Initial abstraction"	"	Time to Centroid	100.973	85.085	85.085	minutes"
"	0.015 Impervious Manning 'n'"	"	Rainfall depth	87.263	87.263	87.263	mm"
"	98.000 Impervious SCS Curve No."	"	Rainfall volume	0.00	112.57	112.57	c.m"
"	0.929 Impervious Runoff coefficient"	"	Rainfall losses	51.029	9.575	9.575	mm"
"	0.100 Impervious Ia/S coefficient"	"	Runoff depth	36.234	77.688	77.688	mm"
"	0.518 Impervious Initial abstraction"	"	Runoff volume	0.00	100.22	100.22	c.m"
"		"	Runoff coefficient	0.000	0.890	0.890	"
"		"	Maximum flow	0.000	0.074	0.074	c.m/sec"
"		"	HYDROGRAPH Add Runoff "				"
"		" 40	4 Add Runoff "				"
"		"		0.074	0.074	0.135	0.279"
"		" 57	TRENCH Design d/s of 2014"				"
"		"	0.074 Peak inflow"				"
"		"	100.218 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	0.058	c.m/sec"		"
"		"	Outflow volume	33.520	c.m"		"
"		"	Peak exfiltration	0.002	c.m/sec"		"
"		"	Exfiltration volume	53.017	c.m"		"
"		"	Maximum level	335.511	metre"		"
" 33	CATCHMENT 2013"	"					"
"	1 Triangular SCS"	"					"
"	1 Equal length"	"					"
"	1 SCS method"	"					"
"	2013 201-3 - Block 1 to SWMF"	"					"
"	62.000 % Impervious"	"					"
"	0.401 Total Area"	"					"
"	80.000 Flow length"	"					"
"	0.500 Overland Slope"	"					"
"	0.152 Pervious Area"	"					"
"	80.000 Pervious length"	"					"
"	0.500 Pervious slope"	"					"
"	0.249 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"	"					"
"		"	0.135	0.000	0.063	0.161 c.m/sec"	"
"	Catchment 2013	Pervious	Impervious	Total Area "			"
"	Surface Area	0.152	0.249	0.401	hectare"		"
"	Time of concentration	32.795	4.298	10.474	minutes"		"
"	Time to Centroid	134.059	89.937	99.499	minutes"		"
"	Rainfall depth	87.263	87.263	87.263	mm"		"
"	Rainfall volume	132.97	216.95	349.93	c.m"		"
"	Rainfall losses	50.657	6.170	23.075	mm"		"
"	Runoff depth	36.606	81.093	64.188	mm"		"
"	Runoff volume	55.78	201.61	257.39	c.m"		"
"	Runoff coefficient	0.419	0.929	0.736	"		"
"	Maximum flow	0.015	0.132	0.135	c.m/sec"		"
" 40	HYDROGRAPH Add Runoff "						"
"	4 Add Runoff "						"
"		0.135	0.135	0.063	0.161"		"
" 40	HYDROGRAPH Copy to Outflow"						"
"	8 Copy to Outflow"						"
"		0.135	0.135	0.135	0.161"		"
" 40	HYDROGRAPH Combine	900"					"
"	6 Combine "						"
"	900 Node #"						"
"	SWMF"						"
"	Maximum flow		0.279	c.m/sec"			"
"	Hydrograph volume		536.668	c.m"			"
"		0.135	0.135	0.135	0.279"		"
" 40	HYDROGRAPH Start - New Tributary"						"
"	2 Start - New Tributary"						"
"		0.135	0.000	0.135	0.279"		"
" 33	CATCHMENT 2014"	"					"
"	1 Triangular SCS"	"					"
"	1 Equal length"	"					"
"	1 SCS method"	"					"
"	2014 201-4 - Block 1 Roofs to SWMF"	"					"
"	100.000 % Impervious"	"					"
"	0.129 Total Area"	"					"
"	10.000 Flow length"	"					"
"	2.000 Overland Slope"	"					"
"	0.000 Pervious Area"	"					"
"	10.000 Pervious length"	"					"
"	2.000 Pervious slope"	"					"

" Maximum storage 38.412 c.m"
 " Centroidal lag 1.581 hours"
 " Infiltration area 2 sides 16.000 sq.metre"
 " Infiltration Base area 96.000 sq.metre"
 " 0.074 0.074 0.058 0.002 c.m/sec"
 " 40 HYDROGRAPH Combine 900"
 " 6 Combine "
 " 900 Node #"
 " SWMF"
 " Maximum flow 0.279 c.m/sec"
 " Hydrograph volume 570.188 c.m"
 " 0.074 0.074 0.058 0.279"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.074 0.000 0.058 0.279"
 " 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 0.058 0.279 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 0.058 0.279"
 " 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 0.279 c.m/sec"

" 40 HYDROGRAPH Combine 900"
 " 6 Combine "
 " 900 Node #"
 " SWMF"
 " Maximum flow 0.285 c.m/sec"
 " Hydrograph volume 582.930 c.m"
 " 0.010 0.010 0.006 0.285"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.010 0.000 0.006 0.285"
 " 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"
 " 0.049 Total Area"
 " 20.000 Flow length"
 " 3.000 Overland Slope"
 " 0.012 Pervious Area"
 " 20.000 Pervious length"
 " 3.000 Pervious slope"
 " 0.037 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"
 " 0.022 0.000 0.006 0.285 c.m/sec"
 " Catchment 2016 Pervious Impervious Total Area "
 " Surface Area 0.012 0.037 0.049 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 10.69 32.07 42.76 c.m"
 " Rainfall losses 50.767 7.569 18.369 mm"
 " Runoff depth 36.496 79.694 68.895 mm"
 " Runoff volume 4.47 29.29 33.76 c.m"
 " Runoff coefficient 0.418 0.913 0.790 "
 " Maximum flow 0.002 0.021 0.022 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.022 0.022 0.006 0.285"
 " 56 DIVERSION"
 " 2106 Node number"
 " 0.012 Overflow threshold"
 " 1.000 Required diverted fraction"
 " 0 Conduit type; 1=Pipe;2=Channel"
 " Peak of diverted flow 0.010 c.m/sec"
 " Volume of diverted flow 4.489 c.m"
 " DIV02106.100hyd"
 " Major flow at 2106"
 " 0.022 0.022 0.012 0.285 c.m/sec"
 " 40 HYDROGRAPH Combine 900"
 " 6 Combine "
 " 900 Node #"
 " SWMF"
 " Maximum flow 0.297 c.m/sec"

" Hydrograph volume 612.198 c.m"
 " 0.022 0.022 0.012 0.297"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.022 0.000 0.012 0.297"
 " 33 CATCHMENT 2017"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2017 201-7 - Block 2 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 0.012 0.297 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 0.012 0.297"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.032 0.032 0.032 0.297"
 " 40 HYDROGRAPH Combine 900"
 " 6 Combine "
 " 900 Node #"
 " SWMF"
 " Maximum flow 0.329 c.m/sec"
 " Hydrograph volume 665.675 c.m"
 " 0.032 0.032 0.032 0.329"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.032 0.000 0.032 0.329"
 " 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 0.329 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 0.329"
 " 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"
 " 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 0.345 c.m/sec"
 " Hydrograph volume 676.268 c.m"
 " 0.018 0.018 0.021 0.345"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.018 0.000 0.021 0.345"
 " 33 CATCHMENT 2019"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2019 201-9 - SWMF Block"
 " 40.000 % Impervious"
 " 0.217 Total Area"
 " 15.000 Flow length"
 " 10.000 Overland Slope"
 " 0.130 Pervious Area"
 " 15.000 Pervious length"
 " 10.000 Pervious slope"
 " 0.087 Impervious Area"
 " 15.000 Impervious length"
 " 10.000 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."
 " 0.866 Impervious Runoff coefficient"
 " 0.100 Impervious Ia/S coefficient"
 " 0.518 Impervious Initial abstraction"
 " 0.067 0.000 0.021 0.345 c.m/sec"
 " Catchment 2019 Pervious Impervious Total Area "
 " Surface Area 0.130 0.087 0.217 hectare"
 " Time of concentration 4.890 0.641 2.424 minutes"
 " Time to Centroid 99.231 85.007 90.976 minutes"
 " Rainfall depth 87.263 87.263 87.263 mm"
 " Rainfall volume 113.62 75.74 189.36 c.m"
 " Rainfall losses 50.838 11.700 35.183 mm"
 " Runoff depth 36.426 75.563 52.081 mm"
 " Runoff volume 47.43 65.59 113.02 c.m"
 " Runoff coefficient 0.417 0.866 0.597 "
 " Maximum flow 0.030 0.049 0.067 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.067 0.067 0.021 0.345"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.067 0.067 0.067 0.345"
 " 40 HYDROGRAPH Combine 900"
 " 6 Combine "

" 900 Node #"
 " SWMF"
 " Maximum flow 0.404 c.m/sec"
 " Hydrograph volume 789.283 c.m"
 " 0.067 0.067 0.067 0.404"
 " 40 HYDROGRAPH Confluence 900"
 " 7 Confluence "
 " 900 Node #"
 " SWMF"
 " Maximum flow 0.404 c.m/sec"
 " Hydrograph volume 789.283 c.m"
 " 0.067 0.404 0.067 0.000"
 " 54 POND DESIGN"
 " 0.404 Current peak flow c.m/sec"
 " 0.051 Target outflow c.m/sec"
 " 789.3 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 45.000"
 " 334.600 0.00230 94.000"
 " 334.700 0.00290 149.000"
 " 334.800 0.04670 208.000"
 " 334.900 0.06500 273.000"
 " 335.000 0.07920 344.000"
 " 335.100 0.09110 419.000"
 " 335.200 0.1017 498.000"
 " 335.300 0.1112 580.000"
 " 335.400 0.2041 666.000"
 " 335.500 0.4716 756.000"
 " Peak outflow 0.095 c.m/sec"
 " Maximum level 335.142 metre"
 " Maximum storage 452.077 c.m"
 " Centroidal lag 4.742 hours"
 " 0.067 0.404 0.095 0.000 c.m/sec"
 " 40 HYDROGRAPH Next link "
 " 5 Next link "
 " 0.067 0.095 0.095 0.000"
 " 54 POND DESIGN"
 " 0.095 Current peak flow c.m/sec"
 " 0.051 Target outflow c.m/sec"
 " 769.8 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 0.00238 19.000"
 " 334.400 0.00258 40.000"
 " 334.500 0.00278 62.000"
 " 334.600 0.00300 87.000"
 " 334.700 0.00323 113.000"
 " 334.800 0.00345 141.000"
 " 334.900 0.1550 171.000"
 " 335.000 0.4636 203.000"
 " 335.100 0.9068 237.000"
 " Peak outflow 0.093 c.m/sec"
 " Maximum level 334.859 metre"
 " Maximum storage 158.800 c.m"

" Centroidal lag 7.565 hours"
 " 0.067 0.095 0.093 0.000 c.m/sec"
 " 40 HYDROGRAPH Combine 800"
 " 6 Combine "
 " 800 Node #"
 " Torrance Creek"
 " Maximum flow 0.093 c.m/sec"
 " Hydrograph volume 726.320 c.m"
 " 0.067 0.095 0.093 0.093"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.067 0.000 0.093 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"
 " 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 0.093 0.093 c.m/sec"
 " Catchment 2021 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 0.093 0.093"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.101 0.101 0.101 0.093"
 " 40 HYDROGRAPH Combine 800"
 " 6 Combine "
 " 800 Node #"
 " Torrance Creek"
 " Maximum flow 0.159 c.m/sec"
 " Hydrograph volume 1042.139 c.m"
 " 0.101 0.101 0.101 0.159"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.101 0.000 0.101 0.159"

" 33 CATCHMENT 2022"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2022 202-2 - Block 3 Rear Yards to Torrance"
 " 0.000 % Impervious"
 " 0.107 Total Area"
 " 15.000 Flow length"
 " 3.000 Overland Slope"
 " 0.107 Pervious Area"
 " 15.000 Pervious length"
 " 3.000 Pervious slope"
 " 0.000 Impervious Area"
 " 15.000 Impervious length"
 " 3.000 Impervious slope"
 " 0.250 Pervious Manning 'n'"
 " 74.000 Pervious SCS Curve No."
 " 0.416 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"
 " 0.023 0.000 0.101 0.159 c.m/sec"
 " Catchment 2022 Pervious Impervious Total Area "
 " Surface Area 0.107 0.000 0.107 hectare"
 " Time of concentration 7.017 0.920 7.017 minutes"
 " Time to Centroid 101.976 85.207 101.976 minutes"
 " Rainfall depth 87.263 87.263 87.263 mm"
 " Rainfall volume 93.37 0.00 93.37 c.m"
 " Rainfall losses 50.924 8.642 50.924 mm"
 " Runoff depth 36.340 78.621 36.340 mm"
 " Runoff volume 38.88 0.00 38.88 c.m"
 " Runoff coefficient 0.416 0.000 0.416 "
 " Maximum flow 0.023 0.000 0.023 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.023 0.023 0.101 0.159"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.023 0.023 0.023 0.159"
 " 40 HYDROGRAPH Combine 800"
 " 6 Combine "
 " 800 Node #"
 " Torrance Creek"
 " Maximum flow 0.164 c.m/sec"
 " Hydrograph volume 1081.023 c.m"
 " 0.023 0.023 0.023 0.164"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.023 0.000 0.023 0.164"
 " 33 CATCHMENT 2023"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2023 202-3 - Block 2 Grassed Area to Torrance"
 " 0.000 % Impervious"
 " 0.015 Total Area"
 " 205.000 Flow length"
 " 0.500 Overland Slope"
 " 0.015 Pervious Area"
 " 205.000 Pervious length"
 " 0.500 Pervious slope"

" 0.000 Impervious Area"
 " 205.000 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"
 " 0.001 0.000 0.023 0.164 c.m/sec"
 " Catchment 2023 Pervious Impervious Total Area "
 " Surface Area 0.015 0.000 0.015 hectare"
 " Time of concentration 57.678 7.559 57.678 minutes"
 " Time to Centroid 165.163 94.427 165.163 minutes"
 " Rainfall depth 87.263 87.263 87.263 mm"
 " Rainfall volume 13.09 0.00 13.09 c.m"
 " Rainfall losses 50.646 5.918 50.646 mm"
 " Runoff depth 36.618 81.345 36.618 mm"
 " Runoff volume 5.49 0.00 5.49 c.m"
 " Runoff coefficient 0.420 0.000 0.420 "
 " Maximum flow 0.001 0.000 0.001 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.001 0.001 0.023 0.164"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.001 0.001 0.001 0.164"
 " 40 HYDROGRAPH Combine 800"
 " 6 Combine "
 " 800 Node #"
 " Torrance Creek"
 " Maximum flow 0.165 c.m/sec"
 " Hydrograph volume 1086.515 c.m"
 " 0.001 0.001 0.001 0.165"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.001 0.000 0.001 0.165"
 " 33 CATCHMENT 2031"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2031 203-1 - Arkell Meadows Embankments to Trail"
 " 0.000 % Impervious"
 " 0.198 Total Area"
 " 10.000 Flow length"
 " 20.000 Overland Slope"
 " 0.198 Pervious Area"
 " 10.000 Pervious length"
 " 20.000 Pervious slope"
 " 0.000 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."
 " 0.930 Impervious Runoff coefficient"
 " 0.100 Impervious Ia/S coefficient"
 " 0.518 Impervious Initial abstraction"

" 0.518 Impervious Initial abstraction"
 " 0.048 0.000 0.001 0.165 c.m/sec"
 " Catchment 2031 Pervious Impervious Total Area "
 " Surface Area 0.198 0.000 0.198 hectare"
 " Time of concentration 3.114 0.408 3.114 minutes"
 " Time to Centroid 97.051 84.720 97.051 minutes"
 " Rainfall depth 87.263 87.263 87.263 mm"
 " Rainfall volume 172.78 0.00 172.78 c.m"
 " Rainfall losses 51.469 15.544 51.469 mm"
 " Runoff depth 35.794 71.720 35.794 mm"
 " Runoff volume 70.87 0.00 70.87 c.m"
 " Runoff coefficient 0.410 0.000 0.410 "
 " Maximum flow 0.048 0.000 0.048 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.048 0.048 0.001 0.165"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.048 0.048 0.048 0.165"
 " 40 HYDROGRAPH Combine 800"
 " 6 Combine "
 " 800 Node #"
 " Torrance Creek"
 " Maximum flow 0.173 c.m/sec"
 " Hydrograph volume 1157.387 c.m"
 " 0.048 0.048 0.048 0.173"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.048 0.000 0.048 0.173"
 " 33 CATCHMENT 2032"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2032 203-2 - Future Park Trail Block"
 " 30.000 % Impervious"
 " 0.216 Total Area"
 " 180.000 Flow length"
 " 0.500 Overland Slope"
 " 0.151 Pervious Area"
 " 180.000 Pervious length"
 " 0.500 Pervious slope"
 " 0.065 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."
 " 0.930 Impervious Runoff coefficient"
 " 0.100 Impervious Ia/S coefficient"
 " 0.518 Impervious Initial abstraction"
 " 0.038 0.000 0.048 0.173 c.m/sec"
 " Catchment 2032 Pervious Impervious Total Area "
 " Surface Area 0.151 0.065 0.216 hectare"
 " Time of concentration 53.348 6.992 30.763 minutes"
 " Time to Centroid 159.744 93.640 127.538 minutes"
 " Rainfall depth 87.263 87.263 87.263 mm"
 " Rainfall volume 131.94 56.55 188.49 c.m"
 " Rainfall losses 50.656 6.109 37.292 mm"
 " Runoff depth 36.608 81.154 49.971 mm"
 " Runoff volume 55.35 52.59 107.94 c.m"
 " Runoff coefficient 0.420 0.930 0.573 "

" Maximum flow 0.010 0.036 0.038 c.m/sec"

" 40 HYDROGRAPH Add Runoff "

" 4 Add Runoff " 0.038 0.038 0.048 0.173"

" 40 HYDROGRAPH Copy to Outflow"

" 8 Copy to Outflow" 0.038 0.038 0.038 0.173"

" 40 HYDROGRAPH Combine 800"

" 6 Combine "

" 800 Node #"

" Torrance Creek"

" Maximum flow 0.187 c.m/sec"

" Hydrograph volume 1265.326 c.m"

" 0.038 0.038 0.038 0.187"

" 40 HYDROGRAPH Start - New Tributary"

" 2 Start - New Tributary" 0.038 0.000 0.038 0.187"

" 33 CATCHMENT 2033"

" 1 Triangular SCS"

" 1 Equal length"

" 1 SCS method"

" 2033 203-3 - Block 1 Embkament to Trail Block"

" 0.000 % Impervious"

" 0.119 Total Area"

" 10.000 Flow length"

" 33.000 Overland Slope"

" 0.119 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"

" 0.029 0.000 0.038 0.187 c.m/sec"

" Catchment 2033 Pervious Impervious Total Area "

" Surface Area 0.119 0.000 0.119 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 103.84 0.00 103.84 c.m"

" Rainfall losses 51.352 16.110 51.352 mm"

" Runoff depth 35.911 71.153 35.911 mm"

" Runoff volume 42.73 0.00 42.73 c.m"

" Runoff coefficient 0.412 0.000 0.412 "

" Maximum flow 0.029 0.000 0.029 c.m/sec"

" 40 HYDROGRAPH Add Runoff "

" 4 Add Runoff " 0.029 0.029 0.038 0.187"

" 40 HYDROGRAPH Copy to Outflow"

" 8 Copy to Outflow" 0.029 0.029 0.029 0.187"

" 40 HYDROGRAPH Combine 800"

" 6 Combine "

" 800 Node #"

" Torrance Creek"

" Maximum flow 0.192 c.m/sec"

" Hydrograph volume 1308.060 c.m"

" 0.029 0.029 0.029 0.192"

" 40 HYDROGRAPH Start - New Tributary"

" 2 Start - New Tributary" 0.029 0.000 0.029 0.192"

" 33 CATCHMENT 2041"

" 1 Triangular SCS"

" 1 Equal length"

" 1 SCS method"

" 2041 204-1 - Block 1 rear yards + Arkell Blvd to Arkell"

" 0.000 % Impervious"

" 0.092 Total Area"

" 15.000 Flow length"

" 12.000 Overland Slope"

" 0.092 Pervious Area"

" 15.000 Pervious length"

" 12.000 Pervious slope"

" 0.000 Impervious Area"

" 15.000 Impervious length"

" 12.000 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."

