Wilmot Woods Subdivision

Preliminary Stormwater Management Report

Project Location:
New Hamburg

Prepared for:
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MTE File No.: 35056-104

Engineers, Scientists, Surveyors.

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MTE Drawing No. 35056-104-QU1.1 – Finished Grade Contour Plan ..... Encl.
MTE Drawing No. 35056-104-QU2.1 – Groundwater Separation Plan ..... Encl.

1.0 Introduction

1.1 Overview

MTE Consultants Inc. (MTE) was retained by Wilmot Woods Developments Inc. to complete a Preliminary Stormwater Management (SWM) Report in support of a Plan of Subdivision application for a proposed residential subdivision in the Township of Wilmot.

The Wilmot Woods subdivision, herein referred to as the 'subject lands', are located in the Town of New Hamburg. The lands are generally bounded by Waterloo Street to the north, agricultural lands to the east, the Canadian National (CN) railway corridor to the south, and the existing Forest Glen residential subdivision to the west. Refer to the Location Plan in **Figure 1.1**.

The subject lands comprise a total area of approximately 37.19ha. Development plans include the construction of street-oriented residential units, multiple residential blocks, park block, open space block and stormwater management facilities with the required roads and municipal services (storm, sanitary, and water). Portions of the lands are not suited for development, as they are within the floodplain limits of the Ivan Gingerich Municipal Drain (IGMD). A Draft Plan of Subdivision (dated January 25, 2022) for the proposed development has been prepared by MHBC Planning and forms the basis of this report. The reduced Draft Plan has been included in **Appendix A**.

This report presents the proposed plan detailing the stormwater quality and quantity measures that will be provided for the proposed development. This report should be read in conjunction with the following additional reports:

- *Wilmot Woods Subdivision - Functional Servicing Report* – MTE Consultants Inc. (April 2022).
- *Wilmot Woods Subdivision - Hydrogeological Assessment Report* – MTE Consultants Inc. (April 2022).
- *Wilmot Employment Lands Industrial Subdivision - Final Stormwater Management Report* - MTE (January 12, 2022).

1.2 Background Information

An *Enhanced Master Drainage Plan* (EMDP) was undertaken for the Wilmot Employment Lands (WEL) by the Township. The EMDP was completed in May 2012 and approved by the Township, the Region of Waterloo (Region), the Grand River Conservation Authority (GRCA), and the Ministry of Transportation of Ontario (MTO). Prior to the EMDP, a holding provision on the zoning was implemented by the Township and the GRCA due to floodplain constraints within the WEL. The purpose of the EMDP was to release this holding provision and prepare a comprehensive SWM strategy for the contributing subwatershed. As part of the design considerations presented in MTE's 2019 WEL reports, storm servicing outlets were proposed for the subject lands through the WEL property. Furthermore, a communal quantity and quality control SWM Facility (SWMF) adjacent to Highway 7/8 is proposed to provide quality control for the portion of the subject lands draining towards the south.

The WEL are located directly south of the subject lands, between the CN railway and Highway 7/8. MTE completed and submitted an FSR and Preliminary SWM Report in support of two Draft Plan of Subdivision applications for the WEL, dated November 22, 2019. The Draft Plans were approved on March 17, 2021.

The preliminary design strategies for stormwater management have been developed to be in accordance with the recommended solutions within the EMDP and MTE's design submissions for the WEL; all of which are described within this preliminary SWM report.

For the WEL, MTE prepared a Final Stormwater Management Report dated January 12, 2022 which documents the design of the communal SWMF located immediately north of Highway 7/8.

1.3 Purpose of Study

The purpose of this study is to develop a comprehensive stormwater management strategy for the proposed development, which implements the approved EMDP, incorporates findings of previous studies, and is acceptable to the Township, the Region, the GRCA, the Ministry of the Environment, Conservation and Parks (MECP, formerly referred to as the MOE).

1.4 Objectives

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

- Document 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; and
- Prepare preliminary designs for the recommended stormwater management infrastructure.

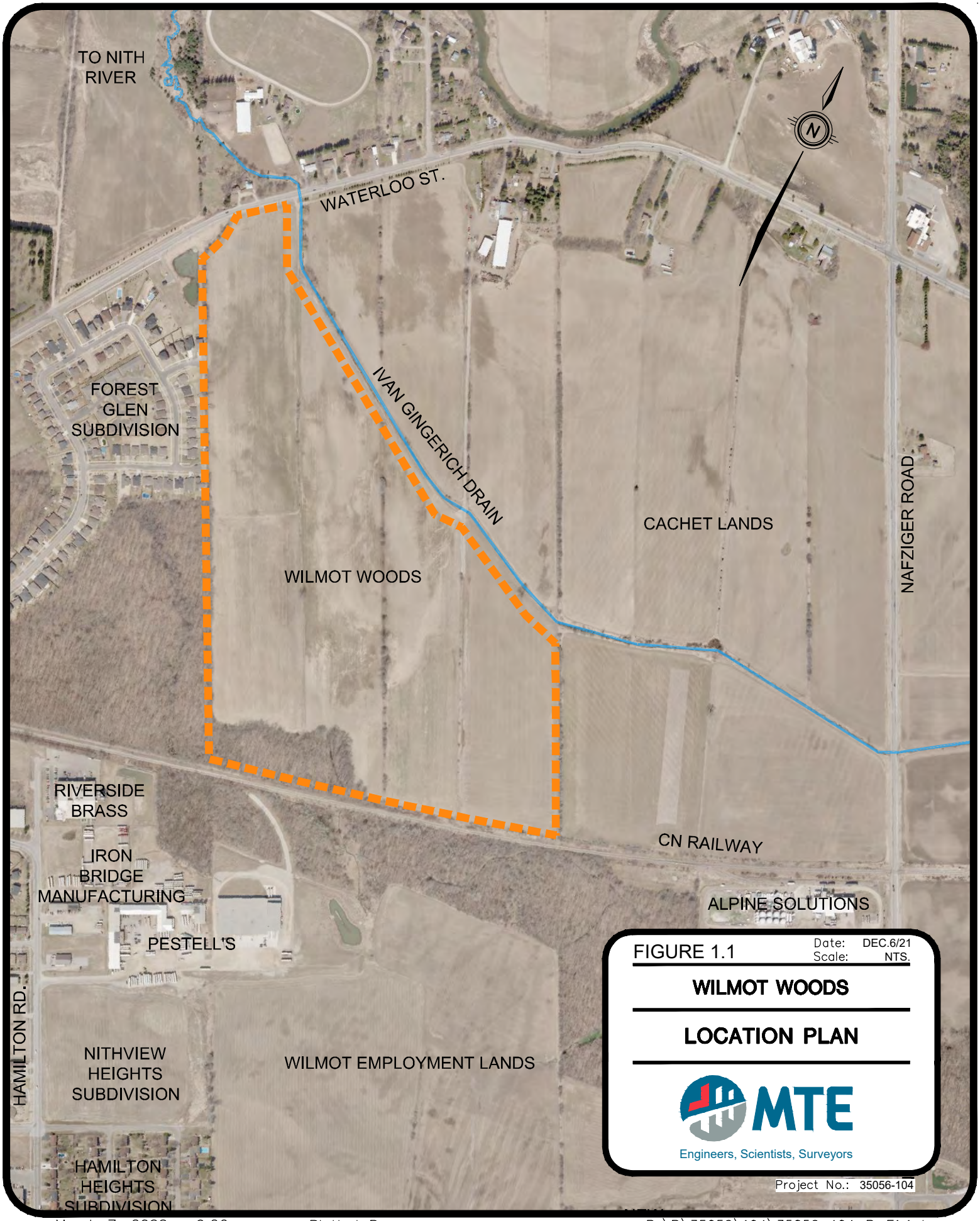


FIGURE 1.1

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Scale: NTS.

WILMOT WOODS

LOCATION PLAN

MTE
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Project No.: 35056-104

March 7, 2022 — 9:26 a.m. — Plotted By: acressman

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2.0 Existing Conditions and Background Information

2.1 Topographical Information

As previously discussed, the subject lands consist of approximately 37.19ha, of which portions of the lands are undevelopable within the IGMD floodplain. The subject lands are generally bounded by Waterloo Street to the north, agricultural lands to the east, the CN railway corridor to the south, and the Forest Glen residential subdivision to the west. The subject lands are currently under an interim agricultural use.

MTE conducted a detailed topographical survey of the subject lands in 2010. Existing topographic conditions for the subject lands are illustrated in **MTE Drawing 35056-104-EC1.1.** Under existing conditions, the subject lands are moderately sloped throughout the majority of the site (generally between 1.0% and 6.0%). Existing elevations range between 339.0m near the IGMD floodplain in the north and the wetland feature in the south, and 348.0m in the southeastern corner of the lands.

2.2 Pre-Development Conditions

The southern portion of the subject lands primarily drains to an adjacent woodlot and wetland feature along the CN railway, as illustrated in **MTE Drawing 35056-104-EC1.1**. This wetland feature has a positive draining surface outlet, through the existing 900mm diameter culvert under the CN railway, and flows south through the remainder of the wetland towards the WEL communal SWMF. Based on monitoring data and a hydrogeological study completed as part of the preliminary design of the WEL, it is understood that this wetland is maintained from surface water inputs along the CN railway corridor and from the agricultural tile drain system throughout the subject lands. The wetland is generally characterized as a surface water feature with minor groundwater inputs. Stormwater runoff flowing south from the subject lands eventually reaches the western culvert beneath Highway 7/8, south of the WEL, and confluences with the Nith River approximately 1.0km further south.

The northern portion of the subject lands drains towards the IGMD. The IGMD flows northward, through a culvert beneath Waterloo Street, eventually reaching the Nith River approximately 700m away. A summary of pre-development conditions and catchment parameters are provided in **Appendix B.**

A hydrologic model was created as part of the EMDP using the SMWHYMO modelling platform. Quantitative estimated flows were simulated for the 25mm (4-hour) and Regional (48-hour) storm events, along with the 2- to 100-year return period (12-hour SCS Type II) design storms. The EMDP used the Region's Intensity-Duration-Frequency (IDF) parameters for analysis of the 12-hour SCS Type II rainfall distribution. For consistency, the revised pre-development model created for the preliminary SWM design of the WEL used the same storm parameters listed above.

The pre-development catchments draining to the existing 900mm culvert beneath the CN railway were included in these models. This included the aforementioned southern portion of the subject lands, as well as some external lands that drain to the ditch along the rail corridor before reaching the culvert. As part of this design, these pre-development catchments were revisited based on updated topographical information of the subject lands and rail corridor, as well as a better understanding of the external drainage patterns also contributing to flow through the culvert. As such, five pre-development catchment areas were modelled to calculate existing flows to the 900mm diameter culvert.

Two additional pre-development catchments were delineated: one for a western portion of the subject lands that currently drains to the adjacent woodlot within the Forest Glen Subdivision, and a second for the aforementioned northern portion of the subject lands draining to the IGMD.

Table 2.1 below provides the target discharge rates from the updated EMDP SWM modeling for pre-development conditions to the IGMD and the existing 900mm diameter railway culvert that will need to be met by the respective SWMFs during post-development conditions. Flows to the 900mm diameter culvert are restricted by the capacity of the culvert under pre-development flow conditions.

Table 2.1 – Pre-Development Peak Runoff Rates (m^3/s)

Storm Event	IGMD (North)	900mm Culvert (South)	Draining West to Forest Glen Woodlot
25mm Storm	0.194	0.142	0.027
2-Year Storm	0.804	0.593	0.110
5-Year Storm	1.471	1.096	0.199
10-Year Storm	1.962	1.470	0.264
25-Year Storm	2.594	1.810 (1.956)*	0.347
50-Year Storm	3.108	1.810 (2.354)*	0.414
100-Year Storm	3.599	1.810 (2.734)*	0.478
Regional Storm	3.005	1.810 (2.483)*	0.346

*Flows are restricted by the capacity of the 900mm culvert @ 1.0%

LEGEND

- SITE BOUNDARY
- 323 — EXISTING CONTOURS (GENERATED BY MTE)
- 323 — EXISTING CONTOURS (PROVIDED BY REGION OF WATERLOO GIS)
- EXISTING DIRECTION OF DRAINAGE/SWALE
- IVAN GINGERICH MUNICIPAL DRAIN FLOODPLAIN
- EXISTING WETLAND
- WETLAND BUFFER
- PRE-DEVELOPMENT CATCHMENT AREA
- 112 / 7.31 — SUB-CATCHMENT NUMBER / AREA (ha.)

102 / 4.20

101 / 21.61

103 / 11.24

105 / 1.00

104 / 1.56

107 / 2.46

106 / 0.27

TO IGMD

TO CN CULVERT

TO NITH RIVER

TO IGMD

TO FOREST GLEN SUBDIVISION

TO CN CULVERT

IVAN GINGERICH DRAIN

WATERLOO STREET

INGOLD AVE

GEXR RAILWAY

EX. SWIM FACILITY

EX. 900mm CSP CULVERT

FIGURE 2.1

Date: NOV.16/21

Scale: 1:5000

PRE-DEVELOPMENT DRAINAGE AREA PLAN

MTE

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2.3 Geotechnical and Hydrogeological Information

In February 2022, Peto MacCallum Ltd. (Peto) prepared a geotechnical investigation for the subject lands. The fieldwork for the investigations on the subject lands included: 22 boreholes, 10 of which included monitoring wells, to depths ranging between 6.5m to 12.6m.

In 2021/2022, MTE carried out a Hydrogeological Assessment Report (April 2022) for the subject lands. This study conducted additional fieldwork and summarizes the hydrogeological investigations performed to date for the development study area.

Based on the results of the detailed investigations, the subsurface stratigraphy is generally described as topsoil and localized fill underlain by extensive deposits of clayey silt, locally containing cohesionless silt, sandy silt, silty sand, and sand layers. Wet and saturated conditions are generally encountered throughout the site. Based on hydrostatic groundwater level readings recorded by Peto, groundwater levels generally rise and fall with the topography. Groundwater flow is interpreted to flow northward toward Waterloo Street and south toward Wilmot Employment Lands (WEL) from the topographic high in the central region of the Subject Lands, which coincides with the subwatershed boundary. Sandy soils may act as an aquifer, but were only encountered within a few boreholes, which indicate that clayey soils dominate the subject lands. Infiltration is minor and the majority of the development portion of the subject lands are not a significant recharge area.

In March 2021, Peto provided MTE with updated water levels within monitoring wells MW101-MW110. Levels were measured from November 2020 to February 2021 and provided supplemental information to the groundwater contours established within the original 2019 hydrogeological report. More recently, MTE has been monitoring water levels within existing wells, as well as within the drilled wells installed in 2021 as part of MTE's *Hydrogeological Assessment Report*. Seasonal high groundwater contours, as shown in **MTE Drawing 35056-104-QU2.1,** have been generated for the subject lands based on collected groundwater level monitoring to date.

Refer to Peto's Geotechnical Investigation Report in **Appendix F** for more details.

2.4 GRCA Mapping

As illustrated in **Figure 2.2,** a portion of the subject lands to the north is within a significant groundwater recharge area (SGRA) as defined by the Source Water Protection Plan Mapping. The SGRA limits within the subject lands has been modified slightly to reflect the geotechnical investigation. The SGRA limit corresponds with a surficial sand layer at the north portion of the subject lands. The SGRA has a vulnerability score of 2.0 generally representing a low score of surface groundwater interaction and base flow to IGMD and the Nith River.

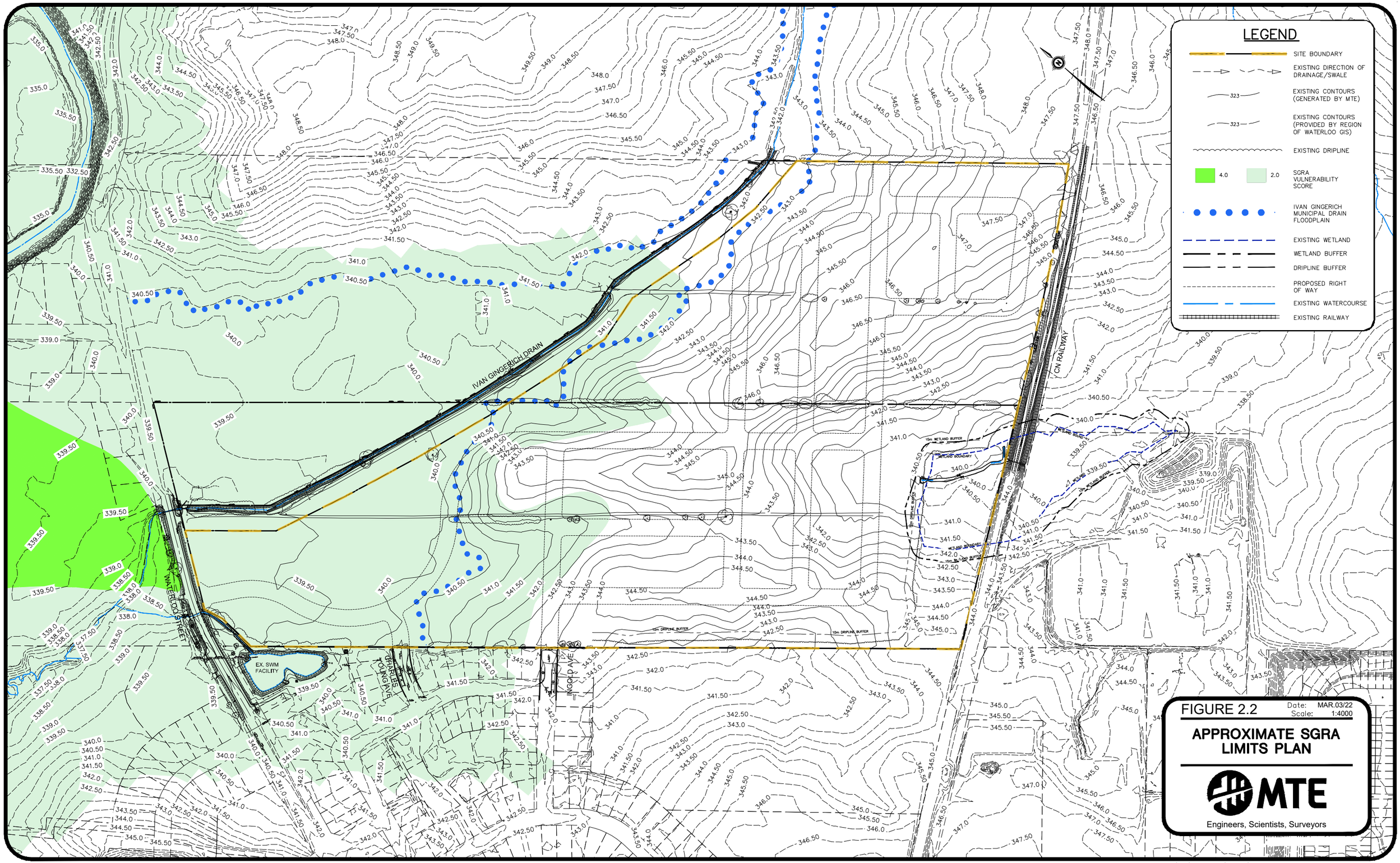


FIGURE 2.2 Date: MAR.03/22 Scale: 1:4000

APPROXIMATE SGRA LIMITS PLAN

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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:

- Stormwater Management Planning and Design Manual (MOE, 2003);
- Enhanced Master Drainage Plan – Wilmot Employment Lands (MTE, May 2012);
- City of Kitchener Stormwater Management Policies and Guidelines (2015); and,
- GRCA Policies for the Administration of Ontario Regulation 150/06 (GRCA, October 2015).

Some of the subject lands have been considered in the approved preliminary stormwater management strategy for the WEL to the south. The details have been well documented in the *Wilmot Employment Lands Industrial Subdivision - Final Stormwater Management Report* (MTE, January 12, 2022).

Based on the proposed design of the communal quantity and quality SWMF within the WEL, as well as the above policies and relevant documents, the following stormwater management criteria have been established for the subject lands:

- **Water Quality** – Provide an *Enhanced* (MOE, 2003) level of stormwater quality treatment prior to discharge to the IGMD and the Nith River to the north
- **Water Quality** - Provide a Basic (MOE, 2003) level of stormwater quality treatment prior to discharging downstream to the Wilmot Employment Lands as required by the EDMP and the Final SWM Report for WEL.
- **Water Quantity and Erosion Control** – Control peak flow rates to receiving surface water systems to existing levels up to and including the 100-year event; preserve hydraulic and hydrologic functions. Ensure positive outlet for the Regional storm event. Provide erosion control by maintaining existing flow duration characteristics.

3.1 Stormwater Management Facility 1 (SWMF1)

As previously discussed, SWM Facility 1 (SWMF1) will be utilized to treat stormwater runoff from the northern portion of the subject lands. The purpose of this facility is to control, treat, and release stormwater runoff to the IGMD at rates, volumes, and frequencies that match pre-development conditions for all storms up to and including the Regional storm event. Erosion controls will be required to appropriately attenuate the release of runoff within the receiving creek, which crosses Waterloo Street on its way to the IGMD and eventually the Nith River. Water's Edge was retained to perform an analysis (a continuous hydrologic model and erosion exceedance analysis) of the existing creek that will serve as the outlet for SWMF1. The proposed design solution should provide adequate attenuation of flows towards the IGMD such that the exceedance hours for pre-development erosion threshold flow rate are not exceeded.

3.2 Stormwater Management Facility 2 (SWMF2)

SWM Facility 2 (SWMF2) will be utilized to attenuate post-development stormwater runoff from the southern portion of the subject lands. Based on the design allocations of the WEL SWMF, quality controls will be established within the communal facility downstream of the proposed SWMF2. As such, this proposed facility will only be required to attenuate post-development flows to the pre-development rates through the existing 900mm CN culvert, as indicated in **Table 2.1**.

4.0 Proposed Development and SWM Strategy

4.1 Proposed Area Grading

The grading design of the subject lands was controlled by many factors, including:

- Road and lot grading in accordance with Township standards;
- Ensuring major storm event overland flows are directed towards the existing road right-of-ways, where applicable, and/or proposed SWMFs;
- Matching existing and proposed boundary grades around the perimeter of the property while respecting existing natural features and buffers;
- Provide required cover for services (utilizing sanitary and storm outlets);
- Maintaining a cut/fill balance for the overall development; and
- Provide groundwater separation to basement floor elevations where practical.

A finished grade contour plan illustrating site grading is enclosed (**MTE Drawing 35056-104-QU1.1**).

4.2 Post-Development Conditions

The preferred stormwater management solution for the subject lands was developed within the EMDP and further refined as part of the preliminary WEL design. The solution requires implementation of two proposed SWMFs. The strategy has been designed to meet the criteria presented in Section 3.0 of this report.

The proposed development is comprised exclusively of residential land use with some SWM blocks, park block, and related roads. Minor storm runoff from all contributing areas; split to the north and south, will be conveyed by the proposed storm sewer system to SWMF1 and SWMF2, respectively. Excess runoff from major storms will flow overland to the respective SWMFs via the proposed right-of-ways and overland flow routes.

SWMF1 is located along the western property line, between Charles Young Avenue and Ingold Avenue. It will discharge to the existing creek channel along the southern side of Waterloo Street, which crosses the street and outlets to the IGMD. The existing channel currently serves as the emergency outlet for the adjacent Forest Glen Subdivision SWMF.

Some of the catchment areas contributing flow to the IGMD will not be routed through the proposed SWMF1. The portion of the subject lands located within the IGMD floodplain will not be developed and will continue to contribute stormwater runoff to the municipal drain at existing rates. A portion of Street Two that is unable to be directed towards SWMF1, will be directed towards an OGS prior to outletting to the IGMD. Additionally, portions of the rear yards adjacent to the floodplain limit will also contribute uncontrolled flow to the municipal drain.

SWMF2 is centrally located along the south property line, to the east of the existing woodlot/wetland. It will discharge along the CN corridor to the existing 900mm diameter culvert beneath the railway. A new outlet channel will be constructed for the development of the WEL to the south which will drain to the proposed SWMF located along the north side of Highway 7/8 under post-development conditions.

Some of the catchment areas contributing flow to the existing southern culvert will not be routed through the proposed SWMF2 during post-development conditions. The existing woodlot and wetland catchment areas will remain undeveloped and continue to contribute stormwater runoff to the culvert at existing rates.

SWMF1 will utilize a forebay/wet pond design; providing quality and quantity control of runoff prior to discharge from the subject lands. The contributing area from the development portion of the subject lands draining to SWMF1 is 9.17ha.

SWMF2 will utilize a forebay/dry pond design; providing only quantity control of runoff prior to discharge from the subject lands. The contributing area from the development portion of the subject lands draining to SWMF2 is 19.43ha.

The respective post-development catchment areas to each SWMF are illustrated in **Figure 4.1**, and the post-development modelling parameters and imperviousness calculations are included in **Appendix C**.

Descriptions of the drainage catchments and their respective drainage patterns are listed below:

4.2.1 Draining North to the IGMD

Catchment 201
Catchment 201 consists of the northern portion of the subject lands that is proposed to drain to SWMF1 via Ingold Avenue. The drainage area contains residential blocks and right-of-ways, for a total area of 6.99ha.

Catchment 202
Catchment 202 consists of a portion of Street Two that bypasses the SWMF1 forebay and drains directly to the wetpond cell. The drainage area is 0.71ha.

Catchment 203
Catchment 203 consists of SWMF1 and any adjacent rear yards and grassed areas directed towards it. The drainage area is 1.47ha.

Total Area to SWMF1 = 9.17ha

Catchment 204
Catchment 204 consists of the park block and adjacent rear yards directly draining to the IGMD. The drainage area is 1.38ha.

Catchment 205
Catchment 205 consists of the remaining portion of Street Two that cannot be managed and attenuated by SWMF1. This area will be directed to an OGS unit before being directed overland to the IGMD. The drainage area is 0.59ha.

Catchments 206 to 208
Catchments 206 to 208 consist of the open space blocks within the subject lands directly flowing overland to the IGMD. The drainage areas total 6.03ha.

Total Area to IGMD = 17.17ha

4.2.2 Draining South to the CN Culvert

Catchment 209
Catchment 209 consists of the southern portion of the subject lands that is proposed to drain to SWMF2 via the Service Corridor block. The drainage area contains residential blocks, trail blocks and right-of-ways, for a total area of 13.14ha.

Catchment 210
Catchment 210 consists of the adjacent Cachet lands proposed to drain through the subject lands to SWMF2. The drainage area is 4.17ha.

Catchment 211
Catchment 211 consists of SWMF2 and any adjacent rear yards and grassed areas directed towards it. The drainage area is 2.12ha.

Total Area to SWMF2 = 19.43ha

Catchment 212 to 214
Catchments 212 to 214 consists of the existing woodlot and wetland within the southern portion of the subject lands, as well as the remaining existing portion of the CN corridor, and drains directly to the existing culvert.

Total Area to CN Culvert = 23.47ha

LEGEND

- SITE BOUNDARY
- 323 — PROPOSED CONTOURS
- 323 — EXISTING CONTOURS
- PROPOSED DIRECTION OF DRAINAGE/SWALE
- IVAN GINGERICH MUNICIPAL DRAIN FLOODPLAIN
- EXISTING WETLAND
- WETLAND BUFFER
- PROPOSED DEVELOPMENT CATCHMENT AREA
- 210 / 7.31 — SUB-CATCHMENT NUMBER / AREA (ha.)

201 — 6.99
202 — 0.71
203 — 1.47
204 — 1.38
205 — 0.59
206 — 1.85
207 — 0.85
208 — 3.33
209 — 13.14
210 — 4.17
211 — 2.12
212 — 2.77
213 — 1.00
214 — 0.27
215 — 1.70

IVAN GINGERICH DRAIN

TO IGMD

TO CN CULVERT

TO NITH RIVER

TO IGMD

TO FOREST GLEN SUBDIVISION

TO CN CULVERT

EX. 900mm CSP CULVERT

GEXR RAILWAY

WATERLOO STREET

INGOLD AVE

CHARLES INGOLD AVE

EX. SWM FACILITY

FIGURE 4.1

Date: NOV.16/21
Scale: 1:5000

POST DEVELOPMENT DRAINAGE AREA PLAN

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Project No.: 35056-104

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5.0 Stormwater Management Design

5.1 Hydrologic Modelling

As previously noted, as part of the EMDP study, a hydrologic model was prepared using the SWMHYMO modelling platform. This model was then updated for the design of the WEL to reflect the proposed conditions and stormwater management strategies approved for the surrounding lands. This updated hydrologic model was further refined as part of this study, wherein both existing and proposed conditions models were completed using SWMHYMO. The existing and 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 (12-hour SCS Type II Storm); and,
- Regional storm event (48-hour, 285mm depth - Hurricane Hazel).

The IDF parameters and the hydrologic parameters for the pre and post-development conditions are included in **Appendices B and C**. The pre-development modelling is included in **Appendix B**; whereas the post-development modelling is included in **Appendix C**.

5.2 Stormwater Management Facility 1 (SWMF1)

5.2.1 Stormwater Quality Control

The proposed SWMF1 has been designed as a wetpond with a permanent pool depth of 1.5m. The facility incorporates a sediment forebay with a depth of 1.5m, which offers benefits of dilution and settling of sediment. A planting scheme will be prepared that carefully selects plant species and their location in and around the basins to stabilize banks, mitigate temperature increases, deter waterfowl from nesting within the area, and provide aesthetics and safety benefits.

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

This being the case, 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 0.0003m/s (from MOE 2003) results in extremely large and unachievable forebay lengths. Therefore, the forebay is designed to satisfy the following four conditions:

- Settling length based on a settling velocity of 0.0003m/s using the main pond peak discharge rate for the 25mm storm event (as per MOE 2003);
- Settling length based on a settling velocity of 0.0055m/s using the forebay inflow/outflow for the 5-year storm event;
- Dispersion length such that, based on the flow and depth of water, the velocity through the forebay is less than 0.5m/s; and,
- Velocity based on flow divided by the cross-sectional area is less than 0.15m/s to prevent scouring.

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

As described in Section 4.2, the facility will provide quality and quantity controls for the majority of the northern portion of the subject lands. The total drainage area to the proposed facility is 9.17ha at 66.4% imperviousness. According to Table 3.2 from the MECP's 2003 Stormwater Management Guidelines, an *Enhanced* level of protection requires 216.6m^3/ha of storage, 40m^3/ha of which is extended detention, and the remainder of which is the permanent pool. The required permanent pool and extended detention volumes for SWMF1 are therefore 1,620m^3 and 367m^3 respectively.

The proposed forebay will accept minor storm event flows via a splitter structure designed to split off flows in excess of the 25mm quality event. The large flows will be directed into the main pond, avoiding potential resuspension or washout of the forebay.

The forebay has a permanent pool volume of 1,137m^3; which, combined with 3,923m^3 of permanent pool within the wet pond, makes for a total permanent pool volume of 5,060m^3. Providing a minimum 24-hour extended detention drawdown for the 367m^3 of storage requires a 75mm diameter orifice to be implemented.

The proposed SWMF1 design characteristics are summarized in **Table 5.1** below. Refer to **Appendix D** for the relevant design sheets and calculations (catchment parameters, imperviousness calculations, stage-storage discharge relationships, drawdown calculations, forebay sizing calculations, control manhole sizing, etc.). Refer to **Figures 5.1 to 5.4** for details of the proposed SWMF1.

5.2.2 Stormwater Quantity Control

As previously discussed, flows for all storm events will be conveyed to the proposed SWMF by a combination of storm sewers and overland flow routes (road right-of-ways). The post-development SWMHYMO design storm event modelling output is included in **Appendix D**.

Discharge from the facility will be controlled via a 2400mm multi-stage control manhole outlet, which includes: a 75mm orifice plate at permanent pool elevation of 339.50m, a 250mm orifice plate at 339.70m, a 0.7m cutout weir at 340.00m and a 1.7m overflow weir at 341.00m. This structure will control peak design flows for all storm durations to suit the targets set by the pre-development conditions. The constructed wetpond portion of the proposed facility has sufficient storage to hold the Regional storm event to an elevation of 340.80m. The facility has a total active storage capacity of 15,855m^3 up to an elevation of 342.00m. A summary of the preliminary stage-storage-discharge relationship for the proposed SWMF is listed in **Table 5.2** below.

The SWMF outlets into an engineered grassed swale within the open space block adjacent to Street Two. This swale conveys the flows downstream towards the existing outlet swale which discharges to the culvert under Waterloo Street, and ultimately to the IGMD.

Table 5.1 – SWMF1 Design Characteristics

General	Facility Characteristics
Stormwater Management Facility Type	Wet Pond
Required MECP Water Quality Protection	Level 1 (Enhanced)
Total Contributing Area	9.17ha
Imperviousness	66.4%
Bottom Elevation (of main facility)	338.00m
Storage	
Unit Area Storage Volume Requirements as per SWMMP (MOE, 2003)	216.6m^3/ha
Required Total Volume	1,987m^3
Permanent Pool	
Required Permanent Pool Volume	1,620m^3
Permanent Pool Volume Provided	5,060m^3
Permanent Pool Elevation	339.50m
Extended Detention	
Minimum Required Volume (40m^3/ha)	367m^3
Approximate Drawdown Time (40m^3/ha)	43.0hr
Extended Detention Elevation (40m^3/ha)	339.58m
Peak Release Rate for Extended Detention (40m^3/ha)	0.0025m^3/s
Forebay	
Required Forebay Length	13.7m
Actual Forebay Length	40.0m
Permanent Pool Elevation	339.50m
Bottom Elevation	338.00m
Outlet Controls	
Orifice 1 Diameter (Extended Detention)	75mm
Orifice 1 Elevation (Extended Detention)	339.50m
Orifice 2 Diameter (25mm-4hr)	250mm
Orifice 2 Elevation (25mm-4hr)	339.70m
Cutout Weir Width (2yr to Regional)	0.7m
Cutout Weir Elevation (2yr to Regional)	340.00m

Table 5.2 – SWMF1 Stage-Storage-Discharge Summary

Elevation (m)	Discharge (m^3/s)	Volume (m^3)	Remarks
339.50	0.000	0	Permanent Pool Elevation, 75mm Orifice
339.70	0.005	944	200mm Orifice
340.00	0.066	2500	0.7m Weir
340.30	0.275	4216	Contour
340.60	0.614	6032	Contour
341.00	1.197	8602	1.7m Weir
341.70	3.967	13533	Contour
342.00	5.655	15855	Top of Berm

A summary of the peak flows and the associated maximum water levels from the SWMF under post-development conditions are summarized in **Table 5.3** below. Enough volume has been provided to store the Regional storm event to a maximum elevation of 340.80m, or 1.3m above the permanent pool level. Refer to **Appendix D** for detailed SWMHYMO output of the post-development model.

Table 5.3 – SWMF1 Proposed Event Modelling Output

Storm Event	Peak Inflow (m^3/s)	Peak Outflow (m^3/s)	Maximum Ponding Volume (m^3)	Maximum Ponding Elevation (m)
25mm 4hr Storm	1.034	0.022	1388	339.79
2-Year Storm	0.784	0.061	2370	339.98
5-Year Storm	1.137	0.147	3163	340.12
10-Year Storm	1.390	0.214	3715	340.22
25-Year Storm	1.710	0.309	4399	340.34
50-Year Storm	1.967	0.402	4900	340.42
100-Year Storm	2.212	0.489	5363	340.50
Regional Storm	1.300	0.897	7282	340.82

The pre and post-development peak flows, which outlet into the IGMD, are summarized in **Table 5.4**.

Table 5.4 – SWMF1 Pre and Post-Development Peak Runoff Rates

Storm Event	Pre-Development (m^3/s)	Post-Development (m^3/s)	
		Pond Outflow	Total to IGMD
25mm 4hr Storm	0.194	0.022	0.086
2-Year Storm	0.804	0.061	0.282
5-Year Storm	1.471	0.147	0.533
10-Year Storm	1.962	0.214	0.755
25-Year Storm	2.594	0.309	1.040
50-Year Storm	3.108	0.402	1.268
100-Year Storm	3.599	0.489	1.518
Regional Storm	3.005	0.897	1.841

LEGEND

- PROPERTY BOUNDARY
- 338.5 — EXISTING CONTOURS
- 339.5 — FINISHED GRADE CONTOURS
- (336.00)EX × — EXISTING SPOT ELEVATIONS
- (336.00) × — PROPOSED SPOT ELEVATIONS
- GABION MAT
- MAJOR OVERLAND FLOW ROUTE
- MAINTENANCE ACCESS
- DIRECTION OF DRAINAGE

STREET TWO

STREET THREE

STREET ONE

INGOLD AVENUE

40.0m–375mmø STM. @ 1.00%

32.0m–375mmø STM. @ 1.00%

12.0m–375mmø STM. @ 1.00%

11.0m–375mmø STM. @ 1.00%

35.6m–750mmø STM. @ 0.40%

15.0m–900mmø STM. @ 0.40%

65.0m–900mmø STM. @ 0.40%

19.0m–525mmø STM. @ 0.50%

19.0m–900mmø STM. @ 0.40%

90.0m–450mmø STM. @ 1.10%

60.5m–375mmø STM. @ 1.70%

19.0m–450mmø STM. @ 0.50%

51.0m–1050mmø STM. @ 0.25%

19.0m–1050mmø STM. @ 0.25%

32.5m–1050mmø STM. @ 0.25%

MH61 MH56 MH46 MH48 MH44 MH50 MH43 MH40 MH41

OGS202

HW203 INV.=339.60

HW206 INV.=339.25

HW201 INV.=339.60

HW201A

4.5m MAINTENANCE TRAIL

WETPOND ACCESS

10m FOREBAY WEIR

WET CELL

FOREBAY

SWM FACILITY 1.02ha

CONTROL MH205 (SEE FIGURE 5.4)

OUTLET SWALE TO IVAN GINGERICH DRAIN

N39°04'07"E 291.95m

N39°24'40"E

FIGURE 5.1 Date: NOV.16/21 Scale: 1:750

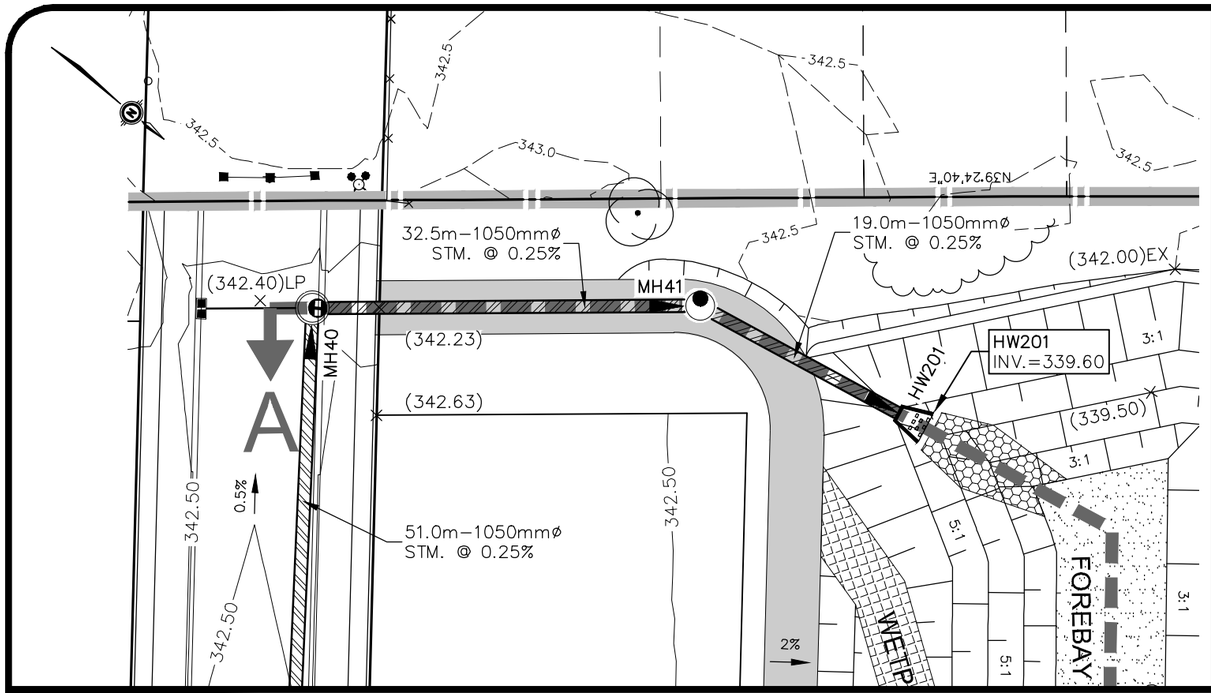
NORTH SWM FACILITY LOCATION PLAN

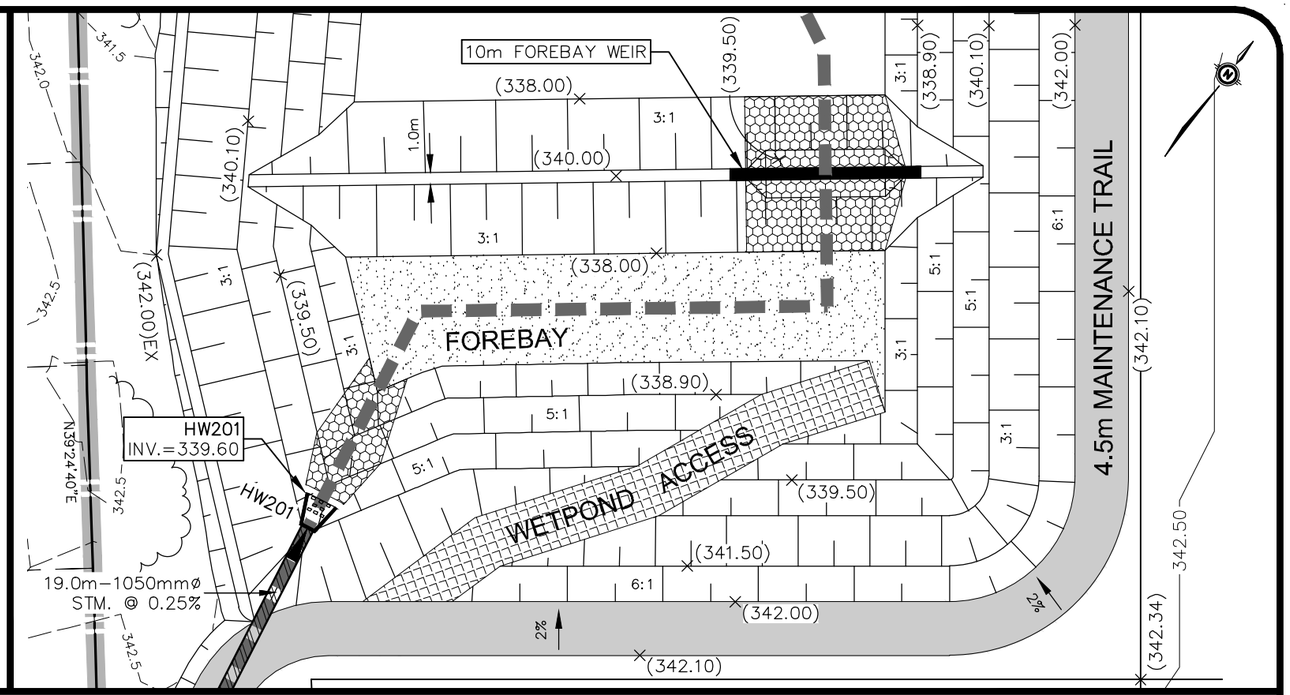
MTE Engineers, Scientists, Surveyors

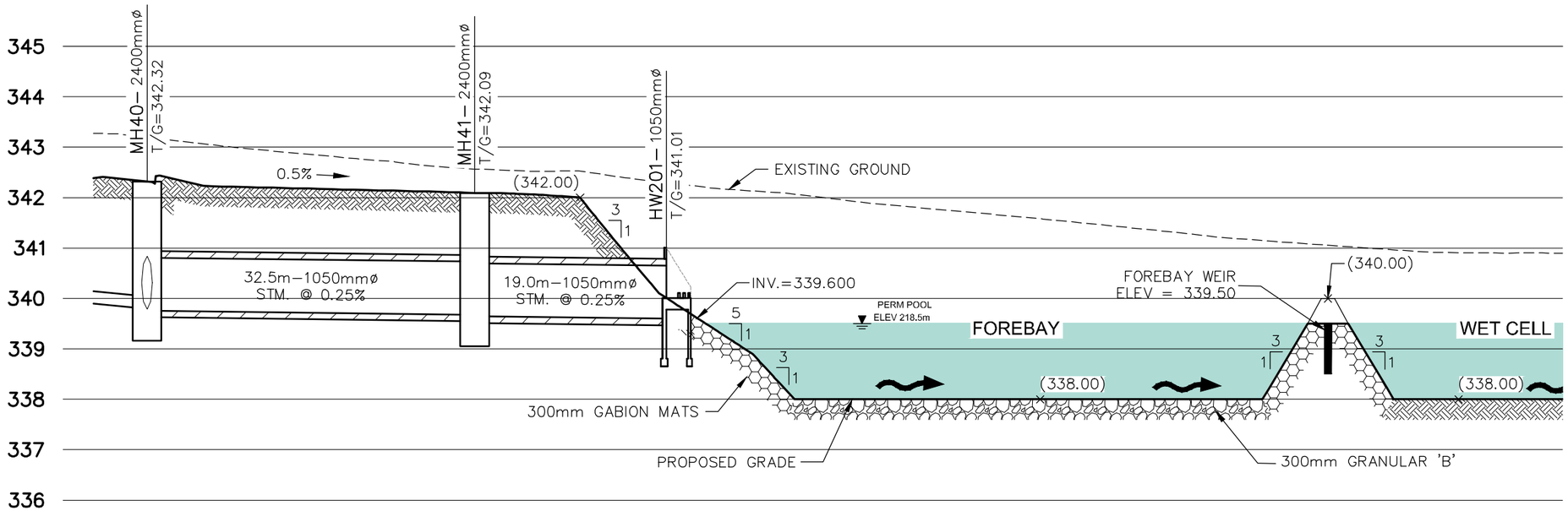
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MAXIMUM PONDING LEVELS	
PERMANENT POOL	339.50
MOE EXT DET	339.58
25mm STORM	339.79
2YR STORM	339.98
5YR STORM	340.12
10YR STORM	340.22
25YR STORM	340.34
50YR STORM	340.42
100YR STORM	340.50
REGIONAL STORM	340.80

FIGURE 5.2 Date: NOV.16/21
Scale: H-1:500 V-1:100

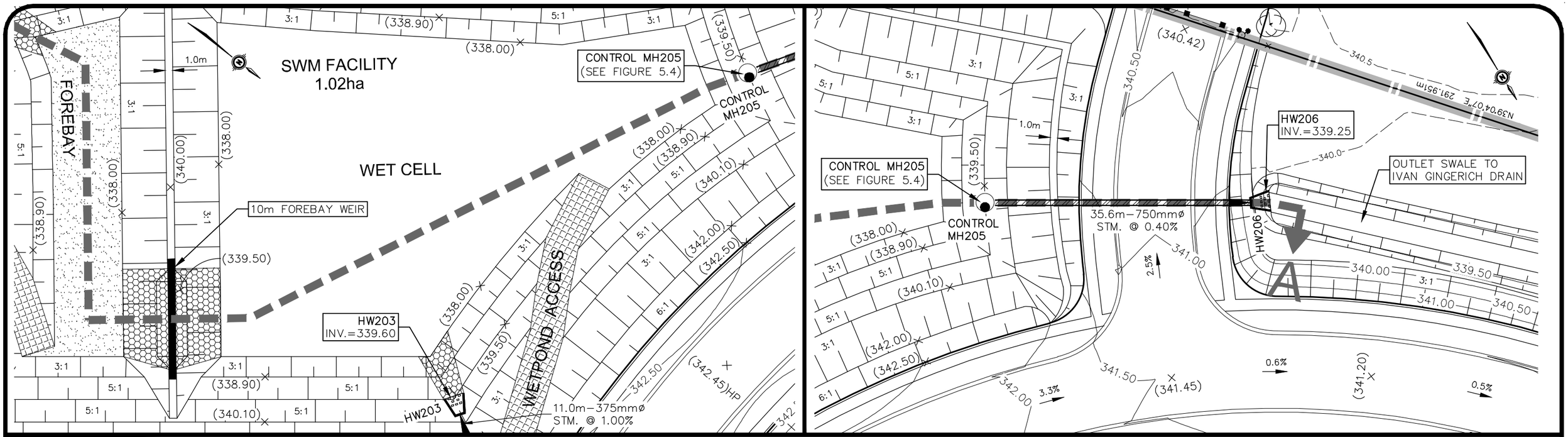
NORTH SWM PLAN & PROFILE SECTION A-A

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Project No.: 35056-104

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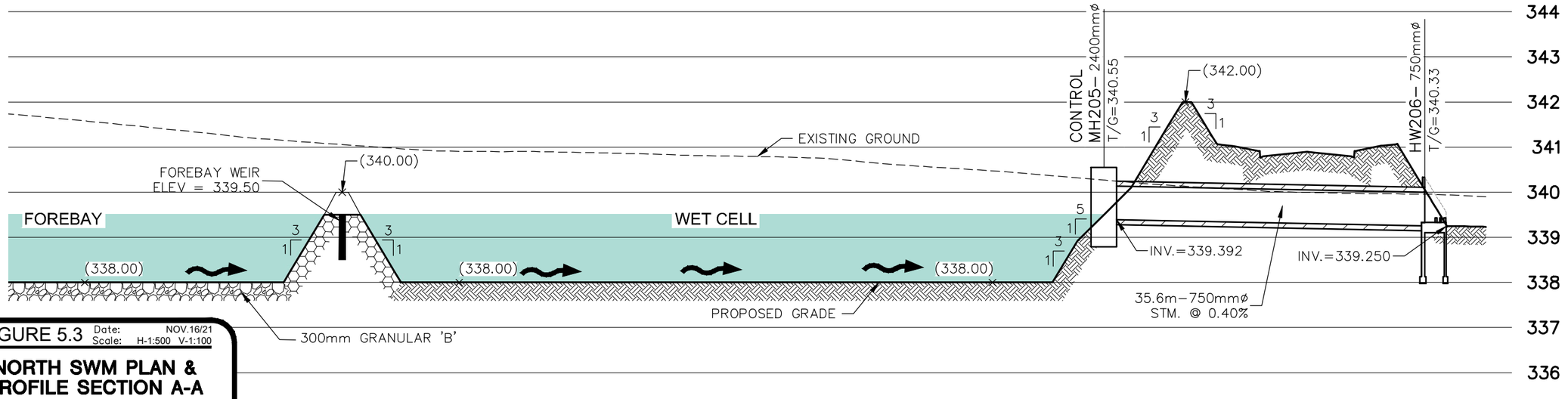


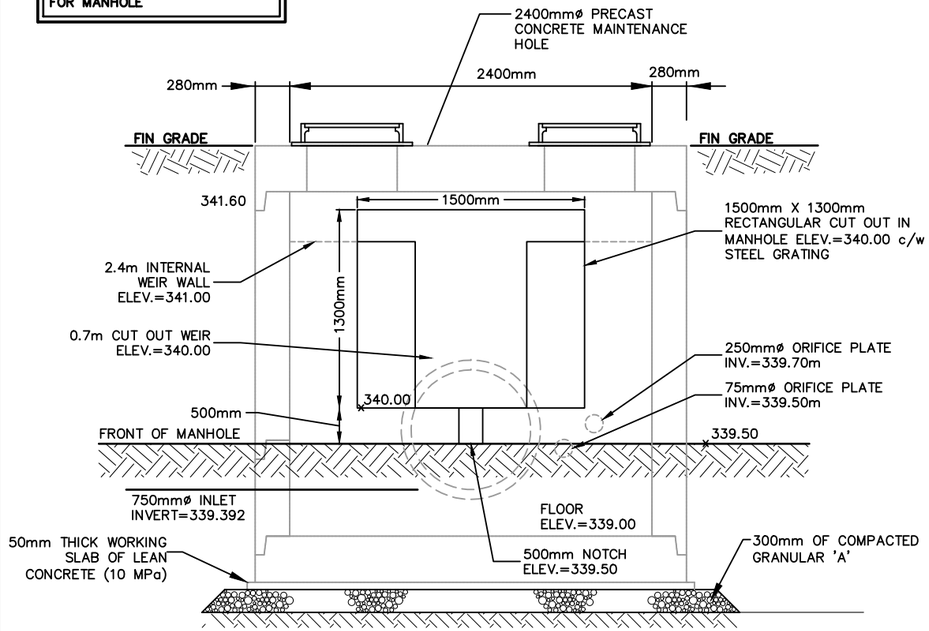
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NORTH SWM PLAN & PROFILE SECTION A-A

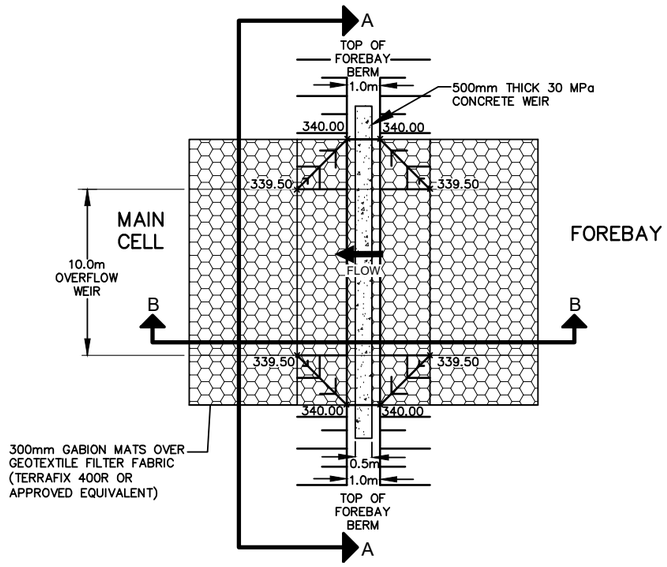
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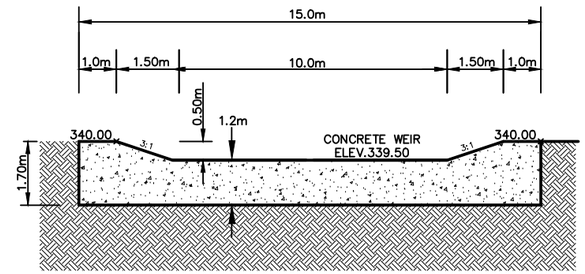
NOTE: CONTRACTOR TO PROVIDE STAMPED SHOP DRAWINGS FOR REVIEW PRIOR TO CONSTRUCTION FOR MANHOLE



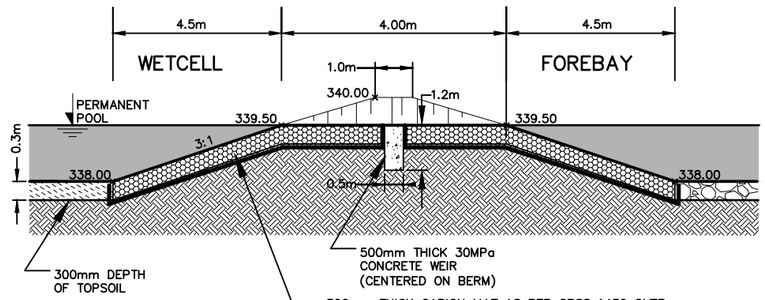
SECTION A–A



PLAN VIEW
N.T.S.



SECTION A–A



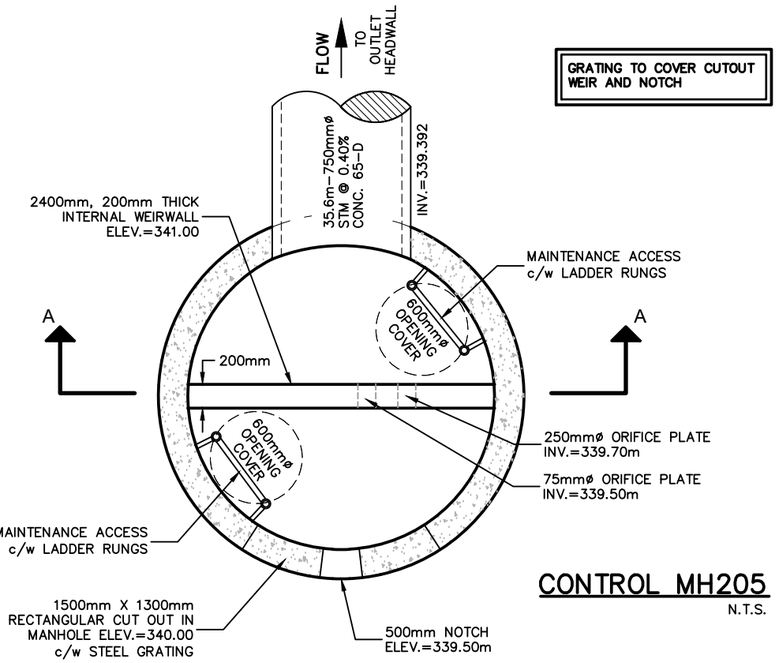
SECTION B–B

CONTRACTOR TO PROVIDE STAMPED SHOP DRAWINGS c/w REINFORCING DETAILS FOR CONCRETE WEIR

CONCRETE OVERFLOW WEIR

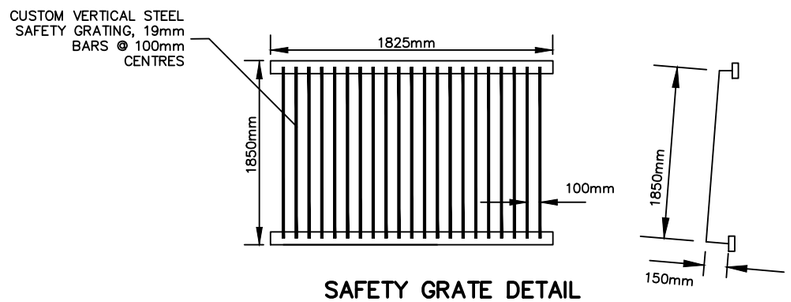
N.T.S.

GRATING TO COVER CUTOUT WEIR AND NOTCH



CONTROL MH205

N.T.S.



SAFETY GRATE DETAIL

FIGURE 5.4 Date: NOV.16/21 Scale: N.T.S.

NORTH SWM FACILITY DETAILS

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Project No.: 35056-104

February 11, 2022 10:15 a.m. Plotted By: acressman

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5.3 Stormwater Management Facility 2 (SWMF2)

5.3.1 Stormwater Quality Control

As previously mentioned, the proposed communal SWMF within the WEL has been designed to accept and treat the stormwater runoff from the southern portion of the subject lands. An *Enhanced* level of quality control will be provided within this SWMF, so the proposed SWMF2 shall only be constructed to provide *Basic* quality control prior to release into the adjacent wetland, and quantity attenuation of the post-development conditions.

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

This being the case, 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 0.0003m/s (from MOE 2003) results in extremely large and unachievable forebay lengths. Therefore, the forebay is designed to satisfy the following four conditions:

- Settling length based on a settling velocity of 0.0003m/s using the main pond peak discharge rate for the 25mm storm event (as per MOE 2003);
- Settling length based on a settling velocity of 0.0055m/s using the forebay inflow/outflow for the 5-year storm event;
- Dispersion length such that, based on the flow and depth of water, the velocity through the forebay is less than 0.5m/s; and,
- Velocity based on flow divided by the cross-sectional area is less than 0.15m/s to prevent scouring.

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

As described in Section 4.2, the facility will provide quality and quantity controls for the majority of the southern portion of the subject lands. The total drainage area to the proposed facility is 19.43ha at 50.3% imperviousness. According to Table 3.2 from the MECP's 2003 Stormwater Management Guidelines, a *Basic* level of protection requires 135.8m^3/ha of storage, 40m^3/ha of which is extended detention, and the remainder of which is the permanent pool. The required permanent pool and extended detention volumes for SWMF1 are therefore 1,862m^3 and 777m^3, respectively.

The proposed forebay will accept minor storm event flows via a splitter structure designed to split off flows in excess of the 25mm quality event. The large flows will be directed into the main pond, avoiding potential resuspension or washout of the forebay.

The proposed SWMF2 design characteristics are summarized in **Table 5.1** below. Refer to **Appendix D** for the relevant design sheets and calculations (catchment parameters, imperviousness calculations, stage-storage discharge relationships, drawdown calculations, forebay sizing calculations, control manhole sizing, etc.). Refer to **Figures 5.5 to 5.8** for details of the proposed SWMF.