" 0.000 Impervious Runoff coefficient"

" 0.100 Impervious Ia/S coefficient"

" 0.518 Impervious Initial abstraction"

" 0.022 0.000 0.029 0.192 c.m/sec"

" Catchment 2041 Pervious Impervious Total Area "

" Surface Area 0.092 0.000 0.092 hectare"

" Time of concentration 4.630 0.607 4.630 minutes"

" Time to Centroid 98.916 85.001 98.916 minutes"

" Rainfall depth 87.263 87.263 87.263 mm"

" Rainfall volume 80.28 0.00 80.28 c.m"

" Rainfall losses 50.879 12.240 50.879 mm"

" Runoff depth 36.384 75.023 36.385 mm"

" Runoff volume 33.47 0.00 33.47 c.m"

" Runoff coefficient 0.417 0.000 0.417 "

" Maximum flow 0.022 0.000 0.022 c.m/sec"

" 40 HYDROGRAPH Add Runoff "

" 4 Add Runoff " 0.022 0.022 0.029 0.192"

" 40 HYDROGRAPH Copy to Outflow"

" 8 Copy to Outflow" 0.022 0.022 0.022 0.192"

" 40 HYDROGRAPH Combine 700"

" 6 Combine "

" 700 Node #"

" Arkell Road"

" Maximum flow 0.022 c.m/sec"

" Hydrograph volume 33.474 c.m"

" 0.022 0.022 0.022 0.022"

" 40 HYDROGRAPH Start - New Tributary"

" 2 Start - New Tributary" 0.022 0.000 0.022 0.022"

" 33 CATCHMENT 2042"

" 1 Triangular SCS"

" 1 Equal length"

" 1 SCS method"

" 2042 204-2 - Street A, Block 2 Rear Yards, Blvd to Arkell"

" 36.000 % Impervious"

" 0.111 Total Area"

"	25.000	Flow length"	"	8.924	Pervious Initial abstraction"					
"	5.000	Overland Slope"	"	0.015	Impervious Manning 'n'"					
"	0.071	Pervious Area"	"	98.000	Impervious SCS Curve No."					
"	25.000	Pervious length"	"	0.924	Impervious Runoff coefficient"					
"	5.000	Pervious slope"	"	0.100	Impervious Ia/S coefficient"					
"	0.040	Impervious Area"	"	0.518	Impervious Initial abstraction"					
"	25.000	Impervious length"	"	0.018	0.000	0.030	0.052 c.m/sec"			
"	5.000	Impervious slope"	"	Catchment 205	Pervious	Impervious	Total Area "			
"	0.250	Pervious Manning 'n'"	"	Surface Area	0.013	0.030	0.043	hectare"		
"	74.000	Pervious SCS Curve No."	"	Time of concentration	10.844	1.421	2.954	minutes"		
"	0.418	Pervious Runoff coefficient"	"	Time to Centroid	106.618	85.803	89.189	minutes"		
"	0.100	Pervious Ia/S coefficient"	"	Rainfall depth	87.263	87.263	87.263	mm"		
"	8.924	Pervious Initial abstraction"	"	Rainfall volume	11.26	26.27	37.52	c.m"		
"	0.015	Impervious Manning 'n'"	"	Rainfall losses	50.713	6.652	19.870	mm"		
"	98.000	Impervious SCS Curve No."	"	Runoff depth	36.551	80.611	67.393	mm"		
"	0.912	Impervious Runoff coefficient"	"	Runoff volume	4.72	24.26	28.98	c.m"		
"	0.100	Impervious Ia/S coefficient"	"	Runoff coefficient	0.419	0.924	0.772	"		
"	0.518	Impervious Initial abstraction"	"	Maximum flow	0.002	0.017	0.018	c.m/sec"		
"	0.030	0.000	0.022	0.022 c.m/sec"	" 40	HYDROGRAPH Add Runoff "	"			
"	Catchment 2042	Pervious	Impervious	Total Area "	"	4 Add Runoff "	"			
"	Surface Area	0.071	0.040	0.111	hectare"	"	0.018	0.030	0.052"	
"	Time of concentration	8.179	1.072	4.265	minutes"	" 40	HYDROGRAPH Copy to Outflow"	"		
"	Time to Centroid	103.355	85.398	93.465	minutes"	"	8 Copy to Outflow"	"		
"	Rainfall depth	87.263	87.263	87.263	mm"	"	0.018	0.018	0.018	0.052"
"	Rainfall volume	61.99	34.87	96.86	c.m"	" 40	HYDROGRAPH Combine	600"	"	
"	Rainfall losses	50.750	7.675	35.243	mm"	"	6 Combine "	"		
"	Runoff depth	36.513	79.588	52.020	mm"	"	600 Node #"	"		
"	Runoff volume	25.94	31.80	57.74	c.m"	"	Ex. SWMF"	"		
"	Runoff coefficient	0.418	0.912	0.596	"	"	Maximum flow	0.018	c.m/sec"	
"	Maximum flow	0.014	0.023	0.030	c.m/sec"	"	Hydrograph volume	28.979	c.m"	
" 40	HYDROGRAPH Add Runoff "	"			"	"	0.018	0.018	0.018"	
"	4 Add Runoff "	"			" 38	START/RE-START TOTALS 205"	"			
"	0.030	0.030	0.022	0.022"	"	3 Runoff Totals on EXIT"	"			
" 40	HYDROGRAPH Copy to Outflow"	"			"	Total Catchment area	3.108	hectare"	"	
"	8 Copy to Outflow"	"			"	Total Impervious area	1.038	hectare"	"	
"	0.030	0.030	0.030	0.022"	"	Total % impervious	33.408"	"	"	
" 40	HYDROGRAPH Combine	700"	"		" 19	EXIT"	"		"	
"	6 Combine "	"			"					
"	700 Node #"	"			"					
"	Arkell Road"	"			"					
"	Maximum flow	0.052	c.m/sec"	"						
"	Hydrograph volume	91.216	c.m"	"						
"	0.030	0.030	0.030	0.052"	" 40	HYDROGRAPH Start - New Tributary"	"			
" 40	HYDROGRAPH Start - New Tributary"	"			"	2 Start - New Tributary"	"			
"	0.030	0.000	0.030	0.052"	"	0.030	0.000	0.030	0.052"	
" 33	CATCHMENT 205"	"			"					
"	1 Triangular SCS"	"			"					
"	1 Equal length"	"			"					
"	1 SCS method"	"			"					
"	205 - Dawes Ave to Ex SWMF"	"			"					
"	70.000 % Impervious"	"			"					
"	0.043 Total Area"	"			"					
"	20.000 Flow length"	"			"					
"	1.250 Overland Slope"	"			"					
"	0.013 Pervious Area"	"			"					
"	20.000 Pervious length"	"			"					
"	1.250 Pervious slope"	"			"					
"	0.030 Impervious Area"	"			"					
"	20.000 Impervious length"	"			"					
"	1.250 Impervious slope"	"			"					
"	0.250 Pervious Manning 'n'"	"			"					
"	74.000 Pervious SCS Curve No."	"			"					
"	0.419 Pervious Runoff coefficient"	"			"					
"	0.100 Pervious Ia/S coefficient"	"			"					


```

" 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\March 2023\MIDUSS\POST"
" Output filename: RegPost2023.in"
" Licensee name: A"
" Company:"
" Date & Time last used: 3/9/2023 at 2:24:28 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"
" 65 Q:\42063\104\SWM\March 2023\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 2011"
" 1 Triangular SCS"
" 1 Equal length"
" 1 SCS method"
" 2011 201-1 - Street A to SWMF"
" 65.000 % Impervious"
" 0.290 Total Area"
" 60.000 Flow length"
" 0.750 Overland Slope"
" 0.102 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 0.102 0.188 0.290 hectare"
" Time of concentration 32.556 5.818 13.532 minutes"
" Time to Centroid 2531.754 2271.612 2346.669 minutes"
" Rainfall depth 285.000 285.000 285.000 mm"
" Rainfall volume 289.28 537.22 826.50 c.m"
" Rainfall losses 76.442 8.071 32.001 mm"
" Runoff depth 208.558 276.929 252.999 mm"
" Runoff volume 211.69 522.01 733.70 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"

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" 40 HYDROGRAPH Combine 900"
" 6 Combine "
" 900 Node #"
" SWMF"
" Maximum flow 0.042 c.m/sec"
" Hydrograph volume 733.698 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 3 Front/Roofs to SWMF"
" 80.000 % Impervious"
" 0.131 Total Area"
" 10.000 Flow length"
" 2.000 Overland Slope"
" 0.026 Pervious Area"
" 10.000 Pervious length"
" 2.000 Pervious slope"
" 0.105 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"
" 0.019 0.000 0.042 0.042 c.m/sec"
" Catchment 2012 Pervious Impervious Total Area "
" Surface Area 0.026 0.105 0.131 hectare"
" Time of concentration 8.278 1.479 2.556 minutes"
" Time to Centroid 2497.307 2266.253 2302.831 minutes"
" Rainfall depth 285.000 285.000 285.000 mm"
" Rainfall volume 74.67 298.68 373.35 c.m"
" Rainfall losses 76.932 8.442 22.140 mm"
" Runoff depth 208.068 276.558 262.860 mm"
" Runoff volume 54.51 289.83 344.35 c.m"
" Runoff coefficient 0.730 0.970 0.922 "
" Maximum flow 0.004 0.015 0.019 c.m/sec"
" 40 HYDROGRAPH Add Runoff "
" 4 Add Runoff "
" 0.019 0.019 0.042 0.042"
" 40 HYDROGRAPH Copy to Outflow"
" 8 Copy to Outflow"
" 0.019 0.019 0.019 0.042"
" 40 HYDROGRAPH Combine 900"
" 6 Combine "
" 900 Node #"
" SWMF"
" Maximum flow 0.061 c.m/sec"
" Hydrograph volume 1078.044 c.m"
" 0.019 0.019 0.019 0.061"
" 40 HYDROGRAPH Start - New Tributary"
" 2 Start - New Tributary"
" 0.019 0.000 0.019 0.061"
" 33 CATCHMENT 2013"
" 1 Triangular SCS"

```

" 1 Equal length"
 " 1 SCS method"
 " 2013 201-3 - Block 1 to SWMF"
 " 62.000 % Impervious"
 " 0.401 Total Area"
 " 80.000 Flow length"
 " 0.500 Overland Slope"
 " 0.152 Pervious Area"
 " 80.000 Pervious length"
 " 0.500 Pervious slope"
 " 0.249 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"
 " 0.057 0.000 0.019 0.061 c.m/sec"
 " Catchment 2013 Pervious Impervious Total Area "
 " Surface Area 0.152 0.249 0.401 hectare"
 " Time of concentration 43.694 7.809 19.096 minutes"
 " Time to Centroid 2547.377 2277.147 2362.142 minutes"
 " Rainfall depth 285.000 285.000 285.000 mm"
 " Rainfall volume 434.28 708.57 1142.85 c.m"
 " Rainfall losses 76.459 6.443 33.049 mm"
 " Runoff depth 208.541 278.557 251.951 mm"
 " Runoff volume 317.78 692.55 1010.32 c.m"
 " Runoff coefficient 0.732 0.977 0.884 "
 " Maximum flow 0.021 0.038 0.057 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.057 0.057 0.019 0.061"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.057 0.057 0.057 0.061"
 " 40 HYDROGRAPH Combine 900"
 " 6 Combine "
 " 900 Node #"
 " SWMF"
 " Maximum flow 0.118 c.m/sec"
 " Hydrograph volume 2088.367 c.m"
 " 0.057 0.057 0.057 0.118"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.057 0.000 0.057 0.118"
 " 33 CATCHMENT 2014"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2014 201-4 - Block 1 Roofs to SWMF"
 " 100.000 % Impervious"
 " 0.129 Total Area"
 " 10.000 Flow length"
 " 2.000 Overland Slope"
 " 0.000 Pervious Area"
 " 10.000 Pervious length"
 " 2.000 Pervious slope"
 " 0.129 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"
 " 0.019 0.000 0.057 0.118 c.m/sec"
 " Catchment 2014 Pervious Impervious Total Area "
 " Surface Area 0.000 0.129 0.129 hectare"
 " Time of concentration 8.278 1.479 1.479 minutes"
 " Time to Centroid 2497.307 2266.252 2266.251 minutes"
 " Rainfall depth 285.000 285.000 285.000 mm"
 " Rainfall volume 0.00 367.65 367.65 c.m"
 " Rainfall losses 76.932 8.442 8.442 mm"
 " Runoff depth 208.068 276.558 276.558 mm"
 " Runoff volume 0.00 356.76 356.76 c.m"
 " Runoff coefficient 0.000 0.970 0.970 "
 " Maximum flow 0.000 0.019 0.019 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.019 0.019 0.057 0.118"
 " 57 TRENCH Design d/s of 2014"
 " 0.019 Peak inflow"
 " 356.759 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 159.216 c.m"
 " Peak exfiltration 0.002 c.m/sec"
 " Exfiltration volume 196.964 c.m"
 " Maximum level 335.502 metre"
 " Maximum storage 38.402 c.m"
 " Centroidal lag 45.185 hours"

```

"      Infiltration area 2 sides 16.000 sq.metre"
"      Infiltration Base area 96.000 sq.metre"
"      0.019 0.019 0.017 0.002 c.m/sec"
" 40 HYDROGRAPH Combine 900"
"      6 Combine "
"      900 Node #"
"      SWMF"
"      Maximum flow 0.135 c.m/sec"
"      Hydrograph volume 2247.580 c.m"
"      0.019 0.019 0.017 0.135"
" 40 HYDROGRAPH Start - New Tributary"
"      2 Start - New Tributary"
"      0.019 0.000 0.017 0.135"
" 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 0.135 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"
"      HYDROGRAPH Add Runoff "
" 40 4 Add Runoff "
"      0.003 0.003 0.017 0.135"
" 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 0.135 c.m/sec"
" 40 HYDROGRAPH Combine 900"
"      6 Combine "

```

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"      900 Node #"
"      SWMF"
"      Maximum flow 0.138 c.m/sec"
"      Hydrograph volume 2300.736 c.m"
"      0.003 0.003 0.003 0.138"
" 40 HYDROGRAPH Start - New Tributary"
"      2 Start - New Tributary"
"      0.003 0.000 0.003 0.138"
" 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"
"      0.049 Total Area"
"      20.000 Flow length"
"      3.000 Overland Slope"
"      0.012 Pervious Area"
"      20.000 Pervious length"
"      3.000 Pervious slope"
"      0.037 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"
"      0.007 0.000 0.003 0.138 c.m/sec"
"      Catchment 2016 Pervious Impervious Total Area "
"      Surface Area 0.012 0.037 0.049 hectare"
"      Time of concentration 11.111 1.986 3.827 minutes"
"      Time to Centroid 2501.014 2266.183 2313.574 minutes"
"      Rainfall depth 285.000 285.000 285.000 mm"
"      Rainfall volume 34.91 104.74 139.65 c.m"
"      Rainfall losses 77.039 10.824 27.378 mm"
"      Runoff depth 207.961 274.176 257.622 mm"
"      Runoff volume 25.48 100.76 126.23 c.m"
"      Runoff coefficient 0.730 0.962 0.904 "
"      Maximum flow 0.002 0.005 0.007 c.m/sec"
"      HYDROGRAPH Add Runoff "
" 40 4 Add Runoff "
"      0.007 0.007 0.003 0.138"
" 56 DIVERSION"
"      2106 Node number"
"      0.012 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"
"      DIV02106.99999hyd"
"      Major flow at 2106"
"      0.007 0.007 0.007 0.138 c.m/sec"
" 40 HYDROGRAPH Combine 900"
"      6 Combine "
"      900 Node #"
"      SWMF"
"      Maximum flow 0.145 c.m/sec"
"      Hydrograph volume 2426.972 c.m"
"      0.007 0.007 0.007 0.145"

```

" 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.007 0.000 0.007 0.145"
 " 33 CATCHMENT 2017"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2017 201-7 - Block 2 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 0.007 0.145 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"
 " HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.011 0.011 0.007 0.145"
 " HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.011 0.011 0.011 0.145"
 " HYDROGRAPH Combine 900"
 " 6 Combine "
 " 900 Node #"
 " SWMF"
 " Maximum flow 0.156 c.m/sec"
 " Hydrograph volume 2625.064 c.m"
 " 0.011 0.011 0.011 0.156"
 " HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.011 0.000 0.011 0.156"
 " 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 0.156 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"
 " HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.005 0.005 0.011 0.156"
 " 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 0.160 c.m/sec"
 " Hydrograph volume 2653.738 c.m"
 " 0.005 0.005 0.004 0.160"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.005 0.000 0.004 0.160"
 " 33 CATCHMENT 2019"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2019 201-9 - SWMF Block"
 " 40.000 % Impervious"
 " 0.217 Total Area"
 " 15.000 Flow length"
 " 10.000 Overland Slope"
 " 0.130 Pervious Area"
 " 15.000 Pervious length"
 " 10.000 Pervious slope"
 " 0.087 Impervious Area"
 " 15.000 Impervious length"
 " 10.000 Impervious slope"
 " 0.250 Pervious Manning 'n'"
 " 74.000 Pervious SCS Curve No."
 " 0.725 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."
 " 0.961 Impervious Runoff coefficient"
 " 0.100 Impervious Ia/S coefficient"
 " 0.518 Impervious Initial abstraction"
 " 0.030 0.000 0.004 0.160 c.m/sec"
 " Catchment 2019 Pervious Impervious Total Area "
 " Surface Area 0.130 0.087 0.217 hectare"
 " Time of concentration 6.515 1.164 4.005 minutes"
 " Time to Centroid 2493.328 2264.890 2386.161 minutes"
 " Rainfall depth 285.000 285.000 285.000 mm"
 " Rainfall volume 371.07 247.38 618.45 c.m"
 " Rainfall losses 78.278 10.982 51.360 mm"
 " Runoff depth 206.722 274.018 233.640 mm"
 " Runoff volume 269.15 237.85 507.00 c.m"
 " Runoff coefficient 0.725 0.961 0.820 "
 " Maximum flow 0.018 0.012 0.030 c.m/sec"
 " HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.030 0.030 0.004 0.160"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.030 0.030 0.030 0.160"
 " 40 HYDROGRAPH Combine 900"
 " 6 Combine "
 " 900 Node #"
 " SWMF"

" Maximum flow 0.189 c.m/sec"
 " Hydrograph volume 3160.737 c.m"
 " 0.030 0.030 0.030 0.189"
 " 40 HYDROGRAPH Confluence 900"
 " 7 Confluence "
 " 900 Node #"
 " SWMF"
 " Maximum flow 0.189 c.m/sec"
 " Hydrograph volume 3160.737 c.m"
 " 0.030 0.189 0.030 0.000"
 " 54 POND DESIGN"
 " 0.189 Current peak flow c.m/sec"
 " 0.051 Target outflow c.m/sec"
 " 3160.7 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 45.000"
 " 334.600 0.00230 94.000"
 " 334.700 0.00290 149.000"
 " 334.800 0.04670 208.000"
 " 334.900 0.06500 273.000"
 " 335.000 0.07920 344.000"
 " 335.100 0.09110 419.000"
 " 335.200 0.1017 498.000"
 " 335.300 0.1112 580.000"
 " 335.400 0.2041 666.000"
 " 335.500 0.4716 756.000"
 " Peak outflow 0.132 c.m/sec"
 " Maximum level 335.323 metre"
 " Maximum storage 599.556 c.m"
 " Centroidal lag 42.446 hours"
 " 0.030 0.189 0.132 0.000 c.m/sec"
 " 40 HYDROGRAPH Next link "
 " 5 Next link "
 " 0.030 0.132 0.132 0.000"
 " 54 POND DESIGN"
 " 0.132 Current peak flow c.m/sec"
 " 0.051 Target outflow c.m/sec"
 " 3160.9 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 0.00238 19.000"
 " 334.400 0.00258 40.000"
 " 334.500 0.00278 62.000"
 " 334.600 0.00300 87.000"
 " 334.700 0.00323 113.000"
 " 334.800 0.00345 141.000"
 " 334.900 0.1550 171.000"
 " 335.000 0.4636 203.000"
 " 335.100 0.9068 237.000"
 " Peak outflow 0.132 c.m/sec"
 " Maximum level 334.885 metre"
 " Maximum storage 166.438 c.m"
 " Centroidal lag 44.406 hours"
 " 0.030 0.132 0.132 0.000 c.m/sec"

" 40 HYDROGRAPH Combine 800"
 " 6 Combine "
 " 800 Node #"
 " Torrance Creek"
 " Maximum flow 0.132 c.m/sec"
 " Hydrograph volume 3160.921 c.m"
 " 0.030 0.132 0.132 0.132"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.030 0.000 0.132 0.132"
 " 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"
 " 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 0.132 0.132 c.m/sec"
 " Catchment 2021 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 0.132 0.132"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.123 0.123 0.123 0.132"
 " 40 HYDROGRAPH Combine 800"
 " 6 Combine "
 " 800 Node #"
 " Torrance Creek"
 " Maximum flow 0.225 c.m/sec"
 " Hydrograph volume 4960.736 c.m"
 " 0.123 0.123 0.123 0.225"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.123 0.000 0.123 0.225"
 " 33 CATCHMENT 2022"
 " 1 Triangular SCS"

" 1 Equal length"
 " 1 SCS method"
 " 2022 202-2 - Block 3 Rear Yards to Torrance"
 " 0.000 % Impervious"
 " 0.107 Total Area"
 " 15.000 Flow length"
 " 3.000 Overland Slope"
 " 0.107 Pervious Area"
 " 15.000 Pervious length"
 " 3.000 Pervious slope"
 " 0.000 Impervious Area"
 " 15.000 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."
 " 0.000 Impervious Runoff coefficient"
 " 0.100 Impervious Ia/S coefficient"
 " 0.518 Impervious Initial abstraction"
 " 0.015 0.000 0.123 0.225 c.m/sec"
 " Catchment 2022 Pervious Impervious Total Area "
 " Surface Area 0.107 0.000 0.107 hectare"
 " Time of concentration 9.349 1.671 9.349 minutes"
 " Time to Centroid 2498.142 2270.257 2498.141 minutes"
 " Rainfall depth 285.000 285.000 285.000 mm"
 " Rainfall volume 304.95 0.00 304.95 c.m"
 " Rainfall losses 77.420 9.312 77.420 mm"
 " Runoff depth 207.580 275.688 207.580 mm"
 " Runoff volume 222.11 0.00 222.11 c.m"
 " Runoff coefficient 0.728 0.000 0.728 "
 " Maximum flow 0.015 0.000 0.015 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.015 0.015 0.123 0.225"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.015 0.015 0.015 0.225"
 " 40 HYDROGRAPH Combine 800"
 " 6 Combine "
 " 800 Node #"
 " Torrance Creek"
 " Maximum flow 0.239 c.m/sec"
 " Hydrograph volume 5182.846 c.m"
 " 0.015 0.015 0.015 0.239"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.015 0.000 0.015 0.239"
 " 33 CATCHMENT 2023"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 2023 202-3 - Block 2 Grassed Area to Torrance"
 " 0.000 % Impervious"
 " 0.015 Total Area"
 " 205.000 Flow length"
 " 0.500 Overland Slope"
 " 0.015 Pervious Area"
 " 205.000 Pervious length"
 " 0.500 Pervious slope"
 " 0.000 Impervious Area"
 " 205.000 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"			
"	0.002	0.000	0.015	0.239	c.m/sec"
"	Catchment 2023	Pervious	Impervious	Total Area	"
"	Surface Area	0.015	0.000	0.015	hectare"
"	Time of concentration	76.845	13.733	76.845	minutes"
"	Time to Centroid	2594.080	2285.675	2594.079	minutes"
"	Rainfall depth	285.000	285.000	285.000	mm"
"	Rainfall volume	42.75	0.00	42.75	c.m"
"	Rainfall losses	76.382	6.214	76.382	mm"
"	Runoff depth	208.618	278.786	208.618	mm"
"	Runoff volume	31.29	0.00	31.29	c.m"
"	Runoff coefficient	0.732	0.000	0.732	"
"	Maximum flow	0.002	0.000	0.002	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.002	0.002	0.015	0.239"	
" 40	HYDROGRAPH Copy to Outflow"				
"	8 Copy to Outflow"				
"	0.002	0.002	0.002	0.239"	
" 40	HYDROGRAPH Combine 800"				
"	6 Combine "				
"	800 Node #"				
"	Torrance Creek"				
"	Maximum flow		0.240	c.m/sec"	
"	Hydrograph volume		5214.137	c.m"	
"	0.002	0.002	0.002	0.240"	
" 40	HYDROGRAPH Start - New Tributary"				
"	2 Start - New Tributary"				
"	0.002	0.000	0.002	0.240"	
" 33	CATCHMENT 2031"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	1 SCS method"				
"	2031 203-1 - Arkell Meadows Embankments to Trail"				
"	0.000 % Impervious"				
"	0.198 Total Area"				
"	10.000 Flow length"				
"	20.000 Overland Slope"				
"	0.198 Pervious Area"				
"	10.000 Pervious length"				
"	20.000 Pervious slope"				
"	0.000 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."				
"	0.977 Impervious Runoff coefficient"				
"	0.100 Impervious Ia/S coefficient"				
"	0.518 Impervious Initial abstraction"				
"	0.026	0.000	0.026	0.266	c.m/sec"
"	Catchment 2032	Pervious	Impervious	Total Area	"
"	Surface Area	0.151	0.065	0.216	hectare"
"	Time of concentration	71.077	12.702	49.832	minutes"
"	Time to Centroid	2585.967	2283.880	2476.025	minutes"
"	Rainfall depth	285.000	285.000	285.000	mm"
"	Rainfall volume	430.92	184.68	615.60	c.m"
"	Rainfall losses	76.385	6.476	55.412	mm"
"	Runoff depth	208.615	278.524	229.588	mm"
"	Runoff volume	315.43	180.48	495.91	c.m"
"	Runoff coefficient	0.732	0.977	0.806	"
"	Maximum flow	0.019	0.010	0.026	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				

"	Catchment 2031	Pervious	Impervious	Total Area	"
"	Surface Area	0.198	0.000	0.198	hectare"
"	Time of concentration	4.149	0.741	4.149	minutes"
"	Time to Centroid	2490.063	2248.701	2490.063	minutes"
"	Rainfall depth	285.000	285.000	285.000	mm"
"	Rainfall volume	564.30	0.00	564.30	c.m"
"	Rainfall losses	78.779	21.227	78.779	mm"
"	Runoff depth	206.221	263.773	206.221	mm"
"	Runoff volume	408.32	0.00	408.32	c.m"
"	Runoff coefficient	0.724	0.000	0.724	"