Table 5.5 – SWMF2 Design Characteristics

General	Facility Characteristics
Stormwater Management Facility Type	Dry Pond
Required MECP Water Quality Protection	Level 3 (Basic)
Total Contributing Area	19.43ha
Imperviousness	50.3%
Bottom Elevation (of main facility)	340.50m
Storage	
Unit Area Storage Volume Requirements as per SWMMP (MOE, 2003)	135.8m^3/ha
Required Total Volume	2,639m^3
Extended Detention	
Minimum Required Volume (40m^3/ha)	777m^3
Approximate Drawdown Time (40m^3/ha)	24.2hr
Extended Detention Elevation (40m^3/ha)	339.62m
Peak Release Rate for Extended Detention (40m^3/ha)	0.0038m^3/s
Forebay	
Required Forebay Length	53.4m
Actual Forebay Length	55.0m
Permanent Pool Elevation	340.30m
Bottom Elevation	340.90m
Outlet Controls	
Orifice 1 Diameter (Extended Detention)	90mm
Orifice 1 Elevation (Extended Detention)	340.50m
Orifice 2 Diameter (25mm-4hr)	300mm
Orifice 2 Elevation (25mm-4hr)	341.10m
DDICB T/G Elevation	341.50m

5.3.2 Stormwater Quantity Control

The proposed SWMF2 has been designed as a forebay/dry pond with a maximum depth of 2.5m (not including micropools).

As described in Section 4.2, the facility will provide quantity controls for the majority of the southern portion of the subject lands. The total drainage area to the proposed facility is 19.50ha at 50.3% imperviousness.

The proposed facility will accept all storm event flows and provide enough volume to detain and attenuate the Regional storm event. These flows will be conveyed to the proposed SWMF by a combination of storm sewers and overland flow routes (road right-of-ways). The post-development SWMHYMO design storm event modelling output is included in **Appendix D**.

The proposed forebay will accept minor storm event flows via a splitter structure designed to split off flows in excess of the 25mm quality event. The large flows will be directed into the main pond, avoiding potential resuspension or washout of the forebay.

Discharge from the facility will be controlled via a typical CSP manhole and double ditch inlet catchbasin. These structures will control peak design flows for all storm durations to suit the targets set by the pre-development conditions. The constructed dry pond has sufficient storage to hold the Regional storm event to an elevation of 342.17m. The facility has a total active storage capacity of 19,062m^3 up to an elevation of 343.00m. A summary of the preliminary stage-storage-discharge relationship for the proposed SWMF is listed in **Table 5.6** below.

Refer to **Appendix D** for the relevant design sheets and calculations (catchment parameters, imperviousness calculations, stage-storage discharge relationships, drawdown calculations, etc.). Refer to **Figures 5.5 to 5.8** for details of the proposed SWMF.

Table 5.6 – SWMF2 Stage-Storage-Discharge Summary

Elevation (m)	Discharge (m^3/s)	Volume (m^3)	Remarks
340.30	0	0	Bottom of Forebay
340.50	0	0	Bottom of Dry Pond, CSP Vertical Invert
340.80	0.009	1613	Contour
341.10	0.013	3308	CSP Horizontal Invert
341.50	0.142	5954	DDICB
342.00	1.309	9731	Contour
342.70	5.995	15929	Emergency Overflow
343.00	11.015	19062	Top of Berm

As summary of the peak flows and the associated maximum water levels from the SWMF under post-development conditions are summarized in **Table 5.7** below. Enough volume has been provided to store the Regional storm event to a maximum elevation of 342.17m, or to a depth of 1.67m. Refer to **Appendix D** for detailed SWMHYMO output of the post-development model.

Table 5.7 – SWMF2 Proposed Event Modelling Output

Storm Event	Peak Inflow (m^3/s)	Peak Outflow (m^3/s)	Maximum Ponding Volume (m^3)	Maximum Ponding Elevation (m)
25mm Storm	1.624	0.011	2512	340.97
2-Year Storm	1.340	0.070	4832	341.34
5-Year Storm	2.004	0.201	6292	341.55
10-Year Storm	2.490	0.365	7240	341.68
25-Year Storm	3.107	0.672	8313	341.82
50-Year Storm	3.607	0.979	9123	341.92
100-Year Storm	4.085	1.338	9696	342.00
Regional Storm	2.713	2.334	11128	342.17

The pre and post-development peak flows, which outlet to the existing 900mm diameter culvert beneath the CN railway, are summarized in **Table 5.8**.

Table 5.8 – SWMF2 Pre and Post-Development Peak Runoff Rates

Storm Event	Pre-Development (m^3/s)	Post-Development (m^3/s)	
		Pond Outflow	Total to Culvert
25mm Storm	0.142	0.011	0.030
2-Year Storm	0.593	0.070	0.108
5-Year Storm	1.096	0.201	0.254
10-Year Storm	1.470	0.365	0.448
25-Year Storm	1.956 (1.810)*	0.672	0.819
50-Year Storm	2.354 (1.810)*	0.979	1.172
100-Year Storm	2.734 (1.810)*	1.338	1.611
Regional Storm	2.483 (1.810)*	2.334	2.837

*Flows are restricted by the capacity of the 900mm culvert @ 1.0%

LEGEND

- PROPERTY BOUNDARY
- 338.5 — EXISTING CONTOURS
- 339.5 — FINISHED GRADE CONTOURS
- (336.00)EX × — EXISTING SPOT ELEVATIONS
- (336.00) × — PROPOSED SPOT ELEVATIONS
- GABION MAT
- MAJOR OVERLAND FLOW ROUTE
- MAINTENANCE ACCESS
- DIRECTION OF DRAINAGE

STREET NINE

STREET EIGHT

STREET TWO

CN RAILWAY

3.0m MULTI-USE TRAIL

4.5m MAINTENANCE TRAIL

5m FOREBAY WEIR

MICROPOOL

FOREBAY

SWM FACILITY
1.43ha

WETPOND ACCESS

15m WETLAND BUFFER

WETLAND BOUNDARY

CSP MH102
(SEE FIGURE 5.8)

HW201
INV.=341.75

HW101.1
INV.=341.00

HW101.2
INV.=340.83

DDICB103
T/G=341.50
(3:1 GRATE)

OUTLET TO SURFACE
TOWARDS CULVERT
INV.=340.200

EX. 900mm
CSP CULVERT
INV.=339.503

MH71 MH72 MH74 MH75 MH77 MH78 MH37 MH201 MH33 MH34 SPMH29 MH70 MH66 MH28 MH68

(344.82) 20.0m–675mmø STM. @ 0.35% 12.5m–600mmø STM. @ 0.50% 20.0m–450mmø STM. @ 0.50% 22.0m–525mmø STM. @ 0.40% 56.5m–525mmø STM. @ 0.40% (345.54) 16.3m–450mmø STM. @ 0.60%

57.0m–675mmø STM. @ 0.35%

74.0m–825mmø STM. @ 0.35%

71.0m–900mmø STM. @ 0.35%

81.0m–450mmø STM. @ 1.40%

12.5m–450mmø STM. @ 1.40%

8.3m–525mmø STM. @ 1.00%

13.0m–450mmø STM. @ 0.50%

23.0m–600mmø STM. @ 0.50%

8.0m–1050mmø STM. @ 0.40%

52.0m–1050mmø STM. @ 0.40%

35.0m–1050mmø STM. @ 0.60%

16.5m–600mmø STM. @ 0.40%

14.5m–900mmø STM. @ 0.35%

23.0m–900mmø STM. @ 0.60%

62.0m–900mmø STM. @ 0.30%

23.5m–900mmø STM. @ 0.35%

55.0m–600mmø STM. @ 0.40%

FIGURE 5.5 Date: NOV.16/21 Scale: 1:750

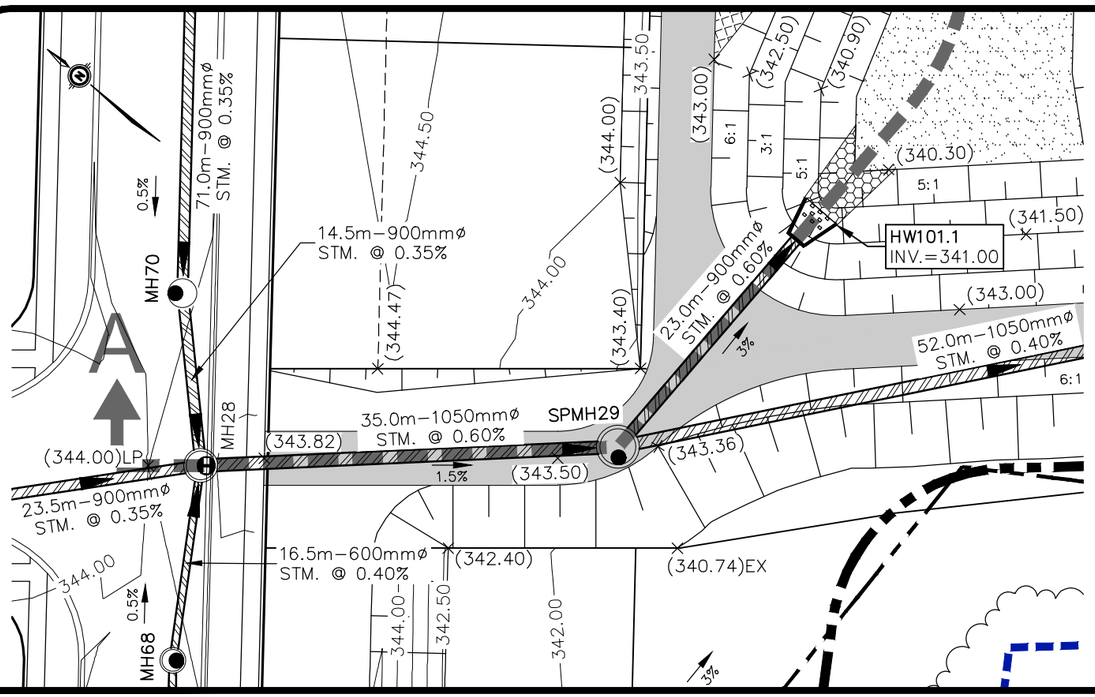
SOUTH SWM FACILITY LOCATION PLAN

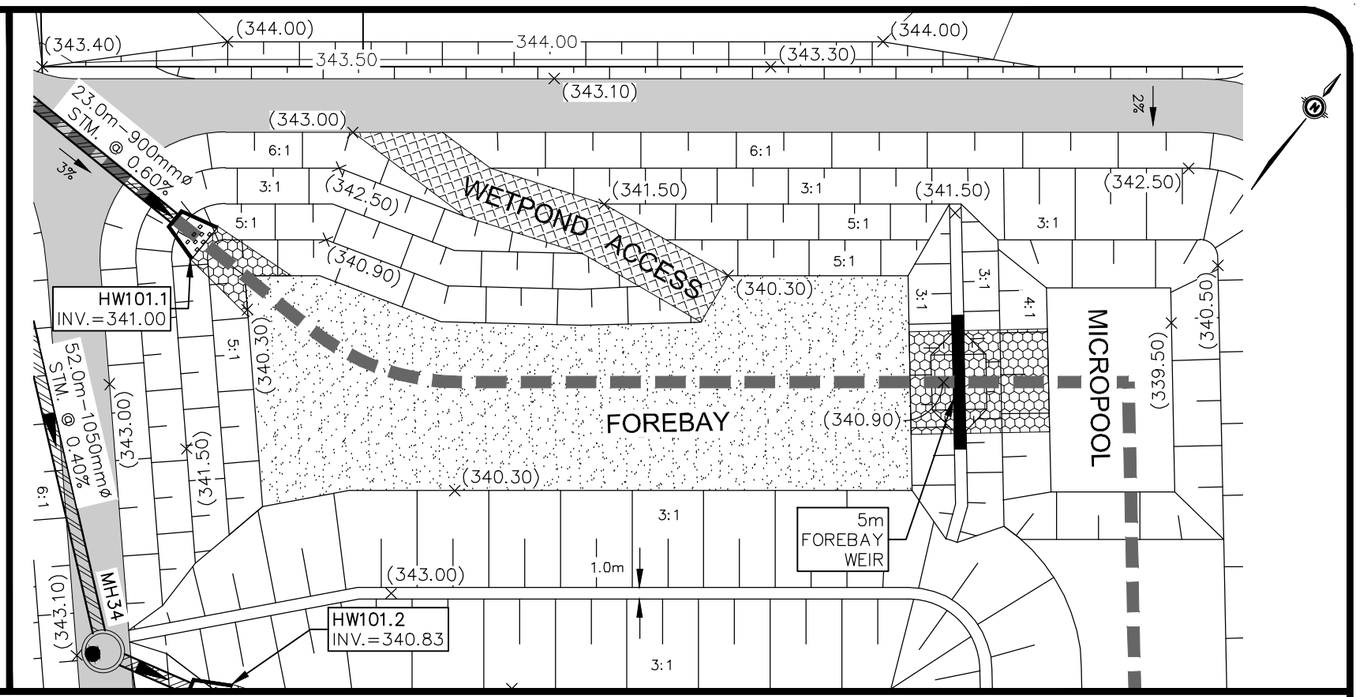
MTE Engineers, Scientists, Surveyors

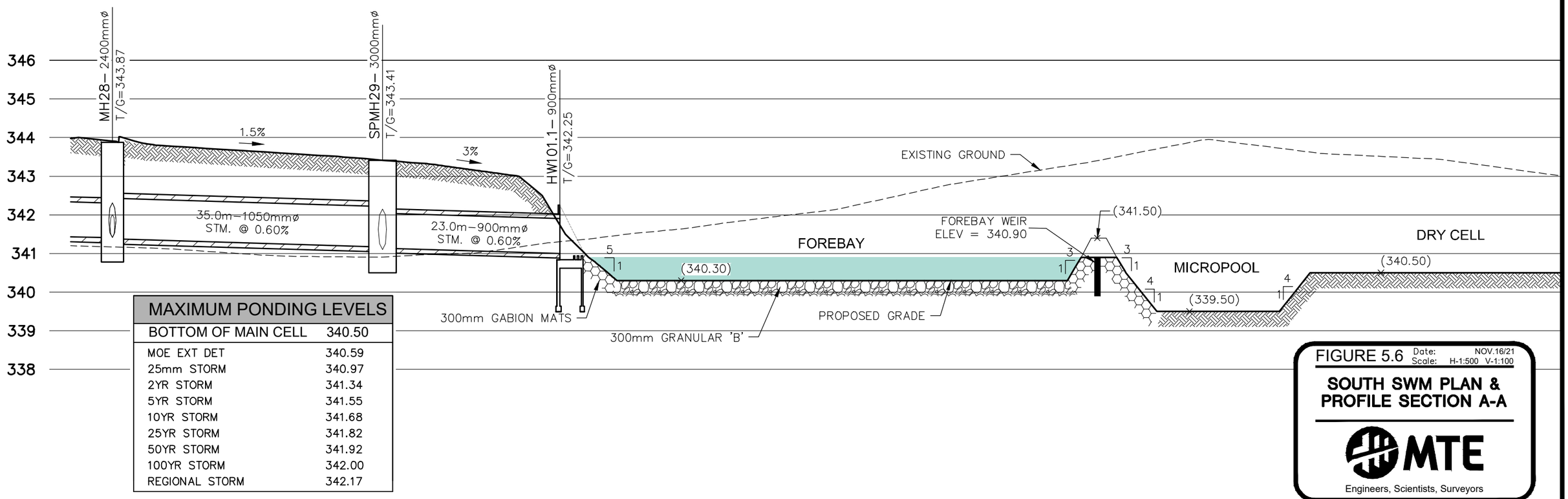
Project No.: 35056-104

March 7, 2022 9:34 a.m. Plotted By: acressman

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MAXIMUM PONDING LEVELS	
BOTTOM OF MAIN CELL	340.50
MOE EXT DET	340.59
25mm STORM	340.97
2YR STORM	341.34
5YR STORM	341.55
10YR STORM	341.68
25YR STORM	341.82
50YR STORM	341.92
100YR STORM	342.00
REGIONAL STORM	342.17

FIGURE 5.6 Date: NOV.16/21
Scale: H-1:500 V-1:100

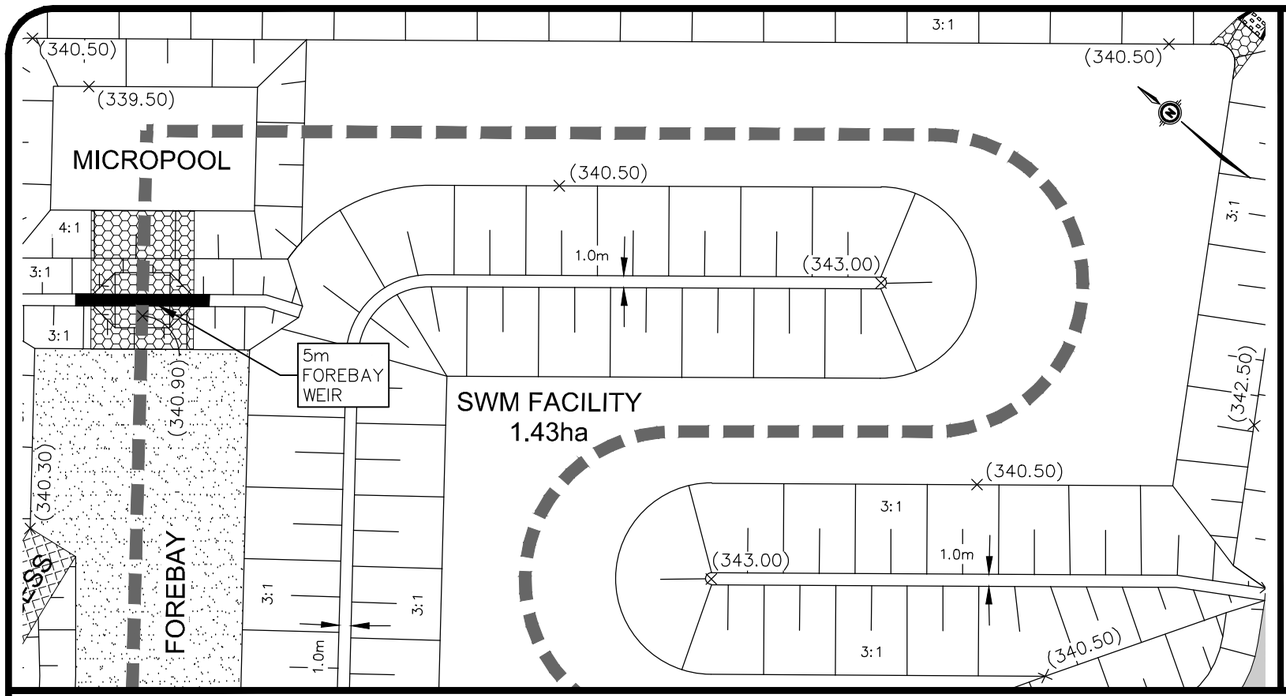
SOUTH SWM PLAN & PROFILE SECTION A-A

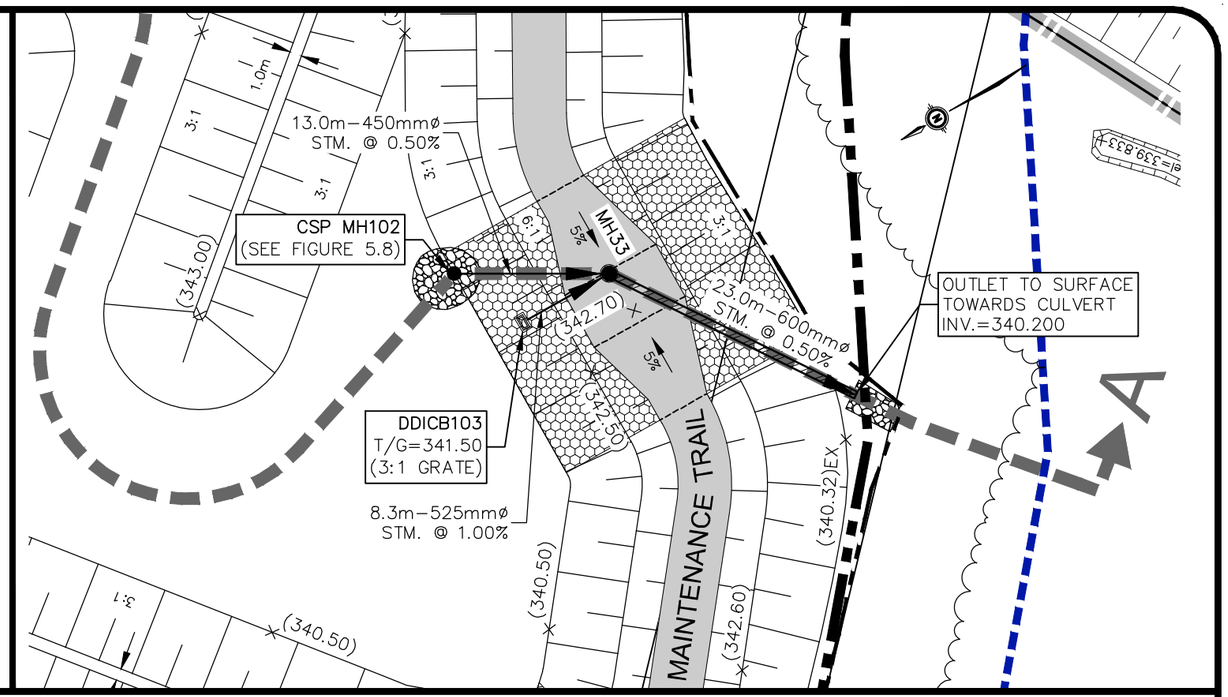
MTE
Engineers, Scientists, Surveyors

Project No.: 35056-104

February 11, 2022 10:13 a.m. Plotted By: acressman

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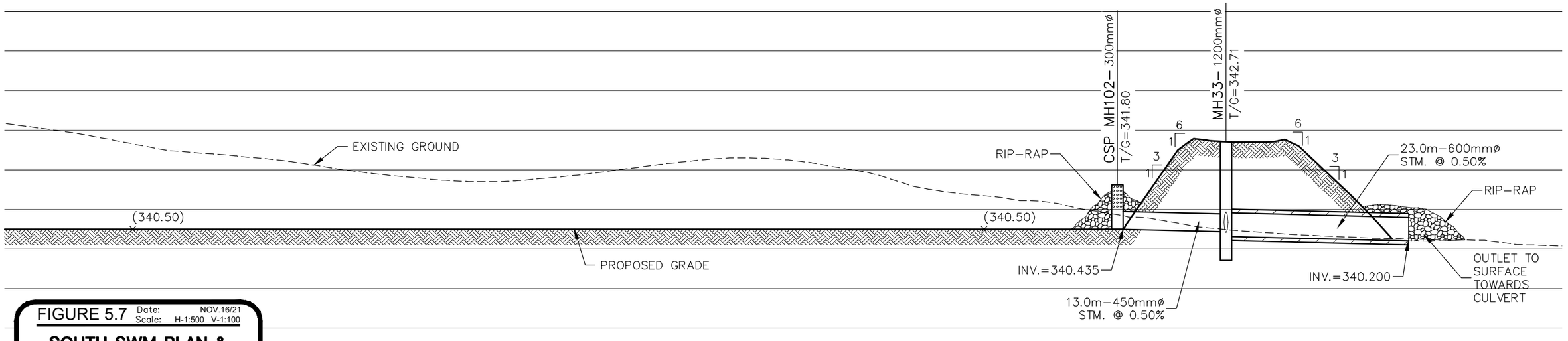


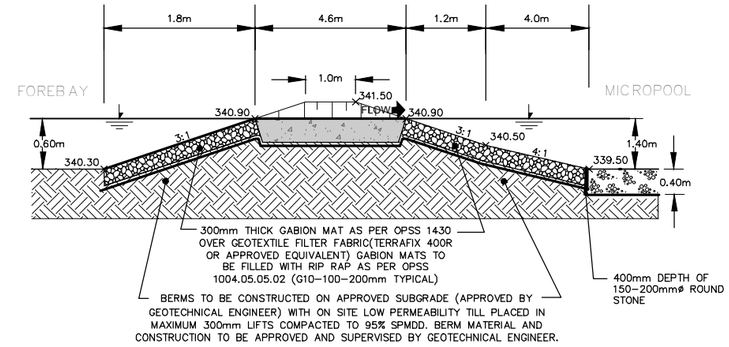
FIGURE 5.7 Date: NOV.16/21
Scale: H-1:500 V-1:100

SOUTH SWM PLAN & PROFILE SECTION A-A

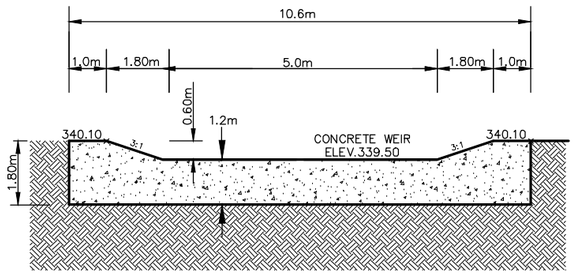
MTE
Engineers, Scientists, Surveyors

Project No.: 35056-104

February 11, 2022 10:14 a.m. Plotted By: acressman
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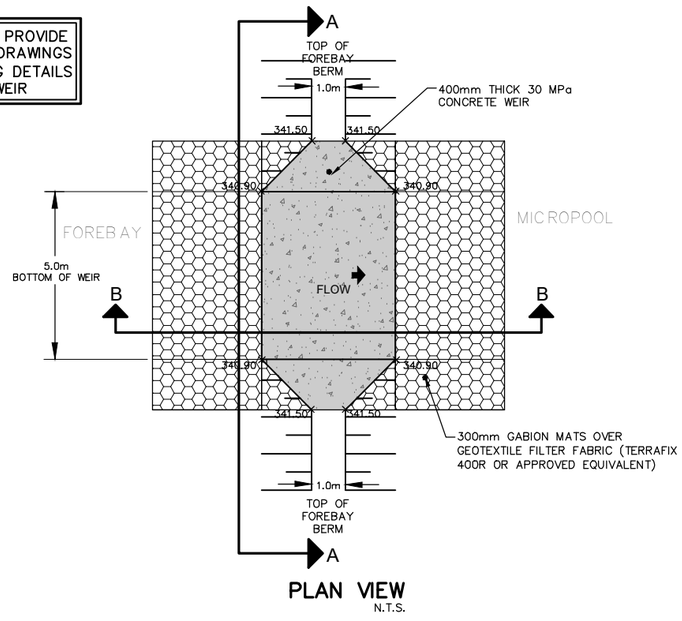


SECTION B-B



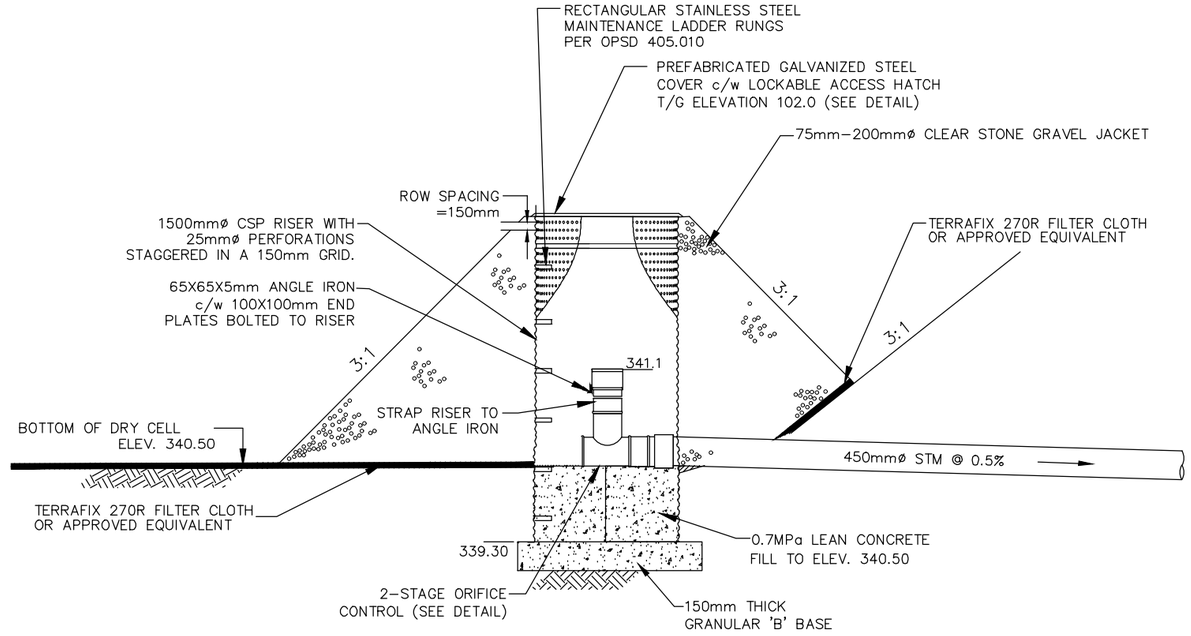
SECTION A-A

CONTRACTOR TO PROVIDE STAMPED SHOP DRAWINGS c/w REINFORCING DETAILS FOR CONCRETE WEIR

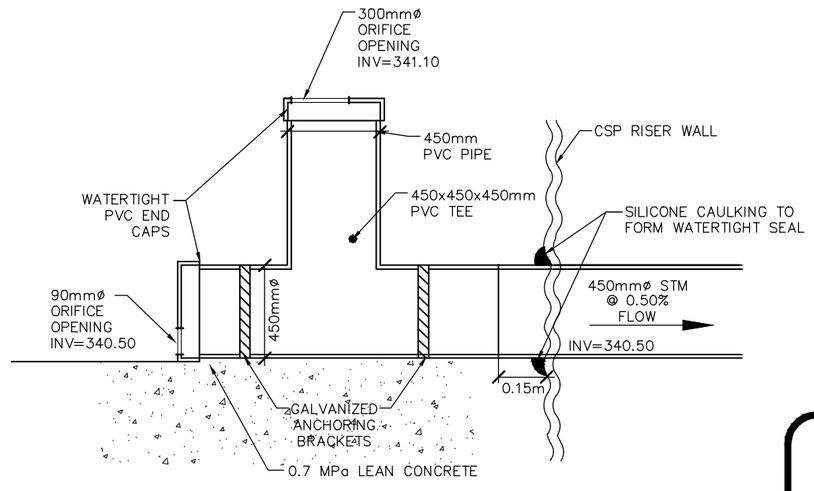


PLAN VIEW
N.T.S.

CONCRETE FOREBAY WEIR
N.T.S.



SECTION A-A
N.T.S.



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

FIGURE 5.8 Date: NOV.16/21 Scale: N.T.S.

SOUTH SWM FACILITY DETAILS

MTE
Engineers, Scientists, Surveyors

Project No.: 35056-104

5.4 Uncontrolled Drainage Areas to the IGMD

As previously discussed, there are several drainage areas which are directed towards the IGMD.

Drainage Area 205 represents a portion of Street Two that is unable to drain towards SWMF1. This 0.59 ha of right-of-way is proposed to be directed towards an OGS prior to be released into the IGMD.

The OGS unit is designed to treat runoff from minor events (i.e. events ≤ 25mm) before releasing flows to the SWMF. Flows from events greater than the 25mm storm may by-pass the OGS unit. The proposed OGS (model EF12) unit has been verified by the Canadian Environmental Technology Verification Program and has been sized to provide at least 69% TSS removal, which is the maximum design TSS removal for a standard OGS unit. A detailed sizing report for the OGS unit is included in **Appendix D.**

The remaining uncontrolled drainage areas to the IGMD are open space blocks (Drainage Areas 204, 206 to 208). Street Two within the floodplain bisects open space Drainage Areas 207 and 208. In order to convey Drainage Area 207 towards the IGMD, a culvert will be introduced underneath Street Two. This culvert will also serve to provide equalization storage across the open space blocks under the large storm events to contribute to the revised floodplain, as further discussed in Section 6.0.

5.5 Overall Water Balance Analysis

The EMDP established that, due to the fine grained nature of the subsurface material within the study area, infiltration will not be feasible as an end-of-pipe stormwater management strategy. This was confirmed throughout the subject lands based on the information gathered from the geotechnical and hydrogeological investigations to date. These analyses have concluded that the majority of the underlying soils within the subject lands include extensive deposits of clayey silt. As such, the prevalence of low-permeability clayey silt deposits indicate the potential for perched groundwater conditions to exist onsite. Infiltration is minor and the subject lands are not a significant recharge area and lot level infiltration measures will not be required.

5.6 Wetland Surface Water Balance

RJ Burnside & Associates Limited was retained to perform an environmental impact study (EIS) of the subject lands. Within this report, a summary was created to assess the potential impacts of the development on the wetland/woodland feature, and outlines mitigation measures to resolve any potential impacts. To address alterations to hydrological regimes through creation of impervious surfaces, it was stated:

> "The grading plan should ensure that existing grades are not significantly altered and that surface water continues to flow through the buffer area towards the woodland and/or wetland."

A surface water balance is provided in **Appendix G** to analyze pre- and post-development surface water contributions to the woodland and wetland features. A majority of the pre-development surface drainage into the wetland is unchanged under the post-development condition. A small additional area (Area 201) of backyards backing onto the wetland will be directed overland as surface drainage to the wetland. The net 8.3% surplus (367m^3 of a total of 4,781m^3) of surface water inputs into the wetland is considered minor and mitigated.

5.7 Block Level Salt Management Plans

The proposed multi-residential blocks are in close proximity, or are present within, the identified SGRA limits. During the Site Plan Application (SPA) and approval process, detailed Salt Management Plans (SMPs) will be prepared for the multi-residential developments.

5.8 Erosion Assessment

As previously mentioned, SWMF1 will discharge to an existing channel beneath Waterloo Street, which conveys existing emergency flow from the neighbouring Forest Glen Subdivision SWMF to the IGMD. Erosion controls will be required to appropriately attenuate the release of runoff within the receiving creek, which crosses Waterloo Street on its way to the IGMD and eventually the Nith River. Water's Edge was retained to perform an analysis (a continuous hydrologic model and erosion exceedance analysis) of the existing creek utilizing the pond design and discharge controls for SWMF1. Water's Edge concluded that adequate attenuation of flows towards the IGMD is provided such that the exceedance hours for pre-development erosion threshold flow rate are not exceeded. The Erosion Threshold Assessment is included in **Appendix H**.

5.9 Landscape Design

A landscape design for the proposed SWMFs will be completed during the final design stage of the development. The reasons for landscaping these facilities are aesthetics, erosion protection and long-term bank stability, and to limit pedestrian access. The SWMFs have been designed in accordance with the City of Kitchener's Stormwater Management Policies and Guidelines for aesthetics, landscape, and safety of stormwater management facilities as required by the Township of Wilmot.

6.0 Ivan Gingerich Municipal Drain Floodplain Mapping

Hydraulic modelling of the Regulatory Floodplain of the IGMD is required to establish the One Zone Floodplain Policy Area whereby development within the One Zone is prohibited with the exception of roadways and infrastructure evaluated through an EA like process. For the purpose of this study, the floodplain establishes the natural hazard zone delineation and the associated limits of potential development areas in accordance with floodplain mapping policies.

Hydraulic modeling of the IGMD was completed utilizing the U.S. Army Corps of Engineers HEC-RAS modeling platform. The floodplain was established within the subject lands assuming that the lands upstream of the subject lands are developed at some point in the future.

A hydrologic model was created assuming a fully developed condition such that flows for the IGMD were inputted into the HEC-RAS modeling.

The limits of the floodplain are shown in **MTE Drawing 35056-104-EC1.1**.

An additional analysis of the floodplain within the subject lands was performed to confirm that the development of the subject lands, as well as the proposed Street Two within the floodplain, does not increase the flooding elevation and limits. Refer to **Table 6.1** below with a summary of the pre- and post-development floodplain elevations. The changes in floodplain elevations due to the construction of Street Two and inclusion of the equalization culvert is generally considered negligible.

Table 6.1 – Ivan Gingerich Floodplain Summary

Section	Station (m)	Pre-Development Floodplain Elevation (m)	Post-Development Floodplain Elevation (m)
A	0+330	339.64	339.64
B	0+545	339.65	339.65
C	0+815	340.32	340.33
D	0+860	340.32	340.33
E	0+895	340.32	340.33
F	0+950	340.32	340.33
G	1+005	340.33	340.34
H	1+085	340.36	340.37
I	1+140	340.46	340.46
J	1+240	340.96	340.96
K	1+340	341.38	341.38
L	1+415	341.76	341.76
M	1+515	342.23	342.23
N	1+625	342.86	342.86
O	1+725	343.27	343.27

Included in the **Appendix E** is the HEC-RAS model utilized to generate flows for floodplain modeling, as well as a figure depicting the sections analysed.

7.0 Monitoring Program

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

7.1 Pre-Construction Monitoring Program

This stage of the monitoring is intended to establish the detailed site background conditions and baseline data. The pre-construction monitoring includes the following parameters:

- Groundwater – continuous groundwater monitoring includes levels and temperatures have been completed since March 2021

7.2 During-Development Monitoring Program

This stage will begin at the commencement of area grading of the subdivision and will continue until 90% buildout of the subdivision. Monitoring of the SWMF will include:

- Standard inspection of vegetation, structures, and general operation of hydraulic controls (observations of drawdown) within the SWMF. These inspections are to occur seasonally and typically after a significant rainfall event; and,
- Regular inspection and maintenance of erosion and sediment control measures around and within the SWMF.
- Surface Water Quality and Levels – Quality (TSS and turbidity) samples captured seasonally following events >15mm at the outlet of the southern SWMF within the wetland.

Standard inspection and maintenance of the SWMF will be provided throughout the “During Development” period.

7.3 Post-Development Monitoring Program

This period of the monitoring will begin following 90% buildout of the subdivision (i.e. road is urbanized, buildings are constructed, lots are sodded/landscaped, and open spaces are stabilized). The purpose of this stage of the monitoring is to ensure that the SWMF 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 SWMF. These inspections are to occur seasonally and typically after a significant rainfall event; until assumption of the facility by the Township.

In addition, per the *Township of Wilmot Infrastructure Standards and Specifications (2020),* the post-construction monitoring program must be in place for a minimum of 2 years prior to Final Acceptance of the SWMF. Reports shall be submitted to the Township at six month intervals, comparing results to the design criteria, including:

- Total Suspended Solids (TSS) removal percentages;
- Release rate flow monitoring;
- Detention time;
- Temperature; and
- Chlorides.

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

8.0 Erosion and Sediment Control Measures

Precautions shall be taken during all stages of construction to limit erosion and sedimentation. The final details of the erosion and sediment control plan will follow the *Erosion & Sediment Control Guideline for Urban Construction* document and will be provided during final design. The plan will illustrate the erosion and sediment control measures to be implemented during construction, which will limit impacts associated with site development.

The recommended construction sequence for erosion and sediment control measures shall be as follows:

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

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

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

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

Access to topsoil or fill storage areas will be located on the upstream side of storage piles. This practice will ensure continuity of the sediment control fencing in the downslope direction; which is most vulnerable to erosion and sediment deposition. Furthermore, 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 Township and the 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 Township and the GRCA, based on field decisions. Additionally, there are to be provisions in place to clean the Waterloo Street roadside ditch and culverts, if necessary, at the developer's expense.

9.0 Conclusions and Recommendations

Based on the foregoing analysis, it is concluded that:

1. 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 for the subject lands, as documented in the *Enhanced Master Drainage Plan – Wilmot Employment Lands* (MTE, May 2012) and the *Wilmot Employment Lands Industrial Subdivision - Final Stormwater Management Report* (MTE, January 12, 2022).
2. 'Enhanced' quality control of stormwater runoff from the northern portion of the subject lands can be provided by SWMF1 and by the proposed SWMF within the Wilmot Employment Lands (WEL) for the southern portion of the subject lands.
3. Quantity control of stormwater runoff can also be achieved by SWMF1 and SWMF2 within the subject lands, and by the proposed WEL SWMF.
4. Post-development erosion within the receiving channel/creek downstream of SWMF1 will be mitigated by the use of extended detention for the 25mm storm events.
5. Surface water inputs to the existing wetland will be maintained in the post-development condition.
6. Implementing erosion and sediment controls during construction will minimize any negative impacts of construction activities on the adjacent properties and the receiving watercourses.

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

1. Upon completion of detailed design, SWMFs be constructed to provide control of stormwater as described in Sections 4.0 and 5.0 of this report.
2. The preliminary design and modelling of the proposed stormwater management measures for the development be reviewed and re-confirmed at the time of final design.
3. Sediment and erosion controls be implemented during construction as described in Section 7.0 of this report.
4. A monitoring program be updated for the Final SWM report at final design.

All of which is respectfully submitted,

MTE Consultants Inc.



Alex Cressman, EIT
Designer
519-743-6500 ext. 1279
acressman@mte85.com

Jeff Martens, P.Eng.
Design Engineer
519-743-6500 ext. 1231
jmartens@mte85.com

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Appendix A

Draft Plan of Subdivision (Reduced)

DRAFT PLAN OF SUBDIVISION

Legal Description
PART OF LOT 20, CONCESSION SOUTH OF SNYDER'S ROAD
TOWNSHIP OF WILMOT
REGIONAL MUNICIPALITY OF WATERLOO

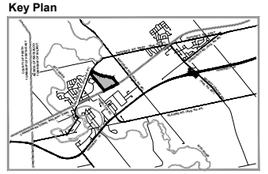
Owner's Certificate
I HEREBY AUTHORIZE MACNAUGHTON HERMSEN BRITTON CLARKSON PLANNING LIMITED TO SUBMIT THIS PLAN FOR APPROVAL.

DATE: January 12, 2022 — Adam Belsky, Wilmot Woods Developments Inc.

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: JAN. 14, 2022 — Trevor D.A. McNeil, OLS (MTE OLS LTD.)

Key Plan



Subject Lands

SCALE: NTS
Source: SLRN, Region of Waterloo

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. RESIDENTIAL, MULTIPLE RESIDENTIAL, STORMWATER MANAGEMENT, PARK, OPEN SPACE		
E. AS SHOWN	F. AS SHOWN	G. AS SHOWN
H. MUNICIPAL WATER SUPPLY	I. SANDY LOAM/CLAY LOAM	J. AS SHOWN
K. ALL SERVICES AS REQUIRED	L. AS SHOWN	

Notes
1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN.
2. BOUNDARY INFORMATION AND TOPOGRAPHICAL BASE INFORMATION PROVIDED BY MTE, May 31, 2021
3. ADJACENT PARCEL FABRIC IS APPROXIMATE.
4. LOTS/BLOCKS ON THE PLAN ARE RESIDENTIAL UNLESS OTHERWISE LISTED

■■■ DENOTES STAGE LIMITS (TO BE CONFIRMED AND SHOWN ON FINAL PLAN)

19/25 MINIMUM/MAXIMUM LOT YIELD PER BLOCK

Rev. No.	Date	Issued / Revision	By
2.	Jan. 25, 2022	Final Draft Plan for Distribution;	DGS
1.	Sept. 30, 2021	For pre-consultation meeting submission;	DGS

Area Schedule 30T-_____

	Stage 1		
Description	Lots/Blocks	Units (min/max)*	Area (ha)
Residential*	1-15	57/113	2.68
Multiple Residential	16-18	120/304	3.04
Park	19		1.00
Open Space	20-22		4.99
Stormwater Management	23,24		2.54
Service Corridor	25		0.24
0.3m Reserve	26-33		0.01
Road Widening	34		0.03
Roads			3.04
Total	34	177/417	17.57

*Blks. 2,3,5,6,7,8,9,10,11,14,15 [street towns (6m) and small single detached lots (9m)]
Blk. 1 [small single detached lots (9m-12m)]
Blks. 4,12,13 [large single detached lots (9-13.76m)]
Blks. 16,17,18 [40 uph to 100 uph (Low=Towns High=Stacked Towns)]

	Stage 2		
Description	Lots/Blocks	Units (min/max)*	Area (ha)
*Residential	1-5	58/103	2.34
Open Space	6		0.38
Trail			
Walkway	7		0.02
0.3m Reserve	8		0.001
Roads			0.90
Total	8	58/103	3.64

*Blks. 3,4,5 [street towns (6m) and small single detached lots (9m)]
Blk. 2 [small single detached lots (9m-12m)]
Blk. 1 [large single detached lots (9-13.76m)]

	Stage 3		
Lots/Blocks	Units (min/max)*	Area (ha)	
1-5	66/98	2.77	
6		0.05	
7		0.001	
		1.02	
7	66/98	3.84	

*Blk. 1 [street towns (6m) and small single detached lots (9m)]
Blks. 2,3,4,5 [small single detached lots (9m-12m)]

	Stage 4		
Description	Lots/Blocks	Units (min/max)*	Area (ha)
*Residential	1-6	56/79	2.43
Open Space	7		2.86
Trail			
0.3m Reserve			
Roads			0.87
Total	7	56/79	6.16

*Blks. 1,2,3,4,5 [small single detached lots (9m-12m)]
Blk. 6 [large single detached lots (9-13.76m)]

	Stage 5		
Lots/Blocks	Units (min/max)*	Area (ha)	
1-9	79/138	3.47	
10-12		0.77	
13		0.001	
		1.74	
13	79/138	5.98	

*Blks. 2(part), 3,4,5,6,7(part) [street towns (6m) and small single detached lots (9m)]
Blks. 2(part), 7(part), 9 [small single detached lots (9m-12m)]
Blk. 1 [large single detached lots (9-13.76m)]

	Total		
Description	Lots/Blocks	Units (min/max)	Area (ha)
Residential	40	316/531	13.69
Multiple Residential	3	120/304	3.04
Park	1		1.00
Open Space	5		8.23
Stormwater Management	2		2.54
Trail	4		0.82
Walkway	1		0.02
Service Corridor	1		0.24
0.3m Reserve	11		0.01
Road Widening	1		0.03
Roads			7.57
Total	69	436/835	37.19

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

Approval Stamp

Date	January 25, 2022
File No.	2123A
Plan Scale	1:2,000 (24x36)
Drawn By	D.G.S.
Checked By	P.B.

Project Wilmot Woods

Applicant
Wilmot Woods Developments Inc.
310 Fairway Rd. S
P.O. Box 45016
Kitchener, ON. N2C 2R6
P: 519.570.2137

File Name DRAFT PLAN

Dwg No. 1 of 1

Scale Bar 0 10 25 50 100m

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Appendix B

Existing Conditions Hydrologic Modelling

Wilmot Woods
STORMWATER MANAGEMENT
New Hamburg, Ontario

Project Number: 35056-104
Date: January 26, 2022
Design By: AJC
File: Q:\35056\104\SWM\35056-104 Master SWM Facility Design Sheet_AJC.xlsx

HYDROLOGIC PARAMETERS
Pre-Development Conditions

Sub-Catchment Number	Area (ha)	Pervious CN (AMC II)	Percent Impervious (TIMP) (%)	Directly Connected (XIMP) (%)	Overland Slope (%)	Overland Length (m)	Pervious IA (mm)	Impervious IA (mm)	Pervious Slope (%)	Impervious Slope (%)	Pervious Length (m)	Impervious Length (m)	Pervious Manning's n	Impervious Manning's n	Tp (hrs)
Catchments Draining to Ivan Gingerich Municipal Drain															
101	21.61	82	1		3.9	200	8.4								0.26
Total to IGMD	**21.61**		**1.0**												
Catchments Draining to Southern Culvert															
102	4.20	82	4		0.5	80	8.4								0.33
103	11.24	82	1		2.5	180	8.4								0.29
104	1.56	70	1		2.5	85	8.2								0.20
105	1.00	70	1		1.5	110	8.2								0.27
106	0.27	70	1		2.0	45	8.2								0.16
Total to South Culvert	**18.27**		**1.7**												
Catchments Draining to Forest Glen Woodlot															
107	2.46	82	1		3.0	80	8.4								0.18
Total to Forest Glen Woodlot	**2.46**		**1.0**												
Grand Total	**42.34**		**1.3**												

Time of concentration calculated using the Airport Method
tc = [3.26 * (1.1 - C) * L0.5] / Sw0.33, where
tc = time of concentration (min)
C = Runoff coefficient (assumed to be 0.2 for rural areas)
L = Overland Flow Length (m)
Sw = Catchment Slope

Tp = 0.6 * tc

IA = kS = k*((1000/CN)-10)*25.4
where k=0.075 for CN <=70
k=0.10 for 70<CN<=80
k=0.15 for 80<CN<=90
k=0.20 for CN >90

```
================================================================================

  SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
  S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
  SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
      S   W W   M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
  SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9   =========
                                                       9   9  9   9   # 3057174
       StormWater Management HYdrologic Model           999    999    =========

*******************************************************************************
***************************** SWMHYMO Ver/4.05  *****************************
*********  A single event and continuous hydrologic simulation model  *********
*********     based on the principles of HYMO and its successors      *********
*********                  OTTHYMO-83 and OTTHYMO-89.                 *********
*******************************************************************************
********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
*********                  Ottawa,  Ontario: (613) 836-3884           *********
*********                  Gatineau, Quebec: (819) 243-6858           *********
*********                  E-Mail: swmhymo@jfsa.Com                   *********
*******************************************************************************

+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++++++++ Licensed user: MTE Consultants Inc.                         +++++++++
+++++++++                in any City          SERIAL#:3057174        +++++++++
+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

*******************************************************************************
*********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++            *********
*********           Maximum value for ID numbers  :     10            *********
*********           Max. number of rainfall points: 105408            *********
*********           Max. number of flow points    : 105408            *********
*******************************************************************************


**********************   D E T A I L E D   O U T P U T   **********************
*******************************************************************************
*         DATE: 2021-11-02     TIME: 13:24:38     RUN COUNTER: 000003         *
*******************************************************************************
* Input   filename: Q:\35056\104\SWM\SWMHYMO\PRE\ex12hr.dat                    *
* Output  filename: Q:\35056\104\SWM\SWMHYMO\PRE\ex12hr.out                    *
* Summary filename: Q:\35056\104\SWM\SWMHYMO\PRE\ex12hr.sum                    *
* User comments:                                                              *
* 1:_____________________________________________________________________     *
* 2:_____________________________________________________________________     *
* 3:_____________________________________________________________________     *
*******************************************************************************

--------------------------------------------------------------------------------
-
```

```
001:0001-------------------------------------------------------------------------
-
*#*****************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056]
*#  Date        : 11-02-2021
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*****************************************************************************
--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\PRE\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\PRE\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 001
    NSTORM=   1
           #  1=25mm.4hr
-------------------------------------------------------------------------------
-
001:0002-------------------------------------------------------------------------
-
--------------------
| READ STORM       |    Filename: 25-mm, 4 hour Chicago Storm, (a=508.5, b
| Ptotal=  25.00 mm|    Comments: 25-mm, 4 hour Chicago Storm, (a=508.5, b
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   1.410 |   1.08   3.570 |   2.08   6.620 |   3.08   2.160
               .17   1.480 |   1.17   4.160 |   2.17   5.580 |   3.17   2.050
               .25   1.560 |   1.25   5.010 |   2.25   4.840 |   3.25   1.960
               .33   1.640 |   1.33   6.350 |   2.33   4.270 |   3.33   1.870
               .42   1.740 |   1.42   8.730 |   2.42   3.830 |   3.42   1.790
               .50   1.850 |   1.50  14.060 |   2.50   3.480 |   3.50   1.720
               .58   1.980 |   1.58  35.190 |   2.58   3.190 |   3.58   1.660
               .67   2.130 |   1.67  71.896 |   2.67   2.950 |   3.67   1.600
               .75   2.310 |   1.75  26.870 |   2.75   2.740 |   3.75   1.540
               .83   2.530 |   1.83  15.350 |   2.83   2.570 |   3.83   1.490
               .92   2.790 |   1.92  10.660 |   2.92   2.410 |   3.92   1.440
              1.00   3.130 |   2.00   8.160 |   3.00   2.280 |   4.00   1.400

-------------------------------------------------------------------------------
-
001:0003-------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=   21.61   Curve Number   (CN)=82.00
| 01:101    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .260
```

```
     Unit Hyd Qpeak  (cms)=    3.175

     PEAK FLOW       (cms)=     .194 (i)
     TIME TO PEAK    (hrs)=    2.067
     RUNOFF VOLUME    (mm)=    3.808
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .152

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
-
001:0004----------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    4.20   Curve Number   (CN)=82.00
| 02:102    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .330

     Unit Hyd Qpeak  (cms)=     .486

     PEAK FLOW       (cms)=     .033 (i)
     TIME TO PEAK    (hrs)=    2.167
     RUNOFF VOLUME    (mm)=    3.808
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .152

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
-
001:0005----------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=   11.24   Curve Number   (CN)=82.00
| 03:103    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .290

     Unit Hyd Qpeak  (cms)=    1.480

     PEAK FLOW       (cms)=     .095 (i)
     TIME TO PEAK    (hrs)=    2.117
     RUNOFF VOLUME    (mm)=    3.808
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .152

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
```

```
-
001:0006------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.56   Curve Number   (CN)=70.00
| 04:104    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .200

     Unit Hyd Qpeak  (cms)=     .298

     PEAK FLOW       (cms)=     .009 (i)
     TIME TO PEAK    (hrs)=    1.967
     RUNOFF VOLUME    (mm)=    2.246
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .090

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
-
001:0007------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.00   Curve Number   (CN)=70.00
| 05:105    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .270

     Unit Hyd Qpeak  (cms)=     .141

     PEAK FLOW       (cms)=     .005 (i)
     TIME TO PEAK    (hrs)=    2.083
     RUNOFF VOLUME    (mm)=    2.246
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .090

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
-
001:0008------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=     .27   Curve Number   (CN)=70.00
| 06:106    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .160

     Unit Hyd Qpeak  (cms)=     .064

     PEAK FLOW       (cms)=     .002 (i)
     TIME TO PEAK    (hrs)=    1.917
```

```
     RUNOFF VOLUME    (mm)=    2.245
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .090

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
001:0009--------------------------------------------------------------------------
-
------------------------
| ADD HYD (CULVRT    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 02:102           4.20     .033    2.17   3.81    .000

                     +ID2 03:103          11.24     .095    2.12   3.81    .000

                     +ID3 04:104           1.56     .009    1.97   2.25    .000

                     +ID4 05:105           1.00     .005    2.08   2.25    .000

                     +ID5 06:106            .27     .002    1.92   2.24    .000

                      ============================================================
                      SUM 07:CULVRT        18.27     .142    2.12   3.57    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------
-
001:0010--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    2.46   Curve Number   (CN)=82.00
| 08:107    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .180

     Unit Hyd Qpeak  (cms)=     .522

     PEAK FLOW       (cms)=     .027 (i)
     TIME TO PEAK    (hrs)=    1.933
     RUNOFF VOLUME    (mm)=    3.808
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .152

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
```

```
001:0011-------------------------------------------------------------------------
-
  ** END OF RUN :   1

*****************************************************************************




--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\PRE\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\PRE\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 002
    NSTORM=   1
           #  1=watSCS2.12h
-------------------------------------------------------------------------------
-
002:0002-------------------------------------------------------------------------
-
*#*****************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056]
*#  Date        : 11-02-2021
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*****************************************************************************
-------------------------------------------------------------------------------
-
002:0002-------------------------------------------------------------------------
-
--------------------
| READ STORM       |    Filename: 2-year, 12 hour SCS Type II Storm, Regio
| Ptotal=  48.05 mm|    Comments: 2-year, 12 hour SCS Type II Storm, Regio
--------------------
             TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
              hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
              .50    .960 |   3.50   1.920 |   6.50   8.650 |   9.50   1.920
             1.00    .960 |   4.00   1.920 |   7.00   3.850 |  10.00    .960
             1.50    .960 |   4.50   2.880 |   7.50   2.880 |  10.50    .960
             2.00    .960 |   5.00   3.850 |   8.00   2.880 |  11.00    .960
             2.50   1.920 |   5.50   5.770 |   8.50   1.920 |  11.50    .960
             3.00   1.920 |   6.00  43.260 |   9.00   1.920 |  12.00    .960

-------------------------------------------------------------------------------
-
```

```
002:0003-------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=   21.61   Curve Number   (CN)=82.00
| 01:101    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .260

     Unit Hyd Qpeak  (cms)=    3.175

     PEAK FLOW       (cms)=     .804 (i)
     TIME TO PEAK    (hrs)=    6.134
     RUNOFF VOLUME    (mm)=   16.478
     TOTAL RAINFALL   (mm)=   48.050
     RUNOFF COEFFICIENT   =     .343

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
002:0004-------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    4.20   Curve Number   (CN)=82.00
| 02:102    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .330

     Unit Hyd Qpeak  (cms)=     .486

     PEAK FLOW       (cms)=     .135 (i)
     TIME TO PEAK    (hrs)=    6.218
     RUNOFF VOLUME    (mm)=   16.478
     TOTAL RAINFALL   (mm)=   48.050
     RUNOFF COEFFICIENT   =     .343

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
002:0005-------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=   11.24   Curve Number   (CN)=82.00
| 03:103    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .290

     Unit Hyd Qpeak  (cms)=    1.480

     PEAK FLOW       (cms)=     .392 (i)
     TIME TO PEAK    (hrs)=    6.168
     RUNOFF VOLUME    (mm)=   16.478
```

```
     TOTAL RAINFALL   (mm)=   48.050
     RUNOFF COEFFICIENT   =     .343

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

---------------------------------------------------------------------------------
-
002:0006---------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.56   Curve Number   (CN)=70.00
| 04:104    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .200

     Unit Hyd Qpeak  (cms)=     .298

     PEAK FLOW       (cms)=     .041 (i)
     TIME TO PEAK    (hrs)=    6.084
     RUNOFF VOLUME    (mm)=   10.679
     TOTAL RAINFALL   (mm)=   48.050
     RUNOFF COEFFICIENT   =     .222

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

---------------------------------------------------------------------------------
-
002:0007---------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.00   Curve Number   (CN)=70.00
| 05:105    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .270

     Unit Hyd Qpeak  (cms)=     .141

     PEAK FLOW       (cms)=     .023 (i)
     TIME TO PEAK    (hrs)=    6.151
     RUNOFF VOLUME    (mm)=   10.678
     TOTAL RAINFALL   (mm)=   48.050
     RUNOFF COEFFICIENT   =     .222

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

---------------------------------------------------------------------------------
-
002:0008---------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=     .27   Curve Number   (CN)=70.00
| 06:106    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
```

```
----------------------   U.H. Tp(hrs)=    .160

     Unit Hyd Qpeak  (cms)=     .064

     PEAK FLOW       (cms)=     .008 (i)
     TIME TO PEAK    (hrs)=    6.051
     RUNOFF VOLUME    (mm)=   10.677
     TOTAL RAINFALL   (mm)=   48.050
     RUNOFF COEFFICIENT   =     .222

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
002:0009---------------------------------------------------------------------
-
-------------------------
| ADD HYD (CULVRT    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 02:102            4.20     .135    6.22  16.48    .000

                     +ID2 03:103           11.24     .392    6.17  16.48    .000

                     +ID3 04:104            1.56     .041    6.08  10.68    .000

                     +ID4 05:105            1.00     .023    6.15  10.68    .000

                     +ID5 06:106             .27     .008    6.05  10.68    .000

                      ============================================================
                      SUM 07:CULVRT        18.27     .593    6.17  15.58    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
-
002:0010---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    2.46   Curve Number   (CN)=82.00
| 08:107    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .180

     Unit Hyd Qpeak  (cms)=     .522

     PEAK FLOW       (cms)=     .110 (i)
     TIME TO PEAK    (hrs)=    6.068
     RUNOFF VOLUME    (mm)=   16.478
     TOTAL RAINFALL   (mm)=   48.050
```

```
     RUNOFF COEFFICIENT   =     .343

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
002:0011-------------------------------------------------------------------------
-
-------------------------------------------------------------------------------
-
002:0002-------------------------------------------------------------------------
-
  ** END OF RUN :   2

*******************************************************************************




--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\PRE\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\PRE\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 003
    NSTORM=   1
           #  1=watSCS5.12h
-------------------------------------------------------------------------------
-
003:0002-------------------------------------------------------------------------
-
*#*****************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056]
*#  Date        : 11-02-2021
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*****************************************************************************
-------------------------------------------------------------------------------
-
003:0002-------------------------------------------------------------------------
-
--------------------
| READ STORM       |    Filename: 5-year, 12 hour SCS Type II Storm, Regio
| Ptotal=  66.06 mm|    Comments: 5-year, 12 hour SCS Type II Storm, Regio
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
```

hrs	mm/hr	hrs	mm/hr	hrs	mm/hr	hrs	mm/hr
.50	1.320	3.50	2.640	6.50	11.890	9.50	2.640
1.00	1.320	4.00	2.640	7.00	5.290	10.00	1.320
1.50	1.320	4.50	3.960	7.50	3.960	10.50	1.320
2.00	1.320	5.00	5.290	8.00	3.960	11.00	1.320
2.50	2.640	5.50	7.930	8.50	2.640	11.50	1.320
3.00	2.640	6.00	59.470	9.00	2.640	12.00	1.320

-
003:0003---
-

| CALIB NASHYD | Area (ha)= 21.61 Curve Number (CN)=82.00
| 01:101 DT= 1.00 | Ia (mm)= 8.400 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= .260

Unit Hyd Qpeak (cms)= 3.175

PEAK FLOW (cms)= 1.471 (i)
TIME TO PEAK (hrs)= 6.118
RUNOFF VOLUME (mm)= 29.310
TOTAL RAINFALL (mm)= 66.056
RUNOFF COEFFICIENT = .444