"	Maximum flow	0.026	0.000	0.026	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				
"	4 Add Runoff "				
"	0.026	0.026	0.002	0.240"	
" 40	HYDROGRAPH Copy to Outflow"				
"	8 Copy to Outflow"				
"	0.026	0.026	0.026	0.240"	
" 40	HYDROGRAPH Combine 800"				
"	6 Combine "				
"	800 Node #"				
"	Torrance Creek"				
"	Maximum flow		0.266	c.m/sec"	
"	Hydrograph volume		5622.454	c.m"	
"	0.026	0.026	0.026	0.266"	
" 40	HYDROGRAPH Start - New Tributary"				
"	2 Start - New Tributary"				
"	0.026	0.000	0.026	0.266"	
" 33	CATCHMENT 2032"				
"	1 Triangular SCS"				
"	1 Equal length"				
"	1 SCS method"				
"	2032 203-2 - Future Park Trail Block"				
"	30.000 % Impervious"				
"	0.216 Total Area"				
"	180.000 Flow length"				
"	0.500 Overland Slope"				
"	0.151 Pervious Area"				
"	180.000 Pervious length"				
"	0.500 Pervious slope"				
"	0.065 Impervious Area"				
"	180.000 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"				
"	0.026	0.000	0.026	0.266	c.m/sec"
"	Catchment 2032	Pervious	Impervious	Total Area	"
"	Surface Area	0.151	0.065	0.216	hectare"
"	Time of concentration	71.077	12.702	49.832	minutes"
"	Time to Centroid	2585.967	2283.880	2476.025	minutes"
"	Rainfall depth	285.000	285.000	285.000	mm"
"	Rainfall volume	430.92	184.68	615.60	c.m"
"	Rainfall losses	76.385	6.476	55.412	mm"
"	Runoff depth	208.615	278.524	229.588	mm"
"	Runoff volume	315.43	180.48	495.91	c.m"
"	Runoff coefficient	0.732	0.977	0.806	"
"	Maximum flow	0.019	0.010	0.026	c.m/sec"
" 40	HYDROGRAPH Add Runoff "				

" 4 Add Runoff " 0.026 0.026 0.266"

" 40 HYDROGRAPH Copy to Outflow"

" 8 Copy to Outflow" 0.026 0.026 0.266"

" 40 HYDROGRAPH Combine 800"

" 6 Combine "

" 800 Node #"

" Torrance Creek"

" Maximum flow 0.291 c.m/sec"

" Hydrograph volume 6118.366 c.m"

" 0.026 0.026 0.026 0.291"

" 40 HYDROGRAPH Start - New Tributary"

" 2 Start - New Tributary" 0.026 0.000 0.026 0.291"

" 33 CATCHMENT 2033"

" 1 Triangular SCS"

" 1 Equal length"

" 1 SCS method"

" 2033 203-3 - Block 1 Embnkament to Trail Block"

" 0.000 % Impervious"

" 0.119 Total Area"

" 10.000 Flow length"

" 33.000 Overland Slope"

" 0.119 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"

" 0.016 0.000 0.026 0.291 c.m/sec"

" Catchment 2033 Pervious Impervious Total Area "

" Surface Area 0.119 0.000 0.119 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 339.15 0.00 339.15 c.m"

" Rainfall losses 81.898 25.077 81.898 mm"

" Runoff depth 203.102 259.923 203.102 mm"

" Runoff volume 241.69 0.00 241.69 c.m"

" Runoff coefficient 0.713 0.000 0.713 "

" Maximum flow 0.016 0.000 0.016 c.m/sec"

" 40 HYDROGRAPH Add Runoff "

" 4 Add Runoff " 0.016 0.016 0.026 0.291"

" 40 HYDROGRAPH Copy to Outflow"

" 8 Copy to Outflow" 0.016 0.016 0.016 0.291"

" 40 HYDROGRAPH Combine 800"

" 6 Combine "

" 800 Node #"

" Torrance Creek"

" Maximum flow 0.306 c.m/sec"

" Hydrograph volume 6360.059 c.m"

" 0.016 0.016 0.016 0.306"

" 40 HYDROGRAPH Start - New Tributary"

" 2 Start - New Tributary" 0.016 0.000 0.016 0.306"

" 33 CATCHMENT 2041"

" 1 Triangular SCS"

" 1 Equal length"

" 1 SCS method"

" 2041 204-1 - Block 1 rear yards + Arkell Blvd to Arkell"

" 0.000 % Impervious"

" 0.092 Total Area"

" 15.000 Flow length"

" 12.000 Overland Slope"

" 0.092 Pervious Area"

" 15.000 Pervious length"

" 12.000 Pervious slope"

" 0.000 Impervious Area"

" 15.000 Impervious length"

" 12.000 Impervious slope"

" 0.250 Pervious Manning 'n'"

" 74.000 Pervious SCS Curve No."

" 0.726 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"

" 0.013 0.000 0.016 0.306 c.m/sec"

" Catchment 2041 Pervious Impervious Total Area "

" Surface Area 0.092 0.000 0.092 hectare"

" Time of concentration 6.168 1.102 6.168 minutes"

" Time to Centroid 2492.799 2266.174 2492.798 minutes"

" Rainfall depth 285.000 285.000 285.000 mm"

" Rainfall volume 262.20 0.00 262.20 c.m"

" Rainfall losses 78.212 12.508 78.212 mm"

" Runoff depth 206.788 272.492 206.788 mm"

" Runoff volume 190.25 0.00 190.25 c.m"

" Runoff coefficient 0.726 0.000 0.726 "

" Maximum flow 0.013 0.000 0.013 c.m/sec"

" 40 HYDROGRAPH Add Runoff "

" 4 Add Runoff " 0.013 0.013 0.016 0.306"

" 40 HYDROGRAPH Copy to Outflow"

" 8 Copy to Outflow" 0.013 0.013 0.013 0.306"

" 40 HYDROGRAPH Combine 700"

" 6 Combine "

" 700 Node #"

" Arkell Road"

" Maximum flow 0.013 c.m/sec"

" Hydrograph volume 190.245 c.m"

" 0.013 0.013 0.013 0.013"

" 40 HYDROGRAPH Start - New Tributary"

" 2 Start - New Tributary" 0.013 0.000 0.013 0.013"

" 33 CATCHMENT 2042"

" 1 Triangular SCS"

" 1 Equal length"

" 1 SCS method"

" 2042 204-2 - Street A, Block 2 Rear Yards, 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 0.013 0.013 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 0.013 0.013"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.016 0.016 0.016 0.013"
 " 40 HYDROGRAPH Combine 700"
 " 6 Combine "
 " 700 Node #"
 " Arkell Road"
 " Maximum flow 0.028 c.m/sec"
 " Hydrograph volume 447.638 c.m"
 " 0.016 0.016 0.016 0.028"
 " 40 HYDROGRAPH Start - New Tributary"
 " 2 Start - New Tributary"
 " 0.016 0.000 0.016 0.028"
 " 33 CATCHMENT 205"
 " 1 Triangular SCS"
 " 1 Equal length"
 " 1 SCS method"
 " 205 205 - Dawes Ave to Ex SWMF"
 " 70.000 % Impervious"
 " 0.043 Total Area"
 " 20.000 Flow length"
 " 1.250 Overland Slope"
 " 0.013 Pervious Area"
 " 20.000 Pervious length"
 " 1.250 Pervious slope"
 " 0.030 Impervious Area"
 " 20.000 Impervious length"
 " 1.250 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"
 " 0.006 0.000 0.016 0.028 c.m/sec"
 " Catchment 205 Pervious Impervious Total Area "
 " Surface Area 0.013 0.030 0.043 hectare"
 " Time of concentration 14.448 2.582 5.495 minutes"
 " Time to Centroid 2505.974 2268.322 2326.665 minutes"
 " Rainfall depth 285.000 285.000 285.000 mm"
 " Rainfall volume 36.76 85.79 122.55 c.m"
 " Rainfall losses 76.699 10.643 30.460 mm"
 " Runoff depth 208.301 274.357 254.540 mm"
 " Runoff volume 26.87 82.58 109.45 c.m"
 " Runoff coefficient 0.731 0.963 0.893 "
 " Maximum flow 0.002 0.005 0.006 c.m/sec"
 " 40 HYDROGRAPH Add Runoff "
 " 4 Add Runoff "
 " 0.006 0.006 0.016 0.028"
 " 40 HYDROGRAPH Copy to Outflow"
 " 8 Copy to Outflow"
 " 0.006 0.006 0.006 0.028"
 " 40 HYDROGRAPH Combine 600"
 " 6 Combine "
 " 600 Node #"
 " Ex. SWMF"
 " Maximum flow 0.006 c.m/sec"
 " Hydrograph volume 109.452 c.m"
 " 0.006 0.006 0.006 0.006"
 " 38 START/RE-START TOTALS 205"
 " 3 Runoff Totals on EXIT"
 " Total Catchment area 3.108 hectare"
 " Total Impervious area 1.038 hectare"
 " Total % impervious 33.408"
 " 19 EXIT"

Appendix D

Proposed SWM Facility Design Calculations



**Arkell Road
STORMWATER MANAGEMENT
Guelph, Ontario**

Project Number: 42063-104
 Date: March 3, 2023
 Design By: AJC
 File: Q:\42063\104\SWMM\March 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)

1.344

Imperviousness (%)

67.2

Interpolated Storage Volume Requirement (m³/ha)

218.47

Permanent Pool Required (m³)

239.86

Extended Detention Volume Required (m³)

53.76

Infiltration Cell

Interpolated Storage Volume Requirement (m³/ha) 33.1
 Infiltration volume required 44.4

Infiltration rate (mm/h) 43.3
 porosity 0.4
 retention time (h) 24
 infiltration bottom area (m²) 107

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

		35	55	70	85
Enhanced	Infiltration	25	30	35	40



**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	0.63
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)	335.30
Length (m)	1.000
Side Slope (H:V)	10
Side Slope (rad)	1.471

STAGE-DISCHARGE RELATIONSHIP (WET CELL)

Stage	Active Volume	Orifice 1			Orifice 2			Orifice 3			Weir 1 Flow	Total Flow	Average Discharge	Increment Volume	Increment Dewatering Time	Cumulative Dewatering Time	Cumulative Dewatering Time	Extended Detention	Erosion Control
		Area	H_o	Flow	Area	H_o	Flow	Area	H_o	Flow								hours	hours
m	m^3	m^2	m	m^3/s	m^2	m	m^3/s	m^2	m	m^3/s	m^3/s	m^3/s	m^3/s	m^3	hours	hours	hours		
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	0.0008	45	16.53	31.81	31.81		
334.50	45	0.00	0.08	0.0015	0.05	0.00	0.0000	0.00	0.00	0.0000	0.0000	0.0015	0.0019	49	7.24	15.28	15.28		
334.60	94	0.00	0.18	0.0023	0.05	0.00	0.0000	0.00	0.00	0.0000	0.0000	0.0023	0.0026	54	5.86	8.03	8.03		
334.70	149	0.00	0.28	0.0029	0.05	0.00	0.0000	0.00	0.00	0.0000	0.0000	0.0029	0.0248	60	0.67	2.18	2.18		
334.80	208	0.00	0.38	0.0034	0.05	0.10	0.0433	0.00	0.00	0.0000	0.0000	0.0467	0.0559	65	0.32	1.51	1.51		
334.90	273	0.00	0.48	0.0038	0.05	0.20	0.0613	0.00	0.00	0.0000	0.0000	0.0650	0.0721	71	0.27	1.19	1.19		
335.00	344	0.00	0.58	0.0042	0.05	0.30	0.0750	0.00	0.00	0.0000	0.0000	0.0792	0.0852	75	0.25	0.91	0.91		
335.10	419	0.00	0.68	0.0045	0.05	0.40	0.0866	0.00	0.00	0.0000	0.0000	0.0911	0.0964	79	0.23	0.67	0.67		
335.20	498	0.00	0.78	0.0048	0.05	0.50	0.0969	0.00	0.00	0.0000	0.0000	0.1017	0.1065	82	0.21	0.44	0.44		
335.30	580	0.00	0.88	0.0051	0.05	0.60	0.1061	0.00	0.00	0.0000	0.0000	0.1112	0.1576	86	0.15	0.23	0.23		
335.40	666	0.00	0.98	0.0054	0.05	0.70	0.1146	0.00	0.00	0.0000	0.0840	0.2041	0.3378	90	0.07	0.07	0.07		
335.50	756	0.00	1.08	0.0057	0.05	0.80	0.1225	0.00	0.00	0.0000	0.3434	0.4716							



Arkell Road
STORMWATER MANAGEMENT
 Guelph, Ontario

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STAGE-STORAGE RELATIONSHIP (WET CELL)

Stage	Active Depth	Wet Cell			Total Pond Volume	Active Storage Volume	Volume Summary	Ponding Elevation	Comments	Stage
		Area	Volume	Cumulative Volume						
<i>m</i>	<i>m</i>	<i>m²</i>	<i>m³</i>	<i>m³</i>	<i>m³</i>	<i>m³</i>	<i>m³</i>	<i>m</i>		<i>m</i>
333.20		69	0	0	0				Bottom of Cell	333.20
333.30		86	8	8	8					333.30
333.40		103	9	17	17					333.40
333.50		121	11	28	28					333.50
333.60		139	13	41	41					333.60
333.70		159	15	56	56					333.70
333.80		179	17	73	73					333.80
333.90		214	20	93	93					333.90
334.00		251	23	116	116					334.00
334.10		290	27	143	143					334.10
334.20		332	31	174	174					334.20
334.30		376	35	210	210					334.30
334.40	0.00	423	40	250	250	0			Permanent Pool	334.40
334.50	0.10	470	45	294	294	45	54	334.52	MOE Extended Detention	334.50
334.60	0.20	519	49	344	344	94	131	334.67	25mm4hr	334.60
334.70	0.30	570	54	398	398	149	166	334.73	2yr	334.70
334.80	0.40	623	60	458	458	208	209	334.80	5yr	334.80
334.90	0.50	678	65	523	523	273	259	334.88	10yr	334.90
335.00	0.60	736	71	594	594	344	329	334.98	25yr	335.00
335.10	0.70	770	75	669	669	419	390	335.06	50yr	335.10
335.20	0.80	805	79	748	748	498	452	335.14	100yr	335.20
335.30	0.90	841	82	830	830	580	600	335.32	Regional	335.30
335.40	1.00	879	86	916	916	666				335.40
335.50	1.10	920	90	1006	1006	756			Top of Berm	335.50

Arkell Road
STORMWATER MANAGEMENT
 Guelph, Ontario



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INFILTRATION CELL
STAGE-STORAGE RELATIONSHIP

Stage	Area	Depth	Inc. volume	Total Volume	Infiltration*	Weir Flow	Total Flow
<i>m</i>	<i>m²</i>	<i>m</i>	<i>m³</i>	<i>m³</i>	<i>m³/s</i>	<i>m³/s</i>	<i>m³/s</i>
334.2	184	0	0	0	0.00000	0.0000	0.00000
334.3	199	0.1	19	19	0.00238	0.0000	0.00238
334.4	216	0.2	21	40	0.00258	0.0000	0.00258
334.5	233	0.3	22	62	0.00278	0.0000	0.00278
334.6	251	0.4	24	87	0.00300	0.0000	0.00300
334.7	270	0.5	26	113	0.00323	0.0000	0.00323
334.8	289	0.6	28	141	0.00345	0.0000	0.00345
334.9	310	0.7	30	171	0.00370	0.1513	0.15498
335.0	333	0.8	32	203	0.00398	0.4596	0.46355
335.1	356	0.9	34	237	0.00425	0.9025	0.90676

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 Department Of Transportation Technical Monitor

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)	334.80
Length (m)	3.000
Side Slope (H:V)	3
Side Slope (rad)	1.249



**Arkell Road
STORMWATER MANAGEMENT
Guelph, Ontario**

Project Number: 42063-104
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File: Q:\42063\104\SWM\March 2023\42063-104 Master SWM Facility Design Sheet.xlsx

FOREBAY DESIGN CALCULATIONS
MOE SWM Planning and Design Manual, 2003

Forebay Design Flows

Flow into forebay during the 1:5-year return period event 0.202 m³/s
Flow into forebay during the 25 mm - 4 hour design storm event 0.090 m³/s
Peak flow from main pond outlet for the 25mm design storm (from MIDUSS) 0.003 m³/s

Forebay Characteristics

b = 2.5 m bottom width
y = 1.2 m depth
z = 5 :1 side slope
w = 8.5 m average width
R = 0.69 m hydraulic radius
A = 10.2 m² 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 (m³/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 = 0.09 m³/s peak flow rate through forebay
v_s = 0.0055 m/s settling velocity
r = 0.22 length-to-width ratio
L = 1.9 m required settling length
L = 1.9 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

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

Q_p = 0.003 m³/s peak flow rate through forebay
v_s = 0.0003 m/s settling velocity
r = 0.13 length-to-width ratio
L = 1.1 m required settling length
L = 1.1 m trial length

2. Length Calculation Based on Flow Dispersion Length

Q = 0.20 m³/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 = 2.7 m required length of dispersion

Equation 4.6: Dispersion Length

3. Required Forebay Length

L (Required) = 2.7 m **Required design length**
L (Provided) = 21.0 m **Provided design length**
r = 2.47 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
α = 1.65 coefficient
H = 0.5 m head
Q = 0.58 m³/s **discharge**

Equation 4.4: Weir Flow

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

6. Estimated Cleanout Frequencies

a) Forebay

Forebay volume 250 m³
Estimated TSS removal efficiency 50%
Impervious level 67%
Estimated annual sediment loading 2.6 m³/ha
Contributing area 1.34 ha
Annual sediment volume 2 m³/yr
Cleanout frequency for 33% volume reduction 46.6 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



**Arkell Road
STORMWATER MANAGEMENT
Guelph, Ontario**

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**FALLING HEAD DRAWDOWN CALCULATION (25mm4hr)
 MOE SWM Planning and Design Manual, 2003**

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

where

t =	89601.6 s	
	24.9 hr	drawdown time
A _p =	556 m ²	surface area of the pond
C =	0.63	discharge coefficient
d =	50 mm	diameter of the orifice
A _o =	0.00196 m ²	cross-sectional area of the orifice
g =	9.81 m/s ²	gravitational acceleration constant
h ₁ =	334.67 m	starting water elevation above the orifice
h ₂ =	334.40 m	ending water elevation above the orifice
h =	0.27 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	423	Permanent pool
2	334.500	0.1	470	
3	334.600	0.2	519	
4	334.700	0.3	570	
5	334.800	0.4	623	

DRAWDOWN TIME: 89602 s
24.9 hr

Regression Output:

m ₁ =	500.00	slope coefficient from the area-depth linear regression
b =	421.00	intercept from the area-depth linear regression
se ₁ =	6.83	standard error for coefficient m ₁
se _b =	1.67	standard error for constant b
R ² =	0.9994	coefficient of determination
se _y =	2.16	standard error of the y estimate
F =	5357.14	F statistic
df =	3	degrees of freedom
SS _{reg} =	25000	regression sum of squares
SS _{resid} =	14	residual sum of squares



**Arkell Road
STORMWATER MANAGEMENT
Guelph, Ontario**

Project Number: 42063-104
 Date: March 3, 2023
 Design By: AJC
 File: Q:\42063\104\SWM\March 2023\42063-104 Master SWM Facility Design Sheet.xlsx

**FALLING HEAD DRAWDOWN CALCULATION (MOE EXT DET)
 MOE SWM Planning and Design Manual, 2003**

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

where

t =	56558.7 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 =	0.00196 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 <i>m</i>	STAGE <i>m</i>	AREA <i>m</i> ²	COMMENTS
1	334.400	0	423	Permanent pool
2	334.500	0.1	470	
3	334.600	0.2	519	
4	334.700	0.3	570	
5	334.800	0.4	623	

DRAWDOWN TIME: 56559 s
15.7 hr

Regression Output:

m ₁ =	500.00	slope coefficient from the area-depth linear regression
b =	421.00	intercept from the area-depth linear regression
se ₁ =	6.83	standard error for coefficient m ₁
se _b =	1.67	standard error for constant b
R ² =	0.9994	coefficient of determination
se _y =	2.16	standard error of the y estimate
F =	5357.14	F statistic
df =	3	degrees of freedom
SS _{reg} =	25000	regression sum of squares
SS _{resid} =	14	residual sum of squares

Arkell Road Subdivision
STORMWATER MANAGEMENT
 Guelph, Ontario



Project Number: 42063-104
 Date: March 13, 2023
 Design By: AJC
 File: Q:\42063\104\SWMM\March 2023\42063-104 Roof Infiltration Galleries.xlsx

ROOF INFILTRATION GALLERIES

	25mm
Rainfall Depth (mm)*	25

	Block 2 (TP102)	Block 1 (TP103/104)
Soil 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
	<i>(m²)</i>	<i>(m³)</i>	<i>(m²)</i>
Block 1	1290	32	78
Block 2	320	8	3

Approximate Potential Dimensions

	Depth	Width	Length	Volume of Stone	Volume of Water Stored
	<i>(m)</i>	<i>(m)</i>	<i>(m)</i>	<i>(m³)</i>	<i>(m³)</i>
Block 1	1.0	8.0	12.0	96	38
Block 2	1.0	5.0	4.0	20	8

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

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:	

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):	

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

Stormceptor® EF Sizing Report

THIRD-PARTY TESTING AND VERIFICATION

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

PERFORMANCE

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

PARTICLE SIZE DISTRIBUTION (PSD)

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

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

Stormceptor®EF Sizing Report

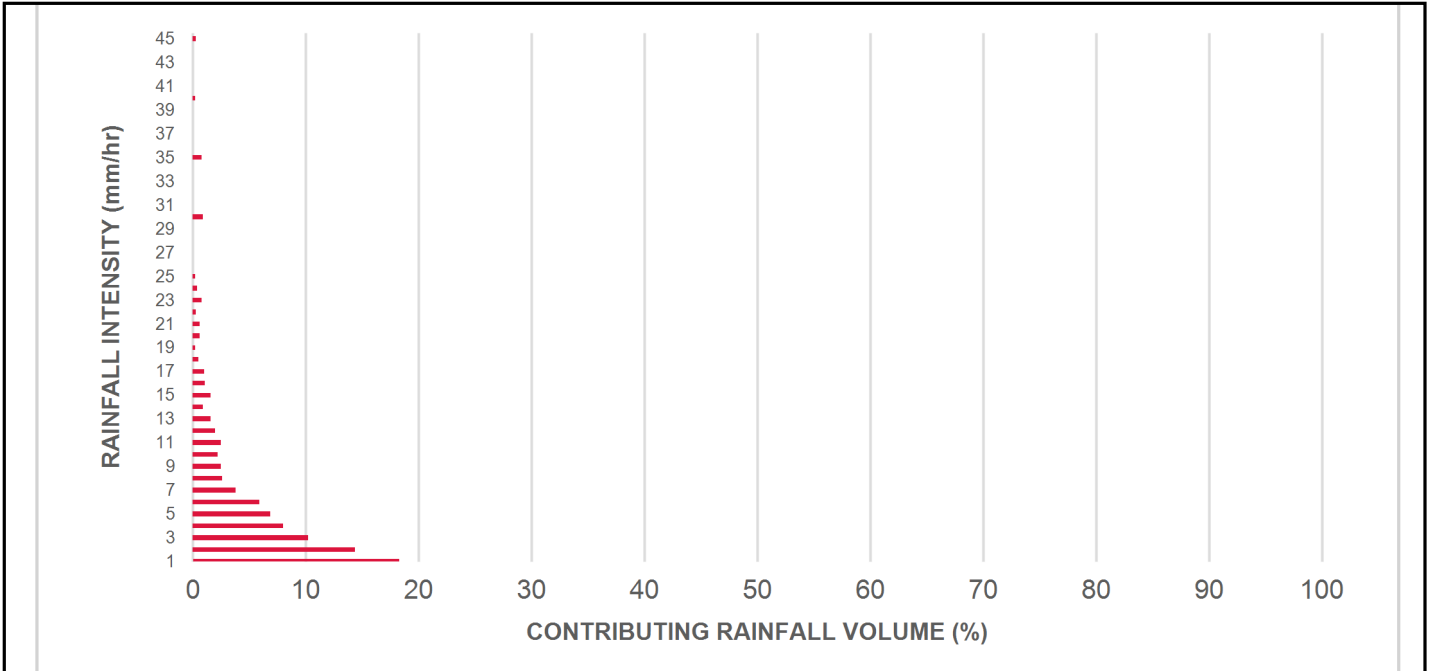
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m ²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.5	8.5	8.5	0.08	5.0	4.0	70	6.0	6.0
1	18.3	26.8	0.16	9.0	8.0	70	12.9	18.9
2	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

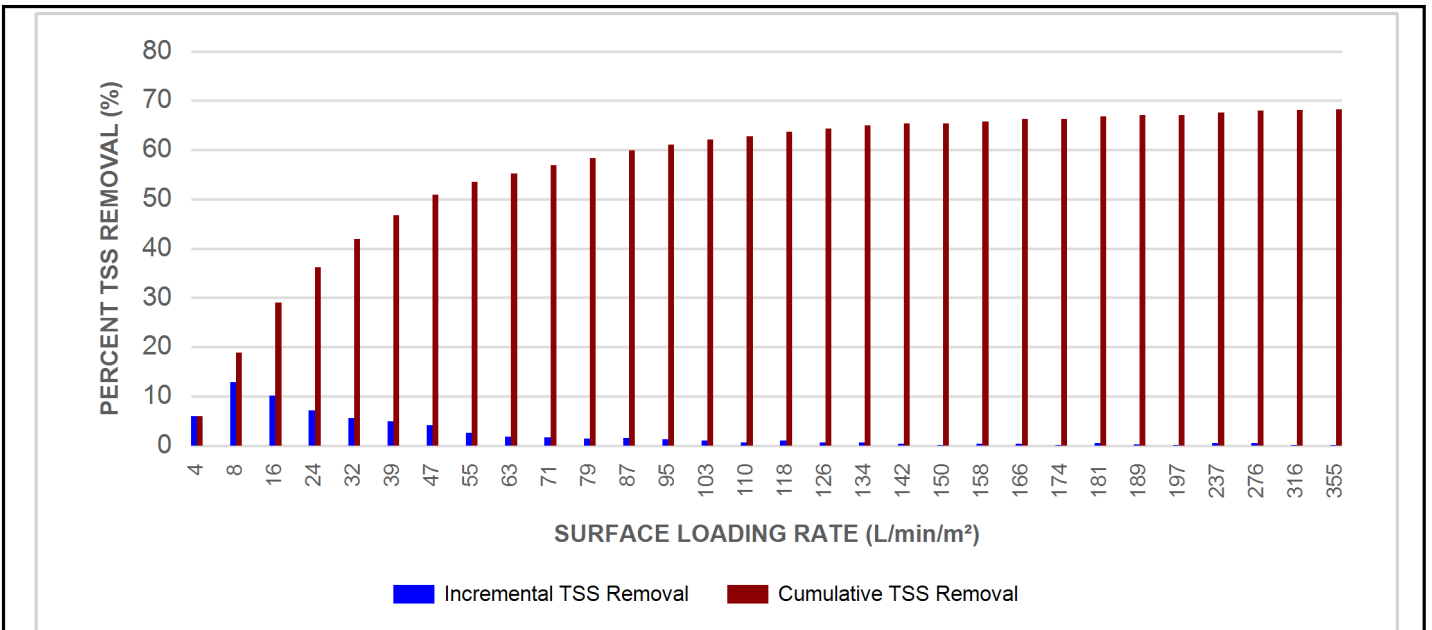


Stormceptor® EF Sizing Report

RAINFALL DATA FROM WATERLOO WELLINGTON AP RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Stormceptor® EF Sizing Report

Maximum Pipe Diameter / Peak Conveyance

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

SCOUR PREVENTION AND ONLINE CONFIGURATION

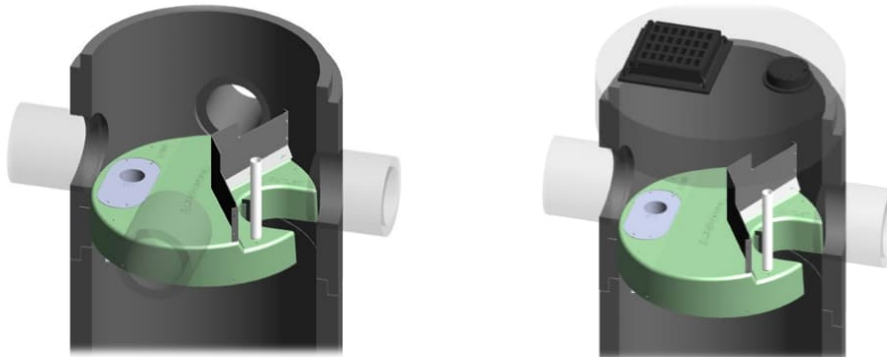
► Stormceptor® EF and EFO feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance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

DESIGN FLEXIBILITY

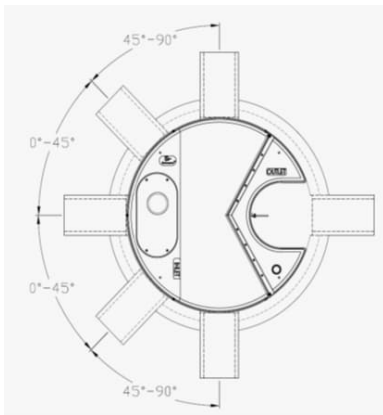
► Stormceptor® EF and EFO offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle,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

OIL CAPTURE AND RETENTION

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



Stormceptor® EF Sizing Report



INLET-TO-OUTLET DROP

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

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

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

HEAD LOSS

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

For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft³)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

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

** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft³)

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

STANDARD STORMCEPTOR EF/EFO DRAWINGS

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

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

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

Stormceptor®EF Sizing Report

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

SLR (L/min/m ²)	TSS % REMOVAL	SLR (L/min/m ²)	TSS % REMOVAL	SLR (L/min/m ²)	TSS % REMOVAL	SLR (L/min/m ²)	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		



Stormceptor® **EF** Sizing Report

**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



Stormceptor®EF Sizing Report

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

3.2 SIZING METHODOLOGY

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

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

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

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

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

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

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

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

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

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

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

Stormceptor®EF Sizing Report

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

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m² to 2600 L/min/m²) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators**. However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

Stormceptor®EF 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

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:	

Site Name:	SWMF OGS
------------	----------

Drainage Area (ha):	1.344
% Imperviousness:	67.20

Runoff Coefficient 'c': 0.70

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

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	35.81
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Site Sediment Transport Rate (kg/ha/yr):	

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: EFO6
Estimated Net Annual Sediment (TSS) Load Reduction (%): 55
Water Quality Runoff Volume Capture (%): > 90



Stormceptor® **EF** Sizing Report

THIRD-PARTY TESTING AND VERIFICATION

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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

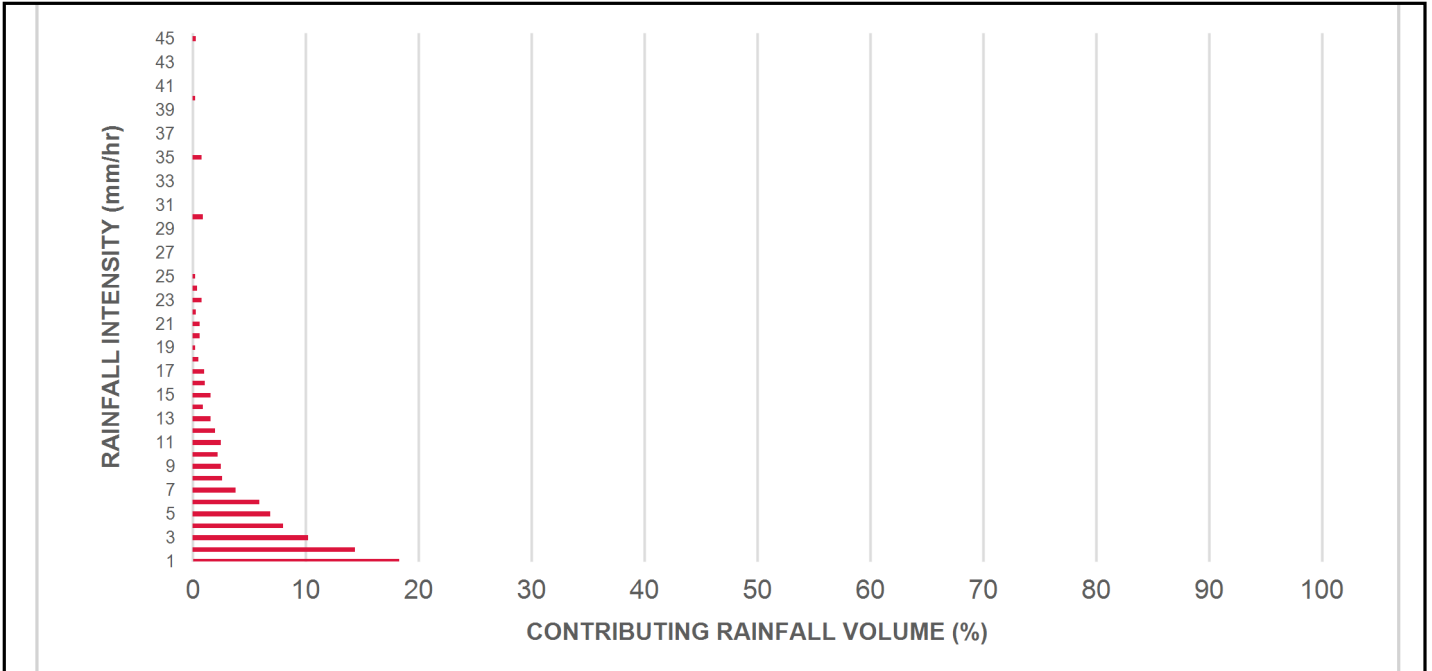
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m ²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.5	8.5	8.5	1.31	79.0	30.0	70	6.0	6.0
1	18.3	26.8	2.63	158.0	60.0	67	12.3	18.3
2	14.4	41.3	5.25	315.0	120.0	61	8.8	27.1
3	10.2	51.5	7.88	473.0	180.0	56	5.7	32.7
4	8.0	59.5	10.51	631.0	240.0	53	4.2	37.0