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-
003:0004---
-

| CALIB NASHYD | Area (ha)= 4.20 Curve Number (CN)=82.00
| 02:102 DT= 1.00 | Ia (mm)= 8.400 # of Linear Res.(N)= 3.00
--- U.H. Tp(hrs)= .330

Unit Hyd Qpeak (cms)= .486

PEAK FLOW (cms)= .248 (i)
TIME TO PEAK (hrs)= 6.184
RUNOFF VOLUME (mm)= 29.310
TOTAL RAINFALL (mm)= 66.056
RUNOFF COEFFICIENT = .444

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-
003:0005---
-

```
----------------------
| CALIB NASHYD       |   Area    (ha)=   11.24   Curve Number   (CN)=82.00
| 03:103    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .290

     Unit Hyd Qpeak  (cms)=    1.480

     PEAK FLOW       (cms)=     .719 (i)
     TIME TO PEAK    (hrs)=    6.151
     RUNOFF VOLUME    (mm)=   29.310
     TOTAL RAINFALL   (mm)=   66.056
     RUNOFF COEFFICIENT   =     .444

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
-
003:0006---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.56   Curve Number   (CN)=70.00
| 04:104    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .200

     Unit Hyd Qpeak  (cms)=     .298

     PEAK FLOW       (cms)=     .080 (i)
     TIME TO PEAK    (hrs)=    6.084
     RUNOFF VOLUME    (mm)=   20.078
     TOTAL RAINFALL   (mm)=   66.056
     RUNOFF COEFFICIENT   =     .304

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
-
003:0007---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.00   Curve Number   (CN)=70.00
| 05:105    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .270

     Unit Hyd Qpeak  (cms)=     .141

     PEAK FLOW       (cms)=     .044 (i)
     TIME TO PEAK    (hrs)=    6.134
     RUNOFF VOLUME    (mm)=   20.078
     TOTAL RAINFALL   (mm)=   66.056
     RUNOFF COEFFICIENT   =     .304
```

```
     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
003:0008---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=     .27   Curve Number   (CN)=70.00
| 06:106    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .160

     Unit Hyd Qpeak  (cms)=     .064

     PEAK FLOW       (cms)=     .015 (i)
     TIME TO PEAK    (hrs)=    6.051
     RUNOFF VOLUME    (mm)=   20.077
     TOTAL RAINFALL   (mm)=   66.056
     RUNOFF COEFFICIENT   =     .304

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
003:0009---------------------------------------------------------------------
-
-------------------------
| ADD HYD (CULVRT    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
-------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 02:102           4.20     .248    6.18  29.31    .000

                     +ID2 03:103          11.24     .719    6.15  29.31    .000

                     +ID3 04:104           1.56     .080    6.08  20.08    .000

                     +ID4 05:105           1.00     .044    6.13  20.08    .000

                     +ID5 06:106            .27     .015    6.05  20.08    .000

                      ============================================================
                      SUM 07:CULVRT       18.27    1.096    6.15  27.88    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
-
003:0010---------------------------------------------------------------------
-
----------------------
```

```
| CALIB NASHYD       |   Area    (ha)=    2.46   Curve Number   (CN)=82.00
| 08:107    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .180

     Unit Hyd Qpeak  (cms)=     .522

     PEAK FLOW       (cms)=     .199 (i)
     TIME TO PEAK    (hrs)=    6.051
     RUNOFF VOLUME    (mm)=   29.310
     TOTAL RAINFALL   (mm)=   66.056
     RUNOFF COEFFICIENT   =     .444

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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003:0011--------------------------------------------------------------------------
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-
003:0002--------------------------------------------------------------------------
-
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-
003:0002--------------------------------------------------------------------------
-
  ** END OF RUN :   3

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--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\PRE\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\PRE\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 004
    NSTORM=   1
           #  1=watSCS10.12h
--------------------------------------------------------------------------------
-
004:0002--------------------------------------------------------------------------
-
*#*****************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056]
```

```
*#  Date        : 11-02-2021
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#************************************************************************
--------------------------------------------------------------------------------
-
004:0002--------------------------------------------------------------------------
-
--------------------
| READ STORM       |    Filename: 10-year, 12 hour SCS Type II Storm, Regi
| Ptotal=  78.19 mm|    Comments: 10-year, 12 hour SCS Type II Storm, Regi
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .50   1.560 |   3.50   3.130 |   6.50  14.080 |   9.50   3.130
              1.00   1.560 |   4.00   3.130 |   7.00   6.260 |  10.00   1.560
              1.50   1.560 |   4.50   4.690 |   7.50   4.690 |  10.50   1.560
              2.00   1.560 |   5.00   6.260 |   8.00   4.690 |  11.00   1.560
              2.50   3.130 |   5.50   9.380 |   8.50   3.130 |  11.50   1.560
              3.00   3.130 |   6.00  70.380 |   9.00   3.130 |  12.00   1.560

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-
004:0003--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=   21.61   Curve Number   (CN)=82.00
| 01:101    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .260

     Unit Hyd Qpeak  (cms)=    3.175

     PEAK FLOW       (cms)=    1.962 (i)
     TIME TO PEAK    (hrs)=    6.118
     RUNOFF VOLUME    (mm)=   38.795
     TOTAL RAINFALL   (mm)=   78.190
     RUNOFF COEFFICIENT   =     .496

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
004:0004--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    4.20   Curve Number   (CN)=82.00
| 02:102    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .330
```

```
     Unit Hyd Qpeak  (cms)=     .486

     PEAK FLOW       (cms)=     .332 (i)
     TIME TO PEAK    (hrs)=    6.184
     RUNOFF VOLUME    (mm)=   38.795
     TOTAL RAINFALL   (mm)=   78.190
     RUNOFF COEFFICIENT   =     .496

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
-
004:0005----------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=   11.24   Curve Number   (CN)=82.00
| 03:103    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .290

     Unit Hyd Qpeak  (cms)=    1.480

     PEAK FLOW       (cms)=     .960 (i)
     TIME TO PEAK    (hrs)=    6.151
     RUNOFF VOLUME    (mm)=   38.795
     TOTAL RAINFALL   (mm)=   78.190
     RUNOFF COEFFICIENT   =     .496

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
-
004:0006----------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.56   Curve Number   (CN)=70.00
| 04:104    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .200

     Unit Hyd Qpeak  (cms)=     .298

     PEAK FLOW       (cms)=     .109 (i)
     TIME TO PEAK    (hrs)=    6.068
     RUNOFF VOLUME    (mm)=   27.390
     TOTAL RAINFALL   (mm)=   78.190
     RUNOFF COEFFICIENT   =     .350

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
-
```

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004:0007-------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.00   Curve Number   (CN)=70.00
| 05:105    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .270

     Unit Hyd Qpeak  (cms)=     .141

     PEAK FLOW       (cms)=     .060 (i)
     TIME TO PEAK    (hrs)=    6.134
     RUNOFF VOLUME    (mm)=   27.389
     TOTAL RAINFALL   (mm)=   78.190
     RUNOFF COEFFICIENT   =     .350

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
004:0008-------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=     .27   Curve Number   (CN)=70.00
| 06:106    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .160

     Unit Hyd Qpeak  (cms)=     .064

     PEAK FLOW       (cms)=     .021 (i)
     TIME TO PEAK    (hrs)=    6.051
     RUNOFF VOLUME    (mm)=   27.389
     TOTAL RAINFALL   (mm)=   78.190
     RUNOFF COEFFICIENT   =     .350

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
004:0009-------------------------------------------------------------------------
-
------------------------
| ADD HYD (CULVRT    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 02:102           4.20     .332    6.18  38.80    .000

                    +ID2 03:103          11.24     .960    6.15  38.80    .000

                    +ID3 04:104           1.56     .109    6.07  27.39    .000

                    +ID4 05:105           1.00     .060    6.13  27.39    .000
```

```
                    +ID5 06:106             .27     .021    6.05  27.39    .000

                     ============================================================
                     SUM 07:CULVRT        18.27    1.470    6.13  37.03    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

------------------------------------------------------------------------------
-
004:0010---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    2.46   Curve Number   (CN)=82.00
| 08:107    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .180

     Unit Hyd Qpeak  (cms)=     .522

     PEAK FLOW       (cms)=     .264 (i)
     TIME TO PEAK    (hrs)=    6.051
     RUNOFF VOLUME    (mm)=   38.795
     TOTAL RAINFALL   (mm)=   78.190
     RUNOFF COEFFICIENT   =     .496

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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004:0011---------------------------------------------------------------------
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004:0002---------------------------------------------------------------------
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004:0002---------------------------------------------------------------------
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004:0002---------------------------------------------------------------------
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  ** END OF RUN :   4

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--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\PRE\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\PRE\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 005
    NSTORM=   1
           #  1=watSCS25.12h
-------------------------------------------------------------------------------
-
005:0002---------------------------------------------------------------------
-
*#*****************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056]
*#  Date        : 11-02-2021
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*****************************************************************************
-------------------------------------------------------------------------------
-
005:0002---------------------------------------------------------------------
-
--------------------
| READ STORM       |    Filename: 25-year, 12 hour SCS Type II Storm, Regi
| Ptotal=  93.08 mm|    Comments: 25-year, 12 hour SCS Type II Storm, Regi
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .50   1.860 |   3.50   3.720 |   6.50  16.760 |   9.50   3.720
              1.00   1.860 |   4.00   3.720 |   7.00   7.450 |  10.00   1.860
              1.50   1.860 |   4.50   5.590 |   7.50   5.590 |  10.50   1.860
              2.00   1.860 |   5.00   7.450 |   8.00   5.590 |  11.00   1.860
              2.50   3.720 |   5.50  11.170 |   8.50   3.720 |  11.50   1.860
              3.00   3.720 |   6.00  83.780 |   9.00   3.720 |  12.00   1.860

-------------------------------------------------------------------------------
-
005:0003---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=   21.61   Curve Number   (CN)=82.00
| 01:101    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .260

     Unit Hyd Qpeak  (cms)=    3.175
```

```
     PEAK FLOW       (cms)=    2.594 (i)
     TIME TO PEAK    (hrs)=    6.118
     RUNOFF VOLUME    (mm)=   51.060
     TOTAL RAINFALL   (mm)=   93.080
     RUNOFF COEFFICIENT   =     .549

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
-
005:0004---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    4.20   Curve Number   (CN)=82.00
| 02:102    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .330

     Unit Hyd Qpeak  (cms)=     .486

     PEAK FLOW       (cms)=     .440 (i)
     TIME TO PEAK    (hrs)=    6.184
     RUNOFF VOLUME    (mm)=   51.060
     TOTAL RAINFALL   (mm)=   93.080
     RUNOFF COEFFICIENT   =     .549

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
-
005:0005---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=   11.24   Curve Number   (CN)=82.00
| 03:103    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .290

     Unit Hyd Qpeak  (cms)=    1.480

     PEAK FLOW       (cms)=    1.271 (i)
     TIME TO PEAK    (hrs)=    6.134
     RUNOFF VOLUME    (mm)=   51.060
     TOTAL RAINFALL   (mm)=   93.080
     RUNOFF COEFFICIENT   =     .549

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
005:0006---------------------------------------------------------------------
```

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-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.56   Curve Number   (CN)=70.00
| 04:104    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .200

     Unit Hyd Qpeak  (cms)=     .298

     PEAK FLOW       (cms)=     .150 (i)
     TIME TO PEAK    (hrs)=    6.068
     RUNOFF VOLUME    (mm)=   37.187
     TOTAL RAINFALL   (mm)=   93.080
     RUNOFF COEFFICIENT   =     .400

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
005:0007-------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.00   Curve Number   (CN)=70.00
| 05:105    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .270

     Unit Hyd Qpeak  (cms)=     .141

     PEAK FLOW       (cms)=     .083 (i)
     TIME TO PEAK    (hrs)=    6.134
     RUNOFF VOLUME    (mm)=   37.187
     TOTAL RAINFALL   (mm)=   93.080
     RUNOFF COEFFICIENT   =     .400

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
005:0008-------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=     .27   Curve Number   (CN)=70.00
| 06:106    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .160

     Unit Hyd Qpeak  (cms)=     .064

     PEAK FLOW       (cms)=     .028 (i)
     TIME TO PEAK    (hrs)=    6.051
     RUNOFF VOLUME    (mm)=   37.187
     TOTAL RAINFALL   (mm)=   93.080
```

```
     RUNOFF COEFFICIENT   =     .400

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
005:0009---------------------------------------------------------------------------
-
------------------------
| ADD HYD (CULVRT    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 02:102           4.20     .440    6.18  51.06    .000

                     +ID2 03:103          11.24    1.271    6.13  51.06    .000

                     +ID3 04:104           1.56     .150    6.07  37.19    .000

                     +ID4 05:105           1.00     .083    6.13  37.19    .000

                     +ID5 06:106            .27     .028    6.05  37.19    .000

                      ============================================================
                      SUM 07:CULVRT       18.27    1.956    6.13  48.91    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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-
005:0010---------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    2.46   Curve Number   (CN)=82.00
| 08:107    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .180

     Unit Hyd Qpeak  (cms)=     .522

     PEAK FLOW       (cms)=     .347 (i)
     TIME TO PEAK    (hrs)=    6.051
     RUNOFF VOLUME    (mm)=   51.060
     TOTAL RAINFALL   (mm)=   93.080
     RUNOFF COEFFICIENT   =     .549

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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005:0011---------------------------------------------------------------------------
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005:0002--------------------------------------------------------------------
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005:0002--------------------------------------------------------------------
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005:0002--------------------------------------------------------------------
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-
005:0002--------------------------------------------------------------------
-
  ** END OF RUN :   5

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--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\PRE\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\PRE\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 006
    NSTORM=   1
           #  1=watSCS50.12h
------------------------------------------------------------------------------
-
006:0002--------------------------------------------------------------------
-
*#*****************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056]
*#  Date        : 11-02-2021
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*****************************************************************************
------------------------------------------------------------------------------
-
006:0002--------------------------------------------------------------------
-
--------------------
```

```
| READ STORM       |    Filename: 50-year, 12 hour SCS Type II Storm, Regi
| Ptotal= 104.85 mm|    Comments: 50-year, 12 hour SCS Type II Storm, Regi
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .50   2.100 |   3.50   4.190 |   6.50  18.870 |   9.50   4.190
              1.00   2.100 |   4.00   4.190 |   7.00   8.390 |  10.00   2.100
              1.50   2.100 |   4.50   6.290 |   7.50   6.290 |  10.50   2.100
              2.00   2.100 |   5.00   8.390 |   8.00   6.290 |  11.00   2.100
              2.50   4.190 |   5.50  12.580 |   8.50   4.190 |  11.50   2.100
              3.00   4.190 |   6.00  94.370 |   9.00   4.190 |  12.00   2.100

--------------------------------------------------------------------------------
-
006:0003---------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=   21.61   Curve Number   (CN)=82.00
| 01:101    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .260

     Unit Hyd Qpeak  (cms)=    3.175

     PEAK FLOW       (cms)=    3.108 (i)
     TIME TO PEAK    (hrs)=    6.118
     RUNOFF VOLUME    (mm)=   61.119
     TOTAL RAINFALL   (mm)=  104.851
     RUNOFF COEFFICIENT   =     .583

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
006:0004---------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    4.20   Curve Number   (CN)=82.00
| 02:102    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .330

     Unit Hyd Qpeak  (cms)=     .486

     PEAK FLOW       (cms)=     .529 (i)
     TIME TO PEAK    (hrs)=    6.168
     RUNOFF VOLUME    (mm)=   61.119
     TOTAL RAINFALL   (mm)=  104.851
     RUNOFF COEFFICIENT   =     .583

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

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--------------------------------------------------------------------------------
-
006:0005--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=   11.24   Curve Number   (CN)=82.00
| 03:103    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .290

     Unit Hyd Qpeak  (cms)=    1.480

     PEAK FLOW       (cms)=    1.525 (i)
     TIME TO PEAK    (hrs)=    6.134
     RUNOFF VOLUME    (mm)=   61.119
     TOTAL RAINFALL   (mm)=  104.851
     RUNOFF COEFFICIENT   =     .583

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
006:0006--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.56   Curve Number   (CN)=70.00
| 04:104    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .200

     Unit Hyd Qpeak  (cms)=     .298

     PEAK FLOW       (cms)=     .183 (i)
     TIME TO PEAK    (hrs)=    6.068
     RUNOFF VOLUME    (mm)=   45.455
     TOTAL RAINFALL   (mm)=  104.851
     RUNOFF COEFFICIENT   =     .434

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
006:0007--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.00   Curve Number   (CN)=70.00
| 05:105    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .270

     Unit Hyd Qpeak  (cms)=     .141

     PEAK FLOW       (cms)=     .102 (i)
```

```
     TIME TO PEAK    (hrs)=    6.134
     RUNOFF VOLUME    (mm)=   45.454
     TOTAL RAINFALL   (mm)=  104.851
     RUNOFF COEFFICIENT   =     .434

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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006:0008---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=     .27   Curve Number   (CN)=70.00
| 06:106    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .160

     Unit Hyd Qpeak  (cms)=     .064

     PEAK FLOW       (cms)=     .034 (i)
     TIME TO PEAK    (hrs)=    6.034
     RUNOFF VOLUME    (mm)=   45.454
     TOTAL RAINFALL   (mm)=  104.851
     RUNOFF COEFFICIENT   =     .434

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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006:0009---------------------------------------------------------------------
-
------------------------
| ADD HYD (CULVRT    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 02:102            4.20     .529    6.17  61.12    .000

                     +ID2 03:103           11.24    1.525    6.13  61.12    .000

                     +ID3 04:104            1.56     .183    6.07  45.45    .000

                     +ID4 05:105            1.00     .102    6.13  45.45    .000

                     +ID5 06:106             .27     .034    6.03  45.45    .000

                      ============================================================
                      SUM 07:CULVRT        18.27    2.354    6.13  58.69    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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006:0010-------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    2.46   Curve Number   (CN)=82.00
| 08:107    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .180

     Unit Hyd Qpeak  (cms)=     .522

     PEAK FLOW       (cms)=     .414 (i)
     TIME TO PEAK    (hrs)=    6.051
     RUNOFF VOLUME    (mm)=   61.119
     TOTAL RAINFALL   (mm)=  104.851
     RUNOFF COEFFICIENT   =     .583

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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006:0011-------------------------------------------------------------------------
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006:0002-------------------------------------------------------------------------
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006:0002-------------------------------------------------------------------------
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006:0002-------------------------------------------------------------------------
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006:0002-------------------------------------------------------------------------
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006:0002-------------------------------------------------------------------------
-
  ** END OF RUN :   6

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```

```
--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\PRE\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\PRE\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 007
    NSTORM=   1
           #  1=watSC100.12h
--------------------------------------------------------------------------------
-
007:0002---------------------------------------------------------------------------
-
*#*****************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056]
*#  Date        : 11-02-2021
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*****************************************************************************
--------------------------------------------------------------------------------
-
007:0002---------------------------------------------------------------------------
-
--------------------
| READ STORM       |    Filename: 100-year, 12 hour SCS Type II Storm, Reg
| Ptotal= 115.84 mm|    Comments: 100-year, 12 hour SCS Type II Storm, Reg
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .50   2.320 |   3.50   4.630 |   6.50  20.850 |   9.50   4.630
              1.00   2.320 |   4.00   4.630 |   7.00   9.270 |  10.00   2.320
              1.50   2.320 |   4.50   6.950 |   7.50   6.950 |  10.50   2.320
              2.00   2.320 |   5.00   9.270 |   8.00   6.950 |  11.00   2.320
              2.50   4.630 |   5.50  13.900 |   8.50   4.630 |  11.50   2.320
              3.00   4.630 |   6.00 104.250 |   9.00   4.630 |  12.00   2.320

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007:0003---------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=   21.61   Curve Number   (CN)=82.00
| 01:101    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .260

     Unit Hyd Qpeak  (cms)=    3.175

     PEAK FLOW       (cms)=    3.599 (i)
```

```
     TIME TO PEAK    (hrs)=    6.101
     RUNOFF VOLUME    (mm)=   70.734
     TOTAL RAINFALL   (mm)=  115.841
     RUNOFF COEFFICIENT   =     .611

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
007:0004---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    4.20   Curve Number   (CN)=82.00
| 02:102    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .330

     Unit Hyd Qpeak  (cms)=     .486

     PEAK FLOW       (cms)=     .613 (i)
     TIME TO PEAK    (hrs)=    6.168
     RUNOFF VOLUME    (mm)=   70.734
     TOTAL RAINFALL   (mm)=  115.841
     RUNOFF COEFFICIENT   =     .611

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
007:0005---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=   11.24   Curve Number   (CN)=82.00
| 03:103    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .290

     Unit Hyd Qpeak  (cms)=    1.480

     PEAK FLOW       (cms)=    1.767 (i)
     TIME TO PEAK    (hrs)=    6.134
     RUNOFF VOLUME    (mm)=   70.734
     TOTAL RAINFALL   (mm)=  115.841
     RUNOFF COEFFICIENT   =     .611

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
007:0006---------------------------------------------------------------------
-
----------------------
```

```
| CALIB NASHYD       |   Area    (ha)=    1.56   Curve Number   (CN)=70.00
| 04:104    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .200

     Unit Hyd Qpeak  (cms)=     .298

     PEAK FLOW       (cms)=     .216 (i)
     TIME TO PEAK    (hrs)=    6.068
     RUNOFF VOLUME    (mm)=   53.518
     TOTAL RAINFALL   (mm)=  115.841
     RUNOFF COEFFICIENT   =     .462

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
-
007:0007---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.00   Curve Number   (CN)=70.00
| 05:105    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .270

     Unit Hyd Qpeak  (cms)=     .141

     PEAK FLOW       (cms)=     .120 (i)
     TIME TO PEAK    (hrs)=    6.134
     RUNOFF VOLUME    (mm)=   53.518
     TOTAL RAINFALL   (mm)=  115.841
     RUNOFF COEFFICIENT   =     .462

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
-
007:0008---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=     .27   Curve Number   (CN)=70.00
| 06:106    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .160

     Unit Hyd Qpeak  (cms)=     .064

     PEAK FLOW       (cms)=     .041 (i)
     TIME TO PEAK    (hrs)=    6.034
     RUNOFF VOLUME    (mm)=   53.518
     TOTAL RAINFALL   (mm)=  115.841
     RUNOFF COEFFICIENT   =     .462
```

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

007:0009---

ADD HYD (CULVRT)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
ID1	02:102	4.20	.613	6.17	70.73	.000
+ID2	03:103	11.24	1.767	6.13	70.73	.000
+ID3	04:104	1.56	.216	6.07	53.52	.000
+ID4	05:105	1.00	.120	6.13	53.52	.000
+ID5	06:106	.27	.041	6.03	53.52	.000
SUM	07:CULVRT	18.27	2.734	6.13	68.07	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

007:0010---

CALIB NASHYD			
08:107 DT= 1.00	Area (ha)= 2.46	Curve Number (CN)=82.00	
	Ia (mm)= 8.400	# of Linear Res.(N)= 3.00	
	U.H. Tp(hrs)= .180		

Unit Hyd Qpeak (cms)= .522

PEAK FLOW (cms)= .478 (i)
TIME TO PEAK (hrs)= 6.051
RUNOFF VOLUME (mm)= 70.734
TOTAL RAINFALL (mm)= 115.841
RUNOFF COEFFICIENT = .611

(i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

007:0011---


```
007:0002----------------------------------------------------------------------
-
----------------------------------------------------------------------------
-
007:0002----------------------------------------------------------------------
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----------------------------------------------------------------------------
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007:0002----------------------------------------------------------------------
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----------------------------------------------------------------------------
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007:0002----------------------------------------------------------------------
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007:0002----------------------------------------------------------------------
-
----------------------------------------------------------------------------
-
007:0002----------------------------------------------------------------------
-
      FINISH
----------------------------------------------------------------------------
-
****************************************************************************
*
     WARNINGS / ERRORS / NOTES
     -------------------------
   Simulation ended on 2021-11-02     at 13:24:40
============================================================================
=
```

```
================================================================================

  SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
  S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
  SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
      S   W W   M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
  SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9   =========
                                                       9   9  9   9   # 3057174
       StormWater Management HYdrologic Model           999    999    =========

*******************************************************************************
***************************** SWMHYMO Ver/4.05  *****************************
*********  A single event and continuous hydrologic simulation model  *********
*********     based on the principles of HYMO and its successors      *********
*********                  OTTHYMO-83 and OTTHYMO-89.                 *********
*******************************************************************************
********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
*********                  Ottawa,  Ontario: (613) 836-3884           *********
*********                  Gatineau, Quebec: (819) 243-6858           *********
*********                  E-Mail: swmhymo@jfsa.Com                   *********
*******************************************************************************

+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++++++++ Licensed user: MTE Consultants Inc.                         +++++++++
+++++++++                in any City          SERIAL#:3057174        +++++++++
+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

*******************************************************************************
*********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++            *********
*********           Maximum value for ID numbers  :     10           *********
*********           Max. number of rainfall points: 105408           *********
*********           Max. number of flow points    : 105408           *********
*******************************************************************************


**********************   D E T A I L E D   O U T P U T   **********************
*******************************************************************************
*         DATE: 2021-11-02     TIME: 13:34:03     RUN COUNTER: 000004         *
*******************************************************************************
* Input   filename: Q:\35056\104\SWM\SWMHYMO\PRE\exreg2.dat                    *
* Output  filename: Q:\35056\104\SWM\SWMHYMO\PRE\exreg2.out                    *
* Summary filename: Q:\35056\104\SWM\SWMHYMO\PRE\exreg2.sum                    *
* User comments:                                                              *
* 1:_____________________________________________________________________     *
* 2:_____________________________________________________________________     *
* 3:_____________________________________________________________________     *
*******************************************************************************

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-
```

```
001:0001-------------------------------------------------------------------------
-
*#*****************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056]
*#  Date        : 11-02-2021
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*****************************************************************************
--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\PRE\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\PRE\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 001
    NSTORM=   1
           #  1=regAMC2.48h
-------------------------------------------------------------------------------
-
001:0002-------------------------------------------------------------------------
-
--------------------
| READ STORM       |    Filename: Regional Storm Zone 1, AMC II Conditions
| Ptotal= 285.08 mm|    Comments: Regional Storm Zone 1, AMC II Conditions
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
              1.00   2.030 |  13.00   2.030 |  25.00   2.030 |  37.00   6.000
              2.00   2.030 |  14.00   2.030 |  26.00   2.030 |  38.00   4.000
              3.00   2.030 |  15.00   2.030 |  27.00   2.030 |  39.00   6.000
              4.00   2.030 |  16.00   2.030 |  28.00   2.030 |  40.00  13.000
              5.00   2.030 |  17.00   2.030 |  29.00   2.030 |  41.00  17.000
              6.00   2.030 |  18.00   2.030 |  30.00   2.030 |  42.00  13.000
              7.00   2.030 |  19.00   2.030 |  31.00   2.030 |  43.00  23.000
              8.00   2.030 |  20.00   2.030 |  32.00   2.030 |  44.00  13.000
              9.00   2.030 |  21.00   2.030 |  33.00   2.030 |  45.00  13.000
             10.00   2.030 |  22.00   2.030 |  34.00   2.030 |  46.00  53.000
             11.00   2.030 |  23.00   2.030 |  35.00   2.030 |  47.00  38.000
             12.00   2.030 |  24.00   2.030 |  36.00   2.030 |  48.00  13.000

-------------------------------------------------------------------------------
-
001:0003-------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=   21.61   Curve Number   (CN)=82.00
| 01:101    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .260
```

```
     Unit Hyd Qpeak  (cms)=    3.175

     PEAK FLOW       (cms)=    3.005 (i)
     TIME TO PEAK    (hrs)=   46.033
     RUNOFF VOLUME    (mm)=  230.277
     TOTAL RAINFALL   (mm)=  285.082
     RUNOFF COEFFICIENT   =     .808

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
001:0004---------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    4.20   Curve Number   (CN)=82.00
| 02:102    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .330

     Unit Hyd Qpeak  (cms)=     .486

     PEAK FLOW       (cms)=     .570 (i)
     TIME TO PEAK    (hrs)=   46.083
     RUNOFF VOLUME    (mm)=  230.277
     TOTAL RAINFALL   (mm)=  285.082
     RUNOFF COEFFICIENT   =     .808

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
001:0005---------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=   11.24   Curve Number   (CN)=82.00
| 03:103    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .290

     Unit Hyd Qpeak  (cms)=    1.480

     PEAK FLOW       (cms)=    1.549 (i)
     TIME TO PEAK    (hrs)=   46.050
     RUNOFF VOLUME    (mm)=  230.277
     TOTAL RAINFALL   (mm)=  285.082
     RUNOFF COEFFICIENT   =     .808

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
```

```
-
001:0006------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.56   Curve Number   (CN)=70.00
| 04:104    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .200

     Unit Hyd Qpeak  (cms)=     .298

     PEAK FLOW       (cms)=     .203 (i)
     TIME TO PEAK    (hrs)=   46.017
     RUNOFF VOLUME    (mm)=  198.744
     TOTAL RAINFALL   (mm)=  285.082
     RUNOFF COEFFICIENT   =     .697

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
-
001:0007------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.00   Curve Number   (CN)=70.00
| 05:105    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .270

     Unit Hyd Qpeak  (cms)=     .141

     PEAK FLOW       (cms)=     .128 (i)
     TIME TO PEAK    (hrs)=   46.050
     RUNOFF VOLUME    (mm)=  198.744
     TOTAL RAINFALL   (mm)=  285.082
     RUNOFF COEFFICIENT   =     .697

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
-
001:0008------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=     .27   Curve Number   (CN)=70.00
| 06:106    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .160

     Unit Hyd Qpeak  (cms)=     .064

     PEAK FLOW       (cms)=     .035 (i)
     TIME TO PEAK    (hrs)=   46.000
```

```
     RUNOFF VOLUME    (mm)=  198.744
     TOTAL RAINFALL   (mm)=  285.082
     RUNOFF COEFFICIENT   =     .697

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
001:0009---------------------------------------------------------------------------
-
------------------------
| ADD HYD (CULVRT    ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 02:102           4.20     .570   46.08 230.28    .000

                     +ID2 03:103          11.24    1.549   46.05 230.28    .000

                     +ID3 04:104           1.56     .203   46.02 198.74    .000

                     +ID4 05:105           1.00     .128   46.05 198.74    .000

                     +ID5 06:106            .27     .035   46.00 198.74    .000

                      ============================================================
                      SUM 07:CULVRT       18.27    2.483   46.05 225.39    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

-------------------------------------------------------------------------------
-
001:0010---------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    2.46   Curve Number   (CN)=82.00
| 08:107    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .180

     Unit Hyd Qpeak  (cms)=     .522

     PEAK FLOW       (cms)=     .346 (i)
     TIME TO PEAK    (hrs)=   46.000
     RUNOFF VOLUME    (mm)=  230.277
     TOTAL RAINFALL   (mm)=  285.082
     RUNOFF COEFFICIENT   =     .808

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
```

```
001:0011--------------------------------------------------------------------------
-
      FINISH
-------------------------------------------------------------------------------
-
*******************************************************************************
*
     WARNINGS / ERRORS / NOTES
     -------------------------
   Simulation ended on 2021-11-02     at 13:34:03
===============================================================================
=
```

Appendix C

Proposed Conditions Hydrologic Modelling

Wilmot Woods
STORMWATER MANAGEMENT
New Hamburg, Ontario

Project Number: 35056-104
Date: March 7, 2022
Design By: AJC
File: Q:\35056\104\SWM\35056-104 Master SWM Facility Design Sheet_AJC.xlsx

HYDROLOGIC PARAMETERS
Post Development Conditions

Sub-Catchment Number	Area (ha)	Pervious CN (AMC II)	Percent Impervious (TIMP) (%)	Directly Connected (XIMP) (%)	Overland Slope (%)	Overland Length (m)	Pervious IA (mm)	Impervious IA (mm)	Pervious Slope (%)	Impervious Slope (%)	Pervious Length (m)	Impervious Length (m)	Pervious Manning's n	Impervious Manning's n	Tp (hrs)	SWMHYMO COMMAND	Land Use	Comment
Catchments Draining to Ivan Gingerich Drain																		
Catchments Draining to North SWM Facility																		
201	6.99	76	70	70	0.5	80	8.0	1.0	2.0	0.5	80	80	0.25	0.013		STAND	Residential	Proposed Subdivision to Forebay
202	0.71	76	65	65	1.0	90	8.0	1.0	2.0	1.0	90	90	0.25	0.013		STAND	Road Allowance	Right-of-way and Street Two to SWMF
203	1.47	76	50	50	5.0	20	8.0	1.0	5.0	2.0	20	20	0.25	0.013		STAND	SWMF	Rear Yards + Proposed SWMF
	9.17		**66.4**															
Catchments Draining Directly to IGD																		
204	1.38	76	1	1	5.0	120	8.0	1.0	5.0	0.5	120	15	0.25	0.013		STAND	Industrial	Park Directly to Ivan Gingerich Drain
205	0.59	76	65	65	1.0	90	8.0	1.0	2.0	1.0	90	90	0.25	0.013		STAND	Road Allowance	Right-of-way and Street Two to IGD
206	1.85	82	0		5.0	30	8.4								0.09	NASH	Open Space	Open Space to IGD
207	0.85	82	8		0.5	180	8.4								0.49	NASH	Open Space	Open Space to IGD, Charles Young Avenue
208	3.33	82	0		0.5	110	8.4								0.39	NASH	Open Space	Open Space to IGD
	8.00		**5.8**															
	17.17		**38.2**															
Catchments Draining to Culvert																		
Catchments Draining to South SWM Facility																		
209	13.14	76	65	65	0.5	80	8.0	1.0	2.0	0.5	80	80	0.25	0.013		STAND	Residential	Proposed Subdivision to Dry Pond
210	4.17	82	4		0.5	80	8.4								0.33	NASH	Agricultural	Southern Portion of Cachet Lands Draining to Proposed SWMF
211	2.12	76	50	50	5	35	8.0	1.0	5.0	2.0	20	20	0.25	0.013		STAND	SWMF	Rear Yards + Proposed SWMF
	19.43		**50.3**															
Catchments Draining Directly to Culvert																		
212	2.77	70	1		2.5	85	8.2								0.20	NASH	Woodlot	Woodlot North of CN Culvert
213	1.00	70	1		0.5	110	8.2								0.39	NASH	Woodlot	Wetland within Woodlot North of CN Culvert
214	0.27	70	1		2.0	45	8.2								0.16	NASH	Agricultural	Southeastern Corner of Forest Glen Subdivision Woodlot
	4.04		**1.0**															
	23.47		**41.8**															
Catchments Draining to Forest Glen Woodlot																		
215	1.70	82	1		3.0	80	8.4								0.18	NASH	Agricultural	Western Portion Draining Externally to Forest Glen Woodlot
	42.34		**38.7**															

Time of concentration calculated using the Airport Method
tc = [3.26 * (1.1 - C) * L0.5] / Sw0.33, where
tc = time of concentration (min)
C = Runoff coefficient (assumed to be 0.2 for rural areas)
L = Overland Flow Length (m)
Sw = Catchment Slope

Tp = 0.6 * tc

IA = kS = k*((1000/CN)-10)*25.4
where k=0.075 for CN <=70
k=0.10 for 70<CN<=80
k=0.15 for 80<CN<=90
k=0.20 for CN >90

```
================================================================================

  SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
  S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
  SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
      S   W W   M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
  SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9   =========
                                                       9   9  9   9   # 3057174
       StormWater Management HYdrologic Model           999    999    =========

*******************************************************************************
***************************** SWMHYMO Ver/4.05  *****************************
*********  A single event and continuous hydrologic simulation model  *********
*********     based on the principles of HYMO and its successors      *********
*********                  OTTHYMO-83 and OTTHYMO-89.                 *********
*******************************************************************************
********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
*********                  Ottawa,  Ontario: (613) 836-3884           *********
*********                  Gatineau, Quebec: (819) 243-6858           *********
*********                  E-Mail: swmhymo@jfsa.Com                   *********
*******************************************************************************

+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++++++++ Licensed user: MTE Consultants Inc.                         +++++++++
+++++++++                in any City          SERIAL#:3057174        +++++++++
+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

*******************************************************************************
*********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++            *********
*********           Maximum value for ID numbers  :     10            *********
*********           Max. number of rainfall points: 105408            *********
*********           Max. number of flow points    : 105408            *********
*******************************************************************************


**********************   D E T A I L E D   O U T P U T   **********************
*******************************************************************************
*         DATE: 2022-01-26     TIME: 09:04:00     RUN COUNTER: 000030         *
*******************************************************************************
* Input   filename: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\pr12hr.dat          *
* Output  filename: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\pr12hr.out          *
* Summary filename: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\pr12hr.sum          *
* User comments:                                                              *
* 1:_____________________________________________________________________     *
* 2:_____________________________________________________________________     *
* 3:_____________________________________________________________________     *
*******************************************************************************

--------------------------------------------------------------------------------
-
```

```
001:0001--------------------------------------------------------------------------
-
*#*************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056]
*#  Date        : 11-11-2021
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*************************************************************************
--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 001
    NSTORM=   1
           #  1=25mm.4hr
-----------------------------------------------------------------------------------
-
001:0002--------------------------------------------------------------------------
-
--------------------
| READ STORM       |    Filename: 25-mm, 4 hour Chicago Storm, (a=508.5, b
| Ptotal=  25.00 mm|    Comments: 25-mm, 4 hour Chicago Storm, (a=508.5, b
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   1.410 |   1.08   3.570 |   2.08   6.620 |   3.08   2.160
               .17   1.480 |   1.17   4.160 |   2.17   5.580 |   3.17   2.050
               .25   1.560 |   1.25   5.010 |   2.25   4.840 |   3.25   1.960
               .33   1.640 |   1.33   6.350 |   2.33   4.270 |   3.33   1.870
               .42   1.740 |   1.42   8.730 |   2.42   3.830 |   3.42   1.790
               .50   1.850 |   1.50  14.060 |   2.50   3.480 |   3.50   1.720
               .58   1.980 |   1.58  35.190 |   2.58   3.190 |   3.58   1.660
               .67   2.130 |   1.67  71.896 |   2.67   2.950 |   3.67   1.600
               .75   2.310 |   1.75  26.870 |   2.75   2.740 |   3.75   1.540
               .83   2.530 |   1.83  15.350 |   2.83   2.570 |   3.83   1.490
               .92   2.790 |   1.92  10.660 |   2.92   2.410 |   3.92   1.440
              1.00   3.130 |   2.00   8.160 |   3.00   2.280 |   4.00   1.400

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001:0003--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=    6.99
| 01:201    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
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```
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.89         2.10
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=        .50         2.00
     Length            (m)=      80.00        80.00
     Mannings n             =     .013         .250

     Max.eff.Inten.(mm/hr)=      71.90         9.45
               over (min)        3.00        31.00
     Storage Coeff.  (min)=       3.14 (ii)   30.62 (ii)
     Unit Hyd. Tpeak (min)=       3.00        31.00
     Unit Hyd. peak  (cms)=        .36          .04
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .81          .01          .811 (iii)
     TIME TO PEAK    (hrs)=       1.68         2.33         1.683
     RUNOFF VOLUME    (mm)=      24.00         2.97        17.692
     TOTAL RAINFALL   (mm)=      25.00        25.00        25.000
     RUNOFF COEFFICIENT   =        .96          .12          .708

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0004--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .71
| 02:202    DT= 1.00 |   Total Imp(%)=   65.00   Dir. Conn.(%)=   65.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .46          .25
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      90.00        90.00
     Mannings n             =     .013         .250

     Max.eff.Inten.(mm/hr)=      71.90         9.45
               over (min)        3.00        32.00
     Storage Coeff.  (min)=       2.74 (ii)   32.23 (ii)
     Unit Hyd. Tpeak (min)=       3.00        32.00
     Unit Hyd. peak  (cms)=        .40          .04
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .08          .00          .079 (iii)
     TIME TO PEAK    (hrs)=       1.67         2.35         1.667
     RUNOFF VOLUME    (mm)=      24.00         2.97        16.640
     TOTAL RAINFALL   (mm)=      25.00        25.00        25.000
```

```
     RUNOFF COEFFICIENT   =        .96          .12           .666

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0005--------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.47
| 03:203    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .74          .74
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      20.00        20.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      71.90         4.69
               over (min)        1.00        13.00
     Storage Coeff.  (min)=        .90 (ii)   12.93 (ii)
     Unit Hyd. Tpeak (min)=       1.00        13.00
     Unit Hyd. peak  (cms)=       1.14          .09
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .15          .01          .147 (iii)
     TIME TO PEAK    (hrs)=       1.67         1.95         1.667
     RUNOFF VOLUME    (mm)=      24.00         2.97        13.486
     TOTAL RAINFALL   (mm)=      25.00        25.00        25.000
     RUNOFF COEFFICIENT   =        .96          .12          .539

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0006--------------------------------------------------------------------------
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------------------------
| ADD HYD (IGD       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 01:201            6.99      .811    1.68  17.69    .000
```

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                  +ID2 02:202             .71     .079    1.67  16.64    .000

                  +ID3 03:203            1.47     .147    1.67  13.49    .000

                   ========================================================
                   SUM 04:IGD            9.17    1.034    1.67  16.94    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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001:0007--------------------------------------------------------------------------
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| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>04:(IGD   )   |
| OUT<05:(SWMF  )   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |    1.197  .8602E+00
                            .005  .9440E-01   |    2.127  .1064E+01
                            .066  .2500E+00   |    3.967  .1353E+01
                            .275  .4216E+00   |    5.655  .1586E+01
                            .614  .6032E+00   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (IGD   )       9.17     1.034     1.667     16.936
     OUTFLOW<05: (SWMF  )       9.17      .022     4.033     16.935
    OVERFLOW<06: (SWMFO )        .00      .000      .000       .000

                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                   PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=    2.160
                   TIME SHIFT OF PEAK FLOW         (min)=   142.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.1388E+00

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001:0008--------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.38
| 01:204    DT= 1.00 |   Total Imp(%)=    1.00   Dir. Conn.(%)=    1.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
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```
     Surface Area     (ha)=        .01          1.37
     Dep. Storage     (mm)=       1.00          8.00
     Average Slope     (%)=        .50          5.00
     Length            (m)=      15.00        120.00
     Mannings n           =       .013          .250

     Max.eff.Inten.(mm/hr)=      71.90          9.45
               over (min)         1.00         28.00
     Storage Coeff.  (min)=       1.15 (ii)    27.78 (ii)
     Unit Hyd. Tpeak (min)=       1.00         28.00
     Unit Hyd. peak  (cms)=        .99           .04
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .00           .01          .007 (iii)
     TIME TO PEAK    (hrs)=       1.67          2.27         2.250
     RUNOFF VOLUME    (mm)=      24.00          2.97         3.183
     TOTAL RAINFALL   (mm)=      25.00         25.00        25.000
     RUNOFF COEFFICIENT   =        .96           .12          .127
      *** WARNING: For areas with impervious ratios below
                   20%, this routine may not be applicable.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0009--------------------------------------------------------------------------
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| CALIB STANDHYD     |   Area    (ha)=     .59
| 02:205    DT= 1.00 |   Total Imp(%)=   65.00   Dir. Conn.(%)=   65.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .38           .21
     Dep. Storage     (mm)=       1.00          8.00
     Average Slope     (%)=       1.00          2.00
     Length            (m)=      90.00         90.00
     Mannings n           =       .013          .250

     Max.eff.Inten.(mm/hr)=      71.90          9.45
               over (min)         3.00         32.00
     Storage Coeff.  (min)=       2.74 (ii)    32.23 (ii)
     Unit Hyd. Tpeak (min)=       3.00         32.00
     Unit Hyd. peak  (cms)=        .40           .04
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .07           .00          .066 (iii)
     TIME TO PEAK    (hrs)=       1.67          2.35         1.667
     RUNOFF VOLUME    (mm)=      24.00          2.97        16.640
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```
     TOTAL RAINFALL   (mm)=      25.00        25.00         25.000
     RUNOFF COEFFICIENT   =        .96          .12           .666

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0010---------------------------------------------------------------------
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| CALIB NASHYD       |   Area    (ha)=    1.85   Curve Number   (CN)=82.00
| 03:206    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .090

     Unit Hyd Qpeak  (cms)=     .785

     PEAK FLOW       (cms)=     .028 (i)
     TIME TO PEAK    (hrs)=    1.783
     RUNOFF VOLUME    (mm)=    3.808
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .152

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0011---------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=     .85   Curve Number   (CN)=82.00
| 04:207    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .490

     Unit Hyd Qpeak  (cms)=     .066

     PEAK FLOW       (cms)=     .005 (i)
     TIME TO PEAK    (hrs)=    2.417
     RUNOFF VOLUME    (mm)=    3.807
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .152

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0012---------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=    3.33   Curve Number   (CN)=82.00
| 07:208    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .390

     Unit Hyd Qpeak  (cms)=     .326

     PEAK FLOW       (cms)=     .024 (i)
     TIME TO PEAK    (hrs)=    2.267
     RUNOFF VOLUME    (mm)=    3.808
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .152

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0013--------------------------------------------------------------------------
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------------------------
| ADD HYD (IGD       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:204            1.38     .007    2.25   3.18    .000

                     +ID2 02:205             .59     .066    1.67  16.64    .000

                     +ID3 03:206            1.85     .028    1.78   3.81    .000

                     +ID4 04:207             .85     .005    2.42   3.81    .000

                     +ID5 05:SWMF           9.17     .022    4.03  16.93    .000

                     +ID6 07:208            3.33     .024    2.27   3.81    .000

                      ============================================================
                      SUM 08:IGD           17.17     .086    1.68  11.21    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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001:0014--------------------------------------------------------------------------
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  ** END OF RUN :   1

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--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 002
    NSTORM=   1
           #  1=watSCS2.12h
-------------------------------------------------------------------------------
-
002:0002---------------------------------------------------------------------
-
*#*****************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056]
*#  Date        : 11-11-2021
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*****************************************************************************
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002:0002---------------------------------------------------------------------
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--------------------
| READ STORM       |    Filename: 2-year, 12 hour SCS Type II Storm, Regio
| Ptotal=  48.05 mm|    Comments: 2-year, 12 hour SCS Type II Storm, Regio
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .50    .960 |   3.50   1.920 |   6.50   8.650 |   9.50   1.920
              1.00    .960 |   4.00   1.920 |   7.00   3.850 |  10.00    .960
              1.50    .960 |   4.50   2.880 |   7.50   2.880 |  10.50    .960
              2.00    .960 |   5.00   3.850 |   8.00   2.880 |  11.00    .960
              2.50   1.920 |   5.50   5.770 |   8.50   1.920 |  11.50    .960
              3.00   1.920 |   6.00  43.260 |   9.00   1.920 |  12.00    .960

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002:0003---------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=    6.99
| 01:201    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
```

```
     Surface Area     (ha)=       4.89         2.10
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=        .50         2.00
     Length            (m)=      80.00        80.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      43.26        12.57
               over (min)        4.00        28.00
     Storage Coeff.  (min)=       3.85 (ii)   28.37 (ii)
     Unit Hyd. Tpeak (min)=       4.00        28.00
     Unit Hyd. peak  (cms)=        .29          .04
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .59          .04          .611 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.37         6.001
     RUNOFF VOLUME    (mm)=      47.05        13.33        36.936
     TOTAL RAINFALL   (mm)=      48.05        48.05        48.050
     RUNOFF COEFFICIENT   =        .98          .28          .769

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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002:0004--------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=     .71
| 02:202    DT= 1.00 |   Total Imp(%)=   65.00   Dir. Conn.(%)=   65.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .46          .25
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      90.00        90.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      43.26        12.04
               over (min)        3.00        30.00
     Storage Coeff.  (min)=       3.35 (ii)   30.13 (ii)
     Unit Hyd. Tpeak (min)=       3.00        30.00
     Unit Hyd. peak  (cms)=        .35          .04
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .06          .00          .058 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.40         6.001
     RUNOFF VOLUME    (mm)=      47.05        13.33        35.250
     TOTAL RAINFALL   (mm)=      48.05        48.05        48.050
     RUNOFF COEFFICIENT   =        .98          .28          .734
```

```
       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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002:0005--------------------------------------------------------------------------
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| CALIB STANDHYD     |   Area    (ha)=    1.47
| 03:203    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .74          .74
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      20.00        20.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      43.26        16.99
               over (min)        1.00         8.00
     Storage Coeff.  (min)=       1.10 (ii)    8.29 (ii)
     Unit Hyd. Tpeak (min)=       1.00         8.00
     Unit Hyd. peak  (cms)=       1.01          .14
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .09          .03          .116 (iii)
     TIME TO PEAK    (hrs)=       5.92         6.03         6.001
     RUNOFF VOLUME    (mm)=      47.05        13.34        30.194
     TOTAL RAINFALL   (mm)=      48.05        48.05        48.050
     RUNOFF COEFFICIENT   =        .98          .28          .628

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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002:0006--------------------------------------------------------------------------
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------------------------
| ADD HYD (IGD       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 01:201            6.99      .611    6.00  36.94    .000

                    +ID2 02:202             .71      .058    6.00  35.25    .000
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                    +ID3 03:203            1.47     .116    6.00  30.19    .000

                     ============================================================
                     SUM 04:IGD            9.17     .784    6.00  35.72    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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002:0007--------------------------------------------------------------------------
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| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>04:(IGD   )   |
| OUT<05:(SWMF  )   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |    1.197  .8602E+00
                            .005  .9440E-01   |    2.127  .1064E+01
                            .066  .2500E+00   |    3.967  .1353E+01
                            .275  .4216E+00   |    5.655  .1586E+01
                            .614  .6032E+00   |     .000  .0000E+00

     ROUTING RESULTS           AREA     QPEAK     TPEAK       R.V.
     --------------------      (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (IGD   )      9.17      .784     6.001     35.725
     OUTFLOW<05: (SWMF  )      9.17      .061     8.034     35.722
    OVERFLOW<06: (SWMFO )       .00      .000      .000       .000

                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                   PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=    7.731
                   TIME SHIFT OF PEAK FLOW         (min)=   122.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.2370E+00

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002:0008--------------------------------------------------------------------------
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| CALIB STANDHYD     |   Area    (ha)=    1.38
| 01:204    DT= 1.00 |   Total Imp(%)=    1.00   Dir. Conn.(%)=    1.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .01         1.37
```

```
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=        .50         5.00
     Length            (m)=      15.00       120.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      43.26        13.32
               over (min)        1.00        25.00
     Storage Coeff.  (min)=       1.41 (ii)   24.62 (ii)
     Unit Hyd. Tpeak (min)=       1.00        25.00
     Unit Hyd. peak  (cms)=        .86          .05
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .00          .03          .031 (iii)
     TIME TO PEAK    (hrs)=       5.98         6.30         6.301
     RUNOFF VOLUME    (mm)=      47.05        13.34        13.675
     TOTAL RAINFALL   (mm)=      48.05        48.05        48.050
     RUNOFF COEFFICIENT   =        .98          .28          .285
      *** WARNING: For areas with impervious ratios below
                   20%, this routine may not be applicable.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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002:0009--------------------------------------------------------------------------
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| CALIB STANDHYD     |   Area    (ha)=     .59
| 02:205    DT= 1.00 |   Total Imp(%)=   65.00   Dir. Conn.(%)=   65.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .38          .21
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      90.00        90.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      43.26        12.04
               over (min)        3.00        30.00
     Storage Coeff.  (min)=       3.35 (ii)   30.13 (ii)
     Unit Hyd. Tpeak (min)=       3.00        30.00
     Unit Hyd. peak  (cms)=        .35          .04
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .05          .00          .048 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.40         6.001
     RUNOFF VOLUME    (mm)=      47.05        13.34        35.251
     TOTAL RAINFALL   (mm)=      48.05        48.05        48.050
```

```
     RUNOFF COEFFICIENT   =        .98          .28           .734

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
002:0010--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.85   Curve Number   (CN)=82.00
| 03:206    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .090

     Unit Hyd Qpeak  (cms)=     .785

     PEAK FLOW       (cms)=     .101 (i)
     TIME TO PEAK    (hrs)=    6.018
     RUNOFF VOLUME    (mm)=   16.478
     TOTAL RAINFALL   (mm)=   48.050
     RUNOFF COEFFICIENT   =     .343

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
002:0011--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=     .85   Curve Number   (CN)=82.00
| 04:207    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .490

     Unit Hyd Qpeak  (cms)=     .066

     PEAK FLOW       (cms)=     .021 (i)
     TIME TO PEAK    (hrs)=    6.418
     RUNOFF VOLUME    (mm)=   16.477
     TOTAL RAINFALL   (mm)=   48.050
     RUNOFF COEFFICIENT   =     .343

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
002:0012--------------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=    3.33   Curve Number   (CN)=82.00
| 07:208    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .390

     Unit Hyd Qpeak  (cms)=     .326

     PEAK FLOW       (cms)=     .096 (i)
     TIME TO PEAK    (hrs)=    6.284
     RUNOFF VOLUME    (mm)=   16.478
     TOTAL RAINFALL   (mm)=   48.050
     RUNOFF COEFFICIENT   =     .343

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
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002:0013--------------------------------------------------------------------
-
------------------------
| ADD HYD (IGD       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:204           1.38     .031    6.30  13.67    .000

                     +ID2 02:205            .59     .048    6.00  35.25    .000

                     +ID3 03:206           1.85     .101    6.02  16.48    .000

                     +ID4 04:207            .85     .021    6.42  16.48    .000

                     +ID5 05:SWMF          9.17     .061    8.03  35.72    .000

                     +ID6 07:208           3.33     .096    6.28  16.48    .000

                      ============================================================
                      SUM 08:IGD          17.17     .282    6.02  27.17    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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002:0014--------------------------------------------------------------------
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002:0002--------------------------------------------------------------------
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  ** END OF RUN :   2
```

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*******************************************************************************



--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\
--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 003
    NSTORM=   1
           #  1=watSCS5.12h
--------------------------------------------------------------------------------
-
003:0002---------------------------------------------------------------------------
-
*#*****************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056]
*#  Date        : 11-11-2021
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*****************************************************************************
--------------------------------------------------------------------------------
-
003:0002---------------------------------------------------------------------------
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--------------------
| READ STORM       |    Filename: 5-year, 12 hour SCS Type II Storm, Regio
| Ptotal=  66.06 mm|    Comments: 5-year, 12 hour SCS Type II Storm, Regio
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .50   1.320 |   3.50   2.640 |   6.50  11.890 |   9.50   2.640
              1.00   1.320 |   4.00   2.640 |   7.00   5.290 |  10.00   1.320
              1.50   1.320 |   4.50   3.960 |   7.50   3.960 |  10.50   1.320
              2.00   1.320 |   5.00   5.290 |   8.00   3.960 |  11.00   1.320
              2.50   2.640 |   5.50   7.930 |   8.50   2.640 |  11.50   1.320
              3.00   2.640 |   6.00  59.470 |   9.00   2.640 |  12.00   1.320

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003:0003---------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=    6.99
```

```
| 01:201    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.89         2.10
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=        .50         2.00
     Length            (m)=      80.00        80.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      59.47        26.05
               over (min)        3.00        22.00
     Storage Coeff.  (min)=       3.39 (ii)   21.71 (ii)
     Unit Hyd. Tpeak (min)=       3.00        22.00
     Unit Hyd. peak  (cms)=        .35          .05
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .81          .10          .877 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.23         6.001
     RUNOFF VOLUME    (mm)=      65.05        24.37        52.852
     TOTAL RAINFALL   (mm)=      66.06        66.06        66.056
     RUNOFF COEFFICIENT   =        .98          .37          .800

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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003:0004---------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .71
| 02:202    DT= 1.00 |   Total Imp(%)=   65.00   Dir. Conn.(%)=   65.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .46          .25
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      90.00        90.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      59.47        25.70
               over (min)        3.00        23.00
     Storage Coeff.  (min)=       2.95 (ii)   22.72 (ii)
     Unit Hyd. Tpeak (min)=       3.00        23.00
     Unit Hyd. peak  (cms)=        .38          .05
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .08          .01          .084 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.25         6.001
```

```
     RUNOFF VOLUME    (mm)=      65.05        24.37         50.818
     TOTAL RAINFALL   (mm)=      66.06        66.06         66.056
     RUNOFF COEFFICIENT   =        .98          .37           .769

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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003:0005---------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.47
| 03:203    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .74          .74
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      20.00        20.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      59.47        30.51
               over (min)        1.00         7.00
     Storage Coeff.  (min)=        .97 (ii)    6.66 (ii)
     Unit Hyd. Tpeak (min)=       1.00         7.00
     Unit Hyd. peak  (cms)=       1.09          .17
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .12          .05          .175 (iii)
     TIME TO PEAK    (hrs)=       5.73         6.02         6.001
     RUNOFF VOLUME    (mm)=      65.05        24.38        44.716
     TOTAL RAINFALL   (mm)=      66.06        66.06        66.056
     RUNOFF COEFFICIENT   =        .98          .37           .677

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
003:0006---------------------------------------------------------------------------
-
------------------------
| ADD HYD (IGD       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
```

```
                  ID1 01:201           6.99     .877    6.00  52.85    .000

                 +ID2 02:202            .71     .084    6.00  50.82    .000

                 +ID3 03:203           1.47     .175    6.00  44.72    .000

                  ============================================================
                  SUM 04:IGD           9.17    1.137    6.00  51.39    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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-
003:0007---------------------------------------------------------------------
-
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>04:(IGD   )   |
| OUT<05:(SWMF  )   |    =========  OUTLFOW STORAGE TABLE  =========
--------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                          (cms)    (ha.m.)   |    (cms)    (ha.m.)
                           .000  .0000E+00   |    1.197  .8602E+00
                           .005  .9440E-01   |    2.127  .1064E+01
                           .066  .2500E+00   |    3.967  .1353E+01
                           .275  .4216E+00   |    5.655  .1586E+01
                           .614  .6032E+00   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     -------------------        (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (IGD   )       9.17     1.137     6.001     51.390
     OUTFLOW<05: (SWMF  )       9.17      .147     6.851     51.385
    OVERFLOW<06: (SWMFO )        .00      .000      .000       .000

                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                   PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   12.896
                   TIME SHIFT OF PEAK FLOW         (min)=    51.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.3163E+00

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003:0008---------------------------------------------------------------------
-
---------------------
| CALIB STANDHYD    |   Area    (ha)=    1.38
| 01:204    DT= 1.00 |   Total Imp(%)=    1.00   Dir. Conn.(%)=    1.00
```

```
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .01          1.37
     Dep. Storage     (mm)=       1.00          8.00
     Average Slope     (%)=        .50          5.00
     Length            (m)=      15.00        120.00
     Mannings n           =       .013          .250

     Max.eff.Inten.(mm/hr)=      59.47         27.05
               over (min)         1.00         19.00
     Storage Coeff.  (min)=       1.24 (ii)    18.73 (ii)
     Unit Hyd. Tpeak (min)=       1.00         19.00
     Unit Hyd. peak  (cms)=        .94           .06
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .00           .07          .068 (iii)
     TIME TO PEAK    (hrs)=       5.73          6.18          6.184
     RUNOFF VOLUME    (mm)=      65.05         24.37         24.783
     TOTAL RAINFALL   (mm)=      66.06         66.06         66.056
     RUNOFF COEFFICIENT   =        .98           .37           .375
      *** WARNING: For areas with impervious ratios below
                   20%, this routine may not be applicable.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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003:0009---------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .59
| 02:205    DT= 1.00 |   Total Imp(%)=   65.00   Dir. Conn.(%)=   65.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .38           .21
     Dep. Storage     (mm)=       1.00          8.00
     Average Slope     (%)=       1.00          2.00
     Length            (m)=      90.00         90.00
     Mannings n           =       .013          .250

     Max.eff.Inten.(mm/hr)=      59.47         25.70
               over (min)         3.00         23.00
     Storage Coeff.  (min)=       2.95 (ii)    22.72 (ii)
     Unit Hyd. Tpeak (min)=       3.00         23.00
     Unit Hyd. peak  (cms)=        .38           .05
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .06           .01          .070 (iii)
```

```
     TIME TO PEAK    (hrs)=       6.00         6.25         6.001
     RUNOFF VOLUME    (mm)=      65.05        24.37        50.818
     TOTAL RAINFALL   (mm)=      66.06        66.06        66.056
     RUNOFF COEFFICIENT   =        .98          .37          .769

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
003:0010--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.85   Curve Number   (CN)=82.00
| 03:206    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .090

     Unit Hyd Qpeak  (cms)=     .785

     PEAK FLOW       (cms)=     .176 (i)
     TIME TO PEAK    (hrs)=    6.018
     RUNOFF VOLUME    (mm)=   29.310
     TOTAL RAINFALL   (mm)=   66.056
     RUNOFF COEFFICIENT   =     .444

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
003:0011--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=     .85   Curve Number   (CN)=82.00
| 04:207    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .490