5	6.9	66.4	13.14	788.0	300.0	51	3.5	40.5
6	5.9	72.3	15.76	946.0	360.0	49	2.9	43.4
7	3.8	76.1	18.39	1103.0	420.0	47	1.8	45.2
8	2.6	78.7	21.02	1261.0	480.0	46	1.2	46.4
9	2.5	81.1	23.65	1419.0	539.0	44	1.1	47.5
10	2.2	83.3	26.27	1576.0	599.0	42	0.9	48.4
11	2.5	85.8	28.90	1734.0	659.0	42	1.0	49.4
12	2.0	87.8	31.53	1892.0	719.0	41	0.8	50.2
13	1.6	89.4	34.16	2049.0	779.0	41	0.7	50.9
14	0.9	90.4	36.78	2207.0	839.0	41	0.4	51.3
15	1.6	91.9	39.41	2365.0	899.0	41	0.6	51.9
16	1.1	93.0	42.04	2522.0	959.0	40	0.4	52.3
17	1.0	94.0	44.67	2680.0	1019.0	40	0.4	52.8
18	0.5	94.6	47.29	2838.0	1079.0	39	0.2	53.0
19	0.2	94.8	49.92	2995.0	1139.0	38	0.1	53.1
20	0.6	95.4	52.55	3153.0	1199.0	37	0.2	53.3
21	0.6	96.1	55.17	3310.0	1259.0	36	0.2	53.5
22	0.3	96.4	57.80	3468.0	1319.0	35	0.1	53.6
23	0.8	97.2	60.43	3626.0	1379.0	34	0.3	53.9
24	0.4	97.6	63.06	3783.0	1439.0	33	0.1	54.1
25	0.2	97.8	65.68	3941.0	1499.0	32	0.0	54.1
30	0.9	98.7	78.82	4729.0	1798.0	27	0.2	54.3
35	0.8	99.5	91.96	5517.0	2098.0	23	0.2	54.5
40	0.2	99.7	105.10	6306.0	2398.0	20	0.0	54.6
45	0.3	100.0	118.23	7094.0	2697.0	18	0.0	54.6
Estimated Net Annual Sediment (TSS) Load Reduction =								55 %

Climate Station ID: 6149387 Years of Rainfall Data: 34

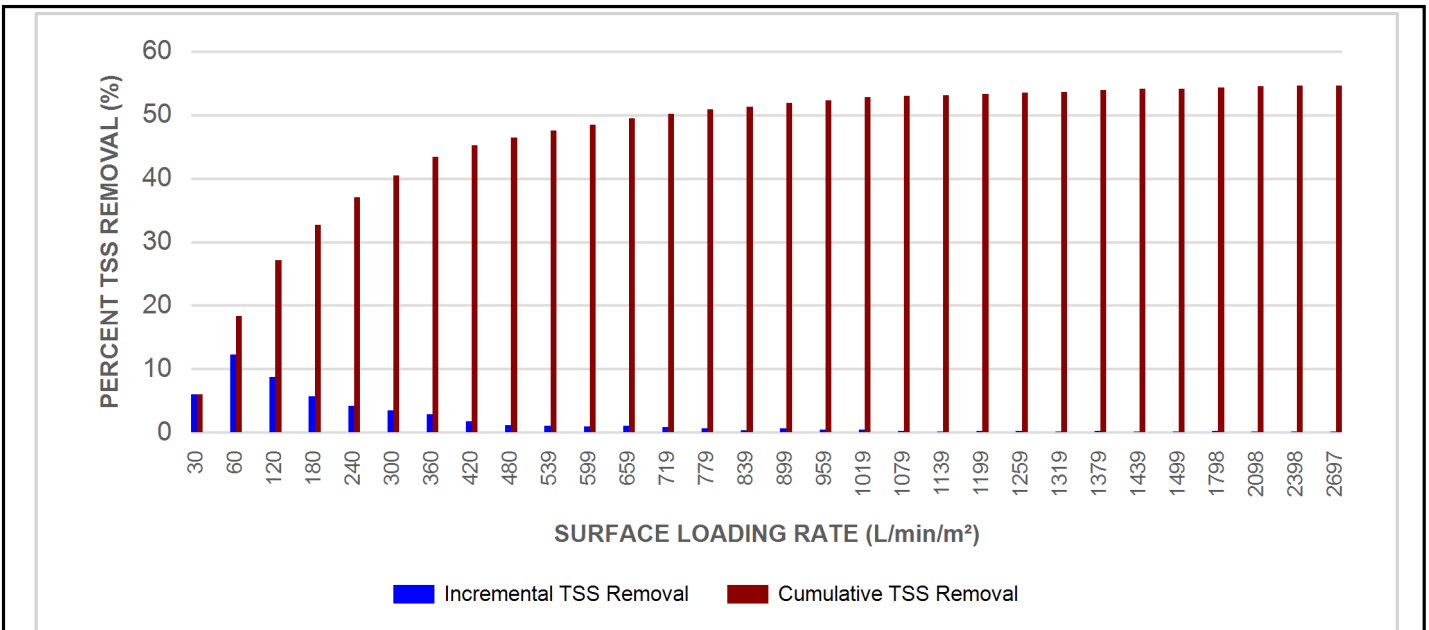


Stormceptor®EF Sizing Report

RAINFALL DATA FROM WATERLOO WELLINGTON AP RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Stormceptor® EF Sizing Report

Maximum Pipe Diameter / Peak Conveyance

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

SCOUR PREVENTION AND ONLINE CONFIGURATION

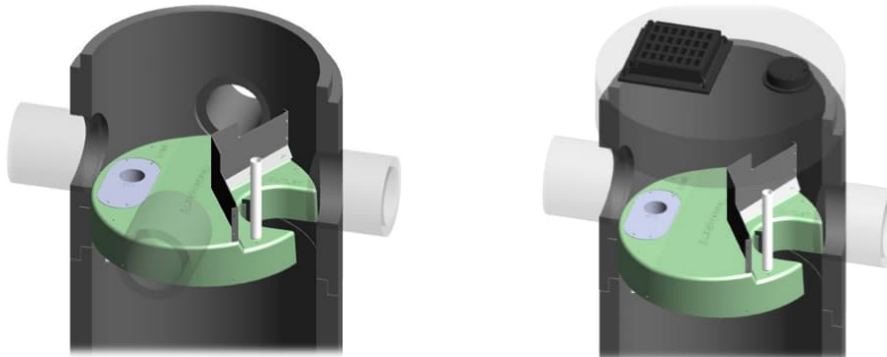
► Stormceptor® EF and EFO feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV Procedure for Laboratory Testing of Oil-Grit Separators, and the exceptional scour test performance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

DESIGN FLEXIBILITY

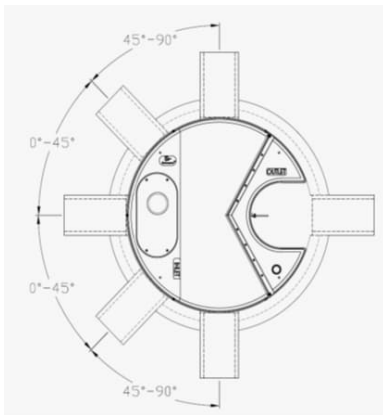
► Stormceptor® EF and EFO offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle,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

OIL CAPTURE AND RETENTION

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



Stormceptor® EF Sizing Report



INLET-TO-OUTLET DROP

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

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

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

HEAD LOSS

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

For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft³)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

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

** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft³)

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

STANDARD STORMCEPTOR EF/EFO DRAWINGS

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

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

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

Stormceptor®EF Sizing Report

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

SLR (L/min/m ²)	TSS % REMOVAL	SLR (L/min/m ²)	TSS % REMOVAL	SLR (L/min/m ²)	TSS % REMOVAL	SLR (L/min/m ²)	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



Stormceptor®EF Sizing Report

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

3.2 SIZING METHODOLOGY

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

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

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

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

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

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

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

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

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

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

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

Stormceptor®**EF** Sizing Report

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

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m² to 2600 L/min/m²) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators**. However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

Appendix E

Monthly Water Balance Calculations

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



Project Number: 42063-104
 Date: March 2, 2023
 Design By: CVP
 File: Q:\42063\104\SWM\March 2023\42063-104 Water Balance (Thornthwaite-Mather)_march 2023_cvp.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: March 2, 2023
 Design By: CVP
 File: Q:\42063\104\SWMM\March 2023\42063-104 Water Balance (Thornthwaite-Mather)_april 2023_cvp_v2.xlsx

Post-Development Water Balance Characteristics

Contributing Catchments: 201, 202, 203	Soil Type: Silt,Sand	Runoff Factor: 0.45
Contributing Areas: 3.11 ha	Vegetation: Urban Lawn	Evapotranspiration
Percent Impervious: 45.2 %	Topography: Flat	Factor for Impervious
Weather Station: Guelph Arboretum	Soil Moisture Retention Capacity: 125 mm	Surfaces: 0.33

Table 7- 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	Acutal Runoff Volume	Acutal Runoff
	(C°)		(mm)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(m ³)	(m ³)	(mm)	(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	4.7	0.0	4.7	145	2.1	65	0	0	44	1.4	109	3.5	101	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	72	1.0	33	0	0	22	0.7	22	0.7	51	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	1.2	0.0	1.2	36	0.5	16	0	0	11	0.4	11	0.4	25	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	22.2	56.1	28.6	26.2	54.9	1,707	24.7	768	0	0	514	16.5	514	16.5	1,192	38.3
May	12.3	3.91	2.0	38.0	77.2	79.9	2.7	0.0	125.0	0.0	77.2	53.8	26.1	27.4	118.1	145.5	4,524	65.5	2,036	0	0	1,364	43.8	1,364	43.8	3,160	101.6
Jun	16.9	6.32	2.8	38.6	109.0	76	-33.0	-33.0	47.0	-78.0	154.0	107.4	46.6	37.0	59.0	96.0	2,987	43.2	1,344	0	0	900	29.0	900	29.0	2,086	67.1
Jul	19.7	7.97	3.3	38.9	128.8	88.5	-40.3	-73.3	27.0	-20.0	108.5	75.6	32.9	34.9	29.5	64.4	2,004	29.0	902	0	0	604	19.4	604	19.4	1,400	45.0
Aug	18.6	7.31	3.1	36.0	112.3	95.9	-16.4	-89.7	22.0	-5.0	100.9	70.3	30.6	32.7	14.8	47.5	1,477	21.4	665	0	0	445	14.3	445	14.3	1,032	33.2
Sep	14.1	4.80	2.3	31.2	73.0	92.1	19.1	0.0	41.1	19.1	73.0	50.9	22.1	27.4	7.4	34.8	1,082	15.7	487	0	0	326	10.5	326	10.5	756	24.3
Oct	7.9	2.00	1.3	28.5	36.5	69.2	32.7	0.0	73.8	32.7	36.5	25.5	11.1	19.2	3.7	22.9	713	10.3	321	0	0	215	6.9	215	6.9	498	16.0
Nov	2.4	0.33	0.4	24.2	9.0	86.3	77.3	0.0	125.0	51.2	9.0	6.3	28.8	24.0	1.8	25.9	804	11.6	362	0	0	242	7.8	242	7.8	562	18.1
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	9.3	1.8	11.1	347	5.0	156	0	0	104	3.4	104	3.4	242	7.8
Total		33.9	16.2		577.6	923.2	345.6					412.0	254.2	248.8	262.4	511.2	15,898	230.0	7,154	0	0	4,792	154.1	4,857	156.2	11,105	357.1

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: April 6, 2023
 Design By: CVP
 File: Q:\42063\104\SWMM\March 2023\42063-104 Water Balance (Thorntwaite-Mather)_april 2023_cvp_v2.xlsx

Post-Development Water Balance Characteristics

Contributing Catchments:	201, 202, 203	Soil Type:	Silt,Sand	Runoff Factor	0.45
Total Contributing Areas Post-Development (201, 202, 203):	2.87 ha	Vegetation:	Urban Lawn	Evapotranspiration	
Percent Impervious	45.2 %	Topography:	Flat	Factor for Impervious	
Weather Station:	Guelph Arboretum	Soil Moisture Retention Capacity:	125 mm	Surfaces:	0.33
Drainage Area to Enhanced Infiltration (201):	1.34 ha				
Percent Impervious Directly to Infiltration Gallery (201):	85 %				
Drainage Area Directly to Wetland (202, 203):	1.52 ha				
Percent Impervious Directly to Wetland (202, 203):	2 %				

Table 7- Post-Development Monthly Water Balance Budget to Wetland - Determination of Runoff to the Wetland

Month	Total Drainage to Wetland Characteristics																201 Characteristics - Drainage to Enhanced Infiltration Features				202 + 203 Characteristics - Uncontrolled Drainage to Wetland		Overall Drainage to Wetland Characteristics		
	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	Total Enhanced Recharge*	Total Enhanced Recharge	Recharge & Runoff of 202 + 203	Runoff of 202 + 203	Acutal Runoff Volume	Acutal 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)	(m ³)	(m ³)	(m ³)
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	4.7	0.0	4.7	133	62	28.0	0	0	71	31.8	94	3.3
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	67	31	14.0	0	0	35	15.9	47	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	1.2	0.0	1.2	33	16	7.0	0	0	18	7.9	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	22.2	56.1	28.6	26.2	54.9	1,575	735	330.9	331	25	833	374.9	779	27.2
May	12.3	3.91	2.0	38.0	77.2	79.9	2.7	0.0	125.0	0.0	77.2	53.8	26.1	27.4	118.1	145.5	4,174	1,949	877.1	877	65	2,208	993.6	2,066	72.0
Jun	16.9	6.32	2.8	38.6	109.0	76	-33.0	-33.0	47.0	-78.0	154.0	107.4	46.6	37.0	59.0	96.0	2,756	1,287	579.1	579	43	1,458	656.1	1,364	47.5
Jul	19.7	7.97	3.3	38.9	128.8	88.5	-40.3	-73.3	27.0	-20.0	108.5	75.6	32.9	34.9	29.5	64.4	1,850	864	388.6	389	29	978	440.2	915	31.9
Aug	18.6	7.31	3.1	36.0	112.3	95.9	-16.4	-89.7	22.0	-5.0	100.9	70.3	30.6	32.7	14.8	47.5	1,363	636	286.4	286	21	721	324.5	675	23.5
Sep	14.1	4.80	2.3	31.2	73.0	92.1	19.1	0.0	41.1	19.1	73.0	50.9	22.1	27.4	7.4	34.8	999	466	209.8	210	16	528	237.7	494	17.2
Oct	7.9	2.00	1.3	28.5	36.5	69.2	32.7	0.0	73.8	32.7	36.5	25.5	11.1	19.2	3.7	22.9	658	307	138.3	138	10	348	156.7	326	11.3
Nov	2.4	0.33	0.4	24.2	9.0	86.3	77.3	0.0	125.0	51.2	9.0	6.3	28.8	24.0	1.8	25.9	742	346	155.9	156	12	392	176.6	367	12.8
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	9.3	1.8	11.1	320	149	67.2	67	5	169	76.1	158	5.5
Total		33.9	16.2		577.6	923.2	345.6					412.0	254.2	248.8	262.4	511.2	14,671	6,850	3082.4	3,033	226	7,760	3491.9	7,308.4	254.6

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: April 6, 2023
 Design By: CVP
 File: Q:\42063\104\SWMM\March 2023\42063-104 Water Balance (Thornthwaite-Mather)_april 2023_cvp_v2.xlsx

Post-Development Water Balance Characteristics

Contributing Catchments:	201, 202, 203, 204, 205	Soil Type:	Silt, Sand	Runoff Factor:	0.45
Total Area on Site:	3.11 ha	Vegetation:	Urban Lawn	Evapotranspiration	
Percent Impervious:	45.2 %	Topography:	Flat	Factor for Impervious	
Weather Station:	Guelph Arboretum	Soil Moisture Retention Capacity:	125 mm	Surfaces:	0.33
Drainage Area to Enhanced Infiltration (201):	1.34 ha				
Percent Impervious Directly to Infiltration Gallery (201):	85 %				
Drainage Area Directly to Wetland (202, 203):	1.52 ha				
Percent Impervious Directly to Wetland (202, 203):	2 %				
Drainage Area Directly to Arkell Road (204+205):	0.25 ha				
Percent Impervious Directly to Arkell Road (204+205):	90 %				

Table 7 - Post-Development Monthly Water Balance Budget for the Site - Determination of Infiltration on Site

Month	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		