     Unit Hyd Qpeak  (cms)=     .066

     PEAK FLOW       (cms)=     .039 (i)
     TIME TO PEAK    (hrs)=    6.384
     RUNOFF VOLUME    (mm)=   29.310
     TOTAL RAINFALL   (mm)=   66.056
     RUNOFF COEFFICIENT   =     .444

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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003:0012-------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    3.33   Curve Number   (CN)=82.00
| 07:208    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .390

     Unit Hyd Qpeak  (cms)=     .326

     PEAK FLOW       (cms)=     .177 (i)
     TIME TO PEAK    (hrs)=    6.251
     RUNOFF VOLUME    (mm)=   29.310
     TOTAL RAINFALL   (mm)=   66.056
     RUNOFF COEFFICIENT   =     .444

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
003:0013-------------------------------------------------------------------------
-
------------------------
| ADD HYD (IGD       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:204            1.38     .068    6.18  24.78    .000

                     +ID2 02:205             .59     .070    6.00  50.82    .000

                     +ID3 03:206            1.85     .176    6.02  29.31    .000

                     +ID4 04:207             .85     .039    6.38  29.31    .000

                     +ID5 05:SWMF           9.17     .147    6.85  51.39    .000

                     +ID6 07:208            3.33     .177    6.25  29.31    .000

                      ============================================================
                      SUM 08:IGD           17.17     .533    6.03  41.47    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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003:0014-------------------------------------------------------------------------
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-
003:0002-------------------------------------------------------------------------
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003:0002--------------------------------------------------------------------------
-
  ** END OF RUN :   3

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--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\
--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 004
    NSTORM=   1
           #  1=watSCS10.12h
--------------------------------------------------------------------------------
-
004:0002--------------------------------------------------------------------------
-
*#*****************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056]
*#  Date        : 11-11-2021
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*****************************************************************************
--------------------------------------------------------------------------------
-
004:0002--------------------------------------------------------------------------
-
--------------------
| READ STORM       |    Filename: 10-year, 12 hour SCS Type II Storm, Regi
| Ptotal=  78.19 mm|    Comments: 10-year, 12 hour SCS Type II Storm, Regi
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .50   1.560 |   3.50   3.130 |   6.50  14.080 |   9.50   3.130
              1.00   1.560 |   4.00   3.130 |   7.00   6.260 |  10.00   1.560
              1.50   1.560 |   4.50   4.690 |   7.50   4.690 |  10.50   1.560
              2.00   1.560 |   5.00   6.260 |   8.00   4.690 |  11.00   1.560
              2.50   3.130 |   5.50   9.380 |   8.50   3.130 |  11.50   1.560
              3.00   3.130 |   6.00  70.380 |   9.00   3.130 |  12.00   1.560
```

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--------------------------------------------------------------------------------
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004:0003--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=    6.99
| 01:201    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.89         2.10
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=        .50         2.00
     Length            (m)=      80.00        80.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      70.38        36.30
               over (min)        3.00        19.00
     Storage Coeff.  (min)=       3.17 (ii)   19.21 (ii)
     Unit Hyd. Tpeak (min)=       3.00        19.00
     Unit Hyd. peak  (cms)=        .36          .06
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .96          .14         1.069 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.18         6.001
     RUNOFF VOLUME    (mm)=      77.19        32.75        63.860
     TOTAL RAINFALL   (mm)=      78.19        78.19        78.190
     RUNOFF COEFFICIENT   =        .99          .42          .817

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
004:0004--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .71
| 02:202    DT= 1.00 |   Total Imp(%)=   65.00   Dir. Conn.(%)=   65.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .46          .25
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      90.00        90.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      70.38        35.91
```

```
           over (min)        3.00        20.00
     Storage Coeff.  (min)=       2.76 (ii)   20.05 (ii)
     Unit Hyd. Tpeak (min)=       3.00        20.00
     Unit Hyd. peak  (cms)=        .40          .06
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .09          .02          .103 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.20         6.001
     RUNOFF VOLUME    (mm)=      77.19        32.75        61.638
     TOTAL RAINFALL   (mm)=      78.19        78.19        78.190
     RUNOFF COEFFICIENT   =        .99          .42          .788

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
004:0005--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.47
| 03:203    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .74          .74
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      20.00        20.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      70.38        40.63
               over (min)        1.00         6.00
     Storage Coeff.  (min)=        .91 (ii)    5.98 (ii)
     Unit Hyd. Tpeak (min)=       1.00         6.00
     Unit Hyd. peak  (cms)=       1.13          .19
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .14          .07          .218 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.02         6.001
     RUNOFF VOLUME    (mm)=      77.19        32.75        54.973
     TOTAL RAINFALL   (mm)=      78.19        78.19        78.190
     RUNOFF COEFFICIENT   =        .99          .42          .703

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
```

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004:0006--------------------------------------------------------------------------
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------------------------
| ADD HYD (IGD       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:201            6.99    1.069    6.00  63.86    .000

                     +ID2 02:202             .71     .103    6.00  61.64    .000

                     +ID3 03:203            1.47     .218    6.00  54.97    .000

                      ============================================================
                      SUM 04:IGD            9.17    1.390    6.00  62.26    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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004:0007--------------------------------------------------------------------------
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---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>04:(IGD   )   |
| OUT<05:(SWMF  )   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |    1.197  .8602E+00
                            .005  .9440E-01   |    2.127  .1064E+01
                            .066  .2500E+00   |    3.967  .1353E+01
                            .275  .4216E+00   |    5.655  .1586E+01
                            .614  .6032E+00   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (IGD   )       9.17     1.390     6.001     62.263
     OUTFLOW<05: (SWMF  )       9.17      .214     6.651     62.258
    OVERFLOW<06: (SWMFO )        .00      .000      .000       .000

                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=   15.390
                    TIME SHIFT OF PEAK FLOW         (min)=    39.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.3715E+00
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004:0008--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.38
| 01:204    DT= 1.00 |   Total Imp(%)=    1.00   Dir. Conn.(%)=    1.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .01          1.37
     Dep. Storage     (mm)=       1.00          8.00
     Average Slope     (%)=        .50          5.00
     Length            (m)=      15.00        120.00
     Mannings n           =       .013          .250

     Max.eff.Inten.(mm/hr)=      70.38         37.05
               over (min)         1.00         17.00
     Storage Coeff.  (min)=       1.16 (ii)    16.58 (ii)
     Unit Hyd. Tpeak (min)=       1.00         17.00
     Unit Hyd. peak  (cms)=        .98           .07
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .00           .10          .098 (iii)
     TIME TO PEAK    (hrs)=       6.00          6.15         6.151
     RUNOFF VOLUME    (mm)=      77.19         32.75        33.201
     TOTAL RAINFALL   (mm)=      78.19         78.19        78.190
     RUNOFF COEFFICIENT   =        .99           .42          .425
      *** WARNING: For areas with impervious ratios below
                   20%, this routine may not be applicable.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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004:0009--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .59
| 02:205    DT= 1.00 |   Total Imp(%)=   65.00   Dir. Conn.(%)=   65.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .38           .21
     Dep. Storage     (mm)=       1.00          8.00
     Average Slope     (%)=       1.00          2.00
     Length            (m)=      90.00         90.00
     Mannings n           =       .013          .250
```

```
     Max.eff.Inten.(mm/hr)=      70.38        35.91
                over (min)        3.00        20.00
     Storage Coeff.  (min)=       2.76 (ii)   20.05 (ii)
     Unit Hyd. Tpeak (min)=       3.00        20.00
     Unit Hyd. peak  (cms)=        .40          .06
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .07          .01          .085 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.20         6.001
     RUNOFF VOLUME    (mm)=      77.19        32.75        61.638
     TOTAL RAINFALL   (mm)=      78.19        78.19        78.190
     RUNOFF COEFFICIENT   =        .99          .42          .788

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
004:0010--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.85   Curve Number   (CN)=82.00
| 03:206    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .090

     Unit Hyd Qpeak  (cms)=     .785

     PEAK FLOW       (cms)=     .231 (i)
     TIME TO PEAK    (hrs)=    6.001
     RUNOFF VOLUME    (mm)=   38.795
     TOTAL RAINFALL   (mm)=   78.190
     RUNOFF COEFFICIENT   =     .496

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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004:0011--------------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=     .85   Curve Number   (CN)=82.00
| 04:207    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .490

     Unit Hyd Qpeak  (cms)=     .066

     PEAK FLOW       (cms)=     .052 (i)
     TIME TO PEAK    (hrs)=    6.368
```

```
     RUNOFF VOLUME    (mm)=   38.795
     TOTAL RAINFALL   (mm)=   78.190
     RUNOFF COEFFICIENT   =     .496

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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004:0012---------------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=    3.33   Curve Number   (CN)=82.00
| 07:208    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .390

     Unit Hyd Qpeak  (cms)=     .326

     PEAK FLOW       (cms)=     .237 (i)
     TIME TO PEAK    (hrs)=    6.251
     RUNOFF VOLUME    (mm)=   38.795
     TOTAL RAINFALL   (mm)=   78.190
     RUNOFF COEFFICIENT   =     .496

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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004:0013---------------------------------------------------------------------------
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------------------------
| ADD HYD (IGD       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:204            1.38     .098    6.15  33.20    .000

                     +ID2 02:205             .59     .085    6.00  61.64    .000

                     +ID3 03:206            1.85     .231    6.00  38.80    .000

                     +ID4 04:207             .85     .052    6.37  38.79    .000

                     +ID5 05:SWMF           9.17     .214    6.65  62.26    .000

                     +ID6 07:208            3.33     .237    6.25  38.80    .000

                      ============================================================
                      SUM 08:IGD           17.17     .755    6.03  51.66    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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004:0014--------------------------------------------------------------------
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004:0002--------------------------------------------------------------------
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004:0002--------------------------------------------------------------------
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004:0002--------------------------------------------------------------------
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  ** END OF RUN :   4

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| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 005
    NSTORM=   1
           #  1=watSCS25.12h
------------------------------------------------------------------------------
-
005:0002--------------------------------------------------------------------
-
*#*****************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056]
*#  Date        : 11-11-2021
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*****************************************************************************
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005:0002--------------------------------------------------------------------
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| READ STORM | Filename: 25-year, 12 hour SCS Type II Storm, Regi
| Ptotal= 93.08 mm| Comments: 25-year, 12 hour SCS Type II Storm, Regi

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.50	1.860	3.50	3.720	6.50	16.760	9.50	3.720
1.00	1.860	4.00	3.720	7.00	7.450	10.00	1.860
1.50	1.860	4.50	5.590	7.50	5.590	10.50	1.860
2.00	1.860	5.00	7.450	8.00	5.590	11.00	1.860
2.50	3.720	5.50	11.170	8.50	3.720	11.50	1.860
3.00	3.720	6.00	83.780	9.00	3.720	12.00	1.860

005:0003---

| CALIB STANDHYD | Area (ha)= 6.99
| 01:201 DT= 1.00 | Total Imp(%)= 70.00 Dir. Conn.(%)= 70.00

		IMPERVIOUS	PERVIOUS (i)
Surface Area	(ha)=	4.89	2.10
Dep. Storage	(mm)=	1.00	8.00
Average Slope	(%)=	.50	2.00
Length	(m)=	80.00	80.00
Mannings n	=	.013	.250
Max.eff.Inten.(mm/hr)	=	83.78	49.25
over (min)		3.00	17.00
Storage Coeff.	(min)=	2.95 (ii)	17.15 (ii)
Unit Hyd. Tpeak	(min)=	3.00	17.00
Unit Hyd. peak	(cms)=	.38	.07

				TOTALS
PEAK FLOW	(cms)=	1.14	.20	1.310 (iii)
TIME TO PEAK	(hrs)=	6.00	6.13	6.001
RUNOFF VOLUME	(mm)=	92.08	43.79	77.594
TOTAL RAINFALL	(mm)=	93.08	93.08	93.080
RUNOFF COEFFICIENT	=	.99	.47	.834

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

005:0004---

```
| CALIB STANDHYD     |   Area    (ha)=     .71
| 02:202    DT= 1.00 |   Total Imp(%)=   65.00   Dir. Conn.(%)=   65.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .46          .25
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      90.00        90.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      83.78        48.82
               over (min)        3.00        18.00
     Storage Coeff.  (min)=       2.57 (ii)   17.87 (ii)
     Unit Hyd. Tpeak (min)=       3.00        18.00
     Unit Hyd. peak  (cms)=        .41          .06
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .11          .02          .127 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.15         6.001
     RUNOFF VOLUME    (mm)=      92.08        43.79        75.180
     TOTAL RAINFALL   (mm)=      93.08        93.08        93.080
     RUNOFF COEFFICIENT   =        .99          .47          .808

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
005:0005---------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.47
| 03:203    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .74          .74
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      20.00        20.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      83.78        53.68
               over (min)        1.00         5.00
     Storage Coeff.  (min)=        .85 (ii)    5.38 (ii)
     Unit Hyd. Tpeak (min)=       1.00         5.00
     Unit Hyd. peak  (cms)=       1.18          .22
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .17          .10          .272 (iii)
```

```
     TIME TO PEAK    (hrs)=       5.90         6.00          6.001
     RUNOFF VOLUME    (mm)=      92.08        43.79         67.936
     TOTAL RAINFALL   (mm)=      93.08        93.08         93.080
     RUNOFF COEFFICIENT   =        .99          .47           .730

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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005:0006--------------------------------------------------------------------------
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-------------------------
| ADD HYD (IGD       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:201            6.99    1.310    6.00  77.59    .000

                     +ID2 02:202             .71     .127    6.00  75.18    .000

                     +ID3 03:203            1.47     .272    6.00  67.94    .000

                      ============================================================
                      SUM 04:IGD            9.17    1.710    6.00  75.86    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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005:0007--------------------------------------------------------------------------
-
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>04:(IGD   )   |
| OUT<05:(SWMF  )   |    =========  OUTLFOW STORAGE TABLE  =========
--------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                          (cms)    (ha.m.)   |    (cms)    (ha.m.)
                           .000  .0000E+00   |    1.197  .8602E+00
                           .005  .9440E-01   |    2.127  .1064E+01
                           .066  .2500E+00   |    3.967  .1353E+01
                           .275  .4216E+00   |    5.655  .1586E+01
                           .614  .6032E+00   |     .000  .0000E+00

     ROUTING RESULTS           AREA     QPEAK     TPEAK       R.V.
     -------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (IGD   )      9.17     1.710     6.001     75.859
     OUTFLOW<05: (SWMF  )      9.17      .309     6.568     75.854
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    OVERFLOW<06: (SWMFO )        .00      .000      .000       .000

                  TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                  CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                  PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                  PEAK   FLOW   REDUCTION [Qout/Qin](%)=   18.081
                  TIME SHIFT OF PEAK FLOW         (min)=    34.00
                  MAXIMUM  STORAGE   USED       (ha.m.)=.4399E+00

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-
005:0008--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.38
| 01:204    DT= 1.00 |   Total Imp(%)=    1.00   Dir. Conn.(%)=    1.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .01         1.37
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=        .50         5.00
     Length            (m)=      15.00       120.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      83.78        50.07
               over (min)         1.00        15.00
     Storage Coeff.  (min)=       1.08 (ii)   14.75 (ii)
     Unit Hyd. Tpeak (min)=       1.00        15.00
     Unit Hyd. peak  (cms)=       1.03          .08
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .00          .14          .140 (iii)
     TIME TO PEAK    (hrs)=       5.90         6.12         6.118
     RUNOFF VOLUME    (mm)=      92.08        43.79        44.276
     TOTAL RAINFALL   (mm)=      93.08        93.08        93.080
     RUNOFF COEFFICIENT   =        .99          .47          .476
      *** WARNING: For areas with impervious ratios below
                   20%, this routine may not be applicable.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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005:0009--------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=     .59
| 02:205    DT= 1.00 |   Total Imp(%)=   65.00   Dir. Conn.(%)=   65.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .38          .21
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      90.00        90.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      83.78        48.82
               over (min)         3.00        18.00
     Storage Coeff.  (min)=       2.57 (ii)   17.87 (ii)
     Unit Hyd. Tpeak (min)=       3.00        18.00
     Unit Hyd. peak  (cms)=        .41          .06
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .09          .02          .105 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.15         6.001
     RUNOFF VOLUME    (mm)=      92.08        43.79        75.180
     TOTAL RAINFALL   (mm)=      93.08        93.08        93.080
     RUNOFF COEFFICIENT   =        .99          .47          .808

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
005:0010---------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.85   Curve Number   (CN)=82.00
| 03:206    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .090

     Unit Hyd Qpeak  (cms)=     .785

     PEAK FLOW       (cms)=     .300 (i)
     TIME TO PEAK    (hrs)=    6.001
     RUNOFF VOLUME    (mm)=   51.060
     TOTAL RAINFALL   (mm)=   93.080
     RUNOFF COEFFICIENT   =     .549

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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005:0011-------------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=     .85   Curve Number   (CN)=82.00
| 04:207    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .490

     Unit Hyd Qpeak  (cms)=     .066

     PEAK FLOW       (cms)=     .069 (i)
     TIME TO PEAK    (hrs)=    6.351
     RUNOFF VOLUME    (mm)=   51.060
     TOTAL RAINFALL   (mm)=   93.080
     RUNOFF COEFFICIENT   =     .549

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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005:0012-------------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=    3.33   Curve Number   (CN)=82.00
| 07:208    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .390

     Unit Hyd Qpeak  (cms)=     .326

     PEAK FLOW       (cms)=     .314 (i)
     TIME TO PEAK    (hrs)=    6.234
     RUNOFF VOLUME    (mm)=   51.060
     TOTAL RAINFALL   (mm)=   93.080
     RUNOFF COEFFICIENT   =     .549

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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005:0013-------------------------------------------------------------------------
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------------------------
| ADD HYD (IGD       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 01:204           1.38     .140    6.12  44.28    .000

                    +ID2 02:205            .59     .105    6.00  75.18    .000

                    +ID3 03:206           1.85     .300    6.00  51.06    .000

                    +ID4 04:207            .85     .069    6.35  51.06    .000
```

```
                    +ID5 05:SWMF           9.17     .309    6.57  75.85    .000

                    +ID6 07:208            3.33     .314    6.23  51.06    .000

                     ============================================================
                     SUM 08:IGD           17.17    1.040    6.03  64.58    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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005:0014----------------------------------------------------------------------
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005:0002----------------------------------------------------------------------
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005:0002----------------------------------------------------------------------
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005:0002----------------------------------------------------------------------
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005:0002----------------------------------------------------------------------
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  ** END OF RUN :   5

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| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 006
    NSTORM=   1
           #  1=watSCS50.12h
------------------------------------------------------------------------------
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006:0002-------------------------------------------------------------------------
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*#*************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056]
*#  Date        : 11-11-2021
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*************************************************************************
-------------------------------------------------------------------------------
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006:0002-------------------------------------------------------------------------
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--------------------
| READ STORM       |    Filename: 50-year, 12 hour SCS Type II Storm, Regi
| Ptotal= 104.85 mm|    Comments: 50-year, 12 hour SCS Type II Storm, Regi
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .50   2.100 |   3.50   4.190 |   6.50  18.870 |   9.50   4.190
              1.00   2.100 |   4.00   4.190 |   7.00   8.390 |  10.00   2.100
              1.50   2.100 |   4.50   6.290 |   7.50   6.290 |  10.50   2.100
              2.00   2.100 |   5.00   8.390 |   8.00   6.290 |  11.00   2.100
              2.50   4.190 |   5.50  12.580 |   8.50   4.190 |  11.50   2.100
              3.00   4.190 |   6.00  94.370 |   9.00   4.190 |  12.00   2.100

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006:0003-------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=    6.99
| 01:201    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.89         2.10
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=        .50         2.00
     Length            (m)=      80.00        80.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      94.37        59.75
               over (min)        3.00        16.00
     Storage Coeff.  (min)=       2.82 (ii)   15.96 (ii)
     Unit Hyd. Tpeak (min)=       3.00        16.00
     Unit Hyd. peak  (cms)=        .39          .07
                                                        *TOTALS*
     PEAK FLOW       (cms)=       1.28          .25         1.505 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.12         6.001
```

```
     RUNOFF VOLUME    (mm)=     103.85        52.97         88.588
     TOTAL RAINFALL   (mm)=     104.85       104.85        104.851
     RUNOFF COEFFICIENT   =        .99          .51           .845

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
006:0004--------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=     .71
| 02:202    DT= 1.00 |   Total Imp(%)=   65.00   Dir. Conn.(%)=   65.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .46          .25
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      90.00        90.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      94.37        59.29
               over (min)        2.00        17.00
     Storage Coeff.  (min)=       2.45 (ii)   16.61 (ii)
     Unit Hyd. Tpeak (min)=       2.00        17.00
     Unit Hyd. peak  (cms)=        .49          .07
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .12          .03          .146 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.13         6.001
     RUNOFF VOLUME    (mm)=     103.85        52.97        86.045
     TOTAL RAINFALL   (mm)=     104.85       104.85       104.851
     RUNOFF COEFFICIENT   =        .99          .51           .821

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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006:0005--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.47
| 03:203    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
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----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .74          .74
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      20.00        20.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      94.37        64.10
               over (min)        1.00         5.00
     Storage Coeff.  (min)=        .81 (ii)    5.03 (ii)
     Unit Hyd. Tpeak (min)=       1.00         5.00
     Unit Hyd. peak  (cms)=       1.21          .23
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .19          .12          .315 (iii)
     TIME TO PEAK    (hrs)=       5.72         6.00         6.001
     RUNOFF VOLUME    (mm)=     103.85        52.97        78.414
     TOTAL RAINFALL   (mm)=     104.85       104.85       104.851
     RUNOFF COEFFICIENT   =        .99          .51          .748

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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006:0006---------------------------------------------------------------------
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------------------------
| ADD HYD (IGD       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 01:201            6.99    1.505    6.00  88.59    .000

                    +ID2 02:202             .71     .146    6.00  86.04    .000

                    +ID3 03:203            1.47     .315    6.00  78.41    .000

                     ========================================================
                     SUM 04:IGD            9.17    1.967    6.00  86.76    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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006:0007---------------------------------------------------------------------
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| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>04:(IGD   )   |
| OUT<05:(SWMF  )   |    =========  OUTLFOW STORAGE TABLE  =========
--------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                          (cms)    (ha.m.)   |    (cms)    (ha.m.)
                           .000  .0000E+00   |    1.197  .8602E+00
                           .005  .9440E-01   |    2.127  .1064E+01
                           .066  .2500E+00   |    3.967  .1353E+01
                           .275  .4216E+00   |    5.655  .1586E+01
                           .614  .6032E+00   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (IGD   )       9.17     1.967     6.001     86.760
     OUTFLOW<05: (SWMF  )       9.17      .402     6.551     86.750
    OVERFLOW<06: (SWMFO )        .00      .000      .000       .000

                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                   PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   20.458
                   TIME SHIFT OF PEAK FLOW         (min)=    33.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.4900E+00

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006:0008----------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.38
| 01:204    DT= 1.00 |   Total Imp(%)=    1.00   Dir. Conn.(%)=    1.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .01         1.37
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=        .50         5.00
     Length            (m)=      15.00       120.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      94.37        60.63
               over (min)        1.00        14.00
     Storage Coeff.  (min)=       1.03 (ii)   13.69 (ii)
     Unit Hyd. Tpeak (min)=       1.00        14.00
     Unit Hyd. peak  (cms)=       1.05          .08
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .00          .17          .175 (iii)
     TIME TO PEAK    (hrs)=       5.68         6.08         6.084
     RUNOFF VOLUME    (mm)=     103.85        52.97        53.485
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     TOTAL RAINFALL   (mm)=     104.85       104.85        104.851
     RUNOFF COEFFICIENT   =        .99          .51           .510
      *** WARNING: For areas with impervious ratios below
                   20%, this routine may not be applicable.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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006:0009--------------------------------------------------------------------------
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| CALIB STANDHYD     |   Area    (ha)=     .59
| 02:205    DT= 1.00 |   Total Imp(%)=   65.00   Dir. Conn.(%)=   65.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .38          .21
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      90.00        90.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      94.37        59.29
               over (min)        2.00        17.00
     Storage Coeff.  (min)=       2.45 (ii)   16.61 (ii)
     Unit Hyd. Tpeak (min)=       2.00        17.00
     Unit Hyd. peak  (cms)=        .49          .07
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .10          .02          .122 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.13         6.001
     RUNOFF VOLUME    (mm)=     103.85        52.97        86.045
     TOTAL RAINFALL   (mm)=     104.85       104.85        104.851
     RUNOFF COEFFICIENT   =        .99          .51           .821

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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006:0010--------------------------------------------------------------------------
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| CALIB NASHYD       |   Area    (ha)=    1.85   Curve Number   (CN)=82.00
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```
| 03:206    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .090

     Unit Hyd Qpeak  (cms)=     .785

     PEAK FLOW       (cms)=     .356 (i)
     TIME TO PEAK    (hrs)=    6.001
     RUNOFF VOLUME    (mm)=   61.119
     TOTAL RAINFALL   (mm)=  104.851
     RUNOFF COEFFICIENT   =     .583

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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006:0011---------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=     .85   Curve Number   (CN)=82.00
| 04:207    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .490

     Unit Hyd Qpeak  (cms)=     .066

     PEAK FLOW       (cms)=     .083 (i)
     TIME TO PEAK    (hrs)=    6.351
     RUNOFF VOLUME    (mm)=   61.118
     TOTAL RAINFALL   (mm)=  104.851
     RUNOFF COEFFICIENT   =     .583

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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006:0012---------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=    3.33   Curve Number   (CN)=82.00
| 07:208    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .390

     Unit Hyd Qpeak  (cms)=     .326

     PEAK FLOW       (cms)=     .378 (i)
     TIME TO PEAK    (hrs)=    6.234
     RUNOFF VOLUME    (mm)=   61.119
     TOTAL RAINFALL   (mm)=  104.851
     RUNOFF COEFFICIENT   =     .583

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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006:0013--------------------------------------------------------------------------
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------------------------
| ADD HYD (IGD       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:204           1.38     .175    6.08  53.48    .000

                     +ID2 02:205            .59     .122    6.00  86.04    .000

                     +ID3 03:206           1.85     .356    6.00  61.12    .000

                     +ID4 04:207            .85     .083    6.35  61.12    .000

                     +ID5 05:SWMF          9.17     .402    6.55  86.75    .000

                     +ID6 07:208           3.33     .378    6.23  61.12    .000

                      ============================================================
                      SUM 08:IGD          17.17    1.268    6.02  75.05    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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006:0014--------------------------------------------------------------------------
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006:0002--------------------------------------------------------------------------
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006:0002--------------------------------------------------------------------------
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006:0002--------------------------------------------------------------------------
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006:0002--------------------------------------------------------------------------
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006:0002--------------------------------------------------------------------------
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  ** END OF RUN :   6

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| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\
--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 007
    NSTORM=   1
           #  1=watSC100.12h
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007:0002---------------------------------------------------------------------------
-
*#*****************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056]
*#  Date        : 11-11-2021
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*****************************************************************************
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007:0002---------------------------------------------------------------------------
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--------------------
| READ STORM       |    Filename: 100-year, 12 hour SCS Type II Storm, Reg
| Ptotal= 115.84 mm|    Comments: 100-year, 12 hour SCS Type II Storm, Reg
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .50   2.320 |   3.50   4.630 |   6.50  20.850 |   9.50   4.630
              1.00   2.320 |   4.00   4.630 |   7.00   9.270 |  10.00   2.320
              1.50   2.320 |   4.50   6.950 |   7.50   6.950 |  10.50   2.320
              2.00   2.320 |   5.00   9.270 |   8.00   6.950 |  11.00   2.320
              2.50   4.630 |   5.50  13.900 |   8.50   4.630 |  11.50   2.320
              3.00   4.630 |   6.00 104.250 |   9.00   4.630 |  12.00   2.320

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007:0003---------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=    6.99
| 01:201    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.89         2.10
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=        .50         2.00
     Length            (m)=      80.00        80.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     104.25        69.86
               over (min)         3.00        15.00
     Storage Coeff.  (min)=       2.71 (ii)   15.05 (ii)
     Unit Hyd. Tpeak (min)=       3.00        15.00
     Unit Hyd. peak  (cms)=        .40          .08
                                                      *TOTALS*
     PEAK FLOW       (cms)=       1.42          .30         1.691 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.10         6.001
     RUNOFF VOLUME    (mm)=     114.84        61.83        98.942
     TOTAL RAINFALL   (mm)=     115.84       115.84       115.841
     RUNOFF COEFFICIENT   =        .99          .53          .854

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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007:0004---------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=     .71
| 02:202    DT= 1.00 |   Total Imp(%)=   65.00   Dir. Conn.(%)=   65.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .46          .25
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      90.00        90.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     104.25        69.39
               over (min)         2.00        16.00
     Storage Coeff.  (min)=       2.36 (ii)   15.65 (ii)
     Unit Hyd. Tpeak (min)=       2.00        16.00
     Unit Hyd. peak  (cms)=        .50          .07
                                                      *TOTALS*
```

```
     PEAK FLOW       (cms)=        .13          .03           .165 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.12          6.001
     RUNOFF VOLUME    (mm)=     114.84        61.83         96.292
     TOTAL RAINFALL   (mm)=     115.84       115.84        115.841
     RUNOFF COEFFICIENT   =        .99          .53           .831

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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007:0005---------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.47
| 03:203    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .74          .74
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      20.00        20.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=     104.25        73.99
               over (min)        1.00         5.00
     Storage Coeff.  (min)=        .78 (ii)    4.77 (ii)
     Unit Hyd. Tpeak (min)=       1.00         5.00
     Unit Hyd. peak  (cms)=       1.23          .23
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .21          .14           .356 (iii)
     TIME TO PEAK    (hrs)=       5.82         6.00          6.001
     RUNOFF VOLUME    (mm)=     114.84        61.84         88.342
     TOTAL RAINFALL   (mm)=     115.84       115.84        115.841
     RUNOFF COEFFICIENT   =        .99          .53           .763

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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007:0006---------------------------------------------------------------------
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ADD HYD (IGD)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
	ID1 01:201	6.99	1.691	6.00	98.94	.000
	+ID2 02:202	.71	.165	6.00	96.29	.000
	+ID3 03:203	1.47	.356	6.00	88.34	.000
	SUM 04:IGD	9.17	2.212	6.00	97.04	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

007:0007

ROUTE RESERVOIR IN>04:(IGD) OUT<05:(SWMF)

Requested routing time step = 1.0 min.

OUTLFOW STORAGE TABLE

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)
.000	.0000E+00	1.197	.8602E+00
.005	.9440E-01	2.127	.1064E+01
.066	.2500E+00	3.967	.1353E+01
.275	.4216E+00	5.655	.1586E+01
.614	.6032E+00	.000	.0000E+00

ROUTING RESULTS	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)
INFLOW >04: (IGD)	9.17	2.212	6.001	97.037
OUTFLOW<05: (SWMF)	9.17	.489	6.534	97.027
OVERFLOW<06: (SWMFO)	.00	.000	.000	.000

TOTAL NUMBER OF SIMULATED OVERFLOWS = 0
CUMULATIVE TIME OF OVERFLOWS (hours)= .00
PERCENTAGE OF TIME OVERFLOWING (%)= .00

PEAK FLOW REDUCTION [Qout/Qin](%)= 22.095
TIME SHIFT OF PEAK FLOW (min)= 32.00
MAXIMUM STORAGE USED (ha.m.)=.5363E+00

007:0008

```
| CALIB STANDHYD     |   Area    (ha)=    1.38
| 01:204    DT= 1.00 |   Total Imp(%)=    1.00   Dir. Conn.(%)=    1.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .01          1.37
     Dep. Storage     (mm)=       1.00          8.00
     Average Slope     (%)=        .50          5.00
     Length            (m)=      15.00        120.00
     Mannings n             =       .013          .250

     Max.eff.Inten.(mm/hr)=     104.25         70.78
               over (min)         1.00         13.00
     Storage Coeff.  (min)=        .99 (ii)    12.89 (ii)
     Unit Hyd. Tpeak (min)=       1.00         13.00
     Unit Hyd. peak  (cms)=       1.08           .09
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .00           .21           .210 (iii)
     TIME TO PEAK    (hrs)=       5.82          6.08          6.084
     RUNOFF VOLUME    (mm)=     114.84         61.84         62.373
     TOTAL RAINFALL   (mm)=     115.84        115.84        115.841
     RUNOFF COEFFICIENT   =        .99           .53           .538
      *** WARNING: For areas with impervious ratios below
                   20%, this routine may not be applicable.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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007:0009---------------------------------------------------------------------------
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| CALIB STANDHYD     |   Area    (ha)=     .59
| 02:205    DT= 1.00 |   Total Imp(%)=   65.00   Dir. Conn.(%)=   65.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .38           .21
     Dep. Storage     (mm)=       1.00          8.00
     Average Slope     (%)=       1.00          2.00
     Length            (m)=      90.00         90.00
     Mannings n             =       .013          .250

     Max.eff.Inten.(mm/hr)=     104.25         69.39
               over (min)         2.00         16.00
     Storage Coeff.  (min)=       2.36 (ii)    15.65 (ii)
     Unit Hyd. Tpeak (min)=       2.00         16.00
     Unit Hyd. peak  (cms)=        .50           .07
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                                                          *TOTALS*
     PEAK FLOW       (cms)=        .11          .03           .137 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.12          6.001
     RUNOFF VOLUME    (mm)=     114.84        61.83         96.292
     TOTAL RAINFALL   (mm)=     115.84       115.84        115.841
     RUNOFF COEFFICIENT   =        .99          .53           .831

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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007:0010---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.85   Curve Number   (CN)=82.00
| 03:206    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .090

     Unit Hyd Qpeak  (cms)=     .785

     PEAK FLOW       (cms)=     .408 (i)
     TIME TO PEAK    (hrs)=    6.001
     RUNOFF VOLUME    (mm)=   70.734
     TOTAL RAINFALL   (mm)=  115.841
     RUNOFF COEFFICIENT   =     .611

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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007:0011---------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=     .85   Curve Number   (CN)=82.00
| 04:207    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .490

     Unit Hyd Qpeak  (cms)=     .066

     PEAK FLOW       (cms)=     .096 (i)
     TIME TO PEAK    (hrs)=    6.351
     RUNOFF VOLUME    (mm)=   70.734
     TOTAL RAINFALL   (mm)=  115.841
     RUNOFF COEFFICIENT   =     .611

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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007:0012--------------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=    3.33   Curve Number   (CN)=82.00
| 07:208    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .390

     Unit Hyd Qpeak  (cms)=     .326

     PEAK FLOW       (cms)=     .438 (i)
     TIME TO PEAK    (hrs)=    6.234
     RUNOFF VOLUME    (mm)=   70.734
     TOTAL RAINFALL   (mm)=  115.841
     RUNOFF COEFFICIENT   =     .611

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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007:0013--------------------------------------------------------------------------
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-------------------------
| ADD HYD (IGD       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:204            1.38     .210    6.08  62.37    .000

                     +ID2 02:205             .59     .137    6.00  96.29    .000

                     +ID3 03:206            1.85     .408    6.00  70.73    .000

                     +ID4 04:207             .85     .096    6.35  70.73    .000

                     +ID5 05:SWMF           9.17     .489    6.53  97.03    .000

                     +ID6 07:208            3.33     .438    6.23  70.73    .000

                      ============================================================
                      SUM 08:IGD           17.17    1.518    6.02  84.98    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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007:0014--------------------------------------------------------------------------
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007:0002-------------------------------------------------------------------------
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007:0002-------------------------------------------------------------------------
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007:0002-------------------------------------------------------------------------
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007:0002-------------------------------------------------------------------------
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007:0002-------------------------------------------------------------------------
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007:0002-------------------------------------------------------------------------
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      FINISH
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*
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================================================================================

  SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
  S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
  SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
      S   W W   M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
  SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9   =========
                                                       9   9  9   9   # 3057174
       StormWater Management HYdrologic Model           999    999    =========

*******************************************************************************
***************************** SWMHYMO Ver/4.05  *****************************
*********  A single event and continuous hydrologic simulation model  *********
*********     based on the principles of HYMO and its successors      *********
*********                  OTTHYMO-83 and OTTHYMO-89.                 *********
*******************************************************************************
********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
*********                  Ottawa,  Ontario: (613) 836-3884           *********
*********                  Gatineau, Quebec: (819) 243-6858           *********
*********                  E-Mail: swmhymo@jfsa.Com                   *********
*******************************************************************************

+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++++++++ Licensed user: MTE Consultants Inc.                         +++++++++
+++++++++                in any City          SERIAL#:3057174        +++++++++
+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

*******************************************************************************
*********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++            *********
*********           Maximum value for ID numbers  :     10            *********
*********           Max. number of rainfall points: 105408            *********
*********           Max. number of flow points    : 105408            *********
*******************************************************************************


**********************   D E T A I L E D   O U T P U T   **********************
*******************************************************************************
*         DATE: 2022-01-26     TIME: 09:04:10     RUN COUNTER: 000031         *
*******************************************************************************
* Input   filename: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\prreg2.dat          *
* Output  filename: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\prreg2.out          *
* Summary filename: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\prreg2.sum          *
* User comments:                                                              *
* 1:_____________________________________________________________________     *
* 2:_____________________________________________________________________     *
* 3:_____________________________________________________________________     *
*******************************************************************************

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-
```

```
001:0001--------------------------------------------------------------------------
-
*#*************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056]
*#  Date        : 11-12-2021
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*************************************************************************
--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\POST\NORTHS~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 001
    NSTORM=   1
           #  1=regAMC2.48h
-------------------------------------------------------------------------------
-
001:0002--------------------------------------------------------------------------
-
--------------------
| READ STORM       |    Filename: Regional Storm Zone 1, AMC II Conditions
| Ptotal= 285.08 mm|    Comments: Regional Storm Zone 1, AMC II Conditions
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
              1.00   2.030 |  13.00   2.030 |  25.00   2.030 |  37.00   6.000
              2.00   2.030 |  14.00   2.030 |  26.00   2.030 |  38.00   4.000
              3.00   2.030 |  15.00   2.030 |  27.00   2.030 |  39.00   6.000
              4.00   2.030 |  16.00   2.030 |  28.00   2.030 |  40.00  13.000
              5.00   2.030 |  17.00   2.030 |  29.00   2.030 |  41.00  17.000
              6.00   2.030 |  18.00   2.030 |  30.00   2.030 |  42.00  13.000
              7.00   2.030 |  19.00   2.030 |  31.00   2.030 |  43.00  23.000
              8.00   2.030 |  20.00   2.030 |  32.00   2.030 |  44.00  13.000
              9.00   2.030 |  21.00   2.030 |  33.00   2.030 |  45.00  13.000
             10.00   2.030 |  22.00   2.030 |  34.00   2.030 |  46.00  53.000
             11.00   2.030 |  23.00   2.030 |  35.00   2.030 |  47.00  38.000
             12.00   2.030 |  24.00   2.030 |  36.00   2.030 |  48.00  13.000

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001:0003--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=    6.99
| 01:201    DT= 1.00 |   Total Imp(%)=   70.00   Dir. Conn.(%)=   70.00
----------------------
```

```
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       4.89         2.10
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=        .50         2.00
     Length            (m)=      80.00        80.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      53.00        49.17
               over (min)        4.00        18.00
     Storage Coeff.  (min)=       3.55 (ii)   17.76 (ii)
     Unit Hyd. Tpeak (min)=       4.00        18.00
     Unit Hyd. peak  (cms)=        .31          .06
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .72          .27          .991 (iii)
     TIME TO PEAK    (hrs)=      45.95        46.07        46.000
     RUNOFF VOLUME    (mm)=     284.07       214.83       263.322
     TOTAL RAINFALL   (mm)=     285.08       285.08       285.082
     RUNOFF COEFFICIENT   =       1.00          .75          .924

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
001:0004--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .71
| 02:202    DT= 1.00 |   Total Imp(%)=   65.00   Dir. Conn.(%)=   65.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .46          .25
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       1.00         2.00
     Length            (m)=      90.00        90.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      53.00        49.17
               over (min)        3.00        18.00
     Storage Coeff.  (min)=       3.09 (ii)   18.34 (ii)
     Unit Hyd. Tpeak (min)=       3.00        18.00
     Unit Hyd. peak  (cms)=        .37          .06
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .07          .03          .100 (iii)
     TIME TO PEAK    (hrs)=      45.73        46.07        46.000
     RUNOFF VOLUME    (mm)=     284.06       214.83       259.861
     TOTAL RAINFALL   (mm)=     285.08       285.08       285.082
```

```
     RUNOFF COEFFICIENT   =       1.00          .75           .912

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
001:0005--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.47
| 03:203    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .74          .74
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      20.00        20.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      53.00        49.30
               over (min)        1.00         6.00
     Storage Coeff.  (min)=       1.02 (ii)    5.71 (ii)
     Unit Hyd. Tpeak (min)=       1.00         6.00
     Unit Hyd. peak  (cms)=       1.06          .19
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .11          .10          .209 (iii)
     TIME TO PEAK    (hrs)=      45.27        46.00        46.000
     RUNOFF VOLUME    (mm)=     284.08       214.86       249.477
     TOTAL RAINFALL   (mm)=     285.08       285.08       285.082
     RUNOFF COEFFICIENT   =       1.00          .75          .875

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
001:0006--------------------------------------------------------------------------
-
------------------------
| ADD HYD (IGD       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:201            6.99     .991   46.00 263.32    .000
```

```
                  +ID2 02:202             .71     .100   46.00 259.86    .000

                  +ID3 03:203            1.47     .209   46.00 249.48    .000

                   ============================================================
                   SUM 04:IGD            9.17    1.300   46.00 260.83    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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-
001:0007--------------------------------------------------------------------------
-
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>04:(IGD   )   |
| OUT<05:(SWMF  )   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |    1.197  .8602E+00
                            .005  .9440E-01   |    2.127  .1064E+01
                            .066  .2500E+00   |    3.967  .1353E+01
                            .275  .4216E+00   |    5.655  .1586E+01
                            .614  .6032E+00   |     .000  .0000E+00

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (IGD   )       9.17     1.300    46.000    260.834
     OUTFLOW<05: (SWMF  )       9.17      .897    47.017    260.814
    OVERFLOW<06: (SWMFO )        .00      .000      .000       .000

                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                   PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   69.029
                   TIME SHIFT OF PEAK FLOW         (min)=    61.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.7282E+00

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001:0008--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=    1.38
| 01:204    DT= 1.00 |   Total Imp(%)=    1.00   Dir. Conn.(%)=    1.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
```

```
     Surface Area     (ha)=        .01          1.37
     Dep. Storage     (mm)=       1.00          8.00
     Average Slope     (%)=        .50          5.00
     Length            (m)=      15.00        120.00
     Mannings n           =       .013          .250

     Max.eff.Inten.(mm/hr)=      53.00         49.20
               over (min)         1.00         15.00
     Storage Coeff.  (min)=       1.30 (ii)    15.06 (ii)
     Unit Hyd. Tpeak (min)=       1.00         15.00
     Unit Hyd. peak  (cms)=        .91           .08
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .00           .18           .183 (iii)
     TIME TO PEAK    (hrs)=      45.25         46.03         46.000
     RUNOFF VOLUME    (mm)=     284.08        214.84        215.571
     TOTAL RAINFALL   (mm)=     285.08        285.08        285.082
     RUNOFF COEFFICIENT   =       1.00           .75           .756
      *** WARNING: For areas with impervious ratios below
                   20%, this routine may not be applicable.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
001:0009--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=     .59
| 02:205    DT= 1.00 |   Total Imp(%)=   65.00   Dir. Conn.(%)=   65.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=        .38           .21
     Dep. Storage     (mm)=       1.00          8.00
     Average Slope     (%)=       1.00          2.00
     Length            (m)=      90.00         90.00
     Mannings n           =       .013          .250

     Max.eff.Inten.(mm/hr)=      53.00         49.17
               over (min)         3.00         18.00
     Storage Coeff.  (min)=       3.09 (ii)    18.34 (ii)
     Unit Hyd. Tpeak (min)=       3.00         18.00
     Unit Hyd. peak  (cms)=        .37           .06
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .06           .03           .083 (iii)
     TIME TO PEAK    (hrs)=      45.72         46.07         46.000
     RUNOFF VOLUME    (mm)=     284.06        214.83        259.860
```

```
     TOTAL RAINFALL   (mm)=     285.08       285.08        285.082
     RUNOFF COEFFICIENT   =       1.00          .75           .912

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
001:0010---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.85   Curve Number   (CN)=82.00
| 03:206    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .090

     Unit Hyd Qpeak  (cms)=     .785

     PEAK FLOW       (cms)=     .261 (i)
     TIME TO PEAK    (hrs)=   46.000
     RUNOFF VOLUME    (mm)=  230.277
     TOTAL RAINFALL   (mm)=  285.082
     RUNOFF COEFFICIENT   =     .808

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
001:0011---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=     .85   Curve Number   (CN)=82.00
| 04:207    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .490

     Unit Hyd Qpeak  (cms)=     .066

     PEAK FLOW       (cms)=     .106 (i)
     TIME TO PEAK    (hrs)=   46.267
     RUNOFF VOLUME    (mm)=  230.277
     TOTAL RAINFALL   (mm)=  285.082
     RUNOFF COEFFICIENT   =     .808

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
001:0012---------------------------------------------------------------------
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-
----------------------
| CALIB NASHYD       |   Area    (ha)=    3.33   Curve Number   (CN)=82.00
| 07:208    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .390

     Unit Hyd Qpeak  (cms)=     .326

     PEAK FLOW       (cms)=     .439 (i)
     TIME TO PEAK    (hrs)=   46.133
     RUNOFF VOLUME    (mm)=  230.277
     TOTAL RAINFALL   (mm)=  285.082
     RUNOFF COEFFICIENT   =     .808

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
001:0013--------------------------------------------------------------------------
-
------------------------
| ADD HYD (IGD       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:204            1.38     .183   46.00 215.57    .000

                     +ID2 02:205             .59     .083   46.00 259.86    .000

                     +ID3 03:206            1.85     .261   46.00 230.28    .000

                     +ID4 04:207             .85     .106   46.27 230.28    .000

                     +ID5 05:SWMF           9.17     .897   47.02 260.81    .000

                     +ID6 07:208            3.33     .439   46.13 230.28    .000

                      ============================================================
                      SUM 08:IGD           17.17    1.841   46.03 246.41    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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001:0014--------------------------------------------------------------------------
-
      FINISH
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  SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
  S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
  SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
      S   W W   M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
  SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9   =========
                                                        9   9  9   9   # 3057174
       StormWater Management HYdrologic Model           999    999    =========

*******************************************************************************
***************************** SWMHYMO Ver/4.05  *****************************
*********  A single event and continuous hydrologic simulation model  *********
*********     based on the principles of HYMO and its successors      *********
*********                  OTTHYMO-83 and OTTHYMO-89.                 *********
*******************************************************************************
********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
*********                  Ottawa,  Ontario: (613) 836-3884           *********
*********                  Gatineau, Quebec: (819) 243-6858           *********
*********                  E-Mail: swmhymo@jfsa.Com                   *********
*******************************************************************************

+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++++++++ Licensed user: MTE Consultants Inc.                         +++++++++
+++++++++                in any City          SERIAL#:3057174        +++++++++
+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

*******************************************************************************
*********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++            *********
*********           Maximum value for ID numbers  :     10            *********
*********           Max. number of rainfall points: 105408            *********
*********           Max. number of flow points    : 105408            *********
*******************************************************************************


**********************   D E T A I L E D   O U T P U T   **********************
*******************************************************************************
*         DATE: 2022-01-19     TIME: 09:37:04     RUN COUNTER: 000028         *
*******************************************************************************
* Input   filename: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\pr12hr.dat          *
* Output  filename: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\pr12hr.out          *
* Summary filename: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\pr12hr.sum          *
* User comments:                                                              *
* 1:_____________________________________________________________________     *
* 2:_____________________________________________________________________     *
* 3:_____________________________________________________________________     *
*******************************************************************************

--------------------------------------------------------------------------------
-
```

```
001:0001--------------------------------------------------------------------------
-
*#*************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056]
*#  Date        : 11-11-2021
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*************************************************************************
--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 001
    NSTORM=   1
           #  1=25mm.4hr
-------------------------------------------------------------------------------
-
001:0002--------------------------------------------------------------------------
-
--------------------
| READ STORM       |    Filename: 25-mm, 4 hour Chicago Storm, (a=508.5, b
| Ptotal=  25.00 mm|    Comments: 25-mm, 4 hour Chicago Storm, (a=508.5, b
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   1.410 |   1.08   3.570 |   2.08   6.620 |   3.08   2.160
               .17   1.480 |   1.17   4.160 |   2.17   5.580 |   3.17   2.050
               .25   1.560 |   1.25   5.010 |   2.25   4.840 |   3.25   1.960
               .33   1.640 |   1.33   6.350 |   2.33   4.270 |   3.33   1.870
               .42   1.740 |   1.42   8.730 |   2.42   3.830 |   3.42   1.790
               .50   1.850 |   1.50  14.060 |   2.50   3.480 |   3.50   1.720
               .58   1.980 |   1.58  35.190 |   2.58   3.190 |   3.58   1.660
               .67   2.130 |   1.67  71.896 |   2.67   2.950 |   3.67   1.600
               .75   2.310 |   1.75  26.870 |   2.75   2.740 |   3.75   1.540
               .83   2.530 |   1.83  15.350 |   2.83   2.570 |   3.83   1.490
               .92   2.790 |   1.92  10.660 |   2.92   2.410 |   3.92   1.440
              1.00   3.130 |   2.00   8.160 |   3.00   2.280 |   4.00   1.400

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001:0003--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=   13.14
| 01:209    DT= 1.00 |   Total Imp(%)=   65.00   Dir. Conn.(%)=   65.00
----------------------
```

```
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.54         4.60
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=        .50         2.00
     Length            (m)=      80.00        80.00
     Mannings n            =       .013         .250

     Max.eff.Inten.(mm/hr)=      71.90         9.45
               over (min)        3.00        31.00
     Storage Coeff.  (min)=       3.14 (ii)   30.62 (ii)
     Unit Hyd. Tpeak (min)=       3.00        31.00
     Unit Hyd. peak  (cms)=        .36          .04
                                                        *TOTALS*
     PEAK FLOW       (cms)=       1.41          .02          1.415 (iii)
     TIME TO PEAK    (hrs)=       1.68         2.33          1.683
     RUNOFF VOLUME    (mm)=      24.00         2.97         16.640
     TOTAL RAINFALL   (mm)=      25.00        25.00         25.000
     RUNOFF COEFFICIENT   =        .96          .12           .666

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
        (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0004--------------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=    4.17   Curve Number   (CN)=82.00
| 02:210    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .330

     Unit Hyd Qpeak  (cms)=     .483

     PEAK FLOW       (cms)=     .033 (i)
     TIME TO PEAK    (hrs)=    2.167
     RUNOFF VOLUME    (mm)=    3.808
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .152

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0005--------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=    2.12
```

```
| 03:211    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.06         1.06
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      20.00        20.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      71.90         4.69
               over (min)         1.00        13.00
     Storage Coeff.  (min)=        .90 (ii)   12.93 (ii)
     Unit Hyd. Tpeak (min)=       1.00        13.00
     Unit Hyd. peak  (cms)=       1.14          .09
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .21          .01          .212 (iii)
     TIME TO PEAK    (hrs)=       1.67         1.95         1.667
     RUNOFF VOLUME    (mm)=      24.00         2.97        13.486
     TOTAL RAINFALL   (mm)=      25.00        25.00        25.000
     RUNOFF COEFFICIENT   =        .96          .12          .539

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0006---------------------------------------------------------------------
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------------------------
| ADD HYD (WEL       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:209          13.14    1.415    1.68  16.64    .000

                     +ID2 02:210           4.17     .033    2.17   3.81    .000

                     +ID3 03:211           2.12     .212    1.67  13.49    .000

                      ============================================================
                      SUM 04:WEL          19.43    1.624    1.67  13.54    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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001:0007---------------------------------------------------------------------
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--------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>04:(WEL   )   |
| OUT<05:(SWMF  )   |    =========  OUTLFOW STORAGE TABLE  =========
--------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                          (cms)    (ha.m.)   |    (cms)    (ha.m.)
                           .000  .0000E+00   |     .394  .7403E+00
                           .004  .8180E-01   |     .862  .8935E+00
                           .007  .1205E+00   |    2.398  .1139E+01
                           .012  .2699E+00   |    4.424  .1402E+01
                           .013  .3938E+00   |    5.995  .1593E+01
                           .142  .5954E+00   |   11.015  .1906E+01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (WEL   )      19.43     1.624     1.667     13.542
     OUTFLOW<05: (SWMF  )      19.43      .011     4.350     13.541
    OVERFLOW<06: (SWMFO )        .00      .000      .000       .000

                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=     .700
                    TIME SHIFT OF PEAK FLOW        (min)=   161.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.2512E+00

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001:0008--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    2.77   Curve Number   (CN)=70.00
| 07:212    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .200

     Unit Hyd Qpeak  (cms)=     .529

     PEAK FLOW       (cms)=     .016 (i)
     TIME TO PEAK    (hrs)=    1.967
     RUNOFF VOLUME    (mm)=    2.246
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .090

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0009--------------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=    1.00   Curve Number   (CN)=70.00
| 08:213    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .390

     Unit Hyd Qpeak  (cms)=     .098

     PEAK FLOW       (cms)=     .004 (i)
     TIME TO PEAK    (hrs)=    2.267
     RUNOFF VOLUME    (mm)=    2.245
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .090

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0010--------------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=     .27   Curve Number   (CN)=70.00
| 01:214    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .160

     Unit Hyd Qpeak  (cms)=     .064

     PEAK FLOW       (cms)=     .002 (i)
     TIME TO PEAK    (hrs)=    1.917
     RUNOFF VOLUME    (mm)=    2.245
     TOTAL RAINFALL   (mm)=   25.000
     RUNOFF COEFFICIENT   =     .090

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0011--------------------------------------------------------------------------
-
------------------------
| ADD HYD (GEXR      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 01:214            .27      .002    1.92   2.24    .000

                    +ID2 05:SWMF          19.43      .011    4.35  13.54    .000

                    +ID3 07:212            2.77      .016    1.97   2.25    .000

                    +ID4 08:213            1.00      .004    2.27   2.25    .000
```

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                    ============================================================
                    SUM 09:GEXR          23.47     .030    2.02  11.60    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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001:0012-------------------------------------------------------------------------
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  ** END OF RUN :   1

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--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 002
    NSTORM=   1
           #  1=watSCS2.12h
--------------------------------------------------------------------------------
-
002:0002-------------------------------------------------------------------------
-
*#*****************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056]
*#  Date        : 11-11-2021
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*****************************************************************************
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002:0002-------------------------------------------------------------------------
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--------------------
| READ STORM       |    Filename: 2-year, 12 hour SCS Type II Storm, Regio
| Ptotal=  48.05 mm|    Comments: 2-year, 12 hour SCS Type II Storm, Regio
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .50    .960 |   3.50   1.920 |   6.50   8.650 |   9.50   1.920
```

```
             1.00    .960 |   4.00   1.920 |   7.00   3.850 |  10.00    .960
             1.50    .960 |   4.50   2.880 |   7.50   2.880 |  10.50    .960
             2.00    .960 |   5.00   3.850 |   8.00   2.880 |  11.00    .960
             2.50   1.920 |   5.50   5.770 |   8.50   1.920 |  11.50    .960
             3.00   1.920 |   6.00  43.260 |   9.00   1.920 |  12.00    .960

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-
002:0003--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=   13.14
| 01:209    DT= 1.00 |   Total Imp(%)=   65.00   Dir. Conn.(%)=   65.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.54         4.60
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=        .50         2.00
     Length            (m)=      80.00        80.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      43.26        12.57
               over (min)        4.00        28.00
     Storage Coeff.  (min)=       3.85 (ii)   28.37 (ii)
     Unit Hyd. Tpeak (min)=       4.00        28.00
     Unit Hyd. peak  (cms)=        .29          .04
                                                      *TOTALS*
     PEAK FLOW       (cms)=       1.03          .10         1.076 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.37         6.001
     RUNOFF VOLUME    (mm)=      47.05        13.33        35.251
     TOTAL RAINFALL   (mm)=      48.05        48.05        48.050
     RUNOFF COEFFICIENT   =        .98          .28          .734

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
002:0004--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    4.17   Curve Number   (CN)=82.00
| 02:210    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .330

     Unit Hyd Qpeak  (cms)=     .483
```

```
     PEAK FLOW       (cms)=     .134 (i)
     TIME TO PEAK    (hrs)=    6.218
     RUNOFF VOLUME    (mm)=   16.478
     TOTAL RAINFALL   (mm)=   48.050
     RUNOFF COEFFICIENT   =     .343

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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002:0005---------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=    2.12
| 03:211    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.06         1.06
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      20.00        20.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      43.26        16.99
               over (min)        1.00         8.00
     Storage Coeff.  (min)=       1.10 (ii)    8.29 (ii)
     Unit Hyd. Tpeak (min)=       1.00         8.00
     Unit Hyd. peak  (cms)=       1.01          .14
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .13          .04          .167 (iii)
     TIME TO PEAK    (hrs)=       5.95         6.03         6.001
     RUNOFF VOLUME    (mm)=      47.05        13.34        30.194
     TOTAL RAINFALL   (mm)=      48.05        48.05        48.050
     RUNOFF COEFFICIENT   =        .98          .28          .628

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
002:0006---------------------------------------------------------------------
-
------------------------
| ADD HYD (WEL       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:209          13.14    1.076    6.00  35.25    .000
```

```
                  +ID2 02:210           4.17     .134    6.22  16.48    .000

                  +ID3 03:211           2.12     .167    6.00  30.19    .000

                   ============================================================
                   SUM 04:WEL          19.43    1.340    6.00  30.67    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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-
002:0007--------------------------------------------------------------------------
-
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>04:(WEL   )   |
| OUT<05:(SWMF  )   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .394  .7403E+00
                            .004  .8180E-01   |     .862  .8935E+00
                            .007  .1205E+00   |    2.398  .1139E+01
                            .012  .2699E+00   |    4.424  .1402E+01
                            .013  .3938E+00   |    5.995  .1593E+01
                            .142  .5954E+00   |   11.015  .1906E+01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (WEL   )      19.43     1.340     6.001     30.670
     OUTFLOW<05: (SWMF  )      19.43      .070     9.568     30.668
    OVERFLOW<06: (SWMFO )        .00      .000      .000       .000

                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                   PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=    5.252
                   TIME SHIFT OF PEAK FLOW         (min)=   214.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.4832E+00

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002:0008--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    2.77   Curve Number   (CN)=70.00
| 07:212    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .200
```

```
     Unit Hyd Qpeak  (cms)=     .529

     PEAK FLOW       (cms)=     .074 (i)
     TIME TO PEAK    (hrs)=    6.084
     RUNOFF VOLUME    (mm)=   10.679
     TOTAL RAINFALL   (mm)=   48.050
     RUNOFF COEFFICIENT   =     .222

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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002:0009--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.00   Curve Number   (CN)=70.00
| 08:213    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .390

     Unit Hyd Qpeak  (cms)=     .098

     PEAK FLOW       (cms)=     .018 (i)
     TIME TO PEAK    (hrs)=    6.284
     RUNOFF VOLUME    (mm)=   10.678
     TOTAL RAINFALL   (mm)=   48.050
     RUNOFF COEFFICIENT   =     .222

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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002:0010--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=     .27   Curve Number   (CN)=70.00
| 01:214    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .160

     Unit Hyd Qpeak  (cms)=     .064

     PEAK FLOW       (cms)=     .008 (i)
     TIME TO PEAK    (hrs)=    6.051
     RUNOFF VOLUME    (mm)=   10.677
     TOTAL RAINFALL   (mm)=   48.050
     RUNOFF COEFFICIENT   =     .222

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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002:0011-------------------------------------------------------------------------
-
------------------------
| ADD HYD (GEXR      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:214            .27     .008    6.05  10.68    .000

                     +ID2 05:SWMF          19.43     .070    9.57  30.67    .000

                     +ID3 07:212            2.77     .074    6.08  10.68    .000

                     +ID4 08:213            1.00     .018    6.28  10.68    .000

                      ============================================================
                      SUM 09:GEXR          23.47     .108    6.10  27.23    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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002:0012-------------------------------------------------------------------------
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002:0002-------------------------------------------------------------------------
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  ** END OF RUN :   2

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--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 003
    NSTORM=   1
           #  1=watSCS5.12h
-------------------------------------------------------------------------------
-
003:0002-------------------------------------------------------------------------
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```

```
*#************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056]
*#  Date        : 11-11-2021
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#************************************************************************
--------------------------------------------------------------------------------
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003:0002---------------------------------------------------------------------
-
--------------------
| READ STORM       |    Filename: 5-year, 12 hour SCS Type II Storm, Regio
| Ptotal=  66.06 mm|    Comments: 5-year, 12 hour SCS Type II Storm, Regio
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .50   1.320 |   3.50   2.640 |   6.50  11.890 |   9.50   2.640
              1.00   1.320 |   4.00   2.640 |   7.00   5.290 |  10.00   1.320
              1.50   1.320 |   4.50   3.960 |   7.50   3.960 |  10.50   1.320
              2.00   1.320 |   5.00   5.290 |   8.00   3.960 |  11.00   1.320
              2.50   2.640 |   5.50   7.930 |   8.50   2.640 |  11.50   1.320
              3.00   2.640 |   6.00  59.470 |   9.00   2.640 |  12.00   1.320

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-
003:0003---------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=   13.14
| 01:209    DT= 1.00 |   Total Imp(%)=   65.00   Dir. Conn.(%)=   65.00
----------------------
                             IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.54         4.60
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=        .50         2.00
     Length            (m)=      80.00        80.00
     Mannings n             =       .013         .250

     Max.eff.Inten.(mm/hr)=      59.47        26.05
               over (min)        3.00        22.00
     Storage Coeff.  (min)=       3.39 (ii)   21.71 (ii)
     Unit Hyd. Tpeak (min)=       3.00        22.00
     Unit Hyd. peak  (cms)=        .35          .05
                                                      *TOTALS*
     PEAK FLOW       (cms)=       1.41          .21          1.562 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.23          6.001
     RUNOFF VOLUME    (mm)=      65.06        24.37         50.818
     TOTAL RAINFALL   (mm)=      66.06        66.06         66.056
     RUNOFF COEFFICIENT   =        .98          .37           .769
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```
       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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003:0004--------------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=    4.17   Curve Number   (CN)=82.00
| 02:210    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .330

     Unit Hyd Qpeak  (cms)=     .483

     PEAK FLOW       (cms)=     .247 (i)
     TIME TO PEAK    (hrs)=    6.184
     RUNOFF VOLUME    (mm)=   29.310
     TOTAL RAINFALL   (mm)=   66.056
     RUNOFF COEFFICIENT   =     .444

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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003:0005--------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=    2.12
| 03:211    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.06         1.06
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      20.00        20.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      59.47        30.51
               over (min)        1.00         7.00
     Storage Coeff.  (min)=        .97 (ii)    6.66 (ii)
     Unit Hyd. Tpeak (min)=       1.00         7.00
     Unit Hyd. peak  (cms)=       1.09          .17
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .18          .08          .253 (iii)
     TIME TO PEAK    (hrs)=       5.77         6.02         6.001
     RUNOFF VOLUME    (mm)=      65.06        24.38         44.716
```

```
     TOTAL RAINFALL   (mm)=      66.06        66.06         66.056
     RUNOFF COEFFICIENT   =        .98          .37           .677

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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003:0006--------------------------------------------------------------------
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------------------------
| ADD HYD (WEL       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:209           13.14    1.562    6.00  50.82    .000

                     +ID2 02:210            4.17     .247    6.18  29.31    .000

                     +ID3 03:211            2.12     .253    6.00  44.72    .000

                      ========================================================
                      SUM 04:WEL           19.43    2.004    6.00  45.54    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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003:0007--------------------------------------------------------------------
-
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>04:(WEL   )   |
| OUT<05:(SWMF  )   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .394  .7403E+00
                            .004  .8180E-01   |     .862  .8935E+00
                            .007  .1205E+00   |    2.398  .1139E+01
                            .012  .2699E+00   |    4.424  .1402E+01
                            .013  .3938E+00   |    5.995  .1593E+01
                            .142  .5954E+00   |   11.015  .1906E+01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (WEL   )      19.43     2.004     6.001     45.536
     OUTFLOW<05: (SWMF  )      19.43      .201     7.468     45.531
    OVERFLOW<06: (SWMFO )        .00      .000      .000       .000
```

```
                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=   10.019
                    TIME SHIFT OF PEAK FLOW        (min)=    88.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.6292E+00

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003:0008--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    2.77   Curve Number   (CN)=70.00
| 07:212    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .200

     Unit Hyd Qpeak  (cms)=     .529

     PEAK FLOW       (cms)=     .141 (i)
     TIME TO PEAK    (hrs)=    6.084
     RUNOFF VOLUME    (mm)=   20.078
     TOTAL RAINFALL   (mm)=   66.056
     RUNOFF COEFFICIENT   =     .304

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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003:0009--------------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=    1.00   Curve Number   (CN)=70.00
| 08:213    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .390

     Unit Hyd Qpeak  (cms)=     .098

     PEAK FLOW       (cms)=     .035 (i)
     TIME TO PEAK    (hrs)=    6.268
     RUNOFF VOLUME    (mm)=   20.077
     TOTAL RAINFALL   (mm)=   66.056
     RUNOFF COEFFICIENT   =     .304

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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003:0010-------------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=     .27   Curve Number   (CN)=70.00
| 01:214    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .160

     Unit Hyd Qpeak  (cms)=     .064

     PEAK FLOW       (cms)=     .015 (i)
     TIME TO PEAK    (hrs)=    6.051
     RUNOFF VOLUME    (mm)=   20.077
     TOTAL RAINFALL   (mm)=   66.056
     RUNOFF COEFFICIENT   =     .304

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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003:0011-------------------------------------------------------------------------
-
------------------------
| ADD HYD (GEXR      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:214            .27      .015    6.05  20.08    .000

                     +ID2 05:SWMF          19.43      .201    7.47  45.53    .000

                     +ID3 07:212            2.77      .141    6.08  20.08    .000

                     +ID4 08:213            1.00      .035    6.27  20.08    .000

                      ============================================================
                      SUM 09:GEXR           23.47      .254    6.15  41.15    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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003:0012-------------------------------------------------------------------------
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003:0002-------------------------------------------------------------------------
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003:0002-------------------------------------------------------------------------
-
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  ** END OF RUN :   3

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| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\
--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 004
    NSTORM=   1
           #  1=watSCS10.12h
--------------------------------------------------------------------------------
-
004:0002--------------------------------------------------------------------------
-
*#*****************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056]
*#  Date        : 11-11-2021
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*****************************************************************************
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004:0002--------------------------------------------------------------------------
-
--------------------
| READ STORM       |    Filename: 10-year, 12 hour SCS Type II Storm, Regi
| Ptotal=  78.19 mm|    Comments: 10-year, 12 hour SCS Type II Storm, Regi
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .50   1.560 |   3.50   3.130 |   6.50  14.080 |   9.50   3.130
              1.00   1.560 |   4.00   3.130 |   7.00   6.260 |  10.00   1.560
              1.50   1.560 |   4.50   4.690 |   7.50   4.690 |  10.50   1.560
              2.00   1.560 |   5.00   6.260 |   8.00   4.690 |  11.00   1.560
              2.50   3.130 |   5.50   9.380 |   8.50   3.130 |  11.50   1.560
              3.00   3.130 |   6.00  70.380 |   9.00   3.130 |  12.00   1.560

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004:0003--------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=   13.14
| 01:209    DT= 1.00 |   Total Imp(%)=   65.00   Dir. Conn.(%)=   65.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.54         4.60
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=        .50         2.00
     Length            (m)=      80.00        80.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      70.38        36.30
               over (min)        3.00        19.00
     Storage Coeff.  (min)=       3.17 (ii)   19.21 (ii)
     Unit Hyd. Tpeak (min)=       3.00        19.00
     Unit Hyd. peak  (cms)=        .36          .06
                                                        *TOTALS*
     PEAK FLOW       (cms)=       1.67          .31          1.916 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.18          6.001
     RUNOFF VOLUME    (mm)=      77.19        32.75         61.638
     TOTAL RAINFALL   (mm)=      78.19        78.19         78.190
     RUNOFF COEFFICIENT   =        .99          .42           .788

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
004:0004--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    4.17   Curve Number   (CN)=82.00
| 02:210    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .330

     Unit Hyd Qpeak  (cms)=     .483

     PEAK FLOW       (cms)=     .330 (i)
     TIME TO PEAK    (hrs)=    6.184
     RUNOFF VOLUME    (mm)=   38.795
     TOTAL RAINFALL   (mm)=   78.190
     RUNOFF COEFFICIENT   =     .496

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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004:0005-------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=    2.12
| 03:211    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.06         1.06
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      20.00        20.00
     Mannings n             =       .013         .250

     Max.eff.Inten.(mm/hr)=      70.38        40.63
               over (min)        1.00         6.00
     Storage Coeff.  (min)=        .91 (ii)    5.98 (ii)
     Unit Hyd. Tpeak (min)=       1.00         6.00
     Unit Hyd. peak  (cms)=       1.13          .19
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .21          .11          .315 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.02         6.001
     RUNOFF VOLUME    (mm)=      77.19        32.76        54.973
     TOTAL RAINFALL   (mm)=      78.19        78.19        78.190
     RUNOFF COEFFICIENT   =        .99          .42          .703

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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004:0006-------------------------------------------------------------------------
-
------------------------
| ADD HYD (WEL       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:209          13.14    1.916    6.00  61.64    .000

                     +ID2 02:210           4.17     .330    6.18  38.80    .000

                     +ID3 03:211           2.12     .315    6.00  54.97    .000

                      ============================================================
                      SUM 04:WEL          19.43    2.490    6.00  56.01    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
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004:0007--------------------------------------------------------------------------
-
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>04:(WEL   )   |
| OUT<05:(SWMF  )   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .394  .7403E+00
                            .004  .8180E-01   |     .862  .8935E+00
                            .007  .1205E+00   |    2.398  .1139E+01
                            .012  .2699E+00   |    4.424  .1402E+01
                            .013  .3938E+00   |    5.995  .1593E+01
                            .142  .5954E+00   |   11.015  .1906E+01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (WEL   )      19.43     2.490     6.001     56.008
     OUTFLOW<05: (SWMF  )      19.43      .365     7.018     56.004
    OVERFLOW<06: (SWMFO )        .00      .000      .000       .000

                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=   14.675
                    TIME SHIFT OF PEAK FLOW         (min)=    61.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.7240E+00

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-
004:0008--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    2.77   Curve Number   (CN)=70.00
| 07:212    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .200

     Unit Hyd Qpeak  (cms)=     .529

     PEAK FLOW       (cms)=     .194 (i)
     TIME TO PEAK    (hrs)=    6.068
     RUNOFF VOLUME    (mm)=   27.390
     TOTAL RAINFALL   (mm)=   78.190
     RUNOFF COEFFICIENT   =     .350

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
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004:0009--------------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=    1.00   Curve Number   (CN)=70.00
| 08:213    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .390

     Unit Hyd Qpeak  (cms)=     .098

     PEAK FLOW       (cms)=     .048 (i)
     TIME TO PEAK    (hrs)=    6.268
     RUNOFF VOLUME    (mm)=   27.389
     TOTAL RAINFALL   (mm)=   78.190
     RUNOFF COEFFICIENT   =     .350

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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004:0010--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=     .27   Curve Number   (CN)=70.00
| 01:214    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .160

     Unit Hyd Qpeak  (cms)=     .064

     PEAK FLOW       (cms)=     .021 (i)
     TIME TO PEAK    (hrs)=    6.051
     RUNOFF VOLUME    (mm)=   27.389
     TOTAL RAINFALL   (mm)=   78.190
     RUNOFF COEFFICIENT   =     .350

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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004:0011--------------------------------------------------------------------------
-
------------------------
| ADD HYD (GEXR      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 01:214            .27      .021    6.05  27.39    .000

                    +ID2 05:SWMF          19.43      .365    7.02  56.00    .000
```

```
                  +ID3 07:212            2.77     .194    6.07  27.39    .000

                  +ID4 08:213            1.00     .048    6.27  27.39    .000

                   ============================================================
                   SUM 09:GEXR          23.47     .448    6.58  51.08    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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004:0012----------------------------------------------------------------------
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004:0002----------------------------------------------------------------------
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004:0002----------------------------------------------------------------------
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004:0002----------------------------------------------------------------------
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  ** END OF RUN :   4

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| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 005
    NSTORM=   1
           #  1=watSCS25.12h
------------------------------------------------------------------------------
-
005:0002----------------------------------------------------------------------
-
*#*****************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056]
```

```
*#  Date        : 11-11-2021
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*************************************************************************
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005:0002--------------------------------------------------------------------------
-
--------------------
| READ STORM       |    Filename: 25-year, 12 hour SCS Type II Storm, Regi
| Ptotal=  93.08 mm|    Comments: 25-year, 12 hour SCS Type II Storm, Regi
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .50   1.860 |   3.50   3.720 |   6.50  16.760 |   9.50   3.720
              1.00   1.860 |   4.00   3.720 |   7.00   7.450 |  10.00   1.860
              1.50   1.860 |   4.50   5.590 |   7.50   5.590 |  10.50   1.860
              2.00   1.860 |   5.00   7.450 |   8.00   5.590 |  11.00   1.860
              2.50   3.720 |   5.50  11.170 |   8.50   3.720 |  11.50   1.860
              3.00   3.720 |   6.00  83.780 |   9.00   3.720 |  12.00   1.860

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005:0003--------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=   13.14
| 01:209    DT= 1.00 |   Total Imp(%)=   65.00   Dir. Conn.(%)=   65.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.54         4.60
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=        .50         2.00
     Length            (m)=      80.00        80.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      83.78        49.25
               over (min)        3.00        17.00
     Storage Coeff.  (min)=       2.95 (ii)   17.15 (ii)
     Unit Hyd. Tpeak (min)=       3.00        17.00
     Unit Hyd. peak  (cms)=        .38          .07
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.99          .44          2.364 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.13          6.001
     RUNOFF VOLUME    (mm)=      92.08        43.79         75.180
     TOTAL RAINFALL   (mm)=      93.08        93.08         93.080
     RUNOFF COEFFICIENT   =        .99          .47           .808

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
```

```
          CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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005:0004---------------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=    4.17   Curve Number   (CN)=82.00
| 02:210    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .330

     Unit Hyd Qpeak  (cms)=     .483

     PEAK FLOW       (cms)=     .437 (i)
     TIME TO PEAK    (hrs)=    6.184
     RUNOFF VOLUME    (mm)=   51.060
     TOTAL RAINFALL   (mm)=   93.080
     RUNOFF COEFFICIENT   =     .549

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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005:0005---------------------------------------------------------------------------
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----------------------
| CALIB STANDHYD     |   Area    (ha)=    2.12
| 03:211    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.06         1.06
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      20.00        20.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      83.78        53.68
               over (min)        1.00         5.00
     Storage Coeff.  (min)=        .85 (ii)    5.38 (ii)
     Unit Hyd. Tpeak (min)=       1.00         5.00
     Unit Hyd. peak  (cms)=       1.18          .22
                                                      *TOTALS*
     PEAK FLOW       (cms)=        .25          .15          .393 (iii)
     TIME TO PEAK    (hrs)=       5.88         6.00         6.001
     RUNOFF VOLUME    (mm)=      92.08        43.79        67.937
     TOTAL RAINFALL   (mm)=      93.08        93.08        93.080
     RUNOFF COEFFICIENT   =        .99          .47          .730
```

```
       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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005:0006--------------------------------------------------------------------
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------------------------
| ADD HYD (WEL       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:209          13.14    2.364    6.00  75.18    .000

                     +ID2 02:210           4.17     .437    6.18  51.06    .000

                     +ID3 03:211           2.12     .393    6.00  67.94    .000

                      ========================================================
                      SUM 04:WEL          19.43    3.107    6.00  69.21    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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005:0007--------------------------------------------------------------------
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---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>04:(WEL   )   |
| OUT<05:(SWMF  )   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                           .000  .0000E+00   |     .394  .7403E+00
                           .004  .8180E-01   |     .862  .8935E+00
                           .007  .1205E+00   |    2.398  .1139E+01
                           .012  .2699E+00   |    4.424  .1402E+01
                           .013  .3938E+00   |    5.995  .1593E+01
                           .142  .5954E+00   |   11.015  .1906E+01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     -------------------         (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (WEL   )      19.43     3.107     6.001     69.213
     OUTFLOW<05: (SWMF  )      19.43      .672     6.668     69.208
    OVERFLOW<06: (SWMFO )        .00      .000      .000       .000

                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
```

```
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=   21.616
                    TIME SHIFT OF PEAK FLOW         (min)=    40.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.8313E+00

------------------------------------------------------------------------------
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005:0008---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    2.77   Curve Number   (CN)=70.00
| 07:212    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .200

     Unit Hyd Qpeak  (cms)=     .529

     PEAK FLOW       (cms)=     .266 (i)
     TIME TO PEAK    (hrs)=    6.068
     RUNOFF VOLUME    (mm)=   37.188
     TOTAL RAINFALL   (mm)=   93.080
     RUNOFF COEFFICIENT   =     .400

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
-
005:0009---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.00   Curve Number   (CN)=70.00
| 08:213    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .390

     Unit Hyd Qpeak  (cms)=     .098

     PEAK FLOW       (cms)=     .066 (i)
     TIME TO PEAK    (hrs)=    6.251
     RUNOFF VOLUME    (mm)=   37.187
     TOTAL RAINFALL   (mm)=   93.080
     RUNOFF COEFFICIENT   =     .400

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
-
005:0010---------------------------------------------------------------------
-
```

```
----------------------
| CALIB NASHYD       |   Area    (ha)=     .27   Curve Number   (CN)=70.00
| 01:214    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .160

     Unit Hyd Qpeak  (cms)=     .064

     PEAK FLOW       (cms)=     .028 (i)
     TIME TO PEAK    (hrs)=    6.051
     RUNOFF VOLUME    (mm)=   37.187
     TOTAL RAINFALL   (mm)=   93.080
     RUNOFF COEFFICIENT   =     .400

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
005:0011--------------------------------------------------------------------------
-
------------------------
| ADD HYD (GEXR      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:214            .27     .028    6.05  37.19    .000

                     +ID2 05:SWMF          19.43     .672    6.67  69.21    .000

                     +ID3 07:212            2.77     .266    6.07  37.19    .000

                     +ID4 08:213            1.00     .066    6.25  37.19    .000

                      ============================================================
                      SUM 09:GEXR          23.47     .819    6.55  63.69    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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005:0012--------------------------------------------------------------------------
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005:0002--------------------------------------------------------------------------
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005:0002--------------------------------------------------------------------------
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-
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005:0002--------------------------------------------------------------------------
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-
005:0002--------------------------------------------------------------------------
-
  ** END OF RUN :   5

********************************************************************************




--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 006
    NSTORM=   1
           #  1=watSCS50.12h
--------------------------------------------------------------------------------
-
006:0002--------------------------------------------------------------------------
-
*#*****************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056]
*#  Date        : 11-11-2021
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*****************************************************************************
--------------------------------------------------------------------------------
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006:0002--------------------------------------------------------------------------
-
--------------------
| READ STORM       |    Filename: 50-year, 12 hour SCS Type II Storm, Regi
| Ptotal= 104.85 mm|    Comments: 50-year, 12 hour SCS Type II Storm, Regi
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .50   2.100 |   3.50   4.190 |   6.50  18.870 |   9.50   4.190
              1.00   2.100 |   4.00   4.190 |   7.00   8.390 |  10.00   2.100
              1.50   2.100 |   4.50   6.290 |   7.50   6.290 |  10.50   2.100
              2.00   2.100 |   5.00   8.390 |   8.00   6.290 |  11.00   2.100
              2.50   4.190 |   5.50  12.580 |   8.50   4.190 |  11.50   2.100
```

```
              3.00   4.190 |   6.00  94.370 |   9.00   4.190 |  12.00   2.100

-------------------------------------------------------------------------------
-
006:0003---------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=   13.14
| 01:209    DT= 1.00 |   Total Imp(%)=   65.00   Dir. Conn.(%)=   65.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.54         4.60
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=        .50         2.00
     Length            (m)=      80.00        80.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      94.37        59.75
               over (min)        3.00        16.00
     Storage Coeff.  (min)=       2.82 (ii)   15.96 (ii)
     Unit Hyd. Tpeak (min)=       3.00        16.00
     Unit Hyd. peak  (cms)=        .39          .07
                                                      *TOTALS*
     PEAK FLOW       (cms)=       2.24          .55          2.727 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.12          6.001
     RUNOFF VOLUME    (mm)=     103.84        52.97         86.044
     TOTAL RAINFALL   (mm)=     104.85       104.85        104.851
     RUNOFF COEFFICIENT   =        .99          .51           .821

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
006:0004---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    4.17   Curve Number   (CN)=82.00
| 02:210    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .330

     Unit Hyd Qpeak  (cms)=     .483

     PEAK FLOW       (cms)=     .525 (i)
     TIME TO PEAK    (hrs)=    6.168
     RUNOFF VOLUME    (mm)=   61.119
     TOTAL RAINFALL   (mm)=  104.851
```

```
     RUNOFF COEFFICIENT   =     .583

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
006:0005--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=    2.12
| 03:211    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.06         1.06
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       2.00         5.00
     Length            (m)=      20.00        20.00
     Mannings n           =       .013         .250

     Max.eff.Inten.(mm/hr)=      94.37        64.10
               over (min)        1.00         5.00
     Storage Coeff.  (min)=        .81 (ii)    5.03 (ii)
     Unit Hyd. Tpeak (min)=       1.00         5.00
     Unit Hyd. peak  (cms)=       1.21          .23
                                                        *TOTALS*
     PEAK FLOW       (cms)=        .28          .18          .455 (iii)
     TIME TO PEAK    (hrs)=       5.72         6.00         6.001
     RUNOFF VOLUME    (mm)=     103.85        52.97        78.414
     TOTAL RAINFALL   (mm)=     104.85       104.85       104.851
     RUNOFF COEFFICIENT   =        .99          .51          .748

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
006:0006--------------------------------------------------------------------------
-
------------------------
| ADD HYD (WEL       ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
                      ID1 01:209           13.14    2.727    6.00  86.04    .000

                     +ID2 02:210            4.17     .525    6.17  61.12    .000

                     +ID3 03:211            2.12     .455    6.00  78.41    .000
```

```
                    ============================================================
                    SUM 04:WEL           19.43    3.607    6.00  79.86    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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-
006:0007--------------------------------------------------------------------------
-
---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>04:(WEL   )   |
| OUT<05:(SWMF  )   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .394  .7403E+00
                            .004  .8180E-01   |     .862  .8935E+00
                            .007  .1205E+00   |    2.398  .1139E+01
                            .012  .2699E+00   |    4.424  .1402E+01
                            .013  .3938E+00   |    5.995  .1593E+01
                            .142  .5954E+00   |   11.015  .1906E+01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (WEL   )      19.43     3.607     6.001     79.862
     OUTFLOW<05: (SWMF  )      19.43      .979     6.568     79.853
    OVERFLOW<06: (SWMFO )        .00      .000      .000       .000

                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=   27.143
                    TIME SHIFT OF PEAK FLOW         (min)=    34.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.9123E+00

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006:0008--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    2.77   Curve Number   (CN)=70.00
| 07:212    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .200

     Unit Hyd Qpeak  (cms)=     .529

     PEAK FLOW       (cms)=     .326 (i)
```

```
     TIME TO PEAK    (hrs)=    6.068
     RUNOFF VOLUME    (mm)=   45.455
     TOTAL RAINFALL   (mm)=  104.851
     RUNOFF COEFFICIENT   =     .434

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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-
006:0009---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.00   Curve Number   (CN)=70.00
| 08:213    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .390

     Unit Hyd Qpeak  (cms)=     .098

     PEAK FLOW       (cms)=     .081 (i)
     TIME TO PEAK    (hrs)=    6.251
     RUNOFF VOLUME    (mm)=   45.454
     TOTAL RAINFALL   (mm)=  104.851
     RUNOFF COEFFICIENT   =     .434

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
006:0010---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=     .27   Curve Number   (CN)=70.00
| 01:214    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .160

     Unit Hyd Qpeak  (cms)=     .064

     PEAK FLOW       (cms)=     .034 (i)
     TIME TO PEAK    (hrs)=    6.034
     RUNOFF VOLUME    (mm)=   45.454
     TOTAL RAINFALL   (mm)=  104.851
     RUNOFF COEFFICIENT   =     .434

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
006:0011---------------------------------------------------------------------
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------------------------
```

ADD HYD (GEXR)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
ID1	01:214	.27	.034	6.03	45.45	.000
+ID2	05:SWMF	19.43	.979	6.57	79.85	.000
+ID3	07:212	2.77	.326	6.07	45.45	.000
+ID4	08:213	1.00	.081	6.25	45.45	.000
SUM	09:GEXR	23.47	1.172	6.53	73.93	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

006:0012---

006:0002---

006:0002---

006:0002---

006:0002---

006:0002---

** END OF RUN : 6

****

| START | Project dir.: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\

```
-------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 007
    NSTORM=   1
           #  1=watSC100.12h
--------------------------------------------------------------------------------
-
007:0002---------------------------------------------------------------------------
-
*#*****************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056]
*#  Date        : 11-11-2021
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*****************************************************************************
--------------------------------------------------------------------------------
-
007:0002---------------------------------------------------------------------------
-
--------------------
| READ STORM       |    Filename: 100-year, 12 hour SCS Type II Storm, Reg
| Ptotal= 115.84 mm|    Comments: 100-year, 12 hour SCS Type II Storm, Reg
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .50   2.320 |   3.50   4.630 |   6.50  20.850 |   9.50   4.630
              1.00   2.320 |   4.00   4.630 |   7.00   9.270 |  10.00   2.320
              1.50   2.320 |   4.50   6.950 |   7.50   6.950 |  10.50   2.320
              2.00   2.320 |   5.00   9.270 |   8.00   6.950 |  11.00   2.320
              2.50   4.630 |   5.50  13.900 |   8.50   4.630 |  11.50   2.320
              3.00   4.630 |   6.00 104.250 |   9.00   4.630 |  12.00   2.320

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007:0003---------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=   13.14
| 01:209    DT= 1.00 |   Total Imp(%)=   65.00   Dir. Conn.(%)=   65.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.54         4.60
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=        .50         2.00
     Length            (m)=      80.00        80.00
     Mannings n             =       .013         .250
```

```
     Max.eff.Inten.(mm/hr)=     104.25        69.86
               over (min)         3.00        15.00
     Storage Coeff.  (min)=       2.71 (ii)   15.05 (ii)
     Unit Hyd. Tpeak (min)=       3.00        15.00
     Unit Hyd. peak  (cms)=        .40          .08
                                                          *TOTALS*
     PEAK FLOW       (cms)=       2.47          .66          3.075 (iii)
     TIME TO PEAK    (hrs)=       6.00         6.10          6.001
     RUNOFF VOLUME    (mm)=     114.84        61.84         96.292
     TOTAL RAINFALL   (mm)=     115.84       115.84        115.841
     RUNOFF COEFFICIENT   =        .99          .53           .831

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
007:0004--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    4.17   Curve Number   (CN)=82.00
| 02:210    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .330

     Unit Hyd Qpeak  (cms)=     .483

     PEAK FLOW       (cms)=     .608 (i)
     TIME TO PEAK    (hrs)=    6.168
     RUNOFF VOLUME    (mm)=   70.734
     TOTAL RAINFALL   (mm)=  115.841
     RUNOFF COEFFICIENT   =     .611

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
007:0005--------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=    2.12
| 03:211    DT= 1.00 |   Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00
----------------------
                            IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       1.06         1.06
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=       2.00         5.00
```

Length (m)=	20.00	20.00		
Mannings n =	.013	.250		
Max.eff.Inten.(mm/hr)=	104.25	73.99		
over (min)	1.00	5.00		
Storage Coeff. (min)=	.78 (ii)	4.77 (ii)		
Unit Hyd. Tpeak (min)=	1.00	5.00		
Unit Hyd. peak (cms)=	1.23	.23		
			TOTALS	
PEAK FLOW (cms)=	.31	.21	.513 (iii)	
TIME TO PEAK (hrs)=	5.83	6.00	6.001	
RUNOFF VOLUME (mm)=	114.84	61.84	88.342	
TOTAL RAINFALL (mm)=	115.84	115.84	115.841	
RUNOFF COEFFICIENT =	.99	.53	.763	

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

007:0006

ADD HYD (WEL)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
ID1	01:209	13.14	3.075	6.00	96.29	.000
+ID2	02:210	4.17	.608	6.17	70.73	.000
+ID3	03:211	2.12	.513	6.00	88.34	.000
SUM	04:WEL	19.43	4.085	6.00	89.94	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

007:0007

ROUTE RESERVOIR	IN>04:(WEL)	OUT<05:(SWMF)

Requested routing time step = 1.0 min.

OUTLFOW STORAGE TABLE

OUTFLOW (cms)	STORAGE (ha.m.)	OUTFLOW (cms)	STORAGE (ha.m.)

```
                          .000  .0000E+00   |     .394  .7403E+00
                          .004  .8180E-01   |     .862  .8935E+00
                          .007  .1205E+00   |    2.398  .1139E+01
                          .012  .2699E+00   |    4.424  .1402E+01
                          .013  .3938E+00   |    5.995  .1593E+01
                          .142  .5954E+00   |   11.015  .1906E+01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     -------------------         (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (WEL   )       19.43     4.085     6.001     89.939
     OUTFLOW<05: (SWMF  )       19.43     1.338     6.501     89.930
    OVERFLOW<06: (SWMFO )         .00      .000      .000       .000

                   TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                   CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                   PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                   PEAK   FLOW   REDUCTION [Qout/Qin](%)=   32.755
                   TIME SHIFT OF PEAK FLOW         (min)=    30.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=.9696E+00

--------------------------------------------------------------------------------
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007:0008----------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    2.77   Curve Number   (CN)=70.00
| 07:212    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .200

     Unit Hyd Qpeak  (cms)=     .529

     PEAK FLOW       (cms)=     .384 (i)
     TIME TO PEAK    (hrs)=    6.068
     RUNOFF VOLUME    (mm)=   53.518
     TOTAL RAINFALL   (mm)=  115.841
     RUNOFF COEFFICIENT   =     .462

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
007:0009----------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    1.00   Curve Number   (CN)=70.00
| 08:213    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .390
```

```
     Unit Hyd Qpeak  (cms)=     .098

     PEAK FLOW       (cms)=     .096 (i)
     TIME TO PEAK    (hrs)=    6.251
     RUNOFF VOLUME    (mm)=   53.518
     TOTAL RAINFALL   (mm)=  115.841
     RUNOFF COEFFICIENT   =     .462

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
007:0010---------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=     .27   Curve Number   (CN)=70.00
| 01:214    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .160

     Unit Hyd Qpeak  (cms)=     .064

     PEAK FLOW       (cms)=     .041 (i)
     TIME TO PEAK    (hrs)=    6.034
     RUNOFF VOLUME    (mm)=   53.518
     TOTAL RAINFALL   (mm)=  115.841
     RUNOFF COEFFICIENT   =     .462

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
007:0011---------------------------------------------------------------------
-
------------------------
| ADD HYD (GEXR      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                       ID1 01:214            .27     .041    6.03  53.52    .000

                      +ID2 05:SWMF          19.43    1.338    6.50  89.93    .000

                      +ID3 07:212            2.77     .384    6.07  53.52    .000

                      +ID4 08:213            1.00     .096    6.25  53.52    .000

                       ============================================================
                       SUM 09:GEXR          23.47    1.611    6.33  83.66    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

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------------------------------------------------------------------------------
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007:0012---------------------------------------------------------------------
-
------------------------------------------------------------------------------
-
007:0002---------------------------------------------------------------------
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007:0002---------------------------------------------------------------------
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------------------------------------------------------------------------------
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007:0002---------------------------------------------------------------------
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------------------------------------------------------------------------------
-
007:0002---------------------------------------------------------------------
-
------------------------------------------------------------------------------
-
007:0002---------------------------------------------------------------------
-
------------------------------------------------------------------------------
-
007:0002---------------------------------------------------------------------
-
      FINISH
------------------------------------------------------------------------------
-
*******************************************************************************
*
     WARNINGS / ERRORS / NOTES
     -------------------------
   Simulation ended on 2022-01-19     at 09:37:06
===============================================================================
=
```

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================================================================================

  SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
  S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
  SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
      S   W W   M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
  SSSSS   W W   M   M  H   H    Y    M   M   OOO           9      9   =========
                                                       9   9  9   9   # 3057174
       StormWater Management HYdrologic Model           999    999    =========

*******************************************************************************
***************************** SWMHYMO Ver/4.05  *****************************
*********  A single event and continuous hydrologic simulation model  *********
*********     based on the principles of HYMO and its successors      *********
*********                  OTTHYMO-83 and OTTHYMO-89.                 *********
*******************************************************************************
********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
*********                  Ottawa,  Ontario: (613) 836-3884           *********
*********                  Gatineau, Quebec: (819) 243-6858           *********
*********                  E-Mail: swmhymo@jfsa.Com                   *********
*******************************************************************************

+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++++++++ Licensed user: MTE Consultants Inc.                         +++++++++
+++++++++                in any City          SERIAL#:3057174        +++++++++
+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

*******************************************************************************
*********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++            *********
*********           Maximum value for ID numbers  :     10           *********
*********           Max. number of rainfall points: 105408           *********
*********           Max. number of flow points    : 105408           *********
*******************************************************************************


**********************   D E T A I L E D   O U T P U T   **********************
*******************************************************************************
*         DATE: 2022-01-19     TIME: 09:37:12     RUN COUNTER: 000029         *
*******************************************************************************
* Input   filename: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\prreg2.dat          *
* Output  filename: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\prreg2.out          *
* Summary filename: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\prreg2.sum          *
* User comments:                                                              *
* 1:_____________________________________________________________________     *
* 2:_____________________________________________________________________     *
* 3:_____________________________________________________________________     *
*******************************************************************************

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001:0001----------------------------------------------------------------------------
-
*#*************************************************************************
*#  Project Name: [Wilmot Woods]    Project Number: [35056]
*#  Date        : 11-12-2021
*#  Modeller    : [AJC]
*#  Company     : MTE Consultants Ltd.
*#  License #   : 3057174
*#*************************************************************************
--------------------
| START            |  Project  dir.: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\

--------------------  Rainfall dir.: Q:\35056\104\SWM\SWMHYMO\POST\SOUTHS~1\

    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 001
    NSTORM=   1
           #  1=regAMC2.48h
-------------------------------------------------------------------------------
-
001:0002----------------------------------------------------------------------------
-
--------------------
| READ STORM       |    Filename: Regional Storm Zone 1, AMC II Conditions
| Ptotal= 285.08 mm|    Comments: Regional Storm Zone 1, AMC II Conditions
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
              1.00   2.030 |  13.00   2.030 |  25.00   2.030 |  37.00   6.000
              2.00   2.030 |  14.00   2.030 |  26.00   2.030 |  38.00   4.000
              3.00   2.030 |  15.00   2.030 |  27.00   2.030 |  39.00   6.000
              4.00   2.030 |  16.00   2.030 |  28.00   2.030 |  40.00  13.000
              5.00   2.030 |  17.00   2.030 |  29.00   2.030 |  41.00  17.000
              6.00   2.030 |  18.00   2.030 |  30.00   2.030 |  42.00  13.000
              7.00   2.030 |  19.00   2.030 |  31.00   2.030 |  43.00  23.000
              8.00   2.030 |  20.00   2.030 |  32.00   2.030 |  44.00  13.000
              9.00   2.030 |  21.00   2.030 |  33.00   2.030 |  45.00  13.000
             10.00   2.030 |  22.00   2.030 |  34.00   2.030 |  46.00  53.000
             11.00   2.030 |  23.00   2.030 |  35.00   2.030 |  47.00  38.000
             12.00   2.030 |  24.00   2.030 |  36.00   2.030 |  48.00  13.000

-------------------------------------------------------------------------------
-
001:0003----------------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=   13.14
| 01:209    DT= 1.00 |   Total Imp(%)=   65.00   Dir. Conn.(%)=   65.00
----------------------
```

```
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       8.54         4.60
     Dep. Storage     (mm)=       1.00         8.00
     Average Slope     (%)=        .50         2.00
     Length            (m)=      80.00        80.00
     Mannings n            =       .013         .250

     Max.eff.Inten.(mm/hr)=      53.00        49.17
               over (min)        4.00        18.00
     Storage Coeff.  (min)=       3.55 (ii)   17.76 (ii)
     Unit Hyd. Tpeak (min)=       4.00        18.00
     Unit Hyd. peak  (cms)=        .31          .06
                                                      *TOTALS*
     PEAK FLOW       (cms)=       1.26          .60         1.852 (iii)
     TIME TO PEAK    (hrs)=      46.00        46.07        46.000
     RUNOFF VOLUME    (mm)=     284.05       214.83       259.861
     TOTAL RAINFALL   (mm)=     285.08       285.08       285.082
     RUNOFF COEFFICIENT   =       1.00          .75          .912

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  76.0    Ia = Dep. Storage  (Above)
        (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
-
001:0004----------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    4.17   Curve Number   (CN)=82.00
| 02:210    DT= 1.00 |   Ia      (mm)=   8.400   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .330

     Unit Hyd Qpeak  (cms)=     .483

     PEAK FLOW       (cms)=     .566 (i)
     TIME TO PEAK    (hrs)=   46.083
     RUNOFF VOLUME    (mm)=  230.277
     TOTAL RAINFALL   (mm)=  285.082
     RUNOFF COEFFICIENT   =     .808

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0005----------------------------------------------------------------------
-
----------------------
| CALIB STANDHYD     |   Area    (ha)=    2.12
```

| 03:211   DT= 1.00 | Total Imp(%)=   50.00   Dir. Conn.(%)=   50.00

		IMPERVIOUS	PERVIOUS (i)	
Surface Area	(ha)=	1.06	1.06	
Dep. Storage	(mm)=	1.00	8.00	
Average Slope	(%)=	2.00	5.00	
Length	(m)=	20.00	20.00	
Mannings n	=	.013	.250	
Max.eff.Inten.(mm/hr)	=	53.00	49.30	
over (min)		1.00	6.00	
Storage Coeff.	(min)=	1.02 (ii)	5.71 (ii)	
Unit Hyd. Tpeak	(min)=	1.00	6.00	
Unit Hyd. peak	(cms)=	1.06	.19	
				TOTALS
PEAK FLOW	(cms)=	.16	.14	.301 (iii)
TIME TO PEAK	(hrs)=	45.28	46.00	46.000
RUNOFF VOLUME	(mm)=	284.07	214.86	249.481
TOTAL RAINFALL	(mm)=	285.08	285.08	285.082
RUNOFF COEFFICIENT	=	1.00	.75	.875

(i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
CN* = 76.0 Ia = Dep. Storage (Above)
(ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
THAN THE STORAGE COEFFICIENT.
(iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

001:0006

ADD HYD (WEL)	ID: NHYD	AREA (ha)	QPEAK (cms)	TPEAK (hrs)	R.V. (mm)	DWF (cms)
ID1	01:209	13.14	1.852	46.00	259.86	.000
+ID2	02:210	4.17	.566	46.08	230.28	.000
+ID3	03:211	2.12	.301	46.00	249.48	.000
SUM	04:WEL	19.43	2.713	46.00	252.38	.000

NOTE: PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

001:0007

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---------------------
| ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
|  IN>04:(WEL   )   |
| OUT<05:(SWMF  )   |    =========  OUTLFOW STORAGE TABLE  =========
---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
                           (cms)    (ha.m.)   |    (cms)    (ha.m.)
                            .000  .0000E+00   |     .394  .7403E+00
                            .004  .8180E-01   |     .862  .8935E+00
                            .007  .1205E+00   |    2.398  .1139E+01
                            .012  .2699E+00   |    4.424  .1402E+01
                            .013  .3938E+00   |    5.995  .1593E+01
                            .142  .5954E+00   |   11.015  .1906E+01

     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
     --------------------       (ha)     (cms)     (hrs)       (mm)
     INFLOW >04: (WEL   )      19.43     2.713    46.000    252.378
     OUTFLOW<05: (SWMF  )      19.43     2.334    46.150    252.359
    OVERFLOW<06: (SWMFO )        .00      .000      .000       .000

                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00


                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=   86.050
                    TIME SHIFT OF PEAK FLOW        (min)=     9.00
                    MAXIMUM  STORAGE   USED       (ha.m.)=.1128E+01

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-
001:0008--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=    2.77   Curve Number   (CN)=70.00
| 07:212    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .200

     Unit Hyd Qpeak  (cms)=     .529

     PEAK FLOW       (cms)=     .360 (i)
     TIME TO PEAK    (hrs)=   46.017
     RUNOFF VOLUME    (mm)=  198.744
     TOTAL RAINFALL   (mm)=  285.082
     RUNOFF COEFFICIENT   =     .697

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0009--------------------------------------------------------------------------
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----------------------
| CALIB NASHYD       |   Area    (ha)=    1.00   Curve Number   (CN)=70.00
| 08:213    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .390

     Unit Hyd Qpeak  (cms)=     .098

     PEAK FLOW       (cms)=     .121 (i)
     TIME TO PEAK    (hrs)=   46.150
     RUNOFF VOLUME    (mm)=  198.744
     TOTAL RAINFALL   (mm)=  285.082
     RUNOFF COEFFICIENT   =     .697

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

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001:0010--------------------------------------------------------------------------
-
----------------------
| CALIB NASHYD       |   Area    (ha)=     .27   Curve Number   (CN)=70.00
| 01:214    DT= 1.00 |   Ia      (mm)=   8.200   # of Linear Res.(N)= 3.00
----------------------   U.H. Tp(hrs)=    .160

     Unit Hyd Qpeak  (cms)=     .064

     PEAK FLOW       (cms)=     .035 (i)
     TIME TO PEAK    (hrs)=   46.000
     RUNOFF VOLUME    (mm)=  198.744
     TOTAL RAINFALL   (mm)=  285.082
     RUNOFF COEFFICIENT   =     .697

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-
001:0011--------------------------------------------------------------------------
-
------------------------
| ADD HYD (GEXR      ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
------------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
                     ID1 01:214            .27      .035   46.00 198.74    .000

                    +ID2 05:SWMF          19.43    2.334   46.15 252.36    .000

                    +ID3 07:212            2.77     .360   46.02 198.74    .000

                    +ID4 08:213            1.00     .121   46.15 198.74    .000
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                    ============================================================
                    SUM 09:GEXR          23.47    2.837   46.10 243.11    .000


   NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

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-
001:0012---------------------------------------------------------------------
-
      FINISH
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******************************************************************************
*
     WARNINGS / ERRORS / NOTES
     -------------------------
   Simulation ended on 2022-01-19     at 09:37:12
==============================================================================
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Appendix D

SWM Design Sheets

Wilmot Woods
STORMWATER MANAGEMENT
New Hamburg, Ontario

Project Number:	35056-104
Date:	January 26, 2022
Design By:	AJC
File:	Q:\35056\104\SWM\35056-104 Master SWM Facility Design Sheet_AJC.xlsx

MOE VOLUME REQUIREMENTS - NORTH SWMF

Step 1: Choose Level of Water Quality Control

Enhanced 80% long-term S.S. removal

Step 2: Choose Type of Facility

Wet Pond

Step 3: Define Catchment area and Imperviousness

Catchment Area (ha)	Imperviousness (%)
9.17	66.4

Interpolated Storage Volume Requirement (m^3/ha)

216.62

Permanent Pool Required (m^3)

1620

Extended Detention Volume Required (m^3)

367

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

Wilmot Woods
STORMWATER MANAGEMENT
New Hamburg, Ontario

Project Number: 35056-104
Date: January 11, 2022
Design By: AJC
File: Q:\35056\104\SWM\35056-104 Master SWM Facility Design Sheet_AJC.xlsx

STAGE-STORAGE RELATIONSHIP - NORTH SWMF

Stage	Active Depth	Forebay			Main Pond			Total Pond Volume	Active Storage Volume	Volume Summary	Ponding Elevation	Comments	Stage
		Area	Volume	Cumulative Volume	Area	Volume	Cumulative Volume						
m	*m*	m^2	m^3	m^3	m^2	m^3	m^3	m^3	m^3	m^3	*m*		*m*
338.00		415	0	0	2066	0	0	0					338.00
338.10		453	44	44	2130	210	210	254					338.10
338.20		493	48	92	2195	217	427	519					338.20
338.30		533	52	144	2260	223	650	794					338.30
338.40		573	56	200	2326	230	880	1080					338.40
338.50		615	60	260	2392	236	1116	1376					338.50
338.60		657	64	324	2460	243	1359	1683					338.60
338.70		700	68	392	2527	250	1609	2001					338.70
338.80		744	73	465	2596	257	1866	2331					338.80
338.90		789	77	542	2665	264	2130	2672					338.90
339.00		851	83	625	2768	272	2402	3027					339.00
339.10		914	89	714	2874	283	2685	3399					339.10
339.20		980	95	809	2981	293	2978	3787					339.20
339.30		1047	102	911	3089	304	3282	4193					339.30
339.40		1115	109	1020	3199	315	3597	4617					339.40
339.50		**1220**	**117**	**1137**	**3316**	**326**	**3923**	**5060**		**5060**		**Permanent Pool**	**339.50**
339.50	0.00				4536	0	0	5060	0				339.50
339.60	0.10				4717	463	463	5523	463	367	339.58	MOE Extended Detention	339.60
339.70	0.20				4900	481	944	6004	944				339.70
339.80	0.30				5086	500	1444	6504	1444	1388	339.79	25mm4hr	339.80
339.90	0.40				5274	519	1963	7023	1963				339.90
340.00	0.50				5465	537	2500	7560	2500	2370	339.98	2yr	340.00
340.10	0.60				5678	558	3058	8118	3058				340.10
340.20	0.70				5782	574	3632	8692	3632	3163	340.12	5yr	340.20
340.30	0.80				5887	584	4216	9276	4216	3715	340.22	10yr	340.30
340.40	0.90				5993	595	4811	9871	4811	4399	340.34	25yr	340.40
340.50	1.00				6099	605	5416	10476	5416	4900	340.42	50yr	340.50
340.60	1.10				6205	616	6032	11092	6032	5363	340.50	100yr	340.60
340.70	1.20				6313	626	6658	11718	6658	7282	340.80	Regional	340.70
340.80	1.30				6421	637	7295	12355	7295				340.80
340.90	1.40				6529	648	7943	13003	7943				340.90
341.00	1.50				6639	659	8602	13662	8602				341.00
341.10	1.60				6748	670	9272	14332	9272				341.10
341.20	1.70				6859	681	9953	15013	9953				341.20
341.30	1.80				6970	692	10645	15705	10645				341.30
341.40	1.90				7082	703	11348	16408	11348				341.40
341.50	2.00				7195	714	12062	17122	12062				341.50
341.60	2.10				7346	728	12790	17850	12790				341.60
341.70	2.20				7501	743	13533	18593	13533				341.70
341.80	2.30				7658	758	14291	19351	14291				341.80
341.90	2.40				7818	774	15065	20125	15065				341.90
342.00	2.50				7981	790	15855	20915	15855				342.00

Wilmot Woods
STORMWATER MANAGEMENT
New Hamburg, Ontario

Project Number: 35056-104
Date: January 11, 2022
Design By: AJC
File: Q:\35056\104\SWM\35056-104 Master SWM Facility Design Sheet_AJC.xlsx

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

	Orifice 1	Orifice 2
C_d	0.63	0.63
Invert (m)	339.50	339.70
Width (m)	0.000	0.000
Diameter/Height (m)	0.075	0.250
Type (H/V)	V	V

C_d	Description
0.63	Orifice Plate
0.80	Orifice Tube

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

	Weir 1	Weir 2	Weir 3
C_d	0.50	0.50	0.50
Invert (m)	340.00	341.00	500.00
Length (m)	0.700	1.700	4.000
Side Slope (H:V)	0	0	20
Side Slope (rad)	0.000	0.000	1.521

Notch	Weir Wall	Overflow

STAGE-DISCHARGE RELATIONSHIP - NORTH SWMF

Stage	Active Volume	Orifice 1			Orifice 2			Weir 1	Weir 2	Weir 3	Sub Total Flow	Total Flow	Comments
		Area	H_o	Flow	Area	H_o	Flow	Flow	Flow	Flow			
m	m^3	m^2	*m*	m^3/s	m^2	*m*	m^3/s	m^3/s	m^3/s	m^3/s		m^3/s	
339.50	0	0.000	0.00	0.0000	0.000	0.00	0.0000				0.0000	0.0000	Permanent Pool, Orifice 1 Starts
339.60	463	0.004	0.06	0.0031	0.000	0.00	0.0000	0.0000	0.0000	0.0000	0.0031	0.0031	
339.70	944	0.004	0.16	0.0050	0.000	0.00	0.0000	0.0000	0.0000	0.0000	0.0050	0.0050	Orifice 2
339.80	1444	0.004	0.26	0.0063	0.018	0.05	0.0114	0.0000	0.0000	0.0000	0.0178	0.0178	
339.90	1963	0.004	0.36	0.0074	0.042	0.10	0.0371	0.0000	0.0000	0.0000	0.0446	0.0446	
340.00	2500	0.004	0.46	0.0084	0.049	0.18	0.0573	0.0000	0.0000	0.0000	0.0657	0.0657	Notch 1 in internal weir
340.10	3058	0.004	0.56	0.0092	0.049	0.28	0.0718	0.0327	0.0000	0.0000	0.1138	0.1138	
340.20	3632	0.004	0.66	0.0100	0.049	0.38	0.0839	0.0924	0.0000	0.0000	0.1864	0.1864	
340.30	4216	0.004	0.76	0.0108	0.049	0.48	0.0944	0.1698	0.0000	0.0000	0.2750	0.2750	
340.40	4811	0.004	0.86	0.0114	0.049	0.58	0.1039	0.2615	0.0000	0.0000	0.3768	0.3768	
340.50	5416	0.004	0.96	0.0121	0.049	0.68	0.1125	0.3654	0.0000	0.0000	0.4900	0.4900	
340.60	6032	0.004	1.06	0.0127	0.049	0.78	0.1206	0.4803	0.0000	0.0000	0.6136	0.6136	
340.70	6658	0.004	1.16	0.0133	0.049	0.88	0.1281	0.6053	0.0000	0.0000	0.7467	0.7467	
340.80	7295	0.004	1.26	0.0139	0.049	0.98	0.1353	0.7395	0.0000	0.0000	0.8886	0.8886	
340.90	7943	0.004	1.36	0.0144	0.049	1.08	0.1420	0.8824	0.0000	0.0000	1.0389	1.0389	
341.00	8602	0.004	1.46	0.0149	0.049	1.18	0.1485	1.0335	0.0000	0.0000	1.1969	1.1969	Internal Weir Wall
341.10	9272	0.004	1.56	0.0154	0.049	1.28	0.1547	1.1924	0.0794	0.0000	1.4418	1.4418	
341.20	9953	0.004	1.66	0.0159	0.049	1.38	0.1606	1.3586	0.2245	0.0000	1.7596	1.7596	
341.30	10645	0.004	1.76	0.0164	0.049	1.48	0.1664	1.5319	0.4124	0.0000	2.1271	2.1271	
341.40	11348	0.004	1.86	0.0168	0.049	1.58	0.1719	1.7121	0.6350	0.0000	2.5358	2.5358	
341.50	12062	0.004	1.96	0.0173	0.049	1.68	0.1773	1.8987	0.8874	0.0000	2.9807	2.9807	
341.60	12790	0.004	2.06	0.0177	0.049	1.78	0.1825	2.0917	1.1666	0.0000	3.4585	3.4585	
341.70	13533	0.004	2.16	0.0181	0.049	1.88	0.1876	2.2909	1.4700	0.0000	3.9666	3.9666	Overflow
341.80	14291	0.004	2.26	0.0185	0.049	1.98	0.1925	2.4959	1.7960	0.0000	4.5030	4.5030	
341.90	15065	0.004	2.36	0.0189	0.049	2.08	0.1973	2.7068	2.1431	0.0000	5.0662	5.0662	
342.00	15855	0.004	2.46	0.0193	0.049	2.18	0.2020	2.9233	2.5100	0.0000	5.6547	5.6547	

Wilmot Woods
STORMWATER MANAGEMENT
New Hamburg, Ontario

Project Number:	35056-104
Date:	January 26, 2022
Design By:	AJC
File:	Q:\35056\104\SWM\35056-104 Master SWM Facility Design Sheet_AJC.xlsx

FALLING HEAD DRAWDOWN CALCULATION - NORTH SWMF
MOE SWM Planning and Design Manual, 2003

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

where

t =	154772.06	***s***	
	43.0	***hr***	drawdown time
A_p =	4612.7025	m^2	surface area of the pond
C =	0.63		discharge coefficient
d =	75	***mm***	diameter of the orifice
A_O =	0.00441786	m^2	cross-sectional area of the orifice
g =	9.81	m/s^2	gravitational acceleration constant
h_1 =	339.580	***m***	starting water elevation above the orifice
h_2 =	339.538	***m***	ending water elevation above the orifice
h =	0.0425	***m***	maximum water elevation above the orifice
C_2 =	1833		slope coefficient from the area-depth linear regression
C_3 =	4534.8		intercept from the area-depth linear regression

	ELEVATION *m*	STAGE *m*	AREA m^2	COMMENTS
1	339.50	0	4536	Permanent pool
2	339.60	0.1	4717	339.58 = MOE Ext Det
3	339.70	0.2	4900	
4	339.80	0.3	5086	

DRAWDOWN TIME: 154772 ***s***
43.0 ***hr***

Regression Output:

m_1 =	1833.00	slope coefficient from the area-depth linear regression
b =	4534.80	intercept from the area-depth linear regression
se_1 =	7.94	standard error for coefficient m_1
se_b =	1.48	standard error for constant b
R^2 =	1.0000	coefficient of determination
se_y =	1.77	standard error of the ***y*** estimate
F =	53331.57	F statistic
df =	2	degrees of freedom
ss_{reg} =	167994	regression sum of squares
ss_{resid} =	6	residual sum of squares

Wilmot Woods

STORMWATER MANAGEMENT

New Hamburg, Ontario

Project Number: 35056-104
Date: January 11, 2022
Design By: AJC
File: Q:\35056\104\SWM\35056-104 Master SWM Facility Design Sheet_AJC.xlsx

STAGE DISCHARGE DRAWDOWN CALCULATION (25mm-4hr

Stage	Elevation *m*	Discharge m^3/s	Volume m^3	Comments
1	339.500	0.0000	0.0	
2	339.600	0.0031	463.0	
3	339.700	0.0050	944.0	
4	339.800	0.0178	1444.0	
5	339.900	0.0446	1963.0	
6	340.000	0.0657	2500.0	
7	340.100	0.1138	3058.0	
8	340.200	0.1864	3632.0	
9	340.300	0.2750	4216.0	
10	340.400	0.3768	4811.0	
11	340.500	0.4900	5416.0	
12	340.600	0.6136	6032.0	
13	340.700	0.7467	6658.0	
14	340.800	0.8886	7295.0	
15	340.900	1.0389	7943.0	
16	341.000	1.1969	8602.0	
17	341.100	1.4418	9272.0	

h_1 =	339.79	***m***	starting elevation
h_2 =	339.50	***m***	bottom elevation
V =	1388	m^3	starting volume
t =	5.0	***min***	time step

Drawdown Time = 71.92 *hrs*

54 ***mm*** remaining
252.1 m^3 remaining

Remaining after:	m^3	*mm*
12 ***hrs***	959	203
24 ***hrs***	758	161
36 ***hrs***	590	126
48 ***hrs***	447	97
72 ***hrs***	252	54

Wilmot Woods
STORMWATER MANAGEMENT
New Hamburg, Ontario

Project Number: 35056-104
Date: January 22, 2022
Design By: AJC
File: Q:\35056\104\SWM\35056-104 Master SWM Facility Design Sheet_AJC.xlsx

FOREBAY DESIGN CALCULATIONS - NORTH SWMF

MOE SWM Planning and Design Manual, 2003

Forebay Design Flows

Flow into forebay during the 1:5-year return period event	1.137	m^3/s
Flow into forebay during the 25 mm - 4 hour design storm event	1.011	m^3/s
Peak flow from main pond outlet for the 25mm design storm (from MIDUSS)	0.022	m^3/s

Forebay Characteristics

b =	9.0	*m*	bottom width
y =	1.5	*m*	depth
z =	3	:1	side slope
w =	13.5	*m*	average width
R =	1.10	*m*	hydraulic radius
A =	20.3	m^2	cross-sectional area

1. Length Calculation Based on Settling Velocity

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

Equation 4.5: Forebay Settling Length

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

Q_p =	1.01	m^3/s	peak flow rate through forebay
v_s =	0.0055	*m/s*	settling velocity
r =	1.01		length-to-width ratio
L =	13.7	*m*	required settling length
L =	*13.7*	*m*	*trial length*

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

Q_p =	0.022	m^3/s	peak flow rate through forebay
v_s =	0.0003	*m/s*	settling velocity
r =	0.41		length-to-width ratio
L =	5.5	*m*	required settling length
L =	*5.5*	*m*	*trial length*

Table 1: Average settling velocities

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

2. Length Calculation Based on Flow Dispersion Length

Q =	1.14	m^3/s	inlet flow rate
d =	1.5	*m*	depth of permanent pool in forebay
V_f =	0.50	*m/s*	desired velocity in forebay (typical value ≤ 0.50 *m/s*)
L =	12.1	m	required length of dispersion

Equation 4.6: Dispersion Length

3. Required Forebay Length

L =	**13.7**	***m***	**required design length**
L (actual) =	**40.0**	***m***	
r =	2.96		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 =	**0.056**	***m/s***	**actual velocity**

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

5. Weir Flow From Forebay

L =	10	*m*	length of crest of weir
α =	1.65		coefficient
H =	0.5	*m*	head
Q =	5.83	m^3/s	**discharge**

Equation 4.4: Weir Flow

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

6. Estimated Cleanout Frequencies

a) Forebay

Forebay volume	1137	m^3
Estimated TSS removal efficiency	50%	
Impervious level	66.4%	
Estimated annual sediment loading	2.6	m^3/ha
Contributing area	9.17	*ha*
Annual sediment volume	12	m^3/yr
Cleanout frequency for 33% volume reduction	**31.5**	***years***

b) Stormwater Management Pond

Wetpond volume (excluding forebay)	3923	m^3
Estimated TSS removal efficiency	30%	
Impervious level	66.4%	
Estimated annual sediment loading	2.6	m^3/ha
Contributing area	9.17	*ha*
Annual sediment volume	7	m^3/yr
Cleanout frequency for 33% volume reduction	**181.0**	***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

Wilmot Woods
STORMWATER MANAGEMENT
New Hamburg, Ontario

Project Number:	35056-104
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MOE VOLUME REQUIREMENTS - SOUTH SWMF

Step 1: Choose Level of Water Quality Control

Basic 60% long-term S.S. Removal

Step 2: Choose Type of Facility

Dry Pond (Continuous Flow)

Step 3: Define Catchment area and Imperviousness

Catchment Area (ha)	Imperviousness (%)
19.43	50.3

Interpolated Storage Volume Requirement (m^3/ha)

135.82

Permanent Pool Required (m^3)

1862

Extended Detention Volume Required (m^3)

777

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

Wilmot Woods
STORMWATER MANAGEMENT
New Hamburg, Ontario

Project Number: 35056-104
Date: January 15, 2022
Design By: AJC
File: Q:\35056\104\SWM\35056-104 Master SWM Facility Design Sheet_AJC.xlsx

STAGE-STORAGE RELATIONSHIP - SOUTH SWMF

Stage	Active Depth	Forebay			Main Pond			Active Storage Volume	Volume Summary	Ponding Elevation	Comments	Stage
		Area	Volume	Cumulative Volume	Area	Volume	Cumulative Volume					
m	*m*	m^2	m^3	m^3	m^2	m^3	m^3	m^3	m^3	*m*		*m*
339.50	0.00				163	0	0	0			**Bottom of Micropool**	339.50
339.60	0.10				186	18	18	18				339.60
339.70	0.20				208	20	38	38				339.70
339.80	0.30				233	23	61	61				339.80
339.90	0.40				258	25	86	86				339.90
340.00	0.50				285	28	114	114				340.00
340.10	0.60				313	30	144	144				340.10
340.20	0.70				343	33	177	177				340.20
340.30	0.80	878	0	0	373	36	213	213			**Bottom of Forebay**	340.30
340.40	0.90	939	91	91	405	39	252	252				340.40
340.50	1.00	1001	98	189	3556	199	451	451	777	340.59	MOE Extended Detention	340.50
340.60	1.10	1065	104	293	3764	367	818	818				340.60
340.70	1.20	1129	110	403	3971	387	1205	1205				340.70
340.80	1.30	1196	117	520	4182	408	1613	1613				340.80
340.90	1.40				5773	498	2111	2111	2512	340.97	25mm4hr	340.90
341.00	1.50				5981	588	2699	2699				341.00
341.10	1.60				6189	609	3308	3308				341.10
341.20	1.70				6399	630	3938	3938				341.20
341.30	1.80				6609	651	4589	4589	4832	341.34	2yr	341.30
341.40	1.90				6820	672	5261	5261				341.40
341.50	2.00				7031	693	5954	5954	6292	341.55	5yr	341.50
341.60	2.10				7243	714	6668	6668	7240	341.68	10yr	341.60
341.70	2.20				7449	735	7403	7403				341.70
341.80	2.30				7653	756	8159	8159	8313	341.82	25yr	341.80
341.90	2.40				7857	776	8935	8935	9123	341.92	50yr	341.90
342.00	2.50				8061	796	9731	9731	9696	342.00	100yr	342.00
342.10	2.60				8267	817	10548	10548	11128	342.17	Regional	342.10
342.20	2.70				8474	838	11386	11386				342.20
342.30	2.80				8680	858	12244	12244				342.30
342.40	2.90				8888	879	13123	13123				342.40
342.50	3.00				9097	900	14023	14023				342.50
342.60	3.10				9515	931	14954	14954				342.60
342.70	3.20				9978	975	15929	15929				342.70
342.80	3.30				10335	1016	16945	16945				342.80
342.90	3.40				10581	1046	17991	17991				342.90
343.00	3.50				10830	1071	19062	19062				343.00