	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	Recharge Pervious of 201	Recharge Pervious 201	Total Enhanced Recharge*	Total Enhanced Recharge	Recharge & 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
	(C°)		(mm)		(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)	(m³)	(m³)	(m³)	(mm)	(m³)	(mm)	(m³)	(m³)	(mm)	(m³)	(m³)	(mm)	(m³)	(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	4.7	0.0	4.7	145	62	5	0.4	0	0	71	38	2.5	11	1	0.3	44	1.4
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	72	31	3	0.2	0	0	35	19	1.3	6	0	0.1	22	0.7
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	1.2	0.0	1.2	36	16	1	0.1	0	0	18	10	0.6	3	0	0.1	11	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	22.2	56.1	28.6	26.2	54.9	1,707	735	61	4.5	331	25	833	449	29.6	135	7	3.0	848	27.3
May	12.3	3.91	2.0	38.0	77.2	79.9	2.7	0.0	125.0	0.0	77.2	53.8	26.1	27.4	118.1	145.5	4,524	1,949	161	12.0	571	43	2,208	1,190	78.4	358	20	8.0	1,941	62.4
Jun	16.9	6.32	2.8	38.6	109.0	76	-33.0	-33.0	47.0	-78.0	154.0	107.4	46.6	37.0	59.0	96.0	2,987	1,287	106	7.9	579	43	1,458	786	51.8	236	13	5.3	1,484	47.7
Jul	19.7	7.97	3.3	38.9	128.8	88.5	-40.3	-73.3	27.0	-20.0	108.5	75.6	32.9	34.9	29.5	64.4	2,004	864	71	5.3	389	29	978	527	34.7	159	9	3.5	996	32.0
Aug	18.6	7.31	3.1	36.0	112.3	95.9	-16.4	-89.7	22.0	-5.0	100.9	70.3	30.6	32.7	14.8	47.5	1,477	636	53	3.9	286	21	721	389	25.6	117	6	2.6	734	23.6
Sep	14.1	4.80	2.3	31.2	73.0	92.1	19.1	0.0	41.1	19.1	73.0	50.9	22.1	27.4	7.4	34.8	1,082	466	38	2.9	210	16	528	285	18.8	86	5	1.9	538	17.3
Oct	7.9	2.00	1.3	28.5	36.5	69.2	32.7	0.0	73.8	32.7	36.5	25.5	11.1	19.2	3.7	22.9	713	307	25	1.9	138	10	348	188	12.4	56	3	1.3	354	11.4
Nov	2.4	0.33	0.4	24.2	9.0	86.3	77.3	0.0	125.0	51.2	9.0	6.3	28.8	24.0	1.8	25.9	804	346	29	2.1	156	12	392	212	13.9	64	3	1.4	399	12.8
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	9.3	1.8	11.1	347	149	12	0.9	67	5	169	91	6.0	27	2	0.6	172	5.5
Total		33.9	16.2		577.6	923.2	345.6					412.0	254.2	248.8	262.4	511.2	15,898	6,850	565	42.2	2,727	203	7,760	4,182	275.5	1,258	69	28.1	7,544	242.6

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

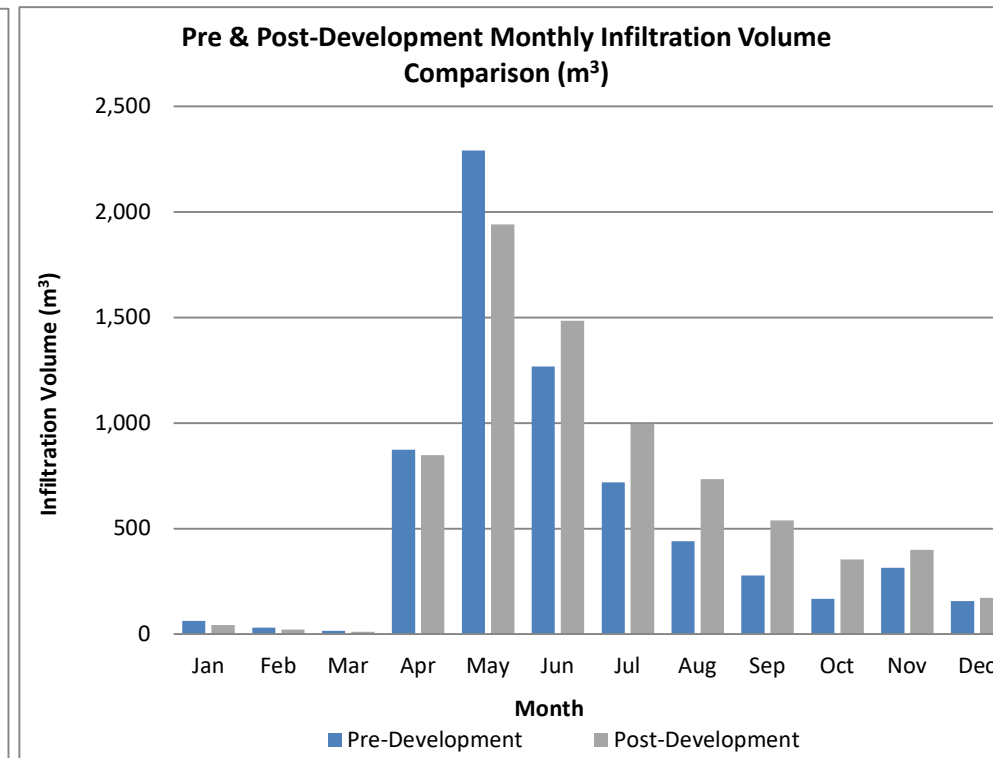
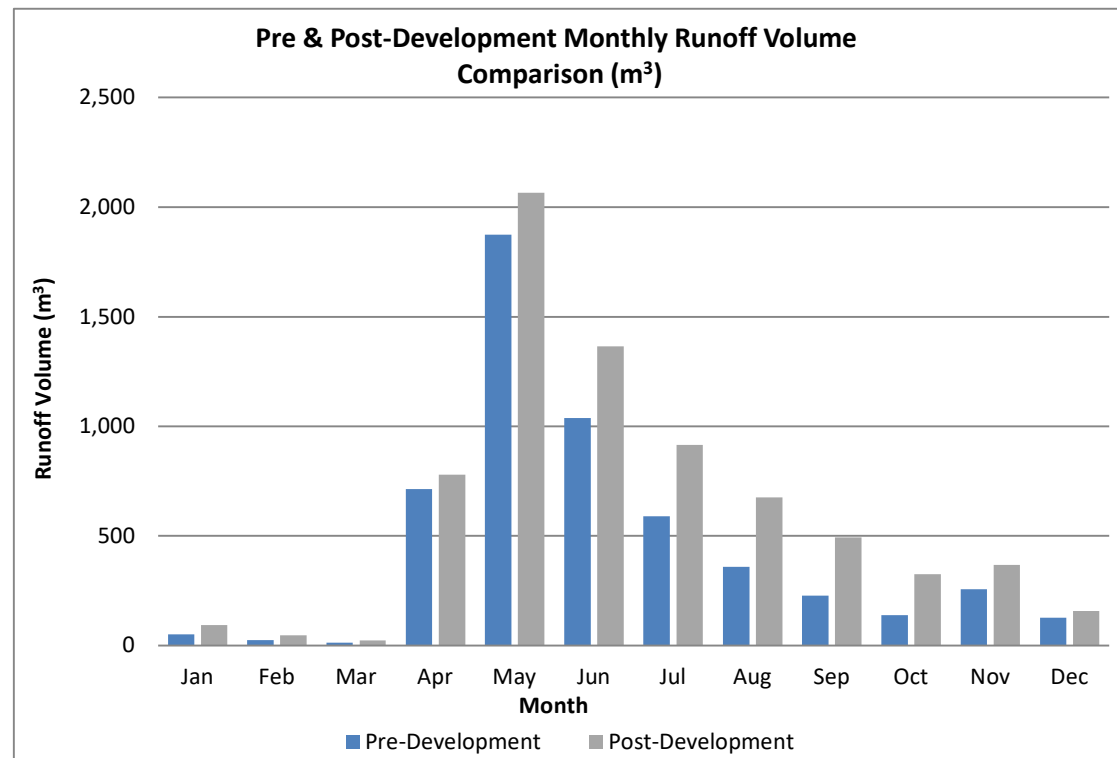


Project Number: 42063-104
 Date: April 6, 2023
 Design By: CVP
 File: Water Balance (Thornthwaite-Mather)_april

Table 5 - Total Runoff and Infiltration Volume to Wetland

Month	Total Runoff Volume to Wetland (m ³)			Total Infiltration Volume (m ³)		
	Pre-development	Post-development	Difference	Pre-development	Post-development	Difference
Jan	51	94	43	62	44	-19
Feb	26	47	21	31	22	-9
Mar	13	24	11	16	11	-5
Apr	714	779	65	873	848	-25
May	1,875	2,066	191	2,291	1,941	-350
Jun	1,037	1,364	327	1,268	1,484	216
Jul	589	915	326	720	996	276
Aug	360	675	315	440	734	294
Sep	227	494	267	278	538	260
Oct	137	326	188	168	354	187
Nov	257	367	111	314	399	86
Dec	128	158	31	156	172	16
Total	5,413	7,308	1,895	6,616	7,544	928

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



Appendix F

Geotechnical Report





**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

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 than 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 MECF, 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

Ken Hanes, P.Eng.
Project Engineer
Geotechnical and Geoenvironmental Services

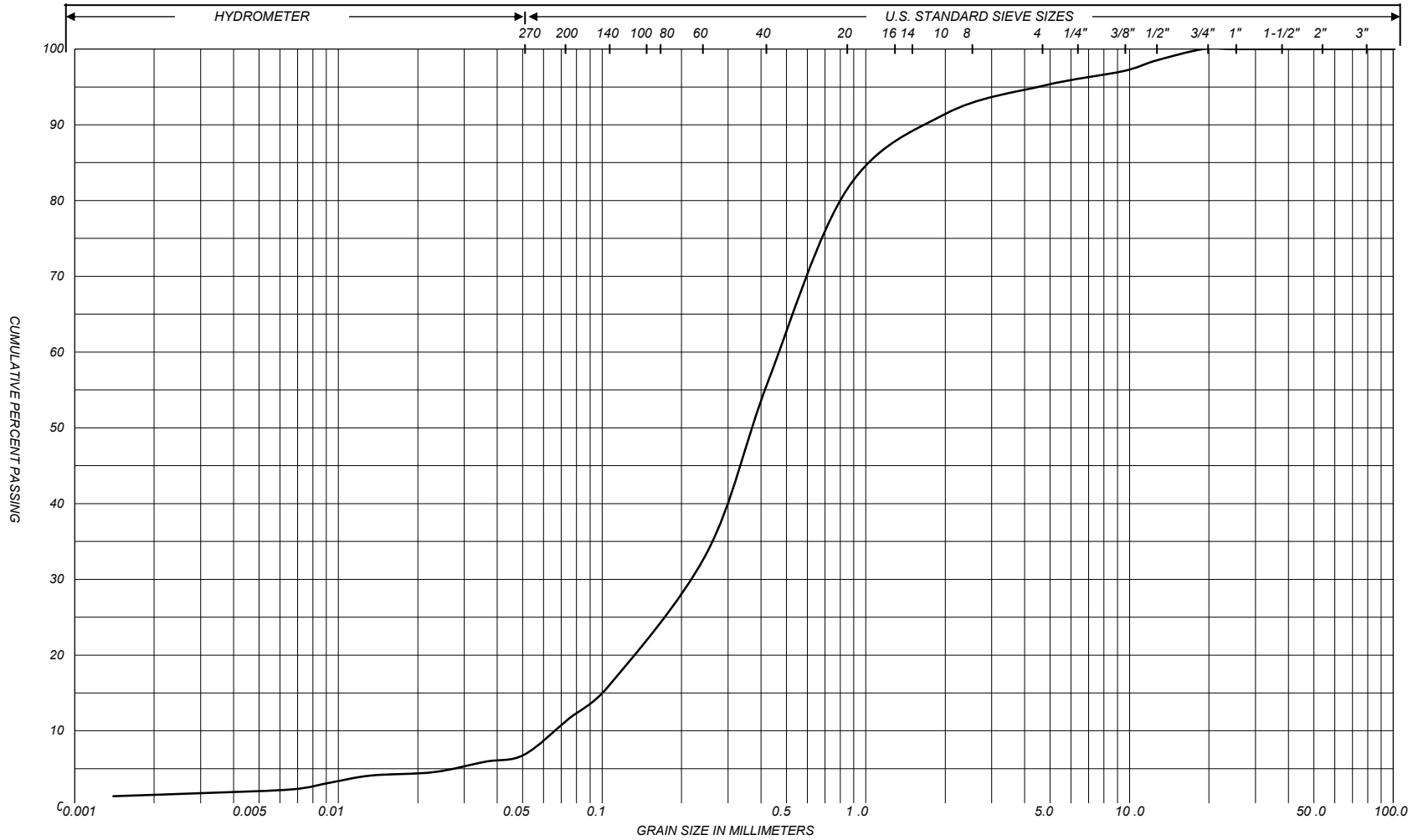
Gerry Mitchell, MEng, P.Eng.
Vice President

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

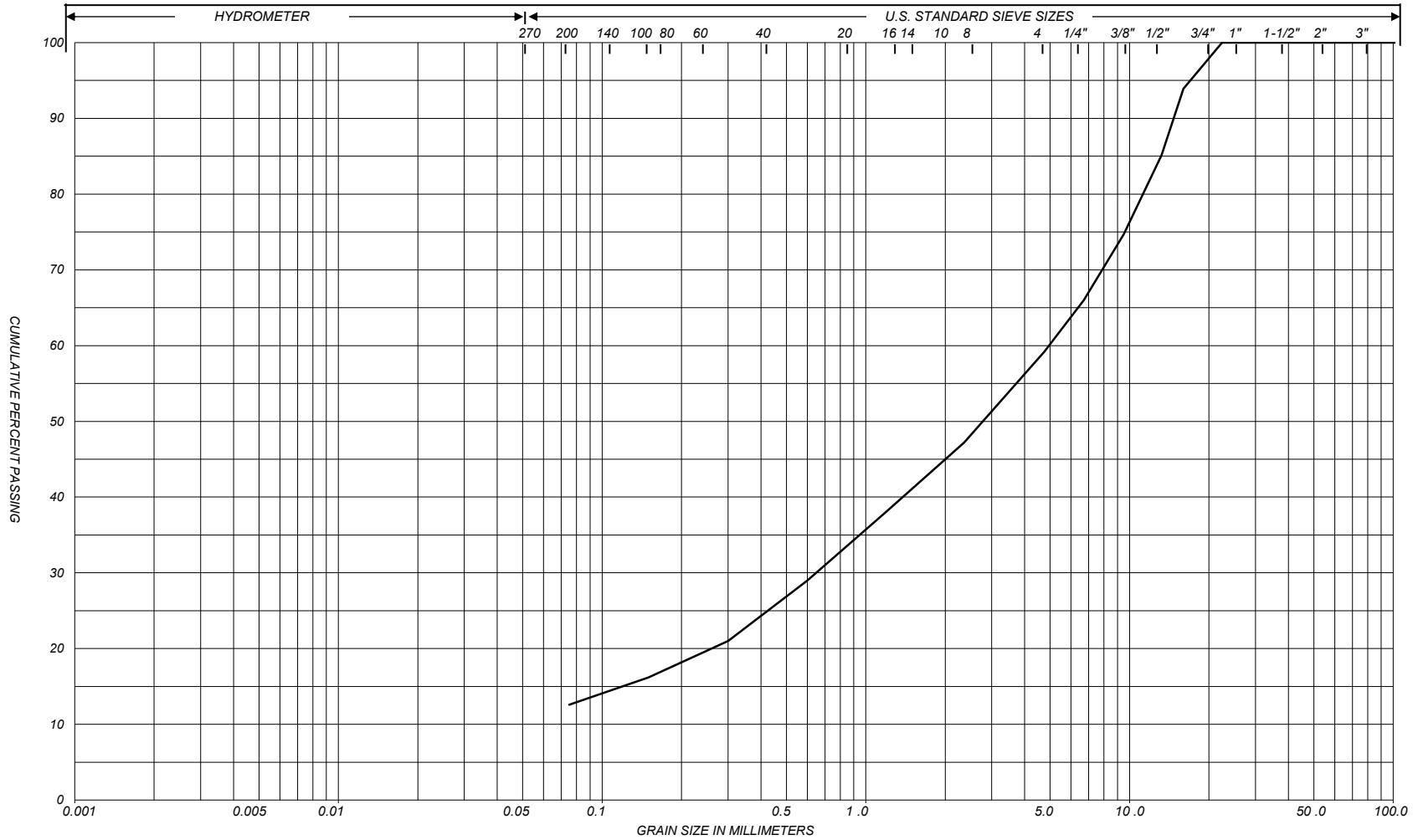
PARTICLE SIZE DISTRIBUTION CHART



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

REMARKS Borehole 1, Sample SS6, Depth 4.5 to 5.0 m
SAND, SOME SILT, TRACE GRAVEL

PARTICLE SIZE DISTRIBUTION CHART



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

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:

<u>CONSISTENCY</u>	<u>N (blows/0.3 m)</u>	<u>c (kPa)</u>	<u>DENSENESS</u>	<u>N (blows/0.3 m)</u>
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		

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. Shinway

SOIL PROFILE		LEGEND	SAMPLES			SHEAR STRENGTH C_u (kPa)		LIQUID LIMIT W_L		UNIT WEIGHT γ kN/m ³	GROUND WATER OBSERVATIONS AND REMARKS
DEPTH in METRES	DESCRIPTION		NUMBER	TYPE	BLOWS/0.3m N - VALUES	ELEVATION SCALE	50 100 150 200	PLASTIC LIMIT W_p	WATER CONTENT W		
GROUND ELEVATION 334.56											
0.0 - 0.10	TOPSOIL: Dark brown silt, trace sand, numerous rootlets, damp		1	SS	7	334					
0.10 - 0.46	FILL: Brown sand and gravel, trace silt, moist		2	SS	42	334					
0.46 - 0.69	SILT: Loose brown silt, trace sand, occasional rootlets, damp		3	SS	50/150mm	333					
0.69 - 333.87											
2.1 - 332.5	SAND AND GRAVEL: Dense to very dense brown sand and gravel, trace to some silt, numerous cobbles, damp becoming moist		4	SS	39	332					
2.9 - 331.7	becoming compact, no cobbles, saturated, contains saturated silt layers		5	SS	23	331					Sampler wet from SS5
4.0 - 330.6	SAND: Compact brown sand, trace to some silt, trace gravel, saturated		6	SS	12	330					
6.6 - 328.0	BOREHOLE TERMINATED AT 6.6 m		7	SS	16	328					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**

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. Shinway

SOIL PROFILE		LEGEND	SAMPLES			SHEAR STRENGTH C_u (kPa)		LIQUID LIMIT W_L		UNIT WEIGHT γ (kN/m ³)	GROUND WATER OBSERVATIONS AND REMARKS
DEPTH in METRES	DESCRIPTION		NUMBER	TYPE	BLOWS/0.3m N-VALUES	50	100	150	200		
GROUND ELEVATION 335.16						DYNAMIC CONE PENETRATION ×		STANDARD PENETRATION TEST ●			
0.0	0.25		1	SS	3	335					Stick up GR SA SI&CL Concrete Sampler wet from SS4 Bentonite Seal 50 mm Plastic Riser Filter Sand Screen
	334.91										
	0.69		2	SS	57	334					
	334.47		3	SS	64	333					
2.0	2.1		4	SS	34	332					
	333.1		5	SS	31	331					
4.0			6	SS	30	330					
5.0			7	SS	26	329					
6.0					328						
7.0	7.7										
8.0	8.1		8	SS	39						
	327.1										Water Level Readings: Initial: 3.40 m Elevation: 331.76 2017-04: 2.51 m Elevation: 332.45
9.0											
10.0											
11.0											
12.0											
13.0											
14.0											
15.0											
16.0											
17.0											

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 TORVAPE
- CHECKED BY KH

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. Shinway

SOIL PROFILE		LEGEND	SAMPLES			SHEAR STRENGTH C_u (kPa)		LIQUID LIMIT W_L		UNIT WEIGHT γ (kN/m ³)	GROUND WATER OBSERVATIONS AND REMARKS
DEPTH in METRES	DESCRIPTION		NUMBER	TYPE	BLOWS/0.3m N - VALUES	50	100	150	200		
GROUND ELEVATION 334.42											
0.0	0.20 TOPSOIL: Dark brown silt, trace sand, numerous rootlets, moist		1	SS	5						
0.51	0.51 SILT: Loose dark brown silt, some sand, occasional rootlets		2	SS	3						
1.0	1.4 SAND AND GRAVEL: Very loose brown sand and gravel, trace to some silt, occasional cobbles, damp		3	SS	35						
2.0	333.1 becoming compact, saturated		4	SS	31						
3.0	2.9 SAND: Compact to dense brown sand, trace to some silt, trace gravel, occasional cobbles, saturated		5	SS	24						
4.0	331.5										
5.0			6	SS	42						
6.0											
7.0											
8.0	7.8 SILT: Compact brown silt, trace sand, trace gravel, wet										
8.0	8.0 BOREHOLE TERMINATED AT 8.0 m										
8.0	326.4										

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

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

SOIL PROFILE		LEGEND	SAMPLES			SHEAR STRENGTH C_u (kPa)		LIQUID LIMIT W_L		UNIT WEIGHT γ kN/m ³	GROUND WATER OBSERVATIONS AND REMARKS
DEPTH in METRES	DESCRIPTION		NUMBER	TYPE	BLOWS/0.3m N - VALUES	ELEVATION SCALE	50 100 150 200	PLASTIC LIMIT W_p	WATER CONTENT W		
GROUND ELEVATION 334.13											
0.0						334					
0.30	TOPSOIL: Dark brown silt, trace sand, numerous rootlets, moist		1	SS	6	334					Stick up GR SA SI&CL Concrete
0.69 333.44	SAND AND GRAVEL: Compact brown sand and gravel, trace to some silt, occasional cobbles, moist becoming saturated		2	SS	13	333					
1.5 332.7	SAND: Compact brown sand, trace to some silt, trace gravel, saturated		3	SS	14	332					Bentonite Seal
2.0		4	SS	11	331						
3.0		5	SS	12	330						
4.0		6	SS	18	329						
5.0		7	SS	10	328						
6.0		8	SS	25	327						
7.0											
8.0											
8.1 326.0	BOREHOLE TERMINATED AT 8.1 m										Screen
9.0											Water Level Readings: Initial: 0.75 m Elevation: 333.38
10.0											2017-04: 0.44 m Elevation: 333.55
11.0											
12.0											
13.0											
14.0											
15.0											
16.0											
17.0											

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

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

SOIL PROFILE		LEGEND	SAMPLES			SHEAR STRENGTH C_u (kPa)		LIQUID LIMIT W_L		UNIT WEIGHT γ (kN/m ³)	GROUND WATER OBSERVATIONS AND REMARKS
DEPTH in METRES	DESCRIPTION		NUMBER	TYPE	BLOWS/0.3m N-VALUES	50	100	150	200		
GROUND ELEVATION 334.97						DYNAMIC CONE PENETRATION ×		STANDARD PENETRATION TEST ●			
0.0	0.25		1	SS	13						Stick up GR SA SI&CL Concrete Sampler wet from SS4 Bentonite Seal Filter Sand Screen
0.25	334.72										
1.0			2	SS	49	334					
2.0			3	SS	31	333					
2.2	332.8		4	SS	24	332					
3.0			5	SS	27	331					
5.0			6	SS	14	330					
5.6	329.4		7	SS	51	329					
7.0	7.1				328						
7.1	327.9										
8.0	8.1				327						
8.1	326.9										
BOREHOLE TERMINATED AT 8.1 m											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

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

SOIL PROFILE		LEGEND	SAMPLES			SHEAR STRENGTH C_u (kPa)		LIQUID LIMIT W_L		UNIT WEIGHT γ kN/m^3	GROUND WATER OBSERVATIONS AND REMARKS
DEPTH in METRES	DESCRIPTION		NUMBER	TYPE	BLOWS/0.3m N - VALUES	ELEVATION SCALE	50 100 150 200	PLASTIC LIMIT W_p	WATER CONTENT W		
GROUND ELEVATION 334.0											
0.0	0.20 TOPSOIL: Dark brown silt, trace sand, numerous rootlets, damp		1	SS	18						Sampler wet from SS3
0.41	0.69 FILL: Dark brown silt, some sand, trace gravel, occasional rootlets, damp		2	SS	45	333					
1.0	1.5 SAND AND GRAVEL: Dense brown sand and gravel, trace to some silt, numerous cobbles, damp		3	SS	36	332					
2.0	2.2 becoming moist		4	SS	12	331					
3.0	3.1.8 becoming saturated		5	SS	10	330					
4.0			6	SS	16	329					
5.0			7	SS	50/75mm	328					
6.0	5.8 SILT TILL: Very dense brown silt, some sand, some gravel, occasional cobbles, damp										
6.6	327.4 BOREHOLE TERMINATED AT 6.6 m										Upon completion of augering Cave to 2.0 m Free water at 1.83 m
7.0											
8.0											
9.0											
10.0											
11.0											
12.0											
13.0											
14.0											
15.0											
16.0											
17.0											

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



APPENDIX A

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 and 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)



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.



Certificate of Analysis

AGAT WORK ORDER: 17T199091

PROJECT: 17KF002

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

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

Parameter	Unit	SAMPLE DESCRIPTION:				
		SAMPLE TYPE:		BH4-SS1	BH5-SS1	BH6-SS1
		G / S	RDL	Soil	Soil	Soil
		DATE SAMPLED:		2017-03-21	2017-03-21	2017-03-21
				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 CaCl ₂ 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



Certificate of Analysis

AGAT WORK ORDER: 17T199091

PROJECT: 17KF002

5835 COOPERS AVENUE
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<http://www.agatlabs.com>

CLIENT NAME: PETO MACCALLUM LIMITED

ATTENTION TO: Ken Hanes

SAMPLING SITE:

SAMPLED BY:

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

DATE RECEIVED: 2017-03-23

DATE REPORTED: 2017-04-18

Parameter	Unit	SAMPLE DESCRIPTION:		BH4-SS1	BH6-SS1
		SAMPLE TYPE:		Soil	Soil
		DATE SAMPLED:		2017-03-21	2017-03-21
		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:



Guideline Violation

AGAT WORK ORDER: 17T199091

PROJECT: 17KF002

5835 COOPERS AVENUE
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<http://www.agatlabs.com>

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

Quality Assurance

 CLIENT NAME: PETO MACCALLUM LIMITED
 PROJECT: 17KF002
 SAMPLING SITE:

 AGAT WORK ORDER: 17T199091
 ATTENTION TO: Ken Hanes
 SAMPLED BY:

Soil Analysis															
RPT Date: Apr 18, 2017			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE		MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	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:



Quality Assurance

 CLIENT NAME: PETO MACCALLUM LIMITED
 PROJECT: 17KF002
 SAMPLING SITE:

 AGAT WORK ORDER: 17T199091
 ATTENTION TO: Ken Hanes
 SAMPLED BY:

Trace Organics Analysis

RPT Date: Apr 18, 2017			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		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:



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 CaCl ₂ 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

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.



Certificate of Analysis

AGAT WORK ORDER: 17W201248

PROJECT: 17KF002

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

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

Parameter	Unit	SAMPLE DESCRIPTION:		BH5-SS4	BH6-SS3
		SAMPLE TYPE:		Soil	Soil
		DATE SAMPLED:		2017-03-21	2017-03-21
		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 CaCl ₂ 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:

Sofra Pehlyora



Guideline Violation

AGAT WORK ORDER: 17W201248

PROJECT: 17KF002

5835 COOPERS AVENUE
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<http://www.agatlabs.com>

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

Quality Assurance

 CLIENT NAME: PETO MACCALLUM LIMITED
 PROJECT: 17KF002
 SAMPLING SITE:

 AGAT WORK ORDER: 17W201248
 ATTENTION TO: Ken Hanes
 SAMPLED BY: H. Shinwary

Soil Analysis															
RPT Date: Apr 10, 2017			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE		MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	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:





Method Summary

CLIENT NAME: PETO MACCALLUM LIMITED
 PROJECT: 17KF002
 SAMPLING SITE:

AGAT WORK ORDER: 17W201248
 ATTENTION TO: Ken Hanes
 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 CaCl ₂ 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)



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.



Certificate of Analysis

AGAT WORK ORDER: 17T199091

PROJECT: 17KF002

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<http://www.agatlabs.com>

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

Parameter	Unit	SAMPLE DESCRIPTION:				
		SAMPLE TYPE:		BH4-SS1	BH5-SS1	BH6-SS1
		G / S	RDL	2017-03-21	2017-03-21	2017-03-21
				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



Certificate of Analysis

AGAT WORK ORDER: 17T199091

PROJECT: 17KF002

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

CLIENT NAME: PETO MACCALLUM LIMITED

ATTENTION TO: Ken Hanes

SAMPLING SITE:

SAMPLED BY:

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

DATE RECEIVED: 2017-03-23

DATE REPORTED: 2017-04-18

Parameter	Unit	SAMPLE DESCRIPTION:		BH4-SS1	BH6-SS1
		SAMPLE TYPE:		Soil	Soil
		DATE SAMPLED:		2017-03-21	2017-03-21
		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:

Quality Assurance

 CLIENT NAME: PETO MACCALLUM LIMITED
 PROJECT: 17KF002
 SAMPLING SITE:

 AGAT WORK ORDER: 17T199091
 ATTENTION TO: Ken Hanes
 SAMPLED BY:

Soil Analysis															
RPT Date: Apr 18, 2017			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE		MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	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:



Quality Assurance

CLIENT NAME: PETO MACCALLUM LIMITED
 PROJECT: 17KF002
 SAMPLING SITE:

AGAT WORK ORDER: 17T199091
 ATTENTION TO: Ken Hanes
 SAMPLED BY:

Trace Organics Analysis

RPT Date: Apr 18, 2017			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	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: 

AGAT Laboratories is accredited to ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA) and/or Standards Council of Canada (SCC) for specific tests listed on the scope of accreditation. AGAT Laboratories (Mississauga) is also accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) for specific drinking water tests. Accreditations are location and parameter specific. A complete listing of parameters for each location is available from www.cala.ca and/or www.scc.ca. The tests in this report may not necessarily be included in the scope of accreditation.

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 CaCl ₂ 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



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.



Certificate of Analysis

AGAT WORK ORDER: 17W201248

PROJECT: 17KF002

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<http://www.agatlabs.com>

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

Parameter	Unit	SAMPLE DESCRIPTION:		BH5-SS4	BH6-SS3
		SAMPLE TYPE:		Soil	Soil
		DATE SAMPLED:		2017-03-21	2017-03-21
		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:



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

Quality Assurance

 CLIENT NAME: PETO MACCALLUM LIMITED
 PROJECT: 17KF002
 SAMPLING SITE:

 AGAT WORK ORDER: 17W201248
 ATTENTION TO: Ken Hanes
 SAMPLED BY: H. Shinwary

Soil Analysis															
RPT Date: Apr 10, 2017			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE		MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	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:





Method Summary

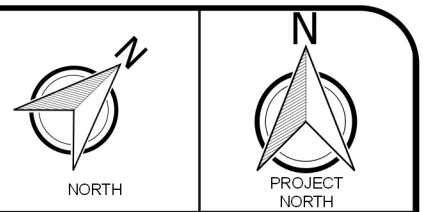
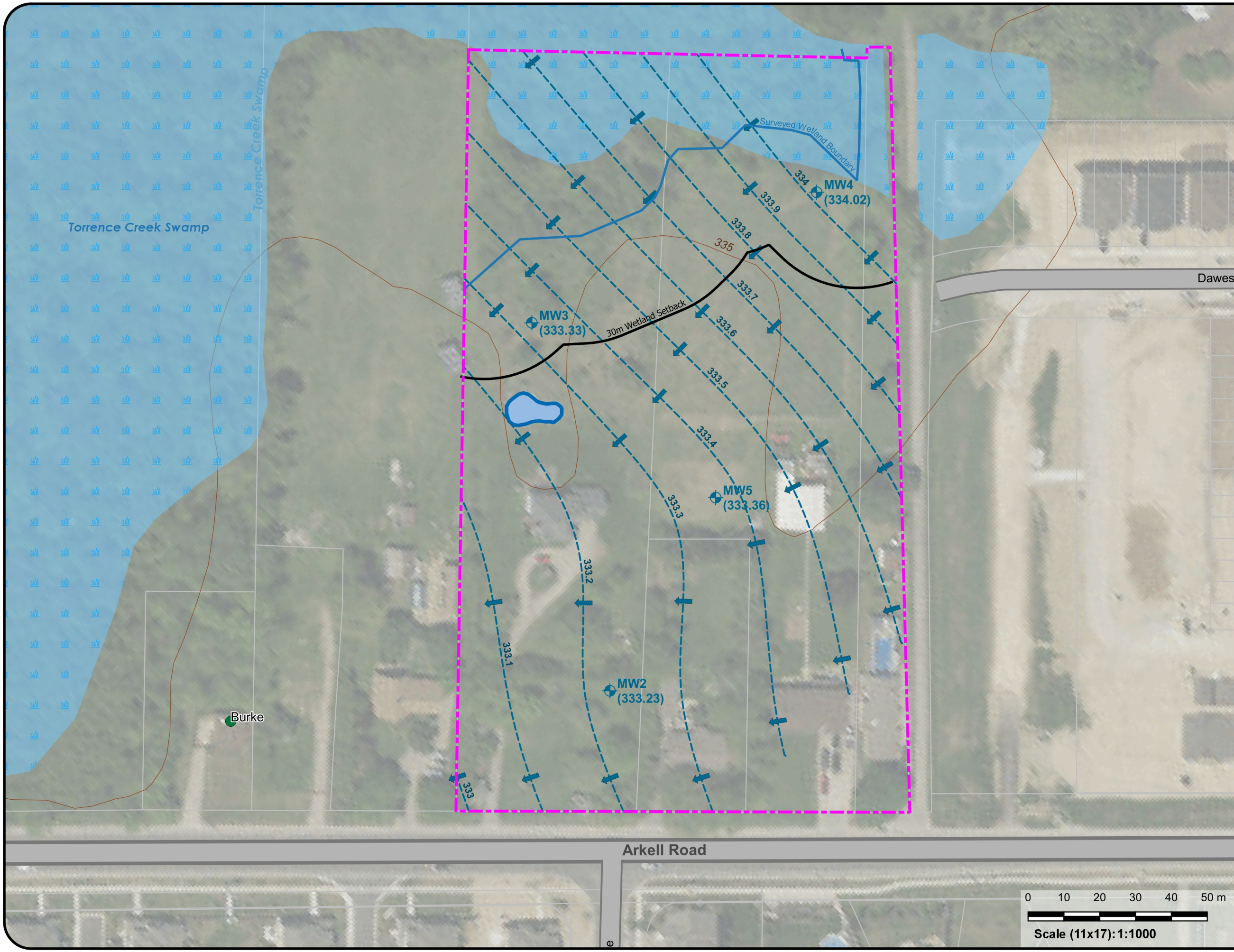
CLIENT NAME: PETO MACCALLUM LIMITED
 PROJECT: 17KF002
 SAMPLING SITE:

AGAT WORK ORDER: 17W201248
 ATTENTION TO: Ken Hanes
 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 CaCl ₂ Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	PH METER

Appendix G

Seasonal High GW



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
 - Provincially Significant Wetland (GRCA)
- Ground Surface Elevation Contour (mamsl)**
- Major Contour (10m)
 - Minor Contour (5m)

Data Sources:

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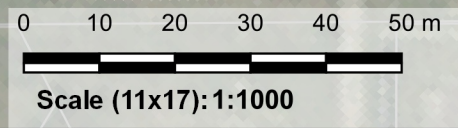
Contains Information made available under Grand River Conservation Authority's Open Data Licence v2.0

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

Project CRS: NAD83 / UTM zone 17N



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

Appendix H

In-Situ Infiltration Testing Technical Memo





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	8.9×10^{-5}	45
TP101-21	1.6	SAND, trace silt, trace gravel	3.5×10^{-4}	64
TP102-21	0.8	SAND and GRAVEL	5.8×10^{-3}	249
TP103-21	0.5	SAND and GRAVEL	5.4×10^{-3}	133
TP104-21	0.9	SAND and GRAVEL	4.3×10^{-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.



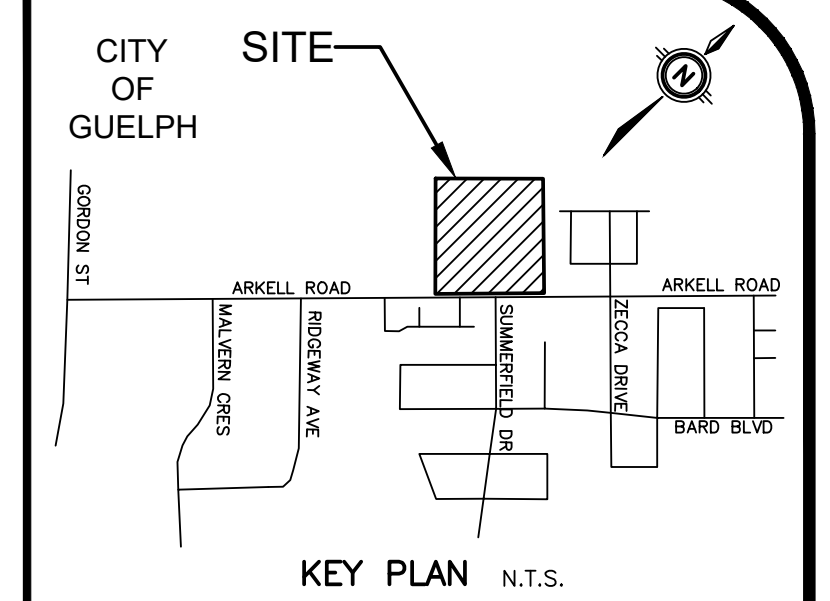
It is noted that based on the two methods of calculating Safety Factors described above, the Civil Designer has selected a conservative Safety Factor of 3 for infiltration gallery design.

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

LEGEND

- SITE BOUNDARY
- WETLAND BOUNDARY
- 15m WETLAND SETBACK
- SURVEYED DRIPLINE
- 10m DRIPLINE SETBACK
- EXISTING CONTOURS
- EXISTING CURB
- EXISTING DIRECTION OF DRAINAGE/SWALE
- EXISTING BUILDING
- EXISTING EMBANKMENT (SLOPE AS NOTED)
- EXISTING SANITARY SEWER
- EXISTING WATERMAIN
- EXISTING STORM SEWER
- EXISTING RETAINING WALL
- EXISTING FENCE
- EXISTING PIEZOMETER
- EXISTING BOREHOLE
- EXISTING MONITORING WELL
- EXISTING TEST PIT



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

SITE BENCHMARK ELEV. = 335.455m
SEE ABOVE

NOTE TO CONTRACTOR :
DO NOT SCALE DRAWINGS.
CONTRACTORS MUST CHECK AND VERIFY ALL DIMENSIONS AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.
ALL DRAWINGS REMAIN THE PROPERTY OF THE ENGINEER AND SHALL NOT BE REPRODUCED OR REUSED WITHOUT THE ENGINEER'S WRITTEN PERMISSION.
THE OWNER/ARCHITECT/CONTRACTOR IS ADVISED THAT M.T.E. CONSULTANTS INC. CANNOT CERTIFY ANY COMPONENT OF THE SITE WORKS NOT INSPECTED DURING CONSTRUCTION. IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO NOTIFY M.T.E. CONSULTANTS INC. PRIOR TO COMMENCEMENT OF CONSTRUCTION TO ARRANGE FOR INSPECTION.

8.		
7.		
6.		
5.		
4.		
3.	ISSUED FOR DRAFT PLAN APPROVAL	KDH MAY 4/23
2.	ISSUED FOR DRAFT PLAN APPROVAL	DFH DEC.03/21
1.	ISSUED FOR DRAFT PLAN APPROVAL	INC APR.3/20
No.	REVISION	BY DATE

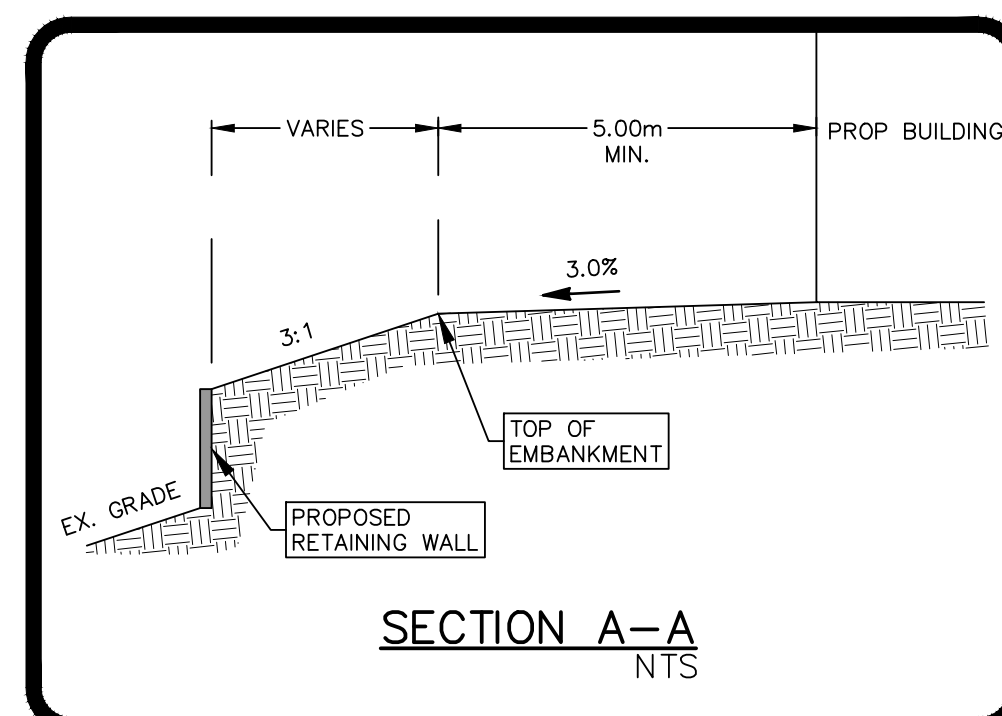
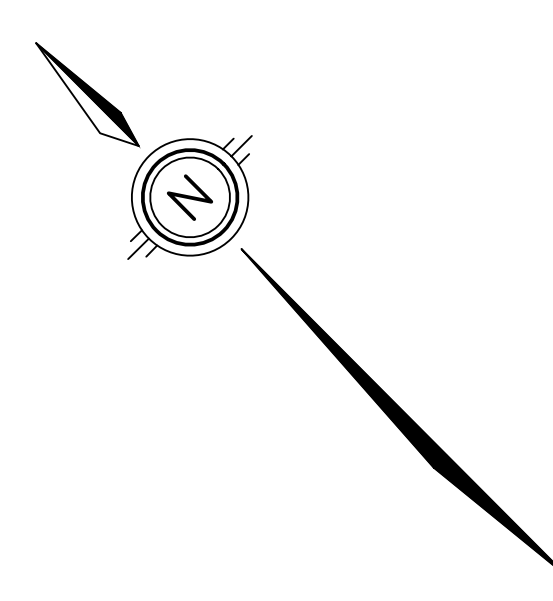
MTE
Engineers, Scientists, Surveyors
519-743-6500

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	AJC
Surveyed By	MTE	Drawing No.	EC1.1
Date	Dec.04/19	Scale	1:400
Scale	1:400	Sheet	of



N 44°32'00" E 6.40
N 45°05'28" W 3.048
111.158
N 45°11'45" E

N 47°29'00" W

DAWES AVENUE

BLOCK 20 OPEN SPACE

FUTURE ROAD CONNECTION TO DAWES AVENUE

MATCH INTO TOP OF EX. BERM OF EX. SWM FACILITY

EX. SWM FACILITY

MATCH INTO EX. GRADE

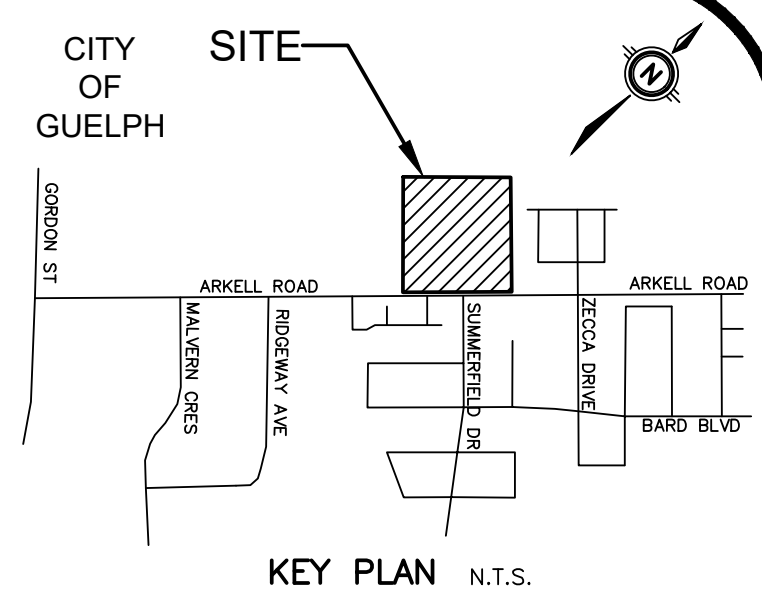
EX. CSW

EX BUS PAD (APPROX)

FUTURE SIDEWALK

LEGEND

- SITE BOUNDARY
- EXISTING CONTOURS
- EXISTING CURB
- EXISTING DRIPLINE
- 10m DRIPLINE SETBACK
- WETLAND BOUNDARY
- 30m WETLAND SETBACK
- FINISHED GRADE CONTOURS
- PROPOSED SPOT ELEVATIONS
EX = MAINTAIN EXISTING
HP = HIGH POINT
LP = LOW POINT
- DIRECTION OF DRAINAGE/SWALE
- PROPOSED EMBANKMENT
- MAJOR OVERLAND FLOW ROUTE



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.			
5.			
4.			
3.	REISSUED FOR DRAFT PLAN APPROVAL	KDH	MAY 4/23
2.	REISSUED FOR DRAFT PLAN APPROVAL	DFH	DEC.3/21
1.	ISSUED FOR DRAFT PLAN APPROVAL	IXC	JAN.10/20



519-743-6500

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

PROJECT
ARKELL ROAD PROPERTIES
216 ARKELL ROAD GUELPH

AREA GRADING PLAN

Project Manager K.HANES	Project No. 42063-104
Design By A/JC/BDS	Checked By VAL
Drawn By SXP/KAT	Checked By AJC
Surveyed By MTE	Drawing No. AG1.1
Date Mar.30/20	Sheet of
Scale 1:400	