Wilmot Woods
STORMWATER MANAGEMENT
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Orifice Calculations

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

	Orifice 1	Orifice 2
C_d	0.63	0.63
Invert (m)	340.50	341.10
Width (m)	0.000	0.000
Diameter/Height (m)	0.090	0.300
Type (H/V)	V	H

C_d	Description
0.63	Orifice Plate
0.80	Orifice Tube

Weir Calculations

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

	Weir 1	Weir 2	Weir 3
C_d	0.50	0.50	0.50
Invert (m)	341.50	341.65	342.70
Length (m)	1.200	3.600	5.000
Side Slope (H:V)	3	0	20
Side Slope (rad)	1.249	0.000	1.521

DICB (3:1)	DICB (WEIR)	Overflow

STAGE-DISCHARGE RELATIONSHIP - SOUTH SWMF

Stage	Active Volume	Orifice 1			Orifice 2			Weir 1	Weir 2	Weir 3	Sub Total Flow	Total Flow	Comments
		Area	H_o	Flow	Area	H_o	Flow	Flow	Flow	Flow			
m	m^3	m^2	*m*	m^3/s	m^2	*m*	m^3/s	m^3/s	m^3/s	m^3/s		m^3/s	
340.50	0	0.00	0.00	0.0000							0.0000	0.0000	Permanent Pool, Orifice 1 Starts
340.60	818	0.01	0.06	0.0042				0.0000		0.0000	0.0042	0.0042	
340.70	1205	0.01	0.16	0.0070				0.0000		0.0000	0.0070	0.0070	
340.80	1613	0.01	0.26	0.0090				0.0000		0.0000	0.0090	0.0090	
340.90	2111	0.01	0.36	0.0106				0.0000		0.0000	0.0106	0.0106	
341.00	2699	0.01	0.46	0.0120				0.0000		0.0000	0.0120	0.0120	
341.10	3308	0.01	0.56	0.0132	0.00	0.00	0.0000	0.0000		0.0000	0.0132	0.0132	Orifice 2
341.20	3938	0.01	0.66	0.0144	0.02	0.10	0.0182	0.0000		0.0000	0.0326	0.0326	
341.30	4589	0.01	0.76	0.0154	0.05	0.20	0.0625	0.0000		0.0000	0.0779	0.0779	
341.40	5261	0.01	0.86	0.0164	0.07	0.30	0.1080	0.0000		0.0000	0.1245	0.1245	
341.50	5954	0.01	0.96	0.0173	0.07	0.40	0.1248	0.0000		0.0000	0.1421	0.1421	DDICB
341.60	6668	0.01	1.06	0.0182	0.07	0.50	0.1395	0.0672		0.0000	0.2249	0.2249	
341.70	7403	0.01	1.16	0.0191	0.07	0.60	0.1528	0.2219		0.0000	0.3937	0.3937	
341.80	8159	0.01	1.26	0.0199	0.07	0.70	0.1650	0.4658		0.0000	0.6507	0.6507	
341.90	8935	0.01	1.36	0.0207	0.07	0.80	0.1764		0.6644	0.0000	0.8615	0.8615	
342.00	9731	0.01	1.46	0.0214	0.07	0.90	0.1871		1.1006	0.0000	1.3092	1.3092	
342.10	10548	0.01	1.56	0.0221	0.07	1.00	0.1973		1.6045	0.0000	1.8239	1.8239	
342.20	11386	0.01	1.66	0.0228	0.07	1.10	0.2069		2.1681	0.0000	2.3978	2.3978	
342.30	12244	0.01	1.76	0.0235	0.07	1.20	0.2161		2.7855	0.0000	3.0251	3.0251	
342.40	13123	0.01	1.86	0.0242	0.07	1.30	0.2249		3.4524	0.0000	3.7015	3.7015	
342.50	14023	0.01	1.96	0.0248	0.07	1.40	0.2334		4.1654	0.0000	4.4236	4.4236	
342.60	14954	0.01	2.06	0.0254	0.07	1.50	0.2416		4.9217	0.0000	5.1887	5.1887	
342.70	15929	0.01	2.16	0.0261	0.07	1.60	0.2495		5.7189	0.0000	5.9945	5.9945	Emergency Overflow
342.80	16945	0.01	2.26	0.0267	0.07	1.70	0.2572		6.5551	0.3082	7.1471	7.1471	
342.90	17991	0.01	2.36	0.0272	0.07	1.80	0.2646		7.4284	1.0829	8.8032	8.8032	
343.00	19062	0.01	2.46	0.0278	0.07	1.90	0.2719		8.3374	2.3776	11.0147	11.0147	

Wilmot Woods
STORMWATER MANAGEMENT
New Hamburg, Ontario

Project Number:	35056-104
Date:	January 26, 2022
Design By:	AJC
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FALLING HEAD DRAWDOWN CALCULATION - SOUTH SWMF
MOE SWM Planning and Design Manual, 2003

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

where	t =	86975.0971	***s***	
		24.2	***hr***	drawdown time
	A_p =	3649.325	***m²***	surface area of the pond
	C =	0.63		discharge coefficient
	d =	90	***mm***	diameter of the orifice
	A_O =	0.00636173	***m²***	cross-sectional area of the orifice
	g =	9.81	***m/s²***	gravitational acceleration constant
	h_1 =	340.59	***m***	starting water elevation above the orifice
	h_2 =	340.55	***m***	ending water elevation above the orifice
	h =	0.045	***m***	maximum water elevation above the orifice
	C_2 =	2085		slope coefficient from the area-depth linear regression
	C_3 =	3555.5		intercept from the area-depth linear regression

	ELEVATION *m*	STAGE *m*	AREA *m²*	COMMENTS
1	340.50	0	3556	Permanent pool
2	340.60	0.1	3764	
3	340.70	0.2	3971	Extended detention
4	340.80	0.3	4182	

DRAWDOWN TIME: 86975 ***s***
24.2 ***hr***

Regression Output:

m_1 =	2085.00	slope coefficient from the area-depth linear regression
b =	3555.50	intercept from the area-depth linear regression
se_1 =	5.92	standard error for coefficient m_1
se_b =	1.11	standard error for constant b
R^2 =	1.0000	coefficient of determination
se_y =	1.32	standard error of the ***y*** estimate
F =	124206.43	F statistic
df =	2	degrees of freedom
ss_{reg} =	217361	regression sum of squares
ss_{resid} =	4	residual sum of squares

Wilmot Woods
STORMWATER MANAGEMENT
New Hamburg, Ontario

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FOREBAY DESIGN CALCULATIONS - SOUTH SWMF

MOE SWM Planning and Design Manual, 2003

Forebay Design Flows

Flow into forebay during the 1:5-year return period event	2.004	m^3/s
Flow into forebay during the 25 mm - 4 hour design storm event	1.624	m^3/s
Peak flow from main pond outlet for the 25mm design storm (from MIDUSS)	0.011	m^3/s

Forebay Characteristics

b =	20.0	*m*	bottom width
y =	0.6	*m*	depth
z =	5	:1	side slope
w =	23.0	*m*	average width
R =	0.53	*m*	hydraulic radius
A =	13.8	m^2	cross-sectional area

1. Length Calculation Based on Settling Velocity

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

Equation 4.5: Forebay Settling Length

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

Q_p =	1.62	m^3/s	peak flow rate through forebay
v_s =	0.0055	*m/s*	settling velocity
r =	0.56		length-to-width ratio
L =	12.8	*m*	required settling length
L =	*12.8*	*m*	*trial length*

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

Q_p =	0.011	m^3/s	peak flow rate through forebay
v_s =	0.0003	*m/s*	settling velocity
r =	0.07		length-to-width ratio
L =	1.5	*m*	required settling length
L =	*1.5*	*m*	*trial length*

Table 1: Average settling velocities

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

2. Length Calculation Based on Flow Dispersion Length

Q =	2.00	m^3/s	inlet flow rate
d =	0.6	*m*	depth of permanent pool in forebay
V_f =	0.50	*m/s*	desired velocity in forebay (typical value ≤ 0.50 *m/s*)
L =	53.4	m	required length of dispersion

Equation 4.6: Dispersion Length

3. Required Forebay Length

L =	**53.4**	***m***	**required design length**
L (actual) =	**55.0**	***m***	
r (actual) =	2.39		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 =	**0.145**	***m/s***	**actual velocity**

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

5. Weir Flow From Forebay

L =	5	*m*	length of crest of weir
α =	1.65		coefficient
H =	0.6	*m*	head
Q =	3.83	***m^3/s***	**discharge**

Equation 4.4: Weir Flow

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

6. Estimated Cleanout Frequencies

a) Forebay

Forebay volume	1137	m^3
Estimated TSS removal efficiency	50%	
Impervious level	66.4%	
Estimated annual sediment loading	2.6	m^3/ha
Contributing area	9.17	*ha*
Annual sediment volume	12	m^3/yr
Cleanout frequency for 33% volume reduction	**31.5**	***years***

b) Stormwater Management Pond

Wetpond volume (excluding forebay)	3923	m^3
Estimated TSS removal efficiency	30%	
Impervious level	66.4%	
Estimated annual sediment loading	2.6	m^3/ha
Contributing area	9.17	*ha*
Annual sediment volume	7	m^3/yr
Cleanout frequency for 33% volume reduction	**181.0**	***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

Stormceptor®

FORTERRA

Stormceptor® EF Sizing Report

STORMCEPTOR®
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

12/10/2021

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

Site Name:	Wilmot Woods
Drainage Area (ha):	0.59
% Imperviousness:	65.00

Runoff Coefficient 'c': 0.69

Particle Size Distribution:	CA ETV
Target TSS Removal (%):	69.0

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	16.21
Oil / Fuel Spill Risk Site?	No
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Site Sediment Transport Rate (kg/ha/yr):	

Project Name:	Wilmot Woods
Project Number:	35056-104
Designer Name:	Alex Cressman
Designer Company:	MTE Consultants Inc.
Designer Email:	acressman@mte85.com
Designer Phone:	519-743-6500
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EF4	55
EF6	61
EF8	65
EF10	67
EF12	69

Recommended Stormceptor EF Model: EF12

Estimated Net Annual Sediment (TSS) Load Reduction (%): 69

Water Quality Runoff Volume Capture (%): > 90

imbrium

THIRD-PARTY TESTING AND VERIFICATION

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

PERFORMANCE

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

PARTICLE SIZE DISTRIBUTION (PSD)

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

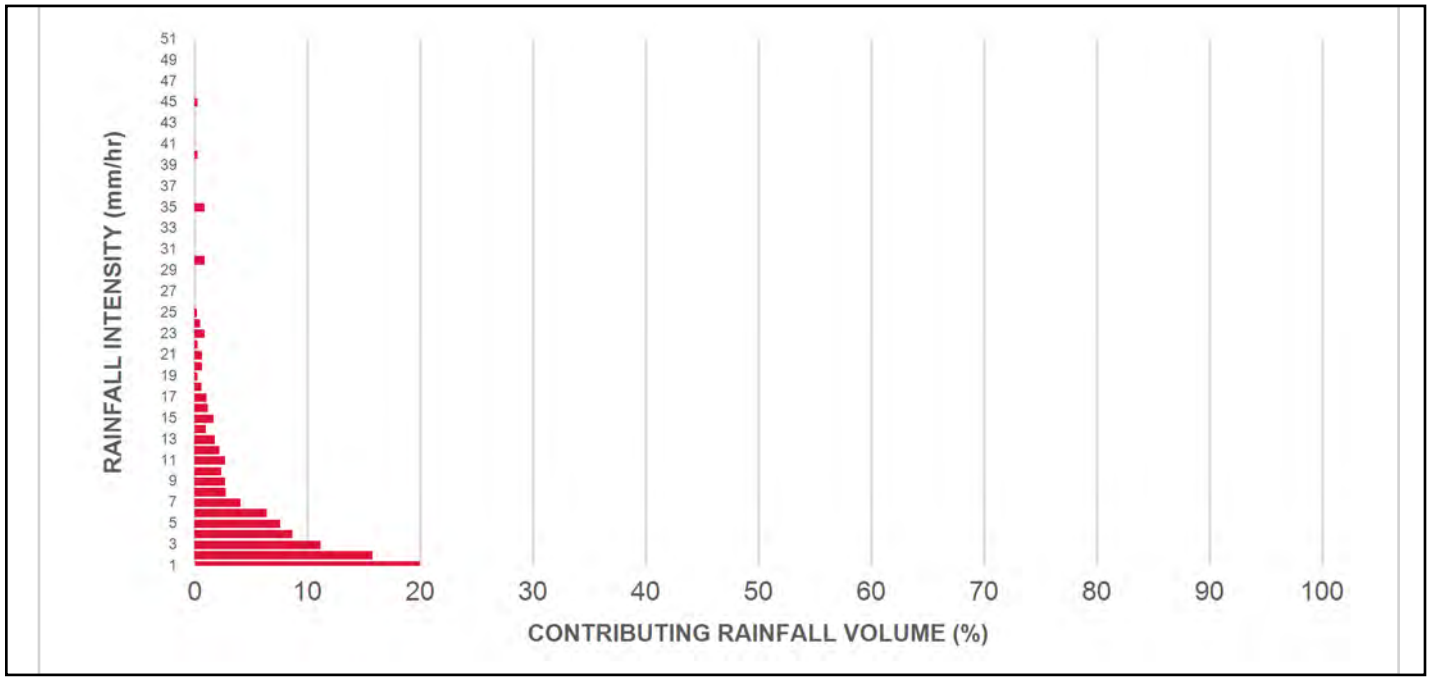
Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

Stormceptor® EF Sizing Report

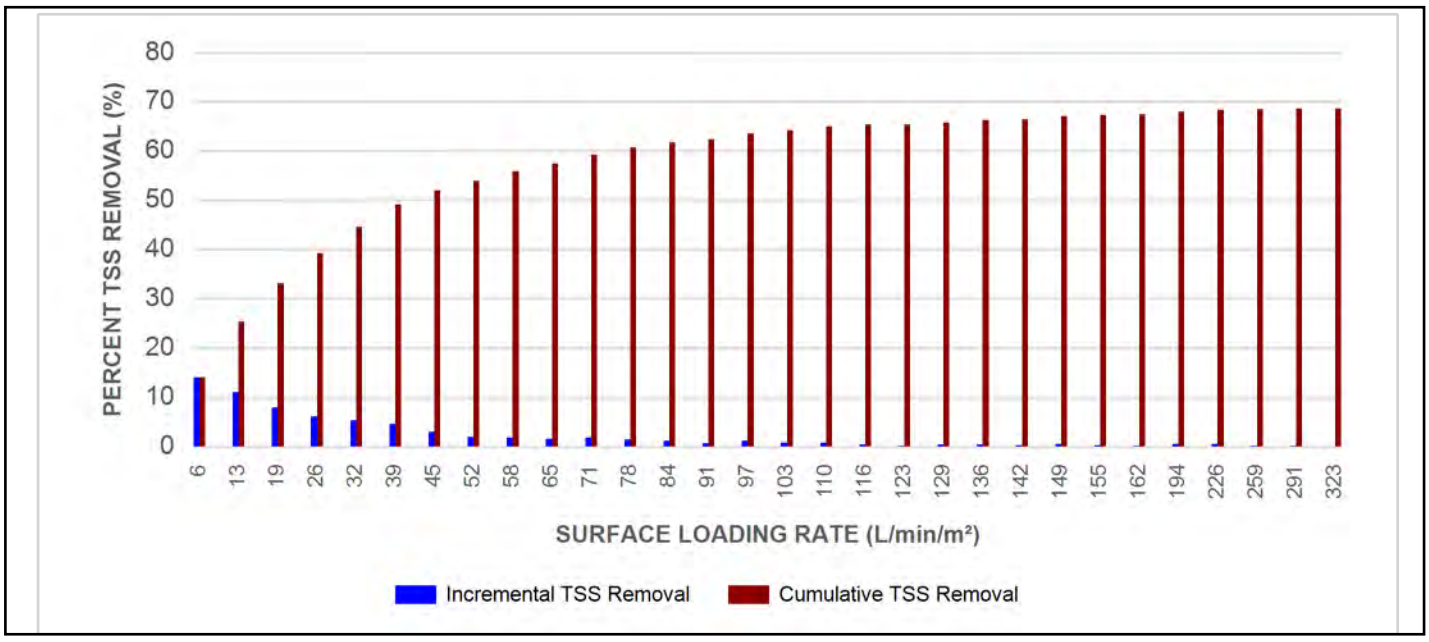
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
1	20.0	20.0	1.13	68.0	6.0	70	14.1	14.1
2	15.8	35.8	2.26	136.0	13.0	70	11.1	25.2
3	11.2	47.0	3.40	204.0	19.0	70	7.9	33.1
4	8.7	55.7	4.53	272.0	26.0	70	6.2	39.2
5	7.6	63.3	5.66	340.0	32.0	70	5.3	44.5
6	6.4	69.7	6.79	407.0	39.0	70	4.5	49.1
7	4.1	73.8	7.92	475.0	45.0	70	2.9	52.0
8	2.8	76.7	9.05	543.0	52.0	69	1.9	53.9
9	2.7	79.4	10.19	611.0	58.0	69	1.9	55.8
10	2.4	81.7	11.32	679.0	65.0	67	1.6	57.4
11	2.7	84.5	12.45	747.0	71.0	66	1.8	59.2
12	2.2	86.7	13.58	815.0	78.0	66	1.4	60.6
13	1.8	88.4	14.71	883.0	84.0	64	1.1	61.7
14	1.0	89.5	15.84	951.0	91.0	63	0.7	62.4
15	1.7	91.2	16.98	1019.0	97.0	63	1.1	63.5
16	1.2	92.3	18.11	1086.0	103.0	62	0.7	64.2
17	1.1	93.5	19.24	1154.0	110.0	62	0.7	64.9
18	0.6	94.1	20.37	1222.0	116.0	62	0.4	65.3
19	0.3	94.3	21.50	1290.0	123.0	61	0.2	65.4
20	0.7	95.0	22.63	1358.0	129.0	60	0.4	65.8
21	0.7	95.7	23.77	1426.0	136.0	60	0.4	66.3
22	0.3	96.0	24.90	1494.0	142.0	59	0.2	66.4
23	0.9	96.9	26.03	1562.0	149.0	59	0.5	67.0
24	0.5	97.4	27.16	1630.0	155.0	58	0.3	67.3
25	0.2	97.6	28.29	1698.0	162.0	57	0.1	67.4
30	0.9	98.5	33.95	2037.0	194.0	55	0.5	67.9
35	0.9	99.4	39.61	2377.0	226.0	53	0.5	68.4
40	0.3	99.7	45.27	2716.0	259.0	53	0.1	68.5
45	0.3	100.0	50.93	3056.0	291.0	51	0.2	68.6
50	0.0	100.0	56.59	3395.0	323.0	50	0.0	68.6
Estimated Net Annual Sediment (TSS) Load Reduction =								**69 %**

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

RAINFALL DATA FROM WATERLOO WELLINGTON AP RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL
FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

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

SCOUR PREVENTION AND ONLINE CONFIGURATION

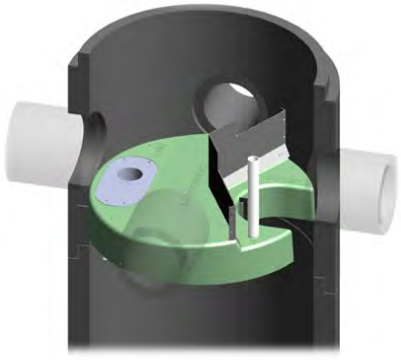
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test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

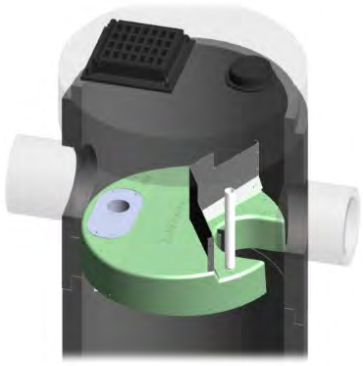
DESIGN FLEXIBILITY

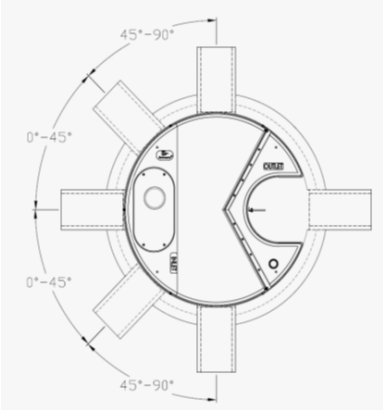
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend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

OIL CAPTURE AND RETENTION

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







INLET-TO-OUTLET DROP

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

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

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

HEAD LOSS

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

Pollutant Capacity

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

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

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

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

STANDARD STORMCEPTOR EF/EFO DRAWINGS

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

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

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

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

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

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

PART 1 – GENERAL

1.1 WORK INCLUDED

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

1.2 REFERENCE STANDARDS & PROCEDURES

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

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

1.3 SUBMITTALS

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

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

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

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

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

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

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

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

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing shall be determined using historical rainfall data and a sediment removal performance curve derived from the actual third-party verified laboratory testing data. The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

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

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

Appendix E

Ivan Gingering Drain Floodplain Modelling

35056-104 Wilmot Woods Subdivision

Ivan Gingerich Municipal Drain HEC-RAS Model

Floodplain Mapping

Proposed Flow – Ultimate Conditions

(cms)

Flow Change Location				Profile Names and Flow Rates	
	River	Reach	RS	Regional	100 yr 12hr
1	Drain	1	2241	19.16	29.53
2	Drain	1	1625	27.06	36.82
3	Drain	1	760	32.92	41.16

35056-104 Wilmot Woods Subdivision

Ivan Gingerich Municipal Drain HEC-RAS Model

Floodplain Mapping - Pre-Development Conditions

HEC-RAS Plan: Plan 05 River: Drain Reach: 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	2241	Regional	19.16	346.00	346.68	346.41	346.73	0.004667	1.44	31.52	87.42	0.58
1	2241	100 yr 12hr	29.53	346.00	346.82	346.64	346.88	0.004489	1.61	44.78	101.33	0.58
1	1887	Regional	19.16	343.49	344.40	344.40	344.58	0.008133	2.14	18.02	59.83	0.78
1	1887	100 yr 12hr	29.53	343.49	344.54	344.54	344.75	0.008382	2.42	27.24	71.75	0.81
1	1725	Regional	19.16	341.30	343.27	343.07	343.33	0.002318	1.40	32.15	75.25	0.41
1	1725	100 yr 12hr	29.53	341.30	343.39	343.21	343.48	0.003120	1.73	41.91	83.06	0.49
1	1625	Regional	27.06	341.09	342.86	342.78	342.98	0.004944	1.83	33.01	97.61	0.61
1	1625	100 yr 12hr	36.82	341.09	342.99		343.10	0.004428	1.89	46.17	105.40	0.59
1	1515	Regional	27.06	340.27	342.23		342.38	0.006256	2.33	31.03	69.70	0.68
1	1515	100 yr 12hr	36.82	340.27	342.36		342.52	0.006654	2.57	40.50	82.43	0.71
1	1415	Regional	27.06	339.77	341.76		341.89	0.003918	2.04	38.03	92.81	0.54
1	1415	100 yr 12hr	36.82	339.77	341.90		342.02	0.003749	2.13	51.60	102.80	0.54
1	1385	Regional	27.06	339.10	341.75	341.36	341.78	0.000782	1.14	79.26	136.28	0.26
1	1385	100 yr 12hr	36.82	339.10	341.88	341.48	341.91	0.000866	1.25	98.34	145.75	0.28
1	1377.5		Culvert									
1	1370	Regional	27.06	338.80	341.75	341.40	341.77	0.001121	1.19	75.64	129.13	0.26
1	1370	100 yr 12hr	36.82	338.80	341.89	341.51	341.91	0.001192	1.28	93.93	138.52	0.27
1	1340	Regional	27.06	339.24	341.38	341.37	341.58	0.006527	2.43	27.32	76.17	0.70
1	1340	100 yr 12hr	36.82	339.24	341.49	341.49	341.71	0.006812	2.64	37.04	87.31	0.72
1	1240	Regional	27.06	339.00	340.96		341.09	0.003729	1.98	39.60	115.26	0.54
1	1240	100 yr 12hr	36.82	339.00	341.12		341.23	0.003340	2.02	62.36	180.94	0.52
1	1140	Regional	27.06	338.44	340.46	340.46	340.62	0.005845	2.27	35.85	124.46	0.65
1	1140	100 yr 12hr	36.82	338.44	340.51	340.51	340.72	0.007980	2.72	42.14	138.51	0.76
1	1085	Regional	27.06	338.32	340.36	340.17	340.37	0.001179	0.99	106.47	310.06	0.28
1	1085	100 yr 12hr	36.82	338.32	340.43	340.23	340.45	0.001258	1.06	129.80	316.90	0.29
1	1005	Regional	27.06	338.04	340.33		340.34	0.000278	0.54	191.69	410.28	0.14
1	1005	100 yr 12hr	36.82	338.04	340.40		340.40	0.000357	0.64	220.01	429.60	0.16
1	950	Regional	27.06	337.64	340.32		340.32	0.000231	0.54	194.84	399.62	0.13
1	950	100 yr 12hr	36.82	337.64	340.38		340.39	0.000307	0.64	220.32	409.67	0.16
1	895	Regional	27.06	337.73	340.32		340.32	0.000026	0.20	429.11	495.06	0.05
1	895	100 yr 12hr	36.82	337.73	340.38		340.38	0.000039	0.26	459.87	498.70	0.06
1	860	Regional	27.06	337.70	340.32		340.32	0.000016	0.17	488.13	505.57	0.04
1	860	100 yr 12hr	36.82	337.70	340.38		340.38	0.000027	0.23	519.41	510.54	0.05
1	815	Regional	27.06	337.45	340.32		340.32	0.000011	0.14	562.75	516.02	0.03
1	815	100 yr 12hr	36.82	337.45	340.38		340.38	0.000017	0.18	594.63	522.62	0.04
1	795	Regional	27.06	337.54	340.32	339.32	340.32	0.000014	0.15	528.31	516.52	0.04
1	795	100 yr 12hr	36.82	337.54	340.38	339.35	340.38	0.000022	0.19	560.02	520.85	0.05
1	790		Culvert									
1	785	Regional	27.06	337.51	340.32	339.84	340.32	0.000018	0.15	507.55	522.23	0.04
1	785	100 yr 12hr	36.82	337.51	340.38	340.16	340.38	0.000027	0.19	539.51	525.24	0.04
1	772.5		Culvert									
1	760	Regional	32.92	337.50	339.62	339.16	339.96	0.003822	2.63	14.05	282.19	0.61
1	760	100 yr 12hr	41.16	337.50	339.37	339.37	340.10	0.009904	3.85	11.86	144.94	0.96
1	725	Regional	32.92	337.42	339.67		339.68	0.000200	0.63	177.80	230.15	0.14
1	725	100 yr 12hr	41.16	337.42	339.08	338.84	339.13	0.001944	1.54	80.77	138.61	0.42
1	545	Regional	32.92	336.30	339.65		339.66	0.000192	0.76	187.82	242.91	0.14
1	545	100 yr 12hr	41.16	336.30	338.23	338.23	338.58	0.010496	3.76	29.60	43.88	0.93
1	330	Regional	32.92	334.42	339.64		339.64	0.000026	0.35	401.78	327.17	0.05
1	330	100 yr 12hr	41.16	334.42	338.13	336.49	338.14	0.000326	0.98	103.06	62.30	0.17
1	190	Regional	32.92	333.00	339.64		339.64	0.000007	0.26	561.04	354.92	0.03
1	190	100 yr 12hr	41.16	333.00	338.13		338.13	0.000030	0.45	255.46	102.93	0.06
1	155	Regional	32.92	333.20	339.64	335.07	339.64	0.000008	0.28	576.82	349.70	0.04

HEC-RAS Plan: Plan 05 River: Drain Reach: 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	155	100 yr 12hr	41.16	333.20	338.12	335.31	338.13	0.000088	0.75	214.83	159.54	0.11
1	142.5		Culvert									
1	130	Regional	32.92	333.10	339.64	335.00	339.64	0.000006	0.24	698.89	448.43	0.03
1	130	100 yr 12hr	41.16	333.10	337.90	335.24	337.91	0.000094	0.75	178.28	93.38	0.11
1	110	Regional	32.92	332.75	339.64	333.85	339.64	0.000001	0.08	1530.17	578.20	0.01
1	110	100 yr 12hr	41.16	332.75	337.90	333.89	337.90	0.000006	0.20	633.57	409.23	0.03

35056-104 Wilmot Woods Subdivision

Ivan Gingerich Municipal Drain HEC-RAS Model

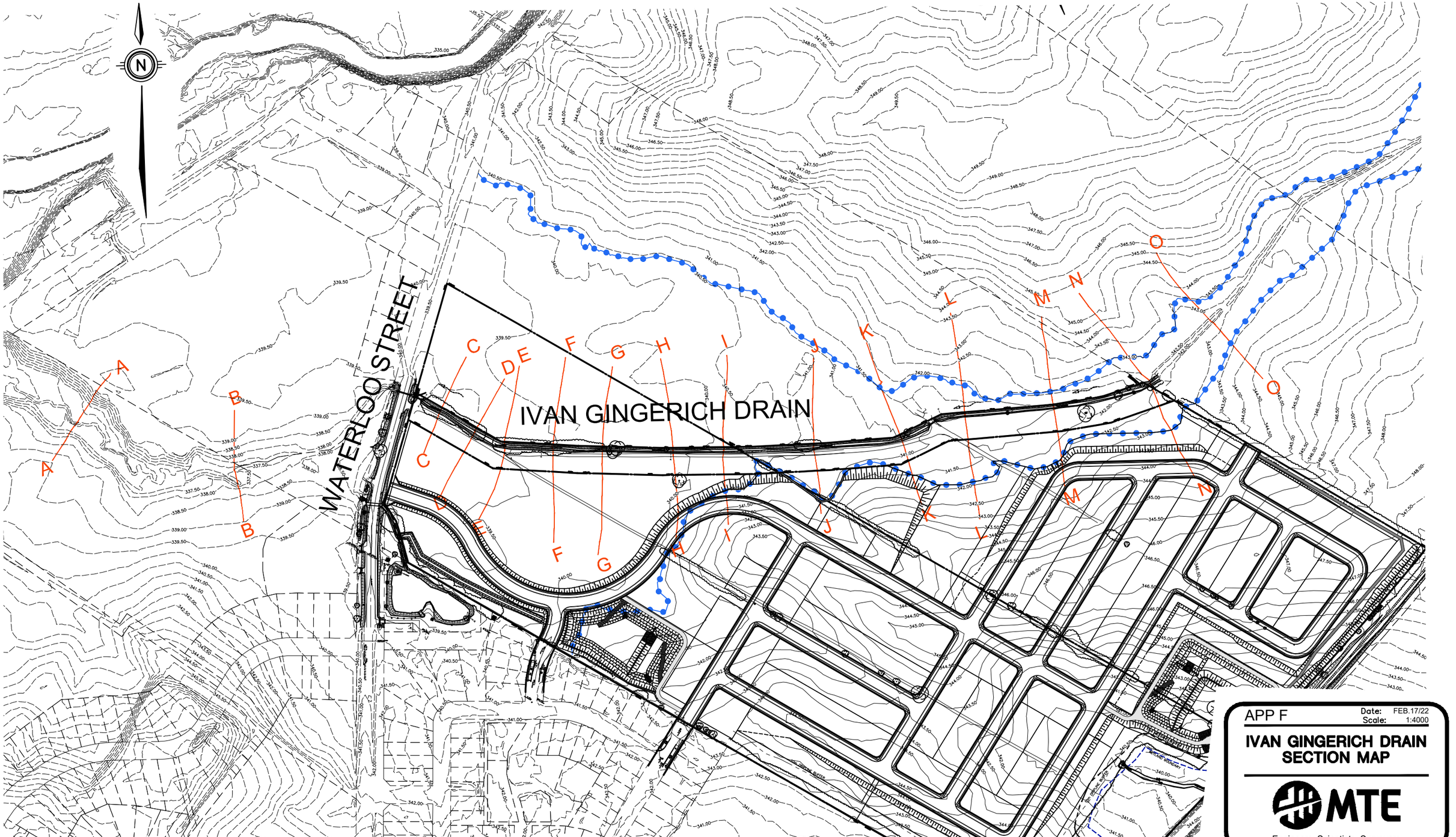
Floodplain Mapping - Post-Development Conditions

HEC-RAS Plan: Plan 05 River: Drain Reach: 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	2241	Regional	19.16	346.00	346.68	346.41	346.73	0.004667	1.44	31.52	87.42	0.58
1	2241	100 yr 12hr	29.53	346.00	346.82	346.64	346.88	0.004489	1.61	44.78	101.33	0.58
1	1887	Regional	19.16	343.49	344.40	344.40	344.58	0.008133	2.14	18.02	59.83	0.78
1	1887	100 yr 12hr	29.53	343.49	344.54	344.54	344.75	0.008382	2.42	27.24	71.75	0.81
1	1725	Regional	19.16	341.30	343.27	343.07	343.33	0.002317	1.40	32.16	75.25	0.41
1	1725	100 yr 12hr	29.53	341.30	343.39	343.21	343.48	0.003121	1.74	41.90	83.06	0.49
1	1625	Regional	27.06	341.09	342.86	342.78	342.98	0.004946	1.83	33.01	97.60	0.61
1	1625	100 yr 12hr	36.82	341.09	342.99		343.10	0.004424	1.89	46.19	105.42	0.59
1	1515	Regional	27.06	340.27	342.23		342.38	0.006254	2.33	31.04	69.71	0.68
1	1515	100 yr 12hr	36.82	340.27	342.36		342.52	0.006664	2.57	40.47	82.41	0.71
1	1415	Regional	27.06	339.77	341.76		341.89	0.003920	2.04	38.02	92.80	0.54
1	1415	100 yr 12hr	36.82	339.77	341.90		342.02	0.003736	2.12	51.66	102.76	0.54
1	1385	Regional	27.06	339.10	341.75	341.36	341.78	0.000782	1.14	79.25	136.27	0.26
1	1385	100 yr 12hr	36.82	339.10	341.88	341.48	341.91	0.000863	1.25	98.44	145.80	0.28
1	1377.5		Culvert									
1	1370	Regional	27.06	338.80	341.75	341.40	341.77	0.001122	1.19	75.61	129.12	0.26
1	1370	100 yr 12hr	36.82	338.80	341.89	341.51	341.91	0.001187	1.28	94.10	138.60	0.27
1	1340	Regional	27.06	339.24	341.38	341.37	341.58	0.006515	2.43	27.35	76.21	0.70
1	1340	100 yr 12hr	36.82	339.24	341.49	341.49	341.71	0.006866	2.65	36.89	87.15	0.73
1	1240	Regional	27.06	339.00	340.96		341.09	0.003720	1.98	39.65	115.31	0.54
1	1240	100 yr 12hr	36.82	339.00	341.12	341.00	341.23	0.003299	2.01	62.25	178.20	0.51
1	1140	Regional	27.06	338.44	340.46	340.46	340.62	0.005867	2.27	35.33	120.17	0.65
1	1140	100 yr 12hr	36.82	338.44	340.51	340.51	340.72	0.008021	2.72	41.37	132.34	0.76
1	1085	Regional	27.06	338.32	340.37	340.17	340.38	0.001086	0.95	104.53	270.61	0.27
1	1085	100 yr 12hr	36.82	338.32	340.44	340.23	340.45	0.001264	1.06	123.05	274.93	0.29
1	1005	Regional	27.06	338.04	340.34		340.35	0.000264	0.53	182.43	354.14	0.14
1	1005	100 yr 12hr	36.82	338.04	340.40		340.41	0.000352	0.63	203.70	357.34	0.16
1	950	Regional	27.06	337.64	340.33		340.34	0.000206	0.51	196.91	376.28	0.13
1	950	100 yr 12hr	36.82	337.64	340.39		340.39	0.000286	0.62	217.87	381.20	0.15
1	895	Regional	27.06	337.73	340.33		340.33	0.000028	0.21	405.42	462.15	0.05
1	895	100 yr 12hr	36.82	337.73	340.38		340.39	0.000043	0.27	430.53	465.85	0.06
1	860	Regional	27.06	337.70	340.33		340.33	0.000017	0.18	470.84	483.82	0.04
1	860	100 yr 12hr	36.82	337.70	340.38		340.38	0.000029	0.24	496.97	491.09	0.05
1	815	Regional	27.06	337.45	340.33		340.33	0.000011	0.14	548.32	506.49	0.03
1	815	100 yr 12hr	36.82	337.45	340.38		340.38	0.000018	0.18	575.57	514.24	0.04
1	795	Regional	27.06	337.54	340.33	339.32	340.33	0.000016	0.16	507.96	512.60	0.04
1	795	100 yr 12hr	36.82	337.54	340.38	339.35	340.38	0.000025	0.21	535.44	520.95	0.05
1	790		Culvert									
1	785	Regional	27.06	337.51	340.32	339.84	340.32	0.000020	0.16	482.22	515.40	0.04
1	785	100 yr 12hr	36.82	337.51	340.38	340.16	340.38	0.000030	0.20	516.29	523.26	0.05
1	772.5		Culvert									
1	760	Regional	32.92	337.50	339.62	339.16	339.96	0.003822	2.63	14.05	282.19	0.61
1	760	100 yr 12hr	41.16	337.50	339.37	339.37	340.10	0.009904	3.85	11.86	144.94	0.96
1	725	Regional	32.92	337.42	339.67		339.68	0.000200	0.63	177.80	230.15	0.14
1	725	100 yr 12hr	41.16	337.42	339.08	338.84	339.13	0.001944	1.54	80.77	138.61	0.42
1	545	Regional	32.92	336.30	339.65		339.66	0.000192	0.76	187.82	242.91	0.14
1	545	100 yr 12hr	41.16	336.30	338.23	338.23	338.58	0.010496	3.76	29.60	43.88	0.93
1	330	Regional	32.92	334.42	339.64		339.64	0.000026	0.35	401.78	327.17	0.05
1	330	100 yr 12hr	41.16	334.42	338.13	336.49	338.14	0.000326	0.98	103.06	62.30	0.17
1	190	Regional	32.92	333.00	339.64		339.64	0.000007	0.26	561.04	354.92	0.03
1	190	100 yr 12hr	41.16	333.00	338.13		338.13	0.000030	0.45	255.46	102.93	0.06
1	155	Regional	32.92	333.20	339.64	335.07	339.64	0.000008	0.28	576.82	349.70	0.04

HEC-RAS Plan: Plan 05 River: Drain Reach: 1 (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(m3/s)	(m)	(m)	(m)	(m)	(m/m)	(m/s)	(m2)	(m)	
1	155	100 yr 12hr	41.16	333.20	338.12	335.31	338.13	0.000088	0.75	214.83	159.54	0.11
1	142.5		Culvert									
1	130	Regional	32.92	333.10	339.64	335.00	339.64	0.000006	0.24	698.89	448.43	0.03
1	130	100 yr 12hr	41.16	333.10	337.90	335.24	337.91	0.000094	0.75	178.28	93.38	0.11
1	110	Regional	32.92	332.75	339.64	333.85	339.64	0.000001	0.08	1530.17	578.20	0.01
1	110	100 yr 12hr	41.16	332.75	337.90	333.89	337.90	0.000006	0.20	633.57	409.23	0.03



APP F

Date: FEB.17/22
Scale: 1:4000

IVAN GINGERICH DRAIN SECTION MAP

MTE
Engineers, Scientists, Surveyors

Project No.: ?????-???

February 17, 2022 11:04 a.m. Plotted By: acressman

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Appendix F

Geotechnical Information

Peto MacCallum Ltd.
CONSULTING ENGINEERS

GEOTECHNICAL INVESTIGATION
PROPOSED WILMOT WOODS DEVELOPMENT
NEW HAMBURG, ONTARIO

for

WILMOT WOODS DEVELOPMENT INC.

PETO MacCALLUM LTD.
16 FRANKLIN STREET SOUTH
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EMAIL: kitchener@petomaccallum.com

Distribution:
1 cc: Wilmot Woods Development Inc.
1 cc: MTE Consultants Inc. (+email – jcabral@mte85.com)
1 cc PML Kitchener

PML Ref.: 18KF031
Report: 1
February 24, 2022

Peto MacCallum Ltd.
CONSULTING ENGINEERS

February 24, 2022

PML Ref.: 18KF031
Report: 1

Mr. Adam Belksy
Wilmot Woods Development Inc.
310 Fairway Road South, P.O. Box 45016
Kitchener, Ontario
N2C 2R6

Dear Mr. Belksy

Geotechnical Investigation
Proposed Wilmot Woods Development
New Hamburg, 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 by Mr. Galbraith in an email dated July 9, 2018.

In general, the project involves the proposed construction of a residential subdivision on a 37 Ha site located south of Waterloo Street and north or the railway in New Hamburg, Ontario. The proposed development is located on an existing agricultural property. Details of the proposed development have yet to be established, but in general it is understood that approximately 600 residential dwellings will be constructed at the site. It is anticipated that the proposed development will have full municipal servicing including watermain, storm and sanitary sewers, with typical invert depths expected to be to a maximum 3 m depth below existing grade. It is also understood that a trunk sewer will extend southward from the site, under the railway and connect to a proposed trunk sewer on the neighbouring property (the Wilmot Employment Lands). Two storm water ponds also are proposed for the development, one near the northwest corner of the site, and the second at the south side of the site.

16 Franklin Street South, Kitchener, Ontario N2C 1R4
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BARRIE, COLLINGWOOD, HAMILTON, KITCHENER, LONDON, TORONTO

The purpose of the current geotechnical investigation was to explore the subsurface soil and ground water conditions at the site and based on this information, to provide geotechnical recommendations for the proposed development. 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;
- Log of borehole sheets, a borehole location plan drawing, and geotechnical laboratory test results;
- Excavation and construction dewatering requirements;
- House foundation design, including bearing resistances, settlement projections and site class for seismic design;
- Slab on grade floors and below grade walls, including compaction requirements and geotechnical suitability of onsite soils for re-use;
- Site servicing (storm, sanitary, water and utilities) including pipe bedding requirements;
- Pavement structure design for new roadways; and,
- Suitability of native soils for infiltration of stormwater.

Recommendations for the proposed trenchless crossing of the railway will be provided under separate cover.

The comments and recommendations provided in this report are based on the site conditions at the time of the investigation, and are for the current project 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 by PML to ensure their applicability.

Investigation Procedure

The field work for this geotechnical investigation was conducted between July 30 and October 15, 2018. The investigation program comprised a total of 22 boreholes (BH1 to BH12 and MW101 to MW110) advanced to between 6.5 and 12.6 m depth, with monitoring wells installed in ten of the boreholes (designated MW101 to MW110). The borehole and monitoring well locations are shown on the appended Borehole Location Plan, Drawing 1.

The borehole locations were established in the field by PML. Borehole locations were surveyed by PML using a Global Navigation Satellite System (GNSS). The survey equipment was provided by SOKKIA Canada, model GCX-2.

The boreholes were advanced using a Diedrich D-50 track mounted drillrig fitted with continuous flight solid and hollow stem augers and automatic hammer, supplied and operated by a specialist drilling contractor. The work was carried out under the full-time supervision of a PML engineering staff member who directed the drilling and sampling operations, documented the soil stratigraphy, monitored ground water conditions and processed the recovered samples.

Representative samples of the overburden were recovered at regular intervals throughout the depths explored. Standard penetration tests (SPT) were carried out during sampling operations in the boreholes using conventional split spoon equipment. Pocket penetrometer testing was carried out on the recovered samples to determine the undrained shear strength of the cohesive soils. Ground water observations were made in the boreholes during and upon completion of drilling. The boreholes were backfilled in accordance with O.Reg.903 upon completion of drilling.

Monitoring wells were installed in ten boreholes to more accurately measure ground water levels. The monitoring wells comprised 50 mm diameter PVC pipe, filter sand, bentonite seals, and protective casings. Subsequent water level measurements from the wells were conducted by PML.

All of the recovered samples were returned to PML's laboratory for detailed visual examination, classification, and routine moisture content determinations. The laboratory testing also included particle size distribution analyses on eleven samples of the major soil types encountered.

Summarized 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, pocket penetrometer test 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 soil stratigraphy encountered comprised surficial topsoil and localized fill, underlain by an extensive clayey silt deposit containing localized discontinuous cohesionless silt, sandy silt, silty sand and sand layers.

Surficial topsoil was contacted in all of the boreholes, with the exception of Borehole 104. The topsoil was between 180 and 850 mm thick, with an average of 294 mm.

Surficial fill was encountered locally in Borehole 104, and extended 0.68 m depth.

An extensive clayey silt deposit was encountered below the surficial topsoil and fill deposits, in all of the boreholes, and extended to the 6.5 to 12.6 m borehole termination depths. The cohesive clayey silt deposit was generally firm to very stiff based on SPT N values between 4 and 30 blows per 0.3 m penetration of the split spoon sampler. Pocket penetrometer shear strengths of the clayey silt ranged between 50 and 225 kPa. Moisture content ranged between 8 and 31% indicating drier than plastic limit (DTPL) to wetter than limit (WPL) conditions in the cohesive clayey silt soils.

Reference is given to the appended Figures 1 to 6 for the results of the particle size analyses conducted on samples of the clayey silt.

Discontinuous localized layers of cohesionless silt, sandy silt, silty sand and sand were encountered above, below and within the clayey silt, in Boreholes BH5, BH6, BH9, MW101, MW102. These layers were loose to compact based on SPT N values between 5 to 28 blows per 0.3 m penetration of the split spoon sampler. Moisture contents ranged between 5 and 22% indicating damp to saturated conditions in the cohesionless soils. Reference is given to Figures 6 to 11 for the results of particle size distribution analyses conducted on samples of the silt, sandy silt, silty sand, and sand soils.

Ground Water Conditions

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

During drilling, wet and saturated conditions were generally encountered in the silt, sandy silt, silty sand and sand layers below 1.0 to 2.9 m depth (Elevation 338.1 to 340.3). Free water was observed upon completion of drilling, in Boreholes 2 and 9, below 2.0 to 2.3 m depth (Elevation 339.4 to 340.9).

On November 26, 2018 water level measurements from the monitoring wells installed in Boreholes 101 to 110 ranged between 0.1 to 5.4 m depth below existing grade (about Elevation 338.1 to 344.1).

The ground water levels at the site are subject to seasonal fluctuations and precipitation patterns. It should be noted that the relatively impermeable nature of the clayey silt deposits could contribute to the development of perched water conditions following short term and seasonal participation events.

Discussion and Recommendations

In general, the project involves the proposed construction of a residential subdivision on a 37 Ha site located south of Waterloo Street and north of the railway in New Hamburg, Ontario. It is anticipated that the proposed development will have full municipal servicing including watermain, storm and sanitary sewers, with typical invert depths expected to be to a maximum 3 m depth below existing grade. It is also understood that a trunk sewer will extend southward from the site, under the railway and connect to a proposed trunk sewer on the neighbouring property (the Wilmot Employment Lands). Two storm water ponds also are proposed for the development.

Foundations and Earthworks Grading

Details of the buildings in the proposed residential subdivision have yet to be established. We have provided the following preliminary foundation design recommendations and earthworks grading recommendations for the development.

The site is generally underlain by firm to very stiff clayey silt. It is feasible to support buildings on conventional spread or strip footings founded in the native firm to very stiff clayey silt. Based on the investigation findings, footings founded a minimum 0.3 m into the firm to very stiff native clayey silt deposits, below any surficial fill and topsoil and local surficial soft or loose zones, 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).

Alternatively, in areas where grades are to be raised footings may be placed at higher elevations on engineered structural fill. The existing topsoil and fill must be excavated to the levels of competent native clayey silt deposits in advance of engineered structural fill placement. Engineered structural fill used to establish footing founding subgrade levels should comprise an approved compactable inorganic soil, placed in lifts with a maximum thickness of 300 mm and be compacted to at least 98% standard Proctor maximum dry density (SPMDD). Additional generic recommendations for engineered fill construction are provided in Appendix A. Footings supported on approved engineered structural fill may also be designed using the values for a net factored resistance of 150 at SLS and 225 kPa at ULS. 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.

The excavated soils likely to be used for site grading will comprise primarily clayey silt soils, in DTPL to WTPL condition, with moisture contents between 8 to 31%. Material described as 'wet' or 'WTPL' on the appended borehole will generally not be compactible to 98% SPMDD and should be segregated and allocated to areas where post construction settlement would not present a concern. The bulk of the clayey silt soil to be excavated would be too wet for immediate reuse given the observed moisture conditions.

Therefore, the excavated soils are considered suitable for reuse only if the work is carried out during the dry summer months and the construction schedule is flexible to permit air drying to reduce the moisture content closer to the optimum value.

It should also be noted that the in-situ clayey silt materials will tend to retain a voided structure when placed as backfill. Sufficient compaction must be applied to breakdown all lumps / clods within the fill matrix to achieve a non-voided condition. Significant post construction settlement could otherwise result.

The maximum total settlement of foundations designed for the net SLS bearing pressures noted above are not expected to exceed 25 mm. Differential settlements of around 50 to 75% of the total settlement should be anticipated.

All founding surfaces should be examined by PML personnel prior to concrete placement, to check that all loose, frozen, organic or otherwise deleterious materials have been satisfactorily removed and the required bearing capacity is available throughout.

All exterior footings and all footings exposed to seasonal freezing conditions must be provided with frost protection. The minimum frost protection should be 1.2 m of earth cover or the thermal insulation equivalent.

Design provisions for earthquake loading should also be applied. For the soil conditions at the site, a Class D site category may be assumed, in accordance with the 2012 Ontario Building Code.

Slab-on-Grade Floors

Preparation of the floor slab subgrade should include stripping of the surficial, topsoil, and other deleterious material, placement and compaction of engineered fill, if necessary, followed by proof rolling 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.

Engineered fill placed under the floor slab to achieve finished subgrade levels or as foundation wall 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% SPMDD. Reference is given to Appendix A for additional engineered fill construction recommendations.

A minimum 150 mm thick layer of free draining Granular A type material compacted to 98% SPMDD is recommended directly beneath the slab-on-grade. A polyethylene vapour barrier should be placed on the surface of the granular base if a moisture sensitive finish is to be placed on the floor. Joints should be saw cut into concrete floor immediately after initial set of the concrete to control potential cracking of the slab.

Below Grade Walls

Below grade walls and basement walls should be designed as retaining walls to resist the unbalanced horizontal earth pressure imposed by the backfill adjacent to the wall. The unfactored lateral earth pressure, p, may be computed using the following equation, assuming a triangular pressure distribution:

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

where K = lateral earth pressure coefficient
= 0.5 for wall restrained at both top and bottom

γ = unit weight of free-draining granular material
= *21* kN/m^3

h = depth below final grade (m)

q = surcharge load (kPa), if present

The excavation adjacent to the basement walls should be backfilled with free-draining granular material satisfying the OPS Granular B gradation specification and a weeping tile system installed to minimize the build-up of hydrostatic pressure behind the wall.

The weeping tiles 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.

Excavation and Ground Water Control

It is generally envisaged that excavations for the earthworks and site servicing will extend to a maximum 5 m depth within the proposed development.

Excavations for service installations are expected to extend up to about 3 m depth through topsoil and into the native clayey silt deposits containing localized layers of silt, sandy silt, silty sand and sand, which are classified as Type 3 materials as defined in the 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.

It is anticipated that ground water seepage or surface water entering the excavations will be handled readily by conventional sump pumping. 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 0.3 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, a Permit to Take Water (PTTW) from the Ministry of Environment Conservation and Parks (MECP) is required if the dewatering discharge is greater than 400,000 L/day. In accordance with the above noted regulatory requirements and in compliance with the MECP's PTTW Manual (April 2005), and application should be filed to the MECP for the subject property 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). PML would be pleased to assist with this process, if required. The depth of excavations for site grading and site servicing are expected to extend to a maximum 3 m depth into clayey silt deposits with wet to saturated layers of silt, sand, sandy silt, and silty sand and it is generally envisaged that sump pumping from within trenching excavating will have dewatering rates less than 50,000 L/day, and a PTTW or EASR should not be required.

It is recommended that test pits be carried out during the tendering stage of the project in order that prospective contractors may familiarize themselves with soil and ground water conditions to be contacted. Also, as noted above, the dewatering requirements should be established by the contractor in the context of a performance specification.

Pipe Bedding and Cover

It is expected that the proposed water and sewer pipes will be founded on competent native deposits, or engineered fill. Providing adequate ground water control is achieved, bearing problems are not anticipated for conduits founded on the native mineral soils or engineered fill. It may be necessary to increase the bedding thickness if excessively loose, soft or wet conditions are present at the pipe subgrade. The need for this is best determined during construction.

Conventional bedding and cover constructed in accordance with applicable Ontario Provincial Standard Drawings (OPSD) will be suitable. Material containing stones larger than 50 mm size should not be used in the bedding layer. The bedding and cover material should be placed in 150 mm lifts compacted to at least 95% SPMDD. Compaction should be provided beneath the pipe haunches to provide uniform support. Over-compaction should be avoided as damage to the pipe could result.

Trench backfill material should comprise approved material placed in uniform 200 mm thick lifts within 3% of the optimum moisture content and compacted to at least 95% SPMDD.

It is anticipated that the excavated material will primarily comprise clayey silt. The in-situ moisture content of the clayey silt typically ranges from 8 to 31%. Based on our experience with similar types of material, the upper limit of placement moisture content compatible with efficient compaction is expected to be about 15%. Therefore, the excavated clayey silt containing wet and saturated soils are considered suitable for reuse only if the work is carried out during the dry summer months and the construction schedule is flexible to permit air drying to reduce the moisture content closer to the optimum value.

Excavated materials intended for backfilling purposes should not be exposed to the elements for prolonged time periods, as they might be rendered unsuitable for reuse. Organic soil, topsoil, deleterious or excessively wet material should not be used as backfill. Should construction start during the winter season, particular attention must be given to ensure that frozen material is not used as backfill for service trenches. Topsoil may be reused for landscape purposes only.

It should also be noted that the in-situ clayey silt materials will tend to retain a voided structure when placed as backfill. Sufficient compaction must be applied to breakdown all lumps / clods within the fill matrix to achieve a non-voided condition. Significant post construction settlement could otherwise result.

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.

Soil Infiltration

Two storm water management (SWM) ponds are proposed for the site. The first SWM pond will be near Boreholes BH2, MW102 and MW103, while the second will be near MW108 and MW109. Design details of the ponds have yet to be finalized. Typical soils at the pond site comprise clayey silt with occasional to numerous silt layers and deposits of sand and sandy silt. Although the clayey silt is considered to be relatively impermeable, the silt, sandy silt and sand layers which are interlayered with the clayey silt are more permeable. Therefore, it will be necessary to line the base of the ponds to maintain the permanent pool water levels.

The earthen liner should comprise clayey silt soils having a hydraulic conductivity of no more than $1x10^{-6}$ cm/s. The native clayey silt has a permeability less than $1x10^{-6}$ cm/sec, however, inspection and testing during construction will be required to confirm if excavated materials are suitable for reuse as the earth liner.

Fill used for earth liner construction at the pond, should be placed in lifts with a maximum 300 mm thickness, and compacted to at least 95%SPMDD. General recommendations for fill subgrade preparation and engineered fill construction are provided in Appendix A.

Where berms are required, they should be constructed using select soil placed in maximum 300 mm thick lifts compacted to 95% SPMDD. Finished slopes of the ponds should not be steeper than 5H:1V for the interior. Slopes should be provided with vegetation cover or other means for erosion protection.

Full-time inspection should be carried out by PML personnel to examine and approve backfill, fill placement operations, and to check the compaction by in situ density testing using nuclear gauges.

It is understood that onsite storm water infiltration parameters are required. The following table provides hydraulic conductivity and infiltration design parameters for the major onsite soils encountered. An appropriate factor of safety should also be used for design.

SOIL	HYDRAULIC CONDUCTIVITY (cm/s)	INFILTRATION RATE (mm/hr)
Clayey Silt/Silt	Less than $1x10^{-6}$	Less than 0.1
Silt/Sandy Silt/Silty Sand	$1x10^{-4}$ to $1x10^{-5}$	2
Sand	$1x10^{-3}$	40

Cognizant of the low permeability and infiltration rates and considering the limited extent and high groundwater level within the silt/sandy silt/silty sand/sand layers, the amount of onsite infiltration is expected to be negligible.

Pavement Design

Based on the proposed pavement usage, frost susceptibility, and strength of the expected subgrade soils, the following minimum pavement component thicknesses are considered suitable for the proposed residential subdivision roadways.

PAVEMENT COMPONENT	THICKNESS (mm)
Asphalt	80
Granular A Base	150
Granular B Subbase	600

The pavement design considers that construction will be carried out during the drier time of the year and that the subgrade is stable, as determined by proofrolling and inspection by PML personnel. If the subgrade is wet and unstable, subexcavation and placement of additional granular subbase material will be required.

In areas where the subgrade is sensitive to disturbance or construction is to occur outside of the drier time of year, then consideration can be given to thickening the granular subbase or using a geotextile separator between the pavement structure and subbase, in lieu of additional granular subbase. The geotextile separator envisaged should provide reinforcement, filtration and separation of the granular subbase from the anticipated clayey silt / clayey silt fill subgrade soils, and a woven geotextile such Terrafix's 200 W (or equivalent) is envisaged.

The pavement materials should conform to current OPS and municipal specifications. The Granular A base and Granular B subbase courses should be placed in thin lifts and be 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) and reference is made to OPS Specification 310.

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

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

The pavement subgrade materials will lose strength to support traffic loads if allowed to become wet. Moreover, the silty clay subgrade soils are considered frost susceptible and the roadway may heave during freezing and thawing periods. Drainage of the pavement structure is essential to maintain structural integrity and limit frost heave. In this regard, installation of longitudinal subdrains is recommended. The longitudinal subdrains should comprise a minimum 100 mm diameter perforated plastic pipe, set below the subbase level, and outlet to ditching, or catch basins. Subdrain pipes should be surrounded by appropriate filter media such as clear stone wrapped in geotextile, or alternatively the pipes should be wrapped in filter cloth and surrounded by concrete sand.

Geotechnical Review and Construction Inspection and Testing

When development design is complete, it is recommended that the design drawings be submitted to PML for general geotechnical review for compatibility with 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 recommendations provided in the report are based on the information revealed in the boreholes. Conditions away from and between boreholes may vary, particularly where service trenches exist. 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.

This report is subject to the Statement of Limitations that is included in Appendix B, which must be read in conjunction with the report

Closure

We trust the information presented in this report 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.



William Loghrin, P.Eng.
Manager Engineering Services



Gerry Mitchell, MEng, P.Eng.
Senior Consultant

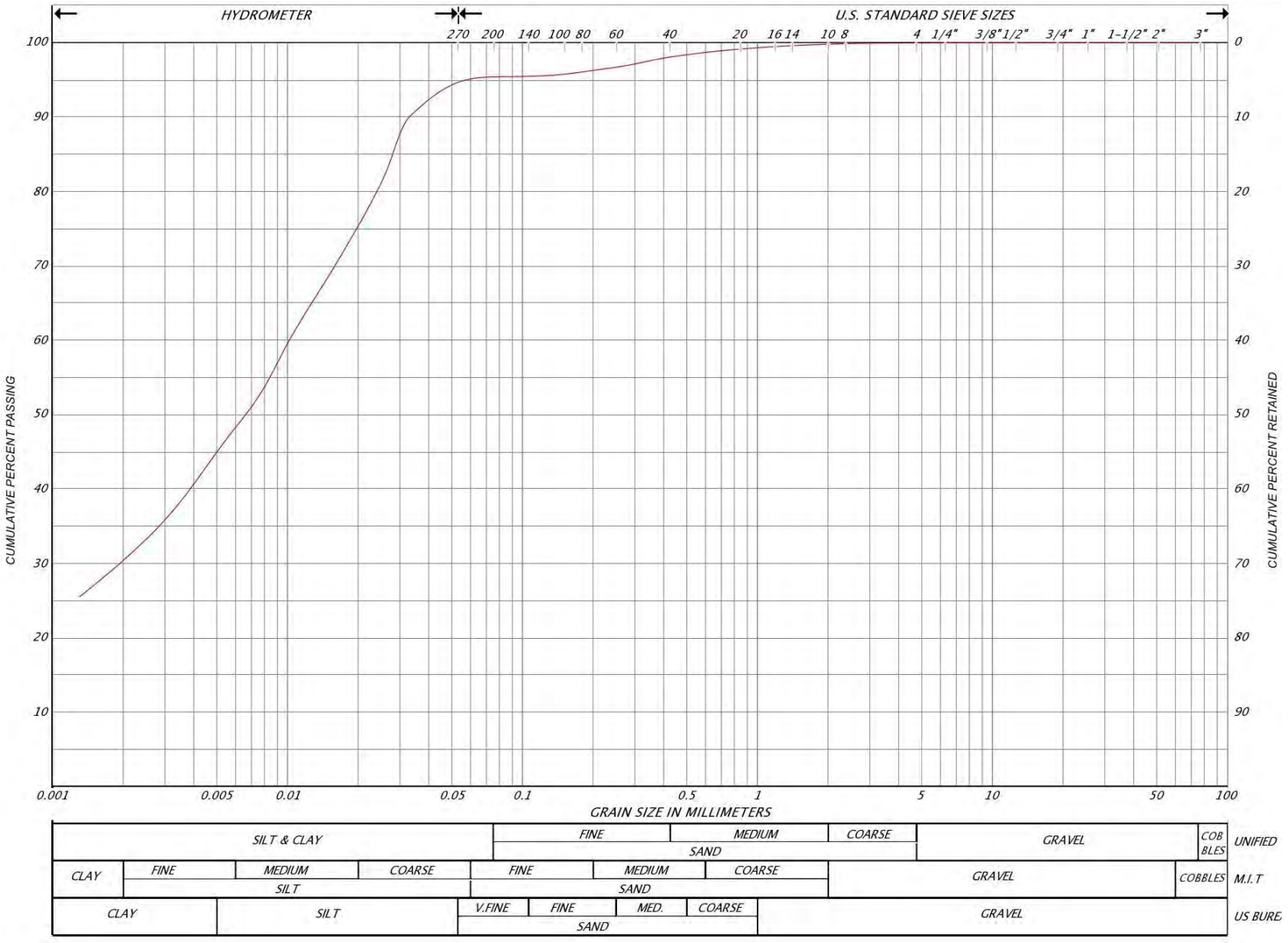
WL/GM:tm

Enclosures:
Figures 1 to 11 - Particle Size Distribution Charts
List of Abbreviations
Log of Boreholes BH1 to BH12 and BH/MW101 to BH/MW110
Drawing 1 - Borehole Location Plan
Appendix A – Engineered Fill
Appendix B – Statement of Limitations

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PARTICLE SIZE DISTRIBUTION CHART

PML REF. 18KF031
FIGURE NO. 1



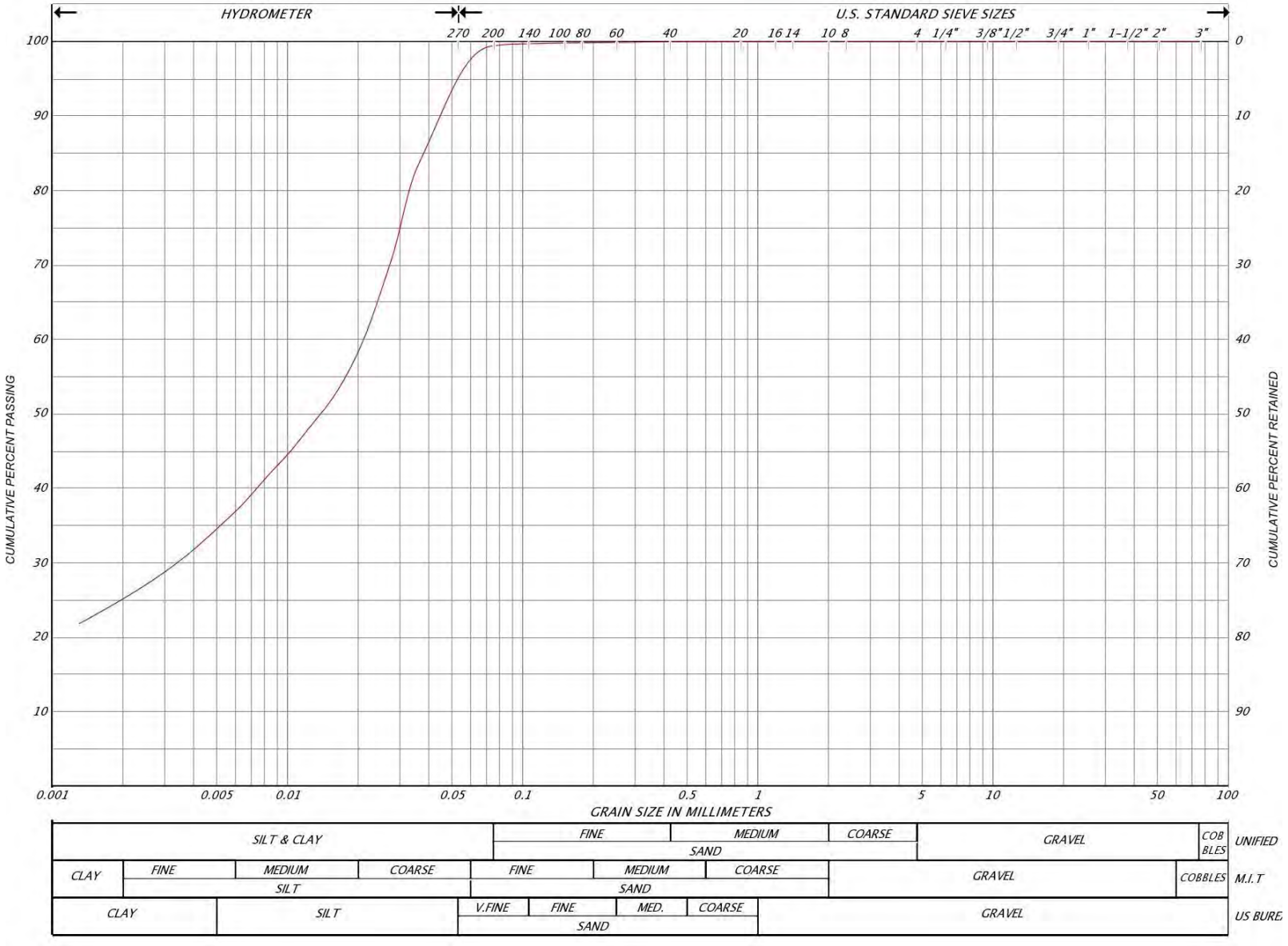
REMARKS Borehole MW101, Sample SS7, Depth 6.1 to 6.5 m

CLAYEY SILT

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PARTICLE SIZE DISTRIBUTION CHART

PML REF. 18KF031
FIGURE NO. 2



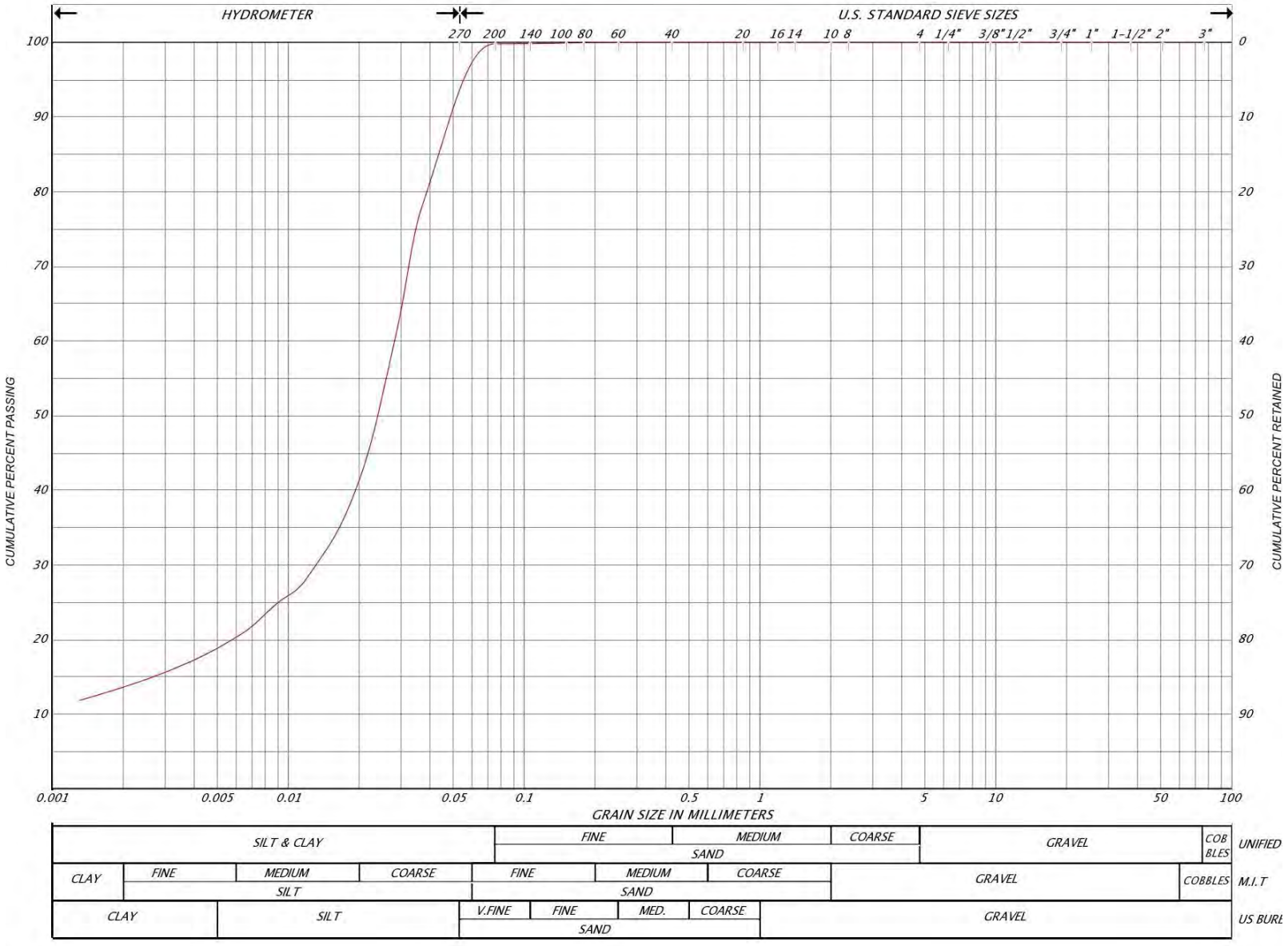
REMARKS Borehole MW104, Sample SS6, Depth 4.6 to 5.0 m

CLAYEY SILT

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PARTICLE SIZE DISTRIBUTION CHART

PML REF. 18KF031
FIGURE NO. 3



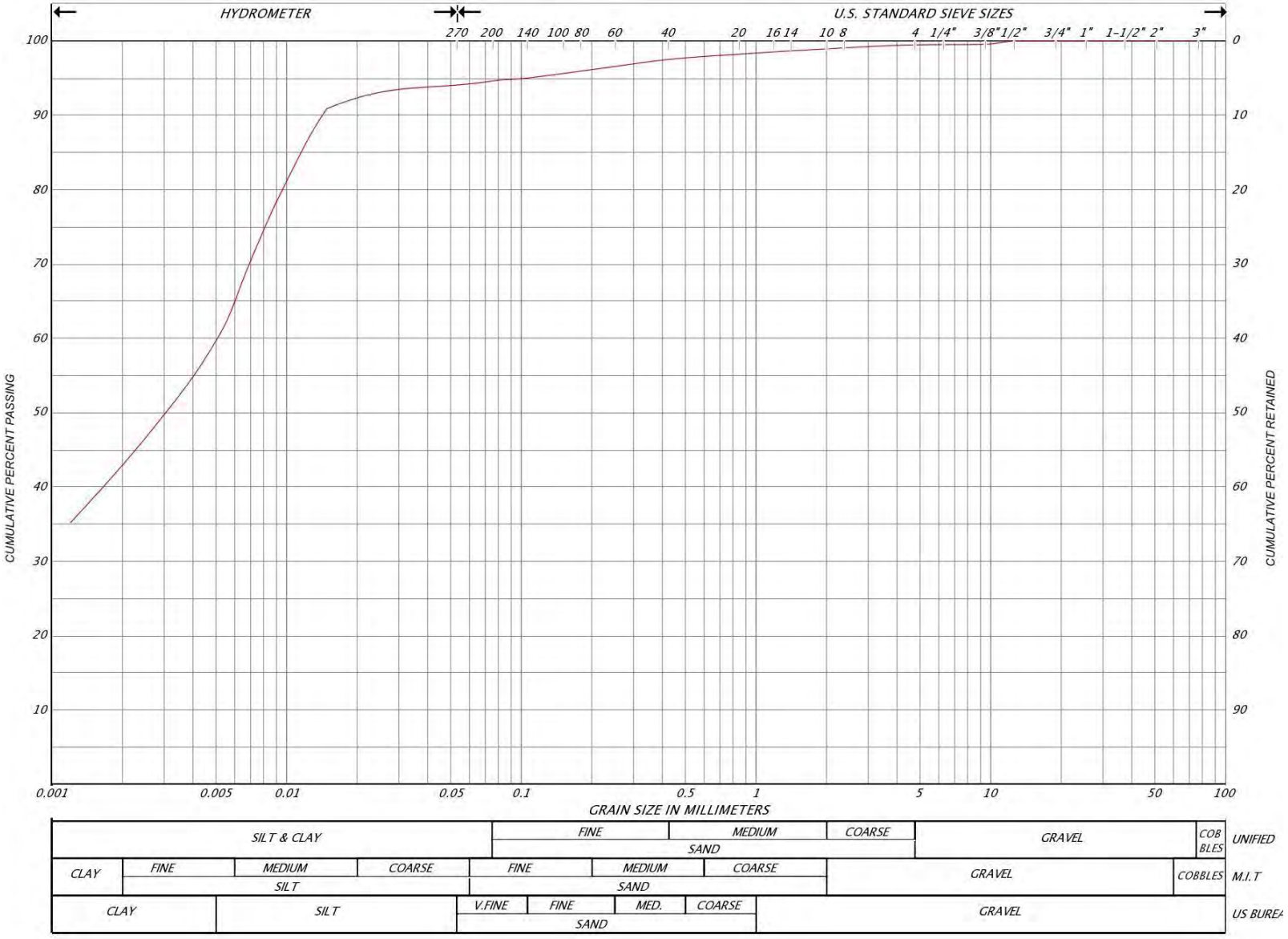
REMARKS Borehole MW105, Sample SS6, Depth 4.5 to 5.0 m

CLAYEY SILT

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PARTICLE SIZE DISTRIBUTION CHART

PML REF. 18KF031
FIGURE NO. 4



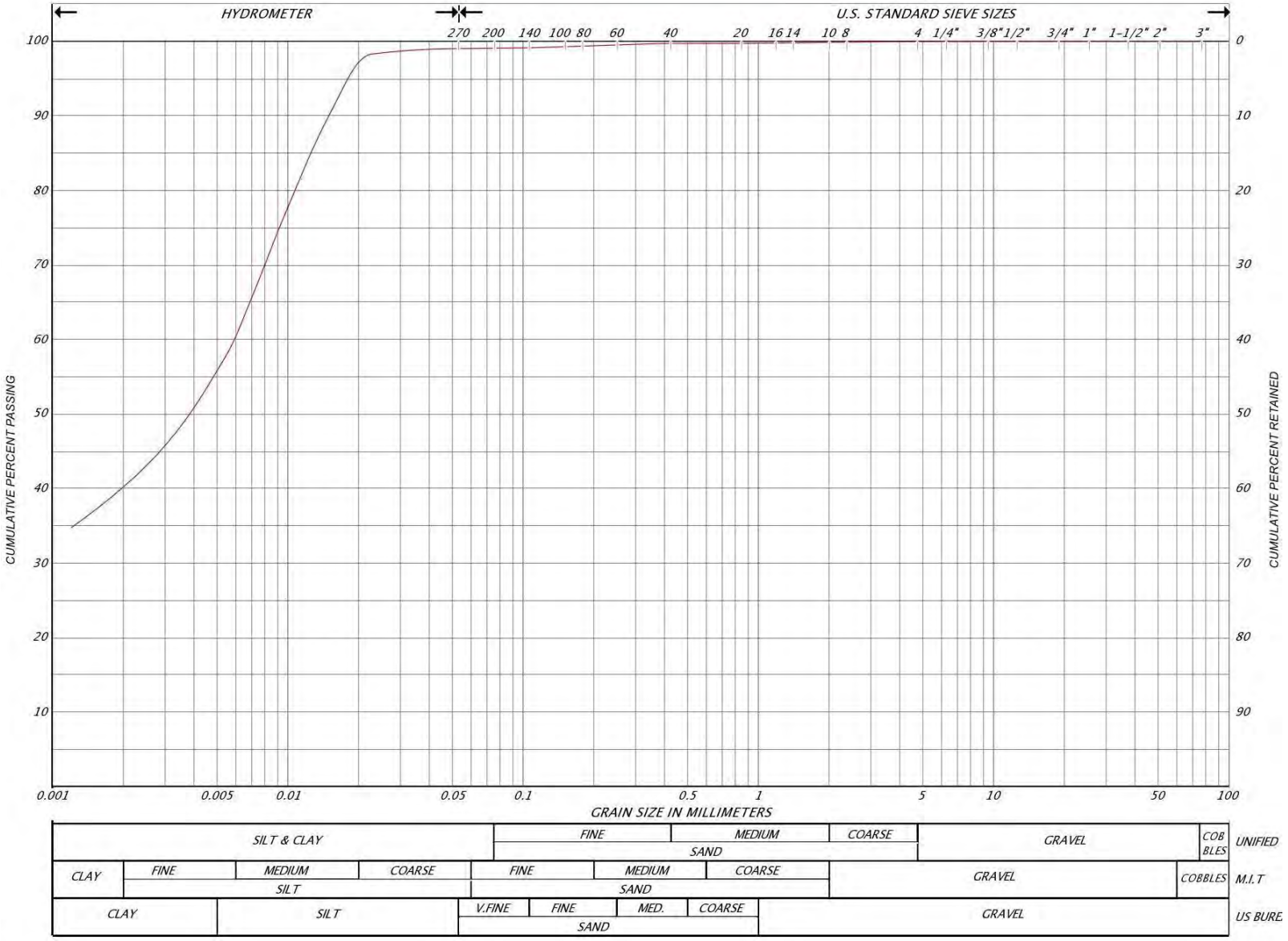
REMARKS Borehole MW107, Sample SS3, Depth 1.5 to 2.0 m

CLAYEY SILT

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PARTICLE SIZE DISTRIBUTION CHART

PML REF. 18KF031
FIGURE NO. 5



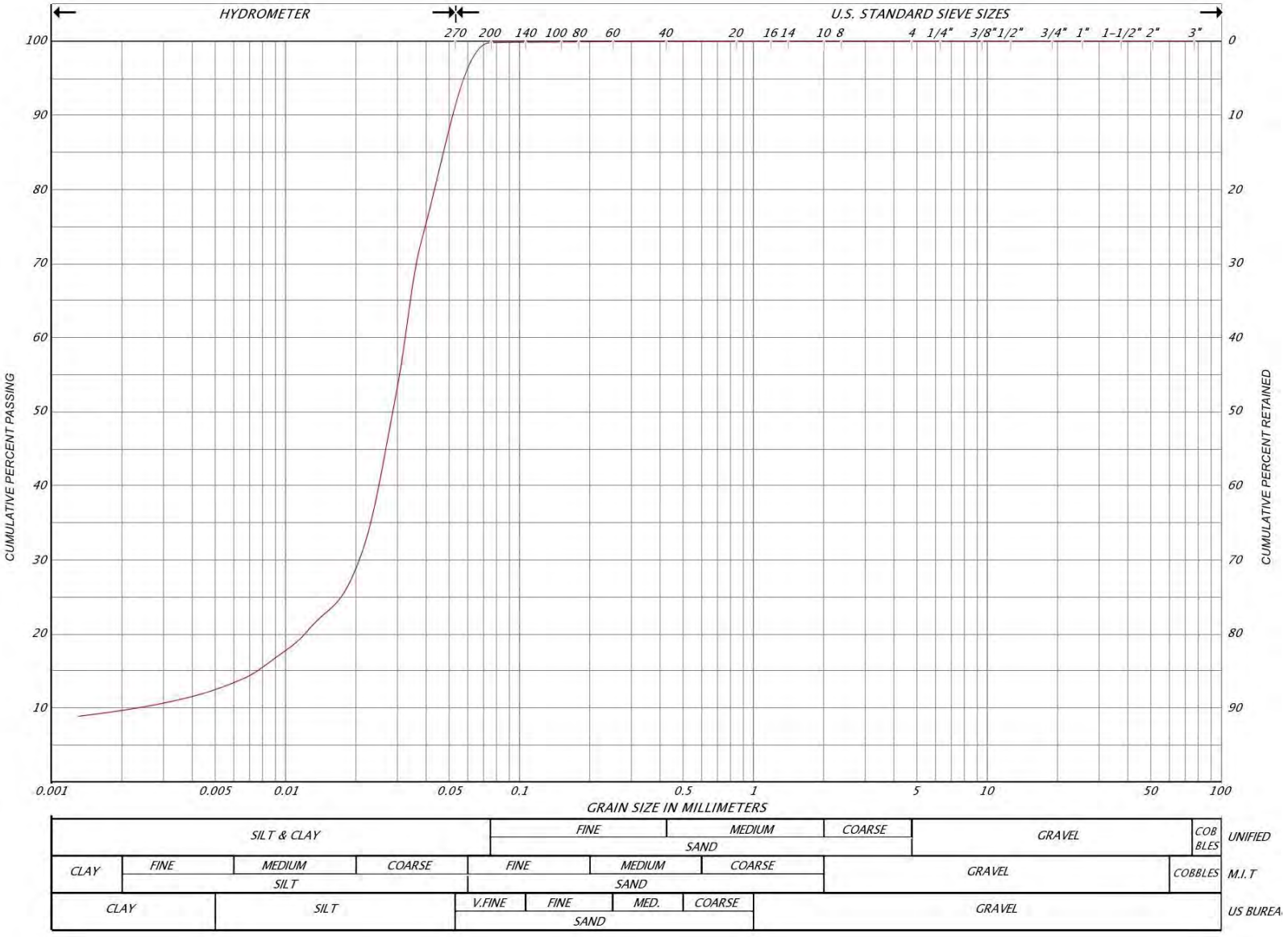
REMARKS Borehole MW107, Sample SS6, Depth 4.6 to 5.0 m

CLAYEY SILT

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PARTICLE SIZE DISTRIBUTION CHART

PML REF. 18KF031
FIGURE NO. 6



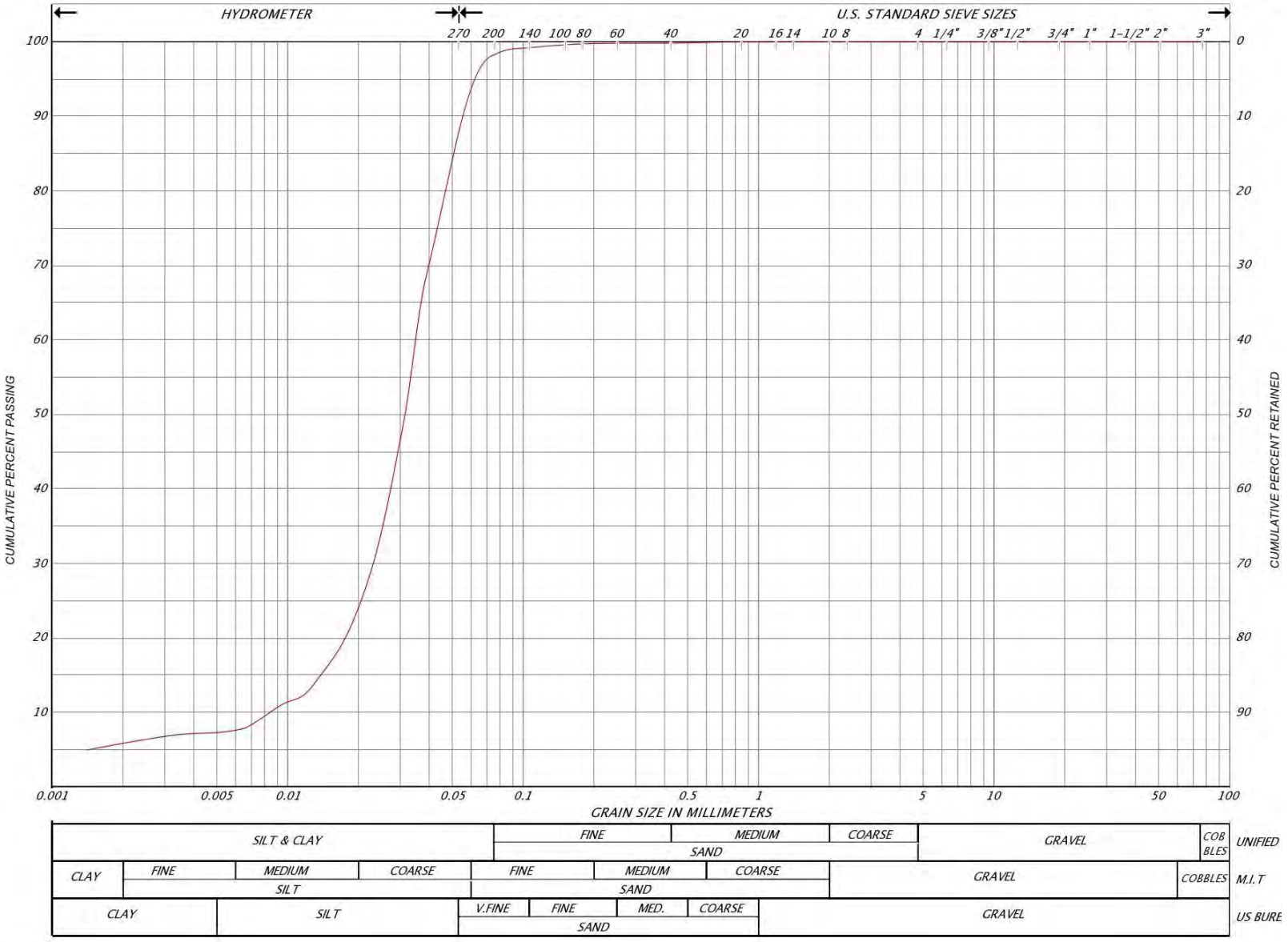
REMARKS Borehole MW109, Sample SS11, Depth 9.1 to 9.6 m

CLAYEY SILT

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PARTICLE SIZE DISTRIBUTION CHART

PML REF. 18KF031
FIGURE NO. 7



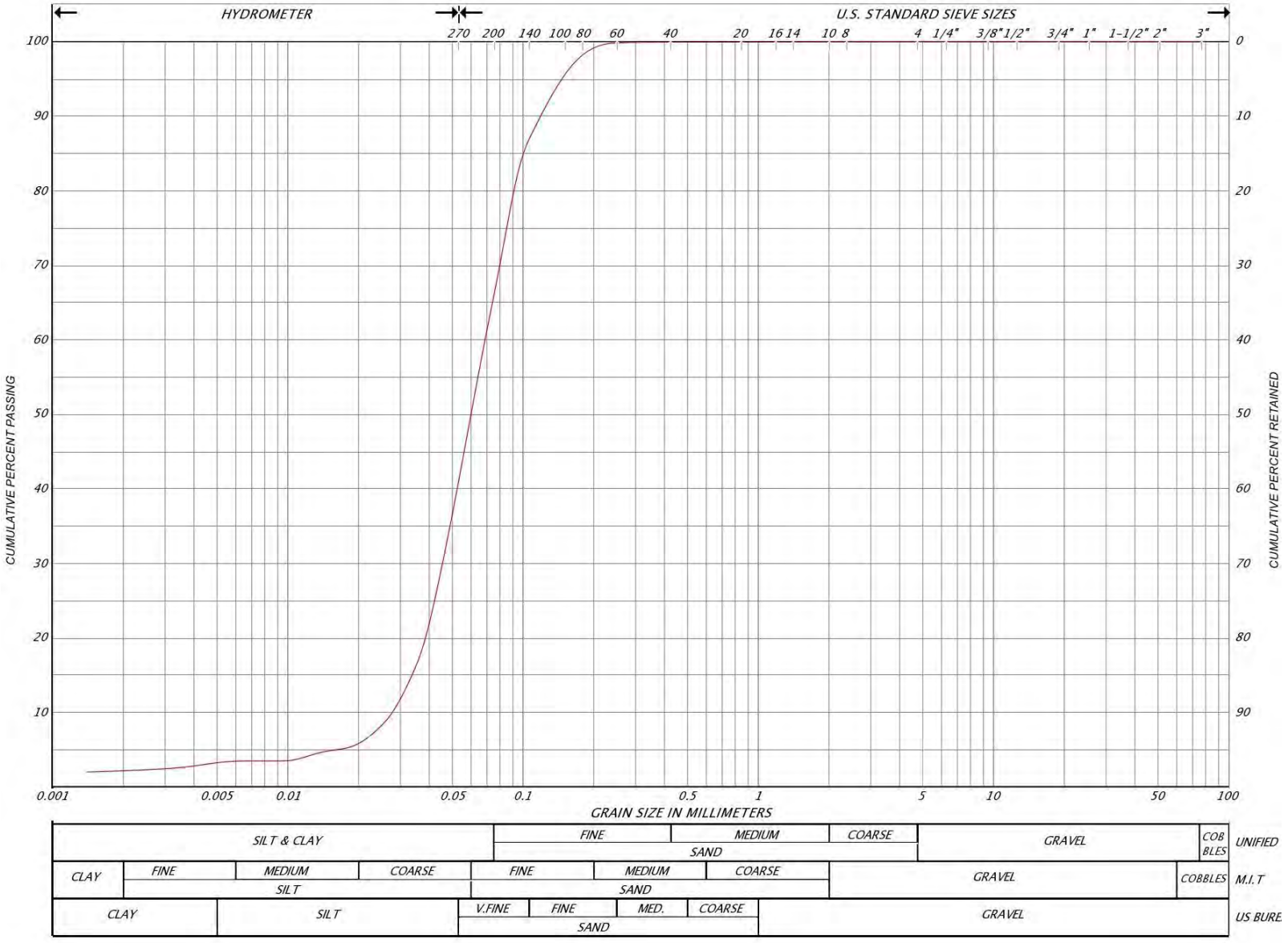
REMARKS Borehole BH9, Sample SS3, Depth 1.5 to 2.0 m

SILT

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PARTICLE SIZE DISTRIBUTION CHART

PML REF. 18KF031
FIGURE NO. 8



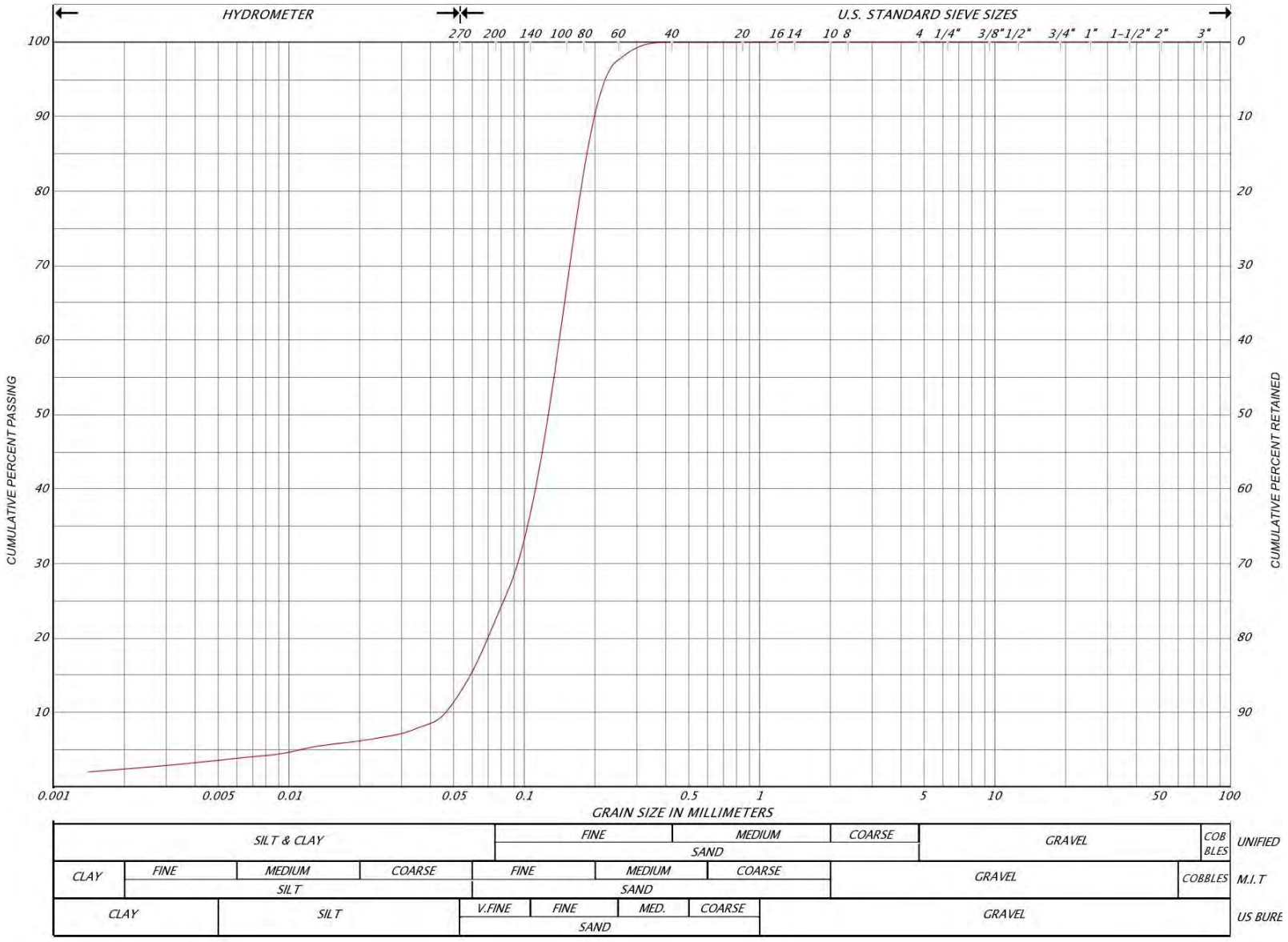
REMARKS Borehole MW102, Sample SS6, Depth 4.6 to 5.0 m

SANDY SILT

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PARTICLE SIZE DISTRIBUTION CHART

PML REF. 18KF031
FIGURE NO. 9



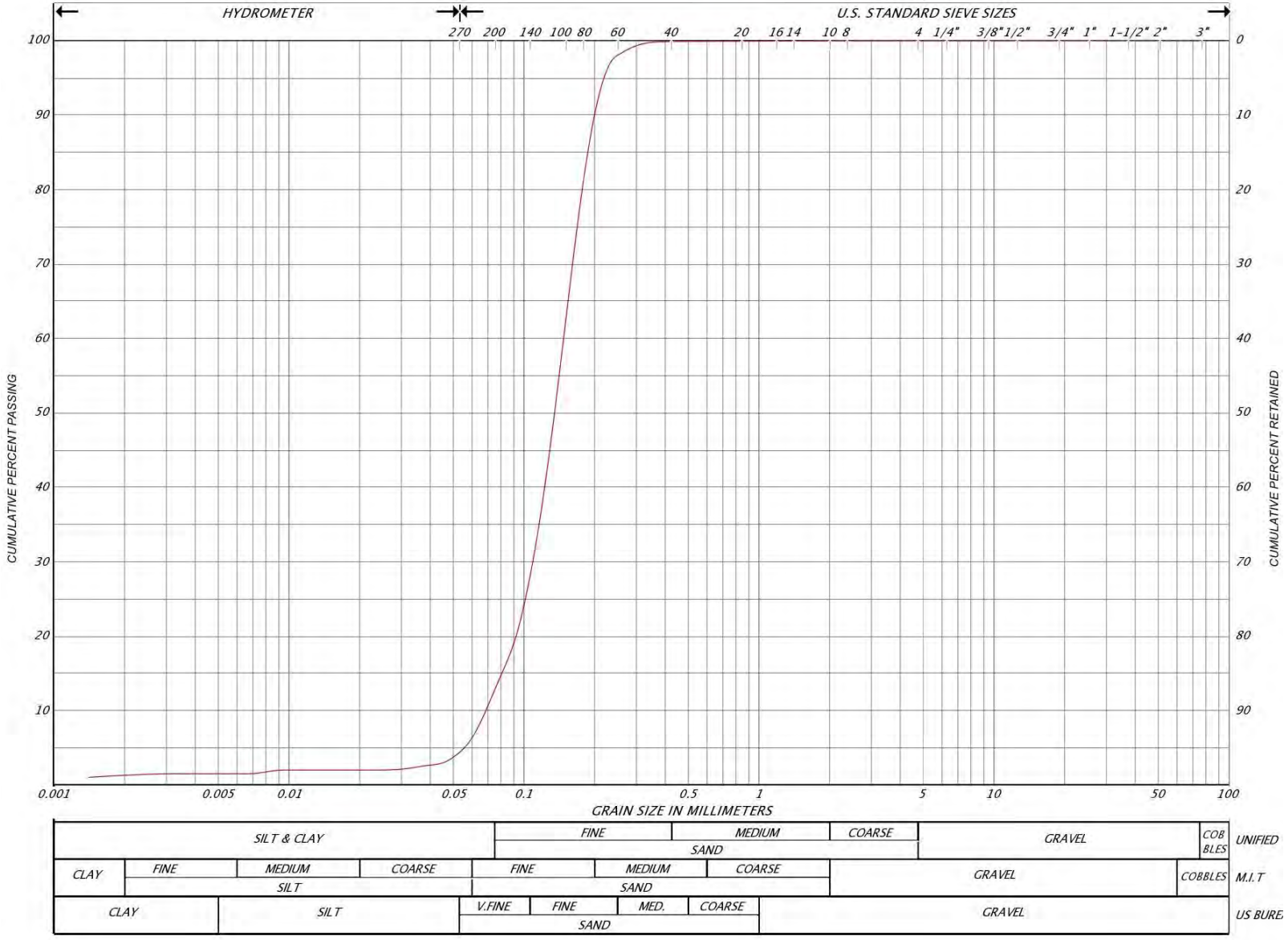
REMARKS Borehole BH9, Sample SS5, Depth 3.1 to 3.5 m

SILTY SAND

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PARTICLE SIZE DISTRIBUTION CHART

PML REF. 18KF031
FIGURE NO. 10



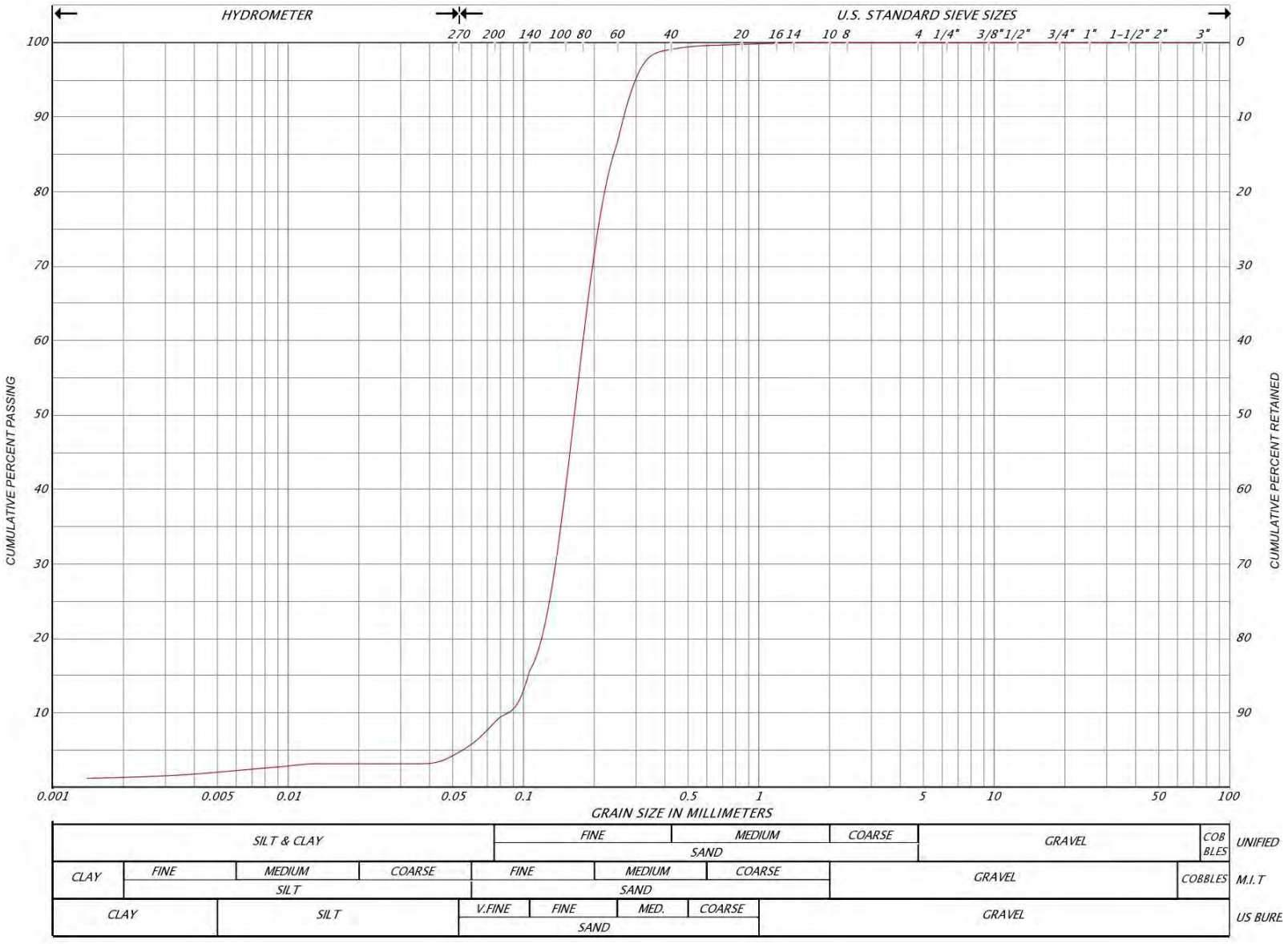
REMARKS Borehole BH6, Sample SS5, Depth 3.1 to 3.5 m

SAND

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PARTICLE SIZE DISTRIBUTION CHART

PML REF. 18KF031
FIGURE NO. 11



REMARKS Borehole MW102, Sample SS4, Depth 2.3 to 2.7 m

SAND

LIST OF ABBREVIATIONS

PENETRATION RESISTANCE

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

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

DESCRIPTION OF SOIL

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

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

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

TYPE OF SAMPLE

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

SOIL TESTS

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

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LOG OF BOREHOLE NO. 1

17T 523755E 4804492N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** September 24, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Solid Stem Augers — **TECHNICIAN** M. Rapsey

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE
		SURFACE ELEVATION 339.37					
0.22	339.15	TOPSOIL: Dark brown sandy silt, trace clay, occasional rootlets, moist		1	SS	6	339
		CLAYEY SILT: Soft brown clayey silt, some sand, moist					
1.1				2	SS	3	
1.4	338.0	becoming WTPL becoming firm					338
				3	SS	7	
2.1	337.3	becoming stiff, numerous silt layers					
				4	SS	14	337
				5	SS	12	336
							335
				6	SS	11	
							334
				7	SS	12	333
6.6	332.8	BOREHOLE TERMINATED AT 6.55 m					

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%)
GR SA SI&CL

NOTES

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LOG OF BOREHOLE NO. 2

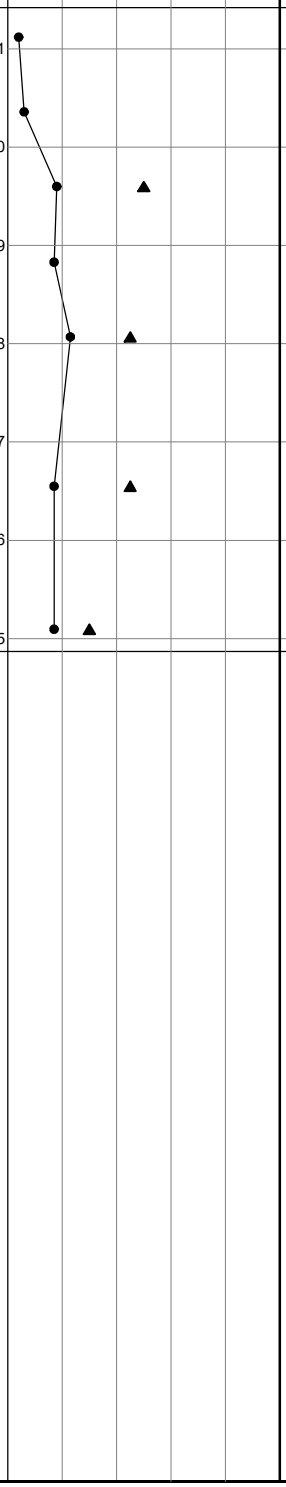
17T 523879E 4804339N

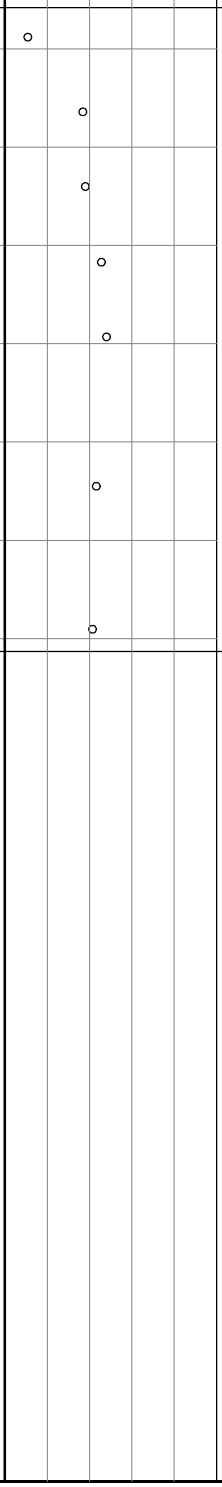
PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** September 24, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Solid Stem Augers — **TECHNICIAN** M. Rapsey

DEPTH (metres)	ELEV	DESCRIPTION	NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 341.42			
0.0	341.42				
	0.18	TOPSOIL: Dark brown sandy silt, trace clay, occasional rootlets, damp	1	SS	4
	341.24				
	0.70	SAND: Loose brown sand, some silt, damp			
1.0	340.72	SANDY SILT: Loose brown sandy silt, moist	2	SS	6
	1.4				
	340.0	becoming compact, saturated	3	SS	18
2.0					
			4	SS	17
3.0					
			5	SS	23
	3.9				
4.0	337.5	SILT: Compact grey silt, trace sand, occasional clayey silt seams, saturated			
			6	SS	17
5.0					
6.0					
	6.2				
	335.2	CLAYEY SILT: Very stiff grey clayey silt, trace sand, WTPL	7	SS	17
	6.6				
	334.8	BOREHOLE TERMINATED AT 6.55 m			
7.0					
8.0					
9.0					
10.0					
11.0					
12.0					
13.0					
14.0					
15.0					





UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Free water encountered after SS3

Upon completion of augering Wet cave at 2.0 m

NOTES

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CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 3

17T 524026E 4804185N

PROJECT Wilmot Woods Development | **PML REF.** 18KF031
LOCATION New Hamburg, Ontario | **BORING DATE** July 31, 2018 | **ENGINEER** H. Shinwary
BORING METHOD Continuous Flight Solid Stem Augers | **TECHNICIAN** K. Pettitt

DEPTH / ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	ELEVATION SCALE
	SURFACE ELEVATION 344.50					
0.20 / 344.30	TOPSOIL: Dark brown sandy silt, some clay, occasional rootlets, moist		1A	SS	5	344
			1B			
	CLAYEY SILT: Very stiff brown clayey silt, some sand, WTPL, numerous silt layers		2	SS	19	
			3	SS	19	343
			4	SS	18	342
2.9 / 341.6	becoming stiff, grey		5	SS	14	341
			6	SS	12	340
			7	SS	13	339
6.5 / 338.0	BOREHOLE TERMINATED AT 6.5 m					

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
Open Dry

0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0 15.0

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 4

17T 524118E 4804016N

PROJECT Wilmot Woods Development | **PML REF.** 18KF031
LOCATION New Hamburg, Ontario | **BORING DATE** July 30, 2018 | **ENGINEER** H. Shinwary
BORING METHOD Continuous Flight Solid Stem Augers | **TECHNICIAN** K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 342.61				
0.0	342.61					
	0.24	TOPSOIL: Dark brown sandy silt, some clay, occasional rootlets, moist		1A	SS	7
	342.37	CLAYEY SILT: Firm brown clayey silt, trace sand, DTPL		1B		
1.0				2	SS	6
				3	SS	6
2.0	2.1					
	340.5	becoming stiff, some sand, WTPL, numerous silt layers		4	SS	15
3.0				5	SS	15
4.0	4.0					
	338.6	becoming grey		6	SS	11
5.0						
	5.6					
	337.0	becoming very stiff				
6.0				7	SS	16
	6.5					
	336.1	BOREHOLE TERMINATED AT 6.5 m				
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						
14.0						
15.0						

ELEVATION SCALE: 342, 341, 340, 339, 338, 337

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
Open
Dry

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 5

17T 523995E 4804385N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031
LOCATION New Hamburg, Ontario — **BORING DATE** July 31, 2018 — **ENGINEER** H. Shinwary
BORING METHOD Continuous Flight Solid Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE
		SURFACE ELEVATION 341.78					
0.0	341.78						
0.31	341.47	TOPSOIL: Dark brown sandy silt, some clay, occasional rootlets, moist		1A	SS	13	
				1B			
		CLAYEY SILT: Stiff brown clayey silt, some sand, DTPL					341
1.0				2	SS	11	
1.4	340.4	numerous silt layers					
				3	SS	13	340
2.0							
2.6	339.2	becoming grey, WTPL		4	SS	14	
							339
3.0				5	SS	9	
							338
4.0							
				6	SS	11	337
5.0							
							336
6.0				7	SS	13	
6.5	335.3	BOREHOLE TERMINATED AT 6.5 m					
7.0							
8.0							
9.0							
10.0							
11.0							
12.0							
13.0							
14.0							
15.0							

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
Open
Dry

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 6

17T 524153E 4804198N

PROJECT Wilmot Woods Development | **PML REF.** 18KF031
LOCATION New Hamburg, Ontario | **BORING DATE** July 31, 2018 | **ENGINEER** H. Shinwary
BORING METHOD Continuous Flight Solid Stem Augers | **TECHNICIAN** K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	"N" VALUES
		SURFACE ELEVATION 343.61				
0.0	343.61					
0.25	343.36	TOPSOIL: Dark brown sandy silt, some clay, occasional rootlets, moist		1A	SS	7
				1B		
		SILTY SAND: Compact brown silty sand, trace gravel, damp		2A	SS	17
1.1				2B		
1.4	342.2	SILT: Compact brown silt, trace clay, trace sand, wet				
		SAND: Compact brown sand, some silt, wet		3	SS	20
2.1	341.5	becoming saturated		4	SS	19
				5	SS	22
5.5				6	SS	28
	338.1	CLAYEY SILT: Very stiff grey clayey silt, WTPL, numersous silt layers		7	SS	23
6.5	337.1	BOREHOLE TERMINATED AT 6.5 m				

ELEVATION SCALE: 343, 342, 341, 340, 339, 338

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ● Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
Cave at 2.1 m
Dry

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 7

17T 524277E 4804038N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** July 30, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Solid Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE
		SURFACE ELEVATION 341.57					
0.0	341.57						
0.22	341.35	TOPSOIL: Dark brown sandy silt, trace clay, occasional rootlets, moist		1A	SS	10	
				1B			341
		CLAYEY SILT: Stiff to very stiff brown clayey silt, some sand, trace gravel, DTPL		2	SS	16	
1.0							
1.4	340.2	numerous silt layers		3	SS	14	340
2.0							
2.1	339.5	becoming grey, WTPL		4	SS	19	339
3.0				5	SS	16	
							338
4.0							
				6	SS	9	337
5.0							
							336
6.0				7	SS	20	
6.5	335.1	BOREHOLE TERMINATED AT 6.5 m					
7.0							
8.0							
9.0							
10.0							
11.0							
12.0							
13.0							
14.0							
15.0							

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
Open
Dry

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 8

17T 524205E 4804333N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** August 1, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Solid Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH (metres) / ELEV	DESCRIPTION	NUMBER	TYPE	"N" VALUES
	SURFACE ELEVATION 343.37			
0.39 / 342.98	TOPSOIL: Dark brown sandy silt, trace clay, occasional rootlets, moist	1A	SS	5
		1B		
0.95 / 342.42	SANDY SILT: Compact brown sandy silt, moist; with topsoil inclusions	2A	SS	11
		2B		
	CLAYEY SILT: Stiff brown clayey silt, some sand, WTPL, numerous silt layers	3	SS	14
		4	SS	15
2.9 / 340.5	becoming grey	5	SS	12
		6	SS	15
		7	SS	9
6.5 / 336.9	BOREHOLE TERMINATED AT 6.5 m			

SHEAR STRENGTH (kPa): + FIELD VANE △ TORVANE ○ Qu ▲ POCKET PENETROMETER O Q; DYNAMIC CONE PENETRATION × STANDARD PENETRATION TEST ●

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L; WATER CONTENT (%)

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
Open
Dry

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 9

17T 524349E 4804152N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** August 1, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Solid Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH / ELEV (metres)	DESCRIPTION	NUMBER	TYPE	"N" VALUES
	SURFACE ELEVATION 343.24			
0.27 / 342.97	TOPSOIL: Dark brown sandy silt, some clay, occasional rootlets, moist	1A / 1B	SS	5
0.68 / 342.56	SILTY SAND: Compact brown silty sand, damp			
	SILT: Compact brown silt, trace sand, trace clay, moist to wet	2	SS	16
		3	SS	17
		4	SS	14
2.9 / 340.3	SILTY SAND: Compact brown silty sand, wet	5	SS	22
4.0 / 339.2	becoming saturated	6	SS	16
5.5 / 337.7	SANDY SILT: Compact grey sandy silt, trace clay, saturated	7	SS	26
6.5 / 336.7	BOREHOLE TERMINATED AT 6.5 m			

SHEAR STRENGTH (kPa): + FIELD VANE △ TORVANE ○ Qu; ▲ POCKET PENETROMETER ○ Q; DYNAMIC CONE PENETRATION ×; STANDARD PENETRATION TEST ●

PLASTIC LIMIT (w_P) — NATURAL MOISTURE CONTENT (w) — LIQUID LIMIT (w_L); WATER CONTENT (%)

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
Free water at 2.3 m
Cave at 2.4 m

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 10

17T 524328E 4804366N

PROJECT Wilmot Woods Development | **PML REF.** 18KF031

LOCATION New Hamburg, Ontario | **BORING DATE** August 2, 2018 | **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Solid Stem Augers | **TECHNICIAN** K. Pettitt

DEPTH / ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	ELEVATION SCALE
	SURFACE ELEVATION 342.20					342
0.27 / 341.93	TOPSOIL: Dark brown sandy silt, trace clay, occasional rootlets, moist		1A / 1B	SS	8	
	CLAYEY SILT: Firm brown clayey silt, DTPL, numerous silt layers		2	SS	5	341
1.4 / 340.8	becoming stiff		3	SS	10	
			4	SS	12	340
2.9 / 339.3	becoming grey, WTPL		5	SS	8	339
			6	SS	14	338
			7	SS	10	337
6.5 / 335.7	BOREHOLE TERMINATED AT 6.5 m					336

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
Open
Dry

0.0 1.0 2.0 3.0 4.0 5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0 15.0

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 11

17T 524447E 4804190N

PROJECT Wilmot Woods Development
PML REF. 18KF031
LOCATION New Hamburg, Ontario
BORING DATE August 2, 2018
ENGINEER H. Shinwary
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE
		SURFACE ELEVATION 346.37					
0.0	346.37	TOPSOIL: Dark brown clayey silt, trace sand, occasional rootlets, DTPL		1A	SS	9	346
0.30	346.07			1B			
		CLAYEY SILT: Stiff brown clayey silt, some sand, DTPL		2	SS	14	
1.0							345
				3	SS	9	
2.0							344
				4	SS	11	
3.0				5	SS	12	343
4.0	342.4	becoming grey, WTPL					
				6	SS	11	342
5.0							341
6.0				7	SS	15	
6.5	339.9	BOREHOLE TERMINATED AT 6.5 m					340
7.0							
8.0							
9.0							
10.0							
11.0							
12.0							
13.0							
14.0							
15.0							

SHEAR STRENGTH (kPa)
+ FIELD VANE △ TORVANE ○ Qu
▲ POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%)
GR SA SI&CL

Upon completion of augering
Open
Dry

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 12

17T 524560E 4804228N

PROJECT Wilmot Woods Development | **PML REF.** 18KF031
LOCATION New Hamburg, Ontario | **BORING DATE** August 2, 2018 | **ENGINEER** H. Shinwary
BORING METHOD Continuous Flight Solid Stem Augers | **TECHNICIAN** K. Pettitt

DEPTH / ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	ELEVATION SCALE
	SURFACE ELEVATION 346.22					346
0.25 / 345.97	TOPSOIL: Dark brown clayey silt, some sand, occasional rootlets, DTPL		1A, 1B	SS	10	
	CLAYEY SILT: Stiff to very stiff brown clayey silt, some sand, DTPL to APL, numerous silt layers		2	SS	14	345
			3	SS	17	
			4	SS	14	344
2.9 / 343.3	becoming grey, WTPL		5	SS	10	343
			6	SS	12	342
			7	SS	8	341
6.5 / 339.7	BOREHOLE TERMINATED AT 6.5 m					340

SHEAR STRENGTH (kPa): + FIELD VANE △ TORVANE ○ Qu ▲ POCKET PENETROMETER ● Q; 50 100 150 200; DYNAMIC CONE PENETRATION × STANDARD PENETRATION TEST ●; 20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%): 10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
Open
Dry

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 101

17T 523684.7E 4804597N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** August 1, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Hollow Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 339.04				
0.0		TOPSOIL: Dark brown sandy silt, some clay, occasional rootlets, moist		1A	SS	7
0.38				1B		
0.68		SANDY SILT: Loose brown sandy silt, moist, occasional rootlets				
0.98		SILT: Loose brown silt, some sand, trace clay, moist		2A	SS	8
1.0	338.06			2B		
		SILTY SAND: Compact brown silty sand, wet		3	SS	11
2.0	2.1					
	336.9	CLAYEY SILT: Stiff to very stiff grey clayey silt, trace sand, WTPL, numerous silt layers		4	SS	17
3.0				5	SS	12
4.0						
5.0				6	SS	16
6.0				7	SS	16
	6.5					
	332.5	BOREHOLE TERMINATED AT 6.5 m				
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						
14.0						
15.0						

ELEVATION SCALE: 338, 337, 336, 335, 334, 333

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%)
GR SA SI&CL

Stickup Well Protector Set in Concrete
Bentonite Seal
Filter Sand
Screen

Water Level Readings:

Date	Depth	Elev.
2018-08-01	2.4	336.6
2018-08-03	1.8	337.2
2018-11-07	0.9	338.1
2018-11-26	0.9	338.1

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 102

17T 523788.7E 4804396N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** August 1, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Hollow Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	NUMBER	TYPE	"N" VALUES
	340.00	SURFACE ELEVATION 340.00			
0.0					
0.30	339.70	TOPSOIL: Dark brown sandy silt, some clay, occasional rootlets, moist	1A	SS	8
			1B		
		CLAYEY SILT: Firm brown clayey silt, trace sand, DTPL, numerous silt layers	2A	SS	6
1.0			2B		
1.1	338.9	SAND: Loose brown sand, trace silt, wet			
1.4		to saturated			
	338.6	becoming compact	3	SS	14
2.0					
			4	SS	17
3.0					
			5	SS	15
4.0					
	336.0	SANDY SILT: Compact grey sandy silt, trace clay, saturated			
			6	SS	20
5.0					
6.0			7	SS	21
6.5					
	333.5	BOREHOLE TERMINATED AT 6.5 m			
7.0					
8.0					
9.0					
10.0					
11.0					
12.0					
13.0					
14.0					
15.0					

ELEVATION SCALE: 339, 338, 337, 336, 335, 334

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Stickup Well Protector Set in Concrete
Bentonite Seal
Filter Sand
Screen

Water Level Readings:

Date	Depth	Elev.
2018-08-01	1.7	338.3
2018-08-03	1.7	338.3
2018-11-07	1.4	338.6
2018-11-26	1.2	338.8

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 103

17T 523910.3E 4804249N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** August 1, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Solid Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES
	SURFACE ELEVATION 343.23				
0.21 / 343.02	TOPSOIL: Dark brown sandy silt topsoil, some clay, occasional rootlets, moist		1A	SS	8
	CLAYEY SILT: Stiff brown clayey silt, trace sand, DTPL, numerous silt layers		1B		
			2	SS	10
			3	SS	13
2.1 / 341.1	becoming WTPL		4	SS	14
			5	SS	18
4.0 / 339.2	becoming grey		6	SS	17
			7	SS	21
6.5 / 336.7	BOREHOLE TERMINATED AT 6.5 m				

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Stickup Well Protector Set in Concrete
Bentonite Seal
Filter Sand
Screen

Water Level Readings:

Date	Depth	Elev.
2018-08-01	4.0	339.2
2018-08-03	2.8	340.4
2018-11-07	2.3	340.9
2018-11-26	1.9	341.3

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 104

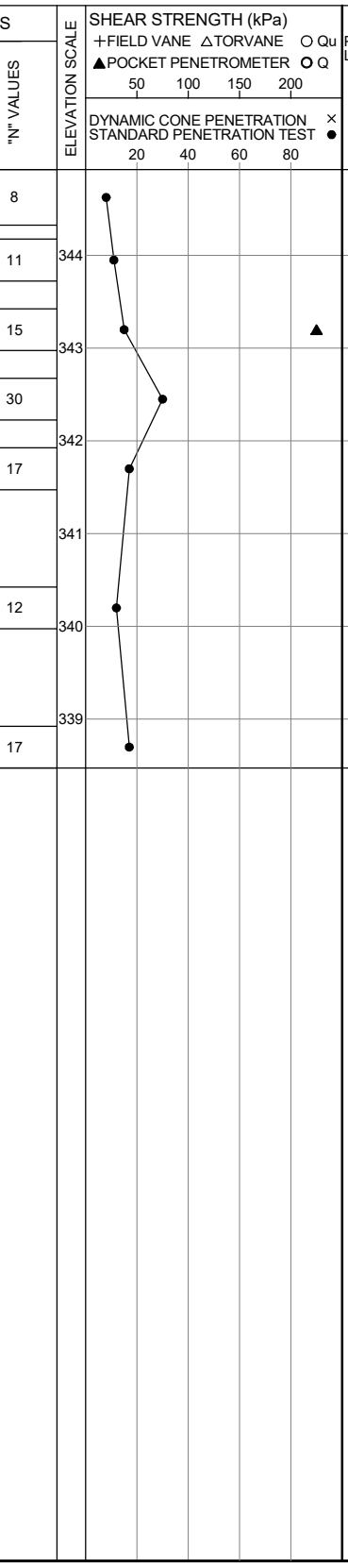
17T 524180E 4803929N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** July 30, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Solid Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES
	SURFACE ELEVATION 344.92				
0.18 / 344.74	FILL: Dark brown clayey silt, some sand, occasional rootlets, APL, occasional wood fragments		1A		
			1B	SS	8
0.68 / 344.24	FILL: Firm brown silty clay , some sand, WTPL, occasional wood fragments		2	SS	11
	CLAYEY SILT: Stiff to very stiff brown clayey silt, trace sand, DTPL, numerous silt layers		3	SS	15
2.1 / 342.8	becoming grey, WTPL		4	SS	30
			5	SS	17
			6	SS	12
			7	SS	17
6.5 / 338.4	BOREHOLE TERMINATED AT 6.5 m				



SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL



Water Level Readings:

Date	Depth	Elev.
2018-07-31	DRY	----
2018-08-03	3.3	341.6
2018-11-07	1.4	343.5
2018-11-26	0.8	344.1

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 105

17T 524125.6E 4804437N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** August 1, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Solid Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	NUMBER	TYPE	"N" VALUES
	341.05	SURFACE ELEVATION 341.05			
0.0	341.05	TOPSOIL: Dark brown sandy silt, trace clay, occasional rootlets, moist	1A	SS	9
0.46	340.59	CLAYEY SILT: Firm brown clayey silt, trace sand, DTPL, numerous silt layers	1B		
			2	SS	7
1.4	339.6	becoming stiff			
			3	SS	10
2.1	338.9	becoming WTPL			
			4	SS	9
			5	SS	9
			6	SS	13
5.6	335.4	becoming very stiff			
			7	SS	17
6.5	334.5	BOREHOLE TERMINATED AT 6.5 m			

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Stickup Well Protector Set in Concrete
Bentonite Seal
Filter Sand
Screen

Water Level Readings:

Date	Depth	Elev.
2018-08-01	DRY	----
2018-08-03	1.4	339.6
2018-11-07	1.0	340.0
2018-11-26	0.8	340.2

NOTES

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LOG OF BOREHOLE/MONITORING WELL NO. 106

17T 524544.9E 4804378N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** August 2, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Solid Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE
	SURFACE ELEVATION 342.98					
0.20 342.78	TOPSOIL: Dark brown clayey silt, some sand, occasional rootlets, DTPL		1A 1B	SS	11	
	CLAYEY SILT: Stiff brown clayey silt, trace sand, DTPL, numerous silt layers		2	SS	15	342
			3	SS	16	
2.1 340.9	becoming firm, grey, WTPL		4	SS	7	341
			5	SS	8	340
4.0 339.0	becoming stiff to very stiff		6	SS	13	339
			7	SS	25	338
6.5 336.5	BOREHOLE TERMINATED AT 6.5 m					337

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Stickup Well Protector Set in Concrete
Bentonite Seal
Filter Sand
Screen

Water Level Readings:

Date	Depth	Elev.
2018-08-02	4.3	338.7
2018-08-03	2.7	340.3
2018-11-07	1.5	341.5
2018-11-24	1.2	341.8

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 107

17T 524733E 4804139N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** August 2, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Solid Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 346.96				
0.0				1A		
0.20	346.76	TOPSOIL: Dark brown clayey silt, some sand, occasional rootlets, DTPL		1B	SS	12
		CLAYEY SILT: Stiff brown clayey silt, trace sand, DTPL, numerous silt layers				
1.0				2	SS	11
				3	SS	12
2.0						
				4	SS	12
2.9	344.1	becoming firm to stiff, grey, WTPL				
3.0				5	SS	7
4.0						
				6	SS	9
5.0						
6.0				7	SS	10
6.5	340.5	BOREHOLE TERMINATED AT 6.5 m				
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						
14.0						
15.0						

ELEVATION SCALE: 346, 345, 344, 343, 342, 341

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ● Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Stickup Well Protector Set in Concrete
Bentonite Seal
Filter Sand
Screen

Water Level Readings:

Date	Depth	Elev.
2018-08-02	DRY	----
2018-08-03	DRY	----
2018-11-07	2.5	344.5
2018-11-26	2.3	344.7

NOTES

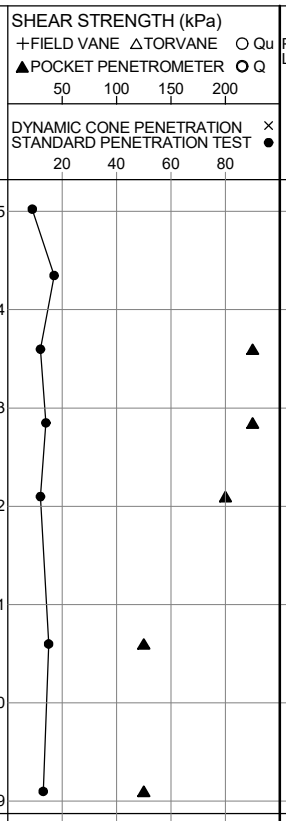
Peto MacCallum Ltd.
CONSULTING ENGINEERS

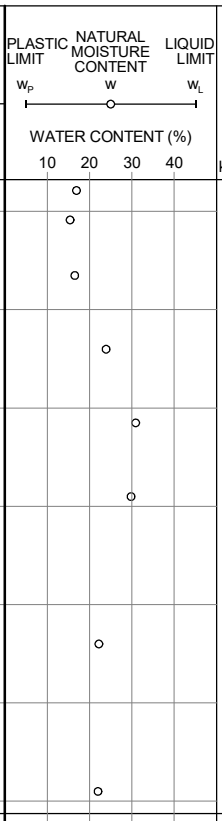
LOG OF BOREHOLE/MONITORING WELL NO. 108

17T 524541.1E 4804122N

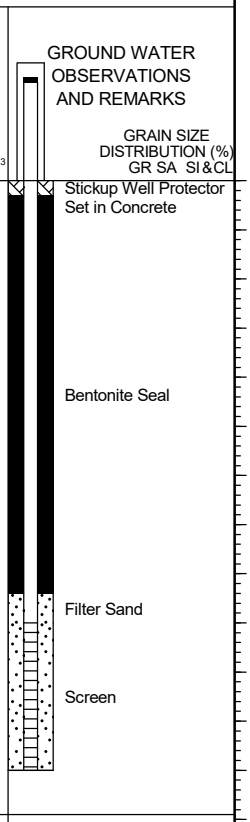
PROJECT Wilmot Woods Development — **PML REF.** 18KF031
LOCATION New Hamburg, Ontario — **BORING DATE** August 2, 2018 — **ENGINEER** H. Shinwary
BORING METHOD Continuous Flight Solid Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 345.32			
0.0	345.32				
	0.22	TOPSOIL: Dark brown sandy silt, trace clay, occasional rootlets, moist	1A	SS	9
	345.10	CLAYEY SILT: Stiff brown clayey silt, trace sand, DTPL, numerous silt layers	1B		
1.0			2	SS	17
2.0			3	SS	12
			4	SS	14
3.0			5	SS	12
	4.0				
4.0	341.3	becoming WTPL			
5.0			6	SS	15
6.0			7	SS	13
	6.5				
	338.8	BOREHOLE TERMINATED AT 6.5 m			
7.0					
8.0					
9.0					
10.0					
11.0					
12.0					
13.0					
14.0					
15.0					





UNIT WEIGHT kN/m³



Water Level Readings:

Date	Depth	Elev.
2018-08-02	DRY	----
2018-08-03	DRY	----
2018-11-07	5.9	339.4
2018-11-26	5.4	339.9

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 109

17T 524441.1E 4803985N

PROJECT Wilmot Woods Development | **PML REF.** 18KF031
LOCATION New Hamburg, Ontario | **BORING DATE** August 2, 2018 | **ENGINEER** H. Shinwary
BORING METHOD Continuous Flight Solid Stem Augers | **TECHNICIAN** K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 339.93			
0.0		TOPSOIL: Dark brown clayey silt, some sand, occasional rootlets, APL to WTPL	1	SS	5
0.85	339.08	CLAYEY SILT: Soft to firm brown clayey silt, trace sand, DTPL, numerous silt layers, occasional cobbles	2A 2B	SS	3
1.0			3	SS	7
2.1	337.8	becoming stiff	4	SS	11
2.9	337.0	becoming WTPL	5	SS	15
3.0			6	SS	13
4.0			7	SS	9
5.0			8	SS	14
6.0			9	SS	10
7.0			10	SS	10
8.0			11	SS	12
9.0			12	SS	16
10.0	10.1				
	329.8	becoming very stiff			
11.0			13	SS	15
12.0	12.5				
	327.4	BOREHOLE TERMINATED AT 12.5 m			
13.0					
14.0					
15.0					

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

ELEVATION SCALE: 339, 338, 337, 336, 335, 334, 333, 332, 331, 330, 329, 328

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Stickup Well Protector Set in Concrete
Bentonite Seal
Filter Sand
Screen

Water Level Readings:

Date	Depth	Elev.
2018-08-03	3.7	336.2
2018-11-07	0.1	339.8
2018-11-26	0.1	339.8

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 110

17T 524499.6E 4803961N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** October 15, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Hollow Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 339.98			
0.0		TOPSOIL: Dark brown silt, trace sand, occasional rootlets, moist to wet	1	SS	3
0.36	339.62	CLAYEY SILT: Stiff brown clayey silt, some sand, DTPL, numerous silt layers			
0.70	339.28	becoming firm to stiff, occasional cobbles, WTPL	2	SS	10
1.0					
			3	SS	12
2.0					
			4	SS	16
2.9	337.1	becoming firm to stiff grey, trace sand, WTPL			
3.0			5	SS	8
4.0			6	SS	7
			7	SS	9
5.0					
			8	SS	9
6.0					
			9	SS	9
7.0	333.0	becoming very stiff, occasional silt layers			
			10	SS	18
8.0					
8.5	331.5	becoming stiff, numerous silt layers			
9.0					
			11	SS	12
10.0					
			12	SS	10
11.0					
12.0					
			13	SS	13
12.6	327.4	BOREHOLE TERMINATED AT 12.6 m			
13.0					
14.0					
15.0					

ELEVATION SCALE: 339, 338, 337, 336, 335, 334, 333, 332, 331, 330, 329, 328

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

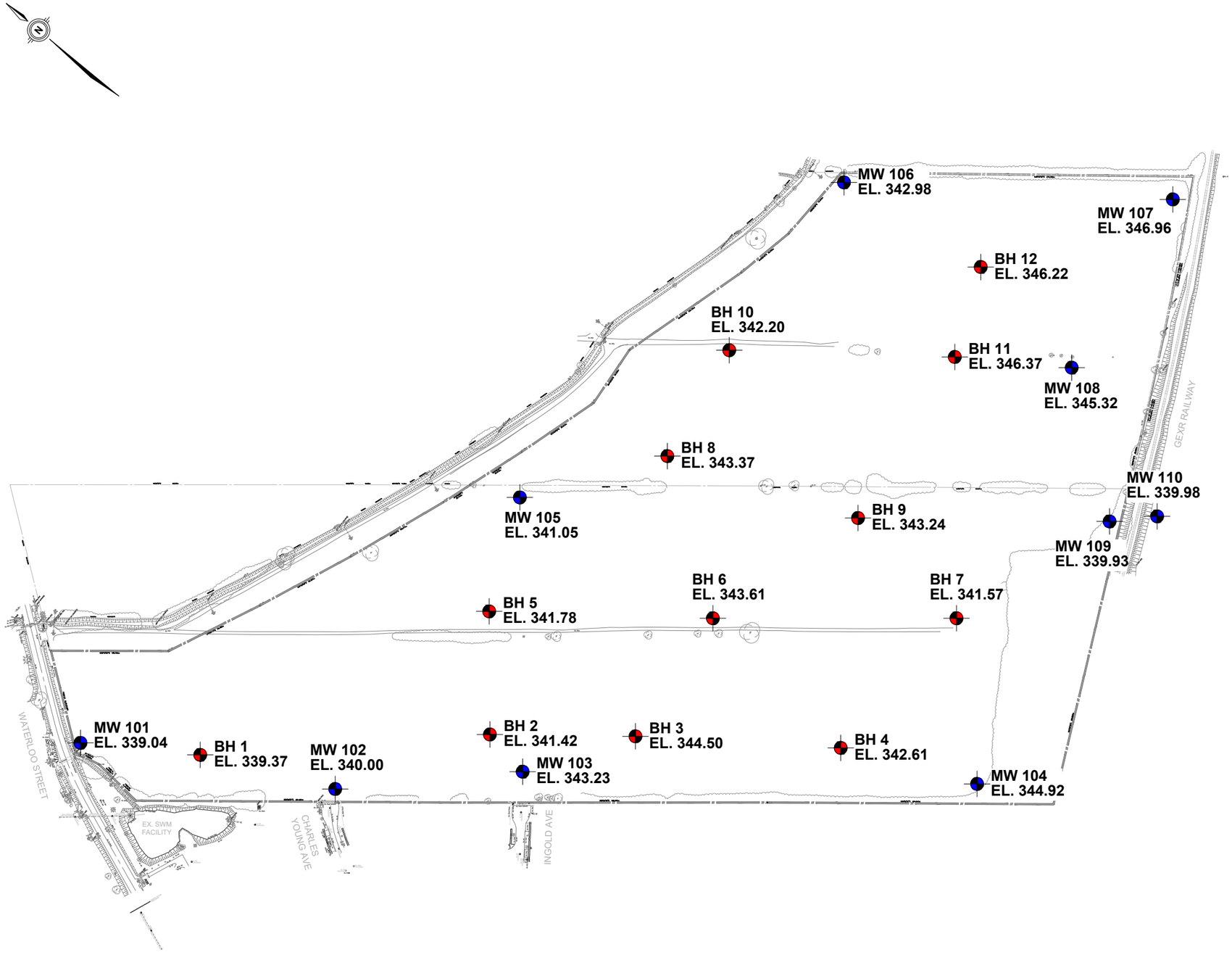
GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Stickup Well Protector Set in Concrete
50 mm pipe
Bentonite Seal
Filter Sand
Screen

Water Level Readings:

Date	Depth	Elev.
2018-10-15	DRY	----
2018-11-07	0.5	339.5
2018-11-26	0.2	339.8

NOTES





KEY PLAN

LEGEND:

- BOREHOLE LOCATION
- MONITORING WELL LOCATION

REFERENCE:

BOREHOLE LOCATION PLAN REPRODUCED FROM DRAWING SUPPLIED BY CLIENT.

NOTE:

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

WILMOT WOODS DEVELOPMENT INC.

PROPOSED WILMOT WOODS DEVELOPMENT

NEW HAMBURG

NEW HAMBURG, ONTARIO

BOREHOLE LOCATION PLAN

Peto MacCallum Ltd.
CONSULTING ENGINEERS

DRAWN	D. BRICE	DATE	SCALE	PML REF.	DWG. NO.
CHECKED	W. LOGHRIN	FEBRUARY 2022	AS SHOWN	18KF031	1
APPROVED	G. MITCHELL				

APPENDIX A

ENGINEERED FILL

ENGINEERED FILL

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

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

1. Purpose

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

2. Minimum Extent

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

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

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

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

3. Survey Control

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

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

4. Subsurface Preparation

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

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

5. Suitable Fill Materials

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

6. Test Section

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

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

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

7. Inspection and Testing

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

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

8. Protection of Fill

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

9. Construction Delay Time Considerations

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

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

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

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

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

10. Approved Fill Pad Surveillance

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

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

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

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

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

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

11. Unusual Working Conditions

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

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

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

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

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

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

APPENDIX B

STATEMENT OF LIMITATIONS

STATEMENT OF LIMITATIONS

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

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

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

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

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

STATEMENT OF LIMITATIONS

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

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

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

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

Peto MacCallum Ltd.
CONSULTING ENGINEERS

GEOTECHNICAL INVESTIGATION
PROPOSED WILMOT WOODS DEVELOPMENT
CN RAILWAY CROSSING
NEW HAMBURG, ONTARIO

for

WILMOT WOODS DEVELOPMENT INC.

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PML Ref.: 18KF031
Report: 2
February 24, 2022

Peto MacCallum Ltd.
CONSULTING ENGINEERS

February 24, 2022

PML Ref.: 18KF031
Report: 2

Mr. Adam Belksy
Wilmot Woods Development Inc.
310 Fairway Road South, P.O. Box 45016
Kitchener, Ontario
N2C 2R6

Dear Mr.Belksy

Geotechnical Investigation
Proposed Wilmot Woods Development
CN Railway Crossing
New Hamburg, 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 by Mr. Galbraith in email dated July 9, 2018.

In general, the project involves the proposed installation of a proposed trunk sanitary sewer extending from the proposed Pfenning Farm development southward under the railway, and will connect to a proposed trunk sewer on the neighboring property (the Wilmot employment Lands). The railway which runs along the south side of the Pfenning Farm development site is located on top of an embankment at about Elevation 345. It is understood that a trenchless installation using jack and bore or pipe ramming methods is being considered for the railway crossing. Detailed design of the crossing has not been provided. However, in general, sewer crossing under the railway will comprise a 400 mm dimeter pipe with inverts at about Elevation 335.7, about 9 m below the railway and 4 to 5 m depth below existing grade beyond the railway.

The purpose of this geotechnical report is to assess the existing subsurface soil and ground water information, and provide preliminary geotechnical engineering recommendations for the proposed trenchless installation of the trunk sanitary sewer under the railway.

Recommendations for the proposed construction of a residential subdivision are provided under separate cover, PML Ref. 18KF031, Report 1.

The comments and recommendations provided in this report are based on the site conditions at the time of the investigation, and are for the current project 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 by PML to ensure their applicability.

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Investigation

The field work for this geotechnical investigation was conducted on August 2, 2018 and October 15, 2018 as part of the investigation for the entire development. The investigation program for the railway crossing comprised two boreholes (MW109 and MW110) advanced to between 12.5 and 12.6 m depth, with monitoring wells installed in both of the boreholes, at the locations shown on the appended Drawing 1. Details of the geotechnical investigation are presented under separate cover in our previous report PML Ref 18KF031 Report 1. Reference is given to Appendix A for the Log of Borehole Sheets, and particle size analyses applicable to the current Railway crossing.

The borehole locations were established in the field by PML. Borehole locations were surveyed by PML using Global Navigation Satellite System (GNSS). The survey equipment was provided by SOKKIA Canada, model GCX-2.

The boreholes were advanced using a Diedrich D-50 track mounted drillrig fitted with continuous flight solid and hollow stem augers and automatic hammer, supplied and operated by a specialist drilling contractor. The work was carried out under the full-time supervision of a PML engineering staff member who directed the drilling and sampling operations, documented the soil stratigraphy, monitored ground water conditions and processed the recovered samples.

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. Pocket penetrometer testing was carried out on the recovered samples to determine the undrained shear strength of the cohesive soils. 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.

Monitoring wells were installed in Boreholes MW109 and MW110 to more accurately measure ground water levels. The monitoring wells comprised 50 mm diameter PVC pipe, filter sand,

All of the recovered samples were returned to PML's laboratory for detailed visual examination, classification, and routine moisture content determinations. The laboratory testing also included particle size distribution analyses on samples of the major soil type encountered.

Summarized 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, dynamic cone penetration test 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 soil stratigraphy encountered comprised surficial topsoil, underlain by an extensive clayey silt deposit containing numerous cohesionless silt layers.

Surficial topsoil was contacted in both boreholes and was between 850 mm and 360 mm thick in Boreholes MW109 and MW110, respectively.

An extensive clayey silt deposit was encountered below the surficial topsoil, in both boreholes, and extended to the 12.5 to 12.6 m borehole termination depths. The cohesive clayey silt deposit was generally firm to very stiff based on standard penetration N values between 7 and 18 blows per 0.3 m penetration of the split spoon sampler. Pocket penetrometer shear strengths of the clayey silt ranged between 75 and 125 kPa. Moisture content ranged between 18 and 28% indicating drier than plastic limit (DTPL) to wetter than limit (WTPL) conditions in the cohesive clayey silt soils. Occasional cobbles and boulders are present in the clayey silt deposit.

Ground Water Conditions

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

During drilling, WTPL conditions were generally encountered in the clayey below 2.9 m depth (Elevation 337.0 and 337.1).

On November 26, 2018 water level measurements from the monitoring wells installed in Boreholes 109 and 110 ranged between 0.1 to 0.2 m depth below existing grade (about Elevation 339.8).

The ground water levels at the site are subject to seasonal fluctuations and precipitation patterns. It should be noted that the relatively impermeable nature of the clayey silt deposits could contribute to the development of perched water conditions following short term and seasonal participation events.

Discussion and Recommendations

As noted previously, the project involves the proposed installation of a trunk sewer below the railway tracks which will extend southward from the Pfenning Farm to the Wilmot employment Lands. The crossing will house a 400 mm diameter pipe inside a steel casing with proposed inverts about Elevations 335.7. The sewer pipe and casing invert will be about 9 m below the railway tracks and 4 to 5 m below the existing grades on each side of the railway. For discussion purposes a maximum 900 mm diameter steel casing is envisioned. Therefore, the top of the steel pipe crossing will be about 4 m below ground on the lands beside the railway, and about 8 m below the railway tracks.

In general, the soil stratigraphy encountered comprised surficial topsoil, underlain by an extensive clayey silt deposit containing numerous cohesionless silt layers and occasional cobbles. The cohesive clayey silt deposit was generally firm to very stiff. The ground water level is at about Elevation 339.8, and above the proposed trunk sewer depth. Considering the subsurface conditions encountered and details proposed for the crossing, both jack and bore and pipe ramming methods were evaluated, and further details on both methods are provided in the sections below.

Regardless of the method used, it is recommended that the contractor prepare a plan in advance of construction outlining the details of the installation to provide instructions for the construction crews and provide a possible contingency action plan should difficulties occur during the tunnelling operations. The plan should also be reviewed by the project proponent and the railway authorities prior to construction. Upon request, PML can assist in reviewing the plan to check that assumptions regarding soil and ground water conditions are appropriate.

Reference is also given to Ontario Provincial Standard Specifications (OPSS) 415, Construction Specifications for Pipeline and Utility Installation by Tunnelling.

Jack and Bore

Jack and bore (or cased auger boring) typically involves the simultaneous advancement of a continuous flight auger and conduit pipe. The auger is used to excavate soil in advance of the casing and transport cuttings back to the receiving pit where they are removed. Rotary power to auger and pushing force is provided by a drill rig located within a jacking pit. Jack and bore is a common method of trenchless installation and in appropriate site and soil conditions may be preferable from a cost perspective.

Jack and bore installation(s) should be conducted in accordance with OPSS 416, Construction Specifications for Pipeline and Utility Installation by Jacking and Boring.

A jack and bore installation is technically feasible for the installations provided the work is carried out by contractors experienced with tunneling in clayey silt with layered silt conditions, and provided adequate measures are used to prevent loss of ground.

The sanitary sewer installation will be below the ground water level in the clayey silt, and ground water conditions could hinder or prevent a jack and bore installation. In wet soils there is potential for ground surface subsidence due to wet soil flowing into the bore, which could result in voids. Dewatering the clayey silt with numerous silt layers is not likely to be effective, therefore the risk of ravelling soil cannot be entirely eliminated.

The jacking forces should be estimated to select the suitable jacks. Suitable jacking head and suitable bracing between jacks and jacking head should be used to assure that pressure will be applied to the pipe uniformly around the ring of the pipe. Utilizing an effective lubrication system may minimize pipe friction during advance. A suitable face pressure or soil plug should be maintained to minimize loss of ground during advance. Any over-cut during augering and pipe advance which potentially create soil disturbance, space or voids outside the pipe should be grouted or filled to avoid potential ground movements.

The proposed crossing may encounter cobbles and boulders during installation. Contractors working on this assignment should provide measures to break up or remove cobbles and boulders if they are encountered during the jack and bore installation.

Pipe Ramming

Pipe ramming installation is analogous to driving an open-ended tube pile horizontally. Impact forces from a percussive hammer (mole) are used to advance a conduit pipe from an entry pit to a receiving pit. During the advance, most of the soil being penetrated fills the conduit rather than being excavated. The rammed conduit is terminated in a receiving pit at which point the soil contained in the pipe is removed.

When the driving has been completed, soil within the pipe can be removed via augering or a pipe shovel. Augering is expected to be the preferred method, however if soil within the pipe cannot be augered, use of a pipe shovel will be necessary. A pipe shovel is essentially a special scoop made from a pipe which fits inside the liner. Excavation via pipe shovel involves advancing the shovel into the soil plug using impact hammer (mole), then pulling the shovel and its contents out with a chain or cable, the process is repeated as required.

Reference is given to the following section for recommendations pertaining to the construction of entry and receiving pits. Dewatering measures will be required at the entry and receiving pits. Ideally, dewatering measures for the staging works should be established to such that the zone of influence includes as much of the tunnel area as possible as this will generally reduce potential ground water seepage through the tunnel during construction.

A pipe ramming installation is technically feasible for the sanitary sewer installation provided the work is carried out by contractors experienced with tunneling in clayey silt conditions, and adequate ground water control is achieved.

It is noted that grade adjustments cannot be completed once pipe ramming has started. It will be necessary to increase the slope of the crossing due to the potential for uncontrolled deflection during pipe ramming installation.

The proposed crossing may encounter cobbles and boulders during installation. Contractors working on this assignment should provide measures to break up cobbles and boulders if they are encountered during the pipe ramming installation.

The effects of the percussive forces on the railway must also be considered and assessed.

In summary, jack and bore is technically feasible for the proposed crossings, however pipe ramming is generally recommended as an alternative given the ground water conditions within the proposed tunneling depths.

Entry and Receiving Pit Excavation and Ground Water Control

Provided adequate ground water control is achieved, the subsurface soils encountered at the borehole locations are classified as Type 3 soils as defined in the Occupational Health and Safety Act (OHSA). For temporary unsupported excavations within Type 3 soils that are to be entered by workers, the excavation side slopes should be maintained no steeper than 1 horizontal to 1 vertical (1H:1V) from the base of shallow excavations. Workers should not enter an unprotected excavation if there is evidence of ongoing seepage in the banks or base of the excavation. An adequate temporary support system (i.e., trench boxes) should be provided at all locations where space limitations prevent construction of sufficiently shallow slopes.

It will also be important to ensure that the excavations do not undermine possible existing in-ground structures, roads and or other services in their proximity. The need for underpinning and utility support can be established according to criteria illustrated on the appended Figure 1. It should be noted that a trench liner box may not be relied on for bracing purposes.

The envisaged excavations for the sending and receiving pits of the sanitary sewer crossing will extend about 6.5 m into clayey silt with numerous wet silt seams. Excavations are anticipated to require dewatering to control of ground water seepage or surface water entering the excavation, and sump pumps along with a more sophisticated dewatering system such as well points, or eductor wells, or water tight sheet pile or secant caisson cut-off may be required.

Regardless of the dewatering method chosen, the hydraulic head and ground water inflow must be properly controlled to ensure stable and safe excavation and to facilitate construction. The design of the dewatering system should be left to the contractor's discretion, and the system should meet a performance specification 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, a Permit to Take Water (PTTW) from the Ministry of Environment Conservation and Parks (MECP) is required if the dewatering discharge is greater than 50,000 L/day. In accordance with the above noted regulatory requirements and in compliance with the MECP's PTTW Manual (April 2005), and application should be filed to the MECP for the subject property 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). PML would be happy to assist with this process, if required.

The depth of excavations for trunk sewer installation are expected to extend to a maximum 6.5 m depth into clayey silt deposits with wet to saturated layers of silt. Due to the presence of numerous water bearing silt layers in the native deposits, excavations for the sending and receiving pits might have pumping rates that exceed 50,000 L/day, and a PTTW or EASR may be required, along with a hydrogeological investigation in support of the application. The estimated construction dewatering volumes should be reassessed once more detailed design information has been established. Upon request, PML would be please to provide further recommendations in this regard.

It is recommended that test pits be carried out during the tendering stage of the project in order that prospective contractors may familiarize themselves with soil and ground water conditions to be expected. Also, the dewatering requirements should be established by the contractor in the context of a performance specification.

Braced Excavations

If space is not available for an enlarged unsupported open cut excavation then consideration should be given to using an engineered system (timber lagging, sheet piling or caisson wall) to support the excavation walls. The soil parameters presented in the following table may be used for the design of braced excavation systems. The parameters are based on the Rankin method of analysis which ignores wall friction.

SOIL TYPE	**CLAYEY SILT**
Coefficient of Active Earth Pressure K_a	0.33
Coefficient of Passive Earth Pressure K_p	3.00
Angle of Internal Friction Ø	30
Cohesive Strength c_u	50 kPa
Unit Weight γ (kN/m^3)	21

For the soil stratigraphy encountered, the bracing system may be designed as a multi-braced system using a rectangular stress distribution in accordance with methods outlined in the latest Canadian Foundation Engineering Manual (CFEM) and summarized on the appended Figure 2, or as a singly-braced system using a triangular stress distribution and summarized on the appended Figure 3. The system design should also consider load effects from ground water, the adjacent embankments, structures and construction equipment.

The ground surface adjacent to a braced excavation is expected to experience some inward movement and vertical settlement. The magnitude of movements adjacent to a braced cut can be limited by proper selection of the lateral earth pressure coefficient, provided good quality workmanship and construction practices are employed.

The maximum allowable movements of braced excavations must be established in a performance specification, and should be determined through agreement with the railway authority.

Backfill

In general, conventional bedding and cover will be suitable for sewer installation and backfilling of the sending and receiving pits. Material containing stones larger than 50 mm size should not be used in the bedding or cover layers. The bedding should be constructed in accordance with applicable Ontario Provincial Standard Drawings (OPSD) and / or local standards. The bedding and cover material should be placed in 150 mm lifts and compacted to at least 95% standard Proctor maximum dry density (SPMDD).

Backfill materials should comprise approved imported granular soil. The backfill materials should be placed in 300 mm maximum lifts and compacted to a minimum of 95% SPMDD.

Should construction extend to the winter months, care must be taken to ensure that frozen material is not used as backfill.

Excavated materials intended for backfilling purposes should not be exposed to the elements for prolonged time periods, as they might be rendered unsuitable for reuse.

Monitoring

The ground surface over the tunnel route may become distorted and distressed by tunnelling. The most common type of distress is settlement caused by loss of ground around the tunnel. Heave of the ground surface is also possible depending on the type of installation. Monitoring of lateral movement of ground near excavations may also be necessary. Mitigation of the distress or distortion on the railway would be a major inconvenience and possibly a safety issue.

Distress at the ground surface is generally prevented or minimized by good construction practices and proper planning. In this regard, preparation of an installation plan as noted above is recommended.

It is also recommended that the project proponent implement a monitoring program to check the condition of the ground over the tunnel before, during and upon completion of construction. The monitoring program should be carried out by a qualified geotechnical consulting firm that is familiar with the proposed work and subsurface conditions. The monitoring period should begin prior to tunnelling, extend throughout the duration and continue at least 2 weeks after completion of tunnelling. More specific monitoring procedures may also be required by the railway authorities.

Monitoring points should be marked using a method approved by the railway authority. Monitoring points should also be functional throughout the monitoring period and should not deteriorate because of traffic, maintenance activities, and weather conditions.

If distress is observed during construction, the contractor should be informed and corrective action should be undertaken immediately. Specific corrective action will be dependent on the nature of the distress and type of installation. Regardless, the process should be outlined in the monitoring program and be part of the contingency actions in the contractor's installation plan.

In general, settlement or heave of the railway from a properly constructed jack and bore or pipe ramming installation carried out in accordance with the recommendations noted in this report, should be less than 10 mm. If settlement or heave of the ground surface exceeds 10 mm, the construction process should be reviewed and adjusted to mitigate further disturbances for the remainder of the tunnelling work.

If total settlement or heave exceeds 15 mm, tunnelling operations should be terminated, the site secured against further deterioration and mitigative action should be undertaken immediately to reinstate the railway and existing utilities

All actions to prevent, secure, or mitigate destruction or damage to the highway and associated features should be done in accordance with, and approved by the railway authorities.

Geotechnical Review and Construction Inspection and Testing

When development design is complete, it is recommended that the design drawings be submitted to PML for general geotechnical review for compatibility with 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 recommendations provided in the report are based on the information revealed in the boreholes. Conditions away from and between boreholes may vary, particularly where service trenches exist. 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.

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

Closure

We trust the information presented in this report 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.



William Loghrin, P.Eng.
Manager Engineering Service



Gerry Mitchell, MEng, P.Eng.
Senior Consultant

WL/GM:tm

Enclosures:
Figure 1 – General Recommendations Regarding Underpinning
Figure 2 – Lateral Earth Pressure Distribution Multi-Braced Cuts in Cohesionless Soils
Figure 3 – Lateral Earth Pressure Distribution Singly-Braced Cuts in Cohesionless Soils
Drawing 1 - Borehole Location Plan
Appendix A – Figure 6 and Borehole Logs BH/MW109 and BH/MW110
Appendix B – Statement of Limitations

Closure

We trust the information presented in this report 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.

William Loghrin, P.Eng.
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Appendix B – Statement of Limitations

NOTES

1. The need to underpin existing footings/utilities is dependent upon soil type, proximity of the existing facility to the face of the excavation, loads imposed on the foundation and permissible movements.

   ZONE A:
   Foundations of relatively heavy and/or settlement sensitive structures/ utilities located in Zone A generally require underpinning.

   ZONE B:
   Foundations of structures located within Zone B generally do not require underpinning. Consideration should be given to underpinning of settlement sensitive utilities or heavy foundation units located in this zone.

   ZONE C:

   Utilities and foundations located within Zone C do not normally require underpinning.

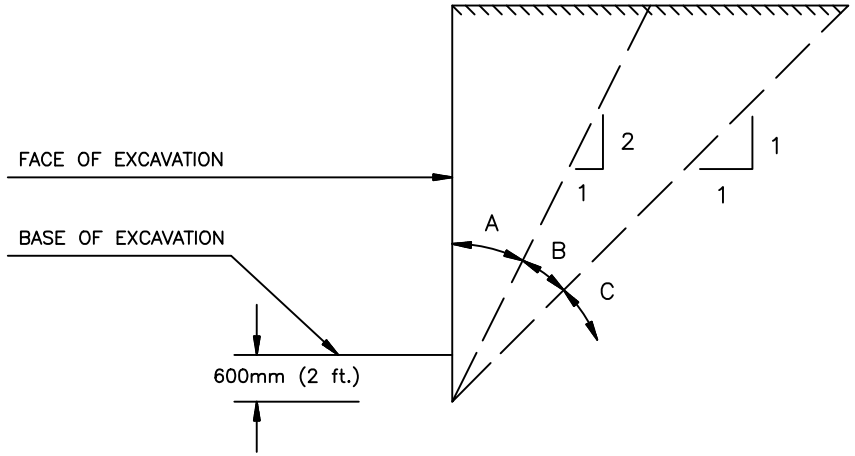
   Underpinning of foundations located in Zones A and B should extend at least into Zone C.

2. As an alternative to underpinning, it may be possible to control movement of existing utilities and foundations by supporting the face of the excavation with bracing/tiebacks or a rigid (caisson) wall. Horizontal and vertical earth pressures imposed on the excavation wall by non–underpinned foundations must be considered in the design of the support system.

3. A condition survey should be conducted prior to construction and appropriate monitoring (surface and insitu) carried out during construction to monitor any movement which may occur.

4. All work should be carried out in accordance with the Occupational Health and Safety Act and local regulations. Good quality workmanship and construction practices are to be employed.

5. This sheet is to be read in conjunction with text of report for this project. Additional comments and recommendations concerning these general guidelines will be provided if required.



Peto MacCallum Ltd. CONSULTING ENGINEERS

STANDARD DRAWING

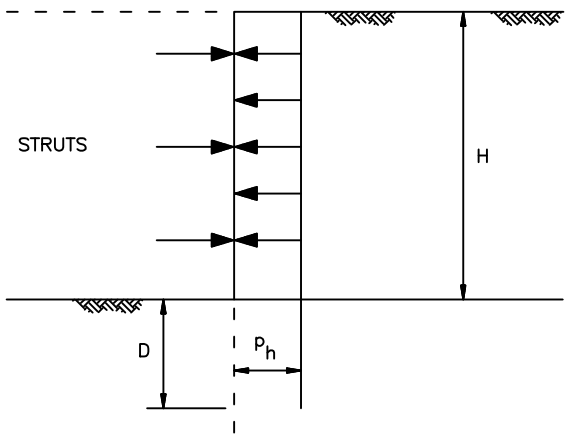
GENERAL RECOMMENDATIONS REGARDING UNDERPINNING OF FOUNDATIONS/UTILITIES LOCATED CLOSE TO EXCAVATION

DATE	JOB NUMBER	FIGURE NO.
FEB 2022	18KF031	1

NOTES

1. The actual magnitude and distribution of the horizontal earth pressures which will act on the bracing system are dependent upon the permissible lateral/vertical movements adjacent to the excavation, the soil type, groundwater conditions, drainage provisions, temporary/permanent surcharge loads, the type of bracing system adopted, weather conditions, quality of workmanship and length of time the excavation will be supported. Hence, the recommended pressure diagram and design parameters should be reviewed when construction details, schedule and type of support system are established.
2. Stability of base of excavation must be confirmed when bracing system design, excavation geometry and surcharge loads are established. If groundwater table is well above base of excavation and/or artesian conditions exist, local lowering of the groundwater level will be necessary to prevent bottom heave/piping of the base of the excavation.
3. Earth pressure diagram is applicable to maximum depth of cut of 12m (40 ft.).
4. Structural components of bracing system should be confirmed adequate for each level of excavation.
5. If sheeting will not permit drainage, bracing system must be designed to resist water pressure.
6. Surcharge loads such as street/construction traffic, supported utilities, adjacent foundations, temporary stockpiles and other loads carried by bracing system are not included in earth pressure diagram.
7. Temporary surcharge loading should not be closer to the face of the excavation than half the depth of excavation unless accounted for in bracing design.
8. If settlement sensitive structures are located near the excavation, special measures should be undertaken to control settlements. A condition survey should be conducted prior to construction and appppropriate monitoring (surface and insitu) carried out during construction.
9. Earth pressure diagram is applicable for relatively short construction periods. If excavation is to be open for long periods, monitoring of deformation is essential, earth pressure diagram must be reviewed, and remedial works may be required.
10. Earth pressure diagram does not account for extended periods of exposure of the excavation to freezing temperatures.
11. Bracing system should be regularly examined for signs of distress.
12. All work should be carried out in accordance with the Occupational Health and Safety Act and local regulations. Good quality workmanship and construction practices are to be employed.
13. This sheet should be read in conjunction with text of report for this project. Additional comments and recommendations concerning these general guidelines will be provided if required.

EARTH PRESSURE DIAGRAM



p_h = design lateral earth pressure
= 0.65 $K\gamma H$

K = lateral earth pressure coefficient

γ = unit weight of soil

H = depth of excavation

D = depth of embedment of soldier piles (if used).

RECOMMENDED DESIGN PARAMETERS

γ = 21.0 kN/m^3

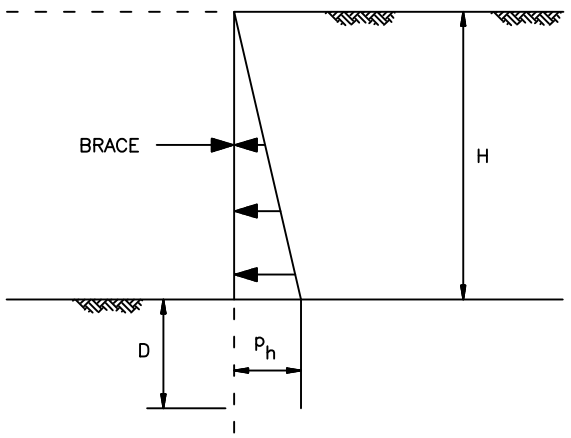
K = 0.33 (movement of retained soil acceptable)
0.50 (movement of adjacent structures/facilities unacceptable)

Peto MacCallum Ltd. CONSULTING ENGINEERS	LATERAL EARTH PRESSURE DISTRIBUTION MULTI–BRACED CUTS IN COHESIONLESS SOILS	DATE FEB 2022	JOB NUMBER 18KF031	FIGURE NO. 2

NOTES

1. The actual magnitude and distribution of the horizontal earth pressures which will act on the bracing system are dependent upon the permissible lateral/vertical movements adjacent to the excavation, the soil type, groundwater conditions, drainage provisions, temporary/permanent surcharge loads, the type of bracing system adopted, weather conditions, quality of workmanship and length of time the excavation will be supported. Hence, the recommended pressure diagram and design parameters should be reviewed when construction details, schedule and type of support system are established.
2. Stability of base of excavation must be confirmed when bracing system design, excavation geometry and surcharge loads are established. If groundwater table is well above base of excavation and/or artesian conditions exist, local lowering of the groundwater level will be necessary to prevent bottom heave/piping of the base of the excavation.
3. Earth pressure diagram is applicable to maximum depth of cut of 12m (40 ft.).
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5. If sheeting will not permit drainage, bracing system must be designed to resist water pressure.
6. Surcharge loads such as street/construction traffic, supported utilities, adjacent foundations, temporary stockpiles and other loads carried by bracing system are not included in earth pressure diagram.
7. Temporary surcharge loading should not be closer to the face of the excavation than half the depth of excavation unless accounted for in bracing design.
8. If settlement sensitive structures are located near the excavation, special measures should be undertaken to control settlements. A condition survey should be conducted prior to construction and apppropriate monitoring (surface and insitu) carried out during construction.
9. Earth pressure diagram is applicable for relatively short construction periods. If excavation is to be open for long periods, monitoring of deformation is essential, the earth pressure diagram must be reviewed, and remedial works may be required.
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RECOMMENDED DESIGN PARAMETERS

γ = 21.0 kN/m^3

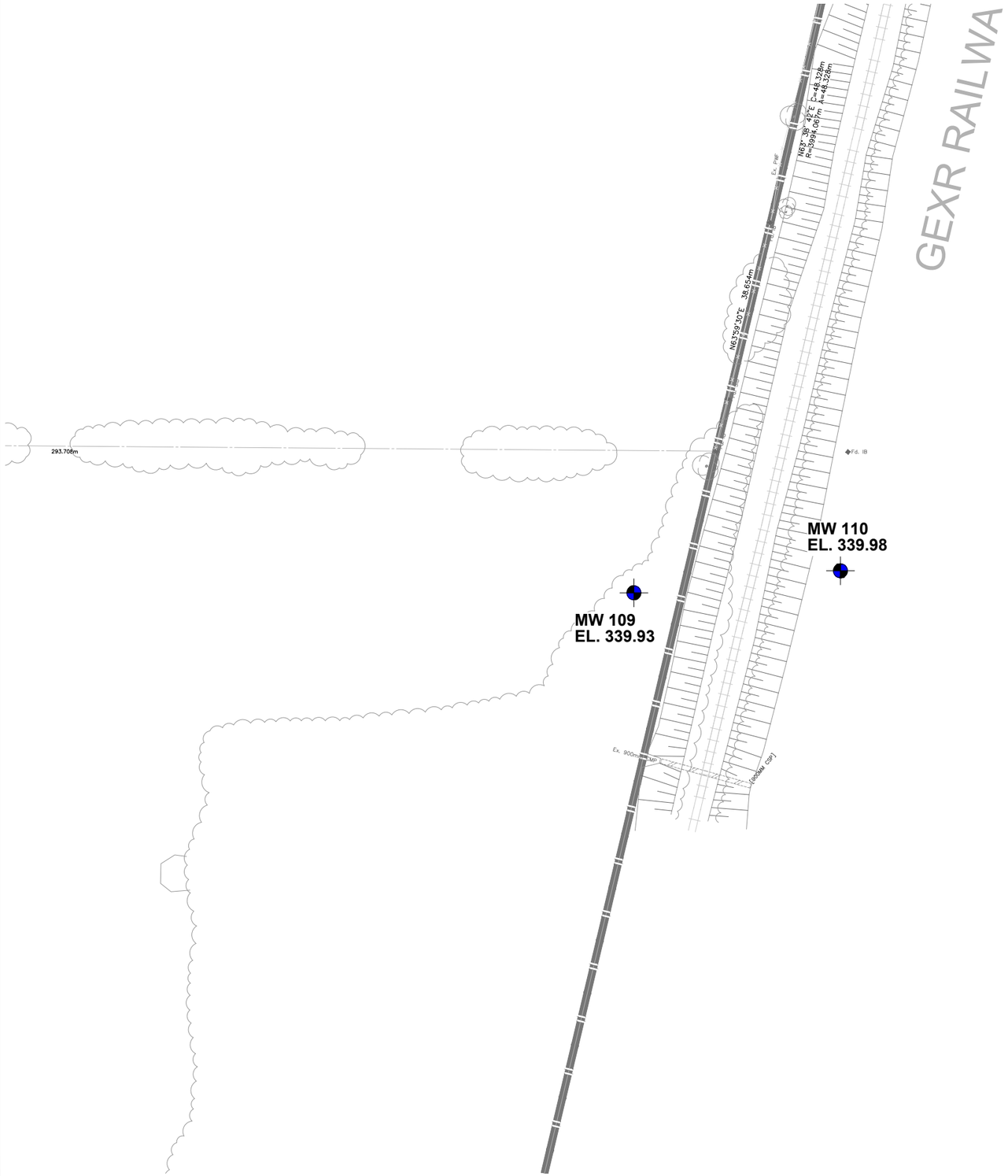
K = 0.33 (movement of retained soil acceptable)
0.50 (movement of adjacent structures/facilities unacceptable)

Peto MacCallum Ltd
CONSULTING ENGINEERS

LATERAL EARTH PRESSURE DISTRIBUTION

SINGLY–BRACED CUTS IN COHESIONLESS SOILS

DATE	JOB NUMBER	FIGURE NO.
FEB 2022	18KF031	3





KEY PLAN

LEGEND:

- BOREHOLE LOCATION
- MONITORING WELL LOCATION

REFERENCE:

BOREHOLE LOCATION PLAN REPRODUCED FROM DRAWING SUPPLIED BY CLIENT.

NOTE:

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

WILMOT WOODS DEVELOPMENT INC.

PROPOSED WILMOT WOODS DEVELOPMENT

NEW HAMBURG

NEW HAMBURG, ONTARIO

BOREHOLE LOCATION PLAN

PML Peto MacCallum Ltd.
CONSULTING ENGINEERS

DRAWN	D. BRICE	DATE	SCALE	PML REF.	DWG. NO.
CHECKED	W. LOGHRIN	FEBRUARY 2022	AS SHOWN	18KF031	1
APPROVED	G. MITCHELL				

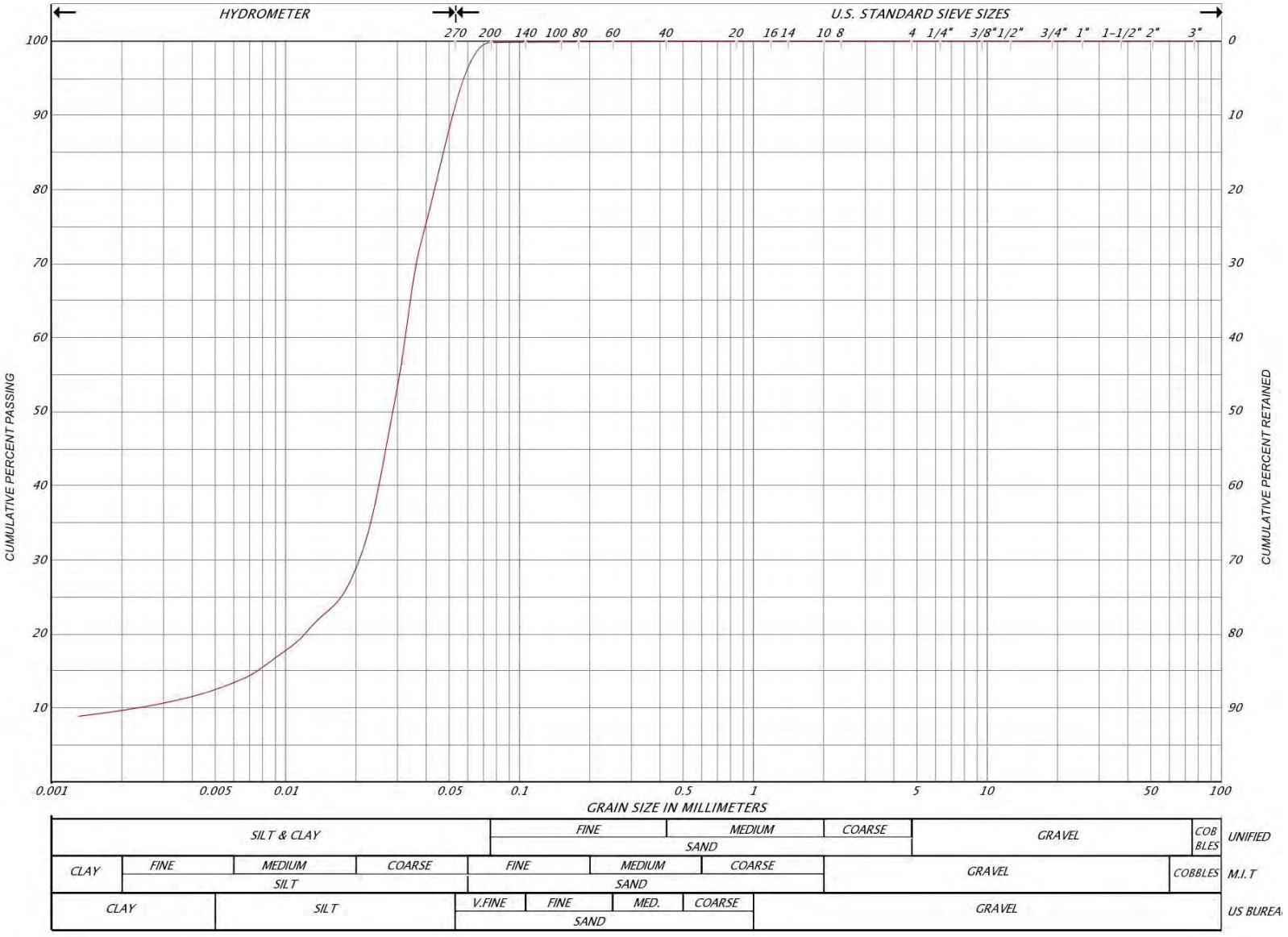
APPENDIX A

FIGURE 6 AND BOREHOLE LOGS 109 AND 110
FROM PREVIOUS REPORT

Peto MacCallum Ltd.
CONSULTING ENGINEERS

PARTICLE SIZE DISTRIBUTION CHART

PML REF. 18KF031
FIGURE NO. 6



REMARKS Borehole MW109, Sample SS11, Depth 9.1 to 9.6 m

CLAYEY SILT

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 109

17T 524441.1E 4803985N

PROJECT Wilmot Woods Development
PML REF. 18KF031
LOCATION New Hamburg, Ontario
BORING DATE August 2, 2018
ENGINEER H. Shinwary
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 339.93			
0.0		TOPSOIL: Dark brown clayey silt, some sand, occasional rootlets, APL to WTPL	1	SS	5
0.85	339.08	CLAYEY SILT: Soft to firm brown clayey silt, trace sand, DTPL, numerous silt layers, occasional cobbles	2A 2B	SS	3
			3	SS	7
2.1	337.8	becoming stiff	4	SS	11
2.9	337.0	becoming WTPL	5	SS	15
			6	SS	13
			7	SS	9
			8	SS	14
			9	SS	10
			10	SS	10
			11	SS	12
10.1	329.8	becoming very stiff	12	SS	16
			13	SS	15
12.5	327.4	BOREHOLE TERMINATED AT 12.5 m			

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Stickup Well Protector Set in Concrete
Bentonite Seal
Filter Sand
Screen

Water Level Readings:

Date	Depth	Elev.
2018-08-03	3.7	336.2
2018-11-07	0.1	339.8
2018-11-26	0.1	339.8

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 110

17T 524499.6E 4803961N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** October 15, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Hollow Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 339.98			
0.0		TOPSOIL: Dark brown silt, trace sand, occasional rootlets, moist to wet	1	SS	3
0.36	339.62	CLAYEY SILT: Stiff brown clayey silt, some sand, DTPL, numerous silt layers			
0.70	339.28	becoming firm to stiff, occasional cobbles, WTPL	2	SS	10
1.0					
			3	SS	12
2.0					
			4	SS	16
2.9	337.1	becoming firm to stiff grey, trace sand, WTPL			
3.0			5	SS	8
4.0			6	SS	7
			7	SS	9
5.0					
			8	SS	9
6.0					
			9	SS	9
7.0	333.0	becoming very stiff, occasional silt layers			
			10	SS	18
8.0					
8.5	331.5	becoming stiff, numerous silt layers			
9.0					
			11	SS	12
10.0					
			12	SS	10
11.0					
12.0			13	SS	13
12.6	327.4	BOREHOLE TERMINATED AT 12.6 m			
13.0					
14.0					
15.0					

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ● Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

ELEVATION SCALE: 339, 338, 337, 336, 335, 334, 333, 332, 331, 330, 329, 328

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Stickup Well Protector Set in Concrete
50 mm pipe
Bentonite Seal
Filter Sand
Screen

Water Level Readings:

Date	Depth	Elev.
2018-10-15	DRY	----
2018-11-07	0.5	339.5
2018-11-26	0.2	339.8

NOTES

APPENDIX B

STATEMENT OF LIMITATIONS

STATEMENT OF LIMITATIONS

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

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

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

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

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

STATEMENT OF LIMITATIONS

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

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

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

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

Peto MacCallum Ltd.
CONSULTING ENGINEERS

February 24, 2022

PML Ref.: 18KF031
Report: 3 Revised

Mr. Adam Belksy
Wilmot Woods Development Inc.
310 Fairway Road South, P.O. Box 45016
Kitchener, Ontario
N2C 2R6

Dear Mr. Belksy

Monitoring Well Water Level Reading
Proposed Wilmot Woods Development
New Hamburg, Ontario

Peto MacCallum Ltd. is pleased to submit our report regarding the ground water monitoring program of Proposed Wilmot Woods Development, New Hamburg, Ontario.

A record of water monitoring completed since September 2018 to February 2021 is presented in Table 1, attached.

We trust that 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.

William Loghrin, P.Eng.
Manager, Engineering Services

WL:tm

Enclosure:
Table 1: Ground Water Level Readings in Monitoring Wells

Distribution:
1 cc: Wilmot Woods Development Inc.
1 cc: MTE Consultants Inc. (+ email – jcabral@mte85.com).
1 cc: PML Kitchener

16 Franklin Street South, Kitchener, Ontario N2C 1R4
Tel: (519) 893-7500 Fax: (519) 893-0654
E-mail: kitchener@petomaccallum.com
BARRIE, COLLINGWOOD, HAMILTON, KITCHENER, LONDON, TORONTO

TABLE 1

GROUND WATER LEVEL READINGS IN MONITORING WELLS

MONITORING WELL No.	GROUND SURFACE ELEVATION[1]	MID-SCREEN ELEVATION[2] (DEPH, m)	HYDROSTATIC GROUND WATER LEVEL ELEVATION (DEPTH, m) [2]								
			SEPTEMBER 19, 2018	OCTOBER 10, 2018	NOVEMBER 7, 2018	NOVEMBER 26, 2018	FEBRUARY 8, 2019	NOVEMBER 19, 2020	DECEMBER 18, 2020	JANUARY 30, 2021	FEBRUARY 26, 2021
101	339.0	333.8 (5.2)	337.2 (1.80)	337.7 (1.34)	338.2 (0.85)	337.8 (1.24)	338.1 (0.96)	337.572 (1.46)	337.832 (1.20)	337.172 (1.86)	337.152 (1.88)
102	340.0	334.8 (5.2)	338.3 (1.71)	338.5 (1.48)	338.8 (1.23)	338.8 (1.24)	338.6 (1.41)	338.404 (1.69)	338.594 (1.50)	338.484 (1.61)	338.794 (1.30)
103	343.2	338.0 (5.2)	340.0 (3.22)	340.6 (2.66)	340.9 (2.33)	341.3 (1.91)	341.5 (1.70)	340.326 (3.00)	340.666 (2.66)	341.466 (1.86)	340.746 (2.58)
104	344.9	339.7 (5.2)	341.8 (3.17)	342.5 (2.45)	343.5 (1.41)	344.1 (0.83)	343.9 (1.03)	341.708 (3.23)	343.168 (1.77)	343.678 (1.26)	343.358 (1.58)
105	341.1	335.9 (5.2)	339.7 (1.31)	340.0 (1.08)	340.1 (0.91)	340.3 (0.77)	340.2 (0.84)	339.874 (1.26)	340.024 (1.11)	340.554 (0.58)	339.284 (1.85)
106	343.0	337.8 (5.2)	340.9 (2.13)	341.7 (1.25)	341.7 (1.31)	341.8 (1.15)	341.3 (1.65)	339.523 (3.47)	341.303 (1.69)	341.753 (1.24)	342.283 (0.71)
107	347.0	341.8 (5.2)	343.9 (3.07)	-	344.7 (2.30)	344.6 (2.33)	344.8 (2.20)	341.475 (5.52)	343.175 (3.82)	346.415 (0.58)	346.245 (0.75)
108	345.3	340.1 (5.2)	339.4 (5.94)	-	339.6 (5.68)	339.9 (5.40)	339.7 (5.63)	339.387 (6.00)	Dry	344.877 (0.51)	344.647 (0.74)
109	339.9	330.8 (9.1)	339.4 (0.53)	339.4 (0.53)	339.7 (0.19)	339.9 (0.04)	339.7 (0.20)	327.355 (0.48)	327.495 (0.34)	327.185 (0.65)	327.375 (0.46)
110	340.0	328.4 (11.6)	-	-	339.8 (0.43)	339.8 (0.17)	339.7 (0.26)	332.442 (0.84)	332.282 (1.00)	332.652 (0.63)	332.782 (0.50)

Notes:

(1) Ground surface elevations at the monitoring well locations were surveyed by PML and are geodetic.
(2) Water levels measured using a Solinst flat tape water level reader.

Appendix G

Wetland Surface Water Balance

Runoff Water Balance Analysis to Wetland
Wilmot Woods Subdivision, Township of Wilmot

Project: 35056-104

Date: March 4, 2022

By:AJC

Q:\35056\104\SWM\35056-104 Wetland Water Balance.xls

Hydrologic Cycle Component Values

Annual Precipitation (mm) [2] = 958

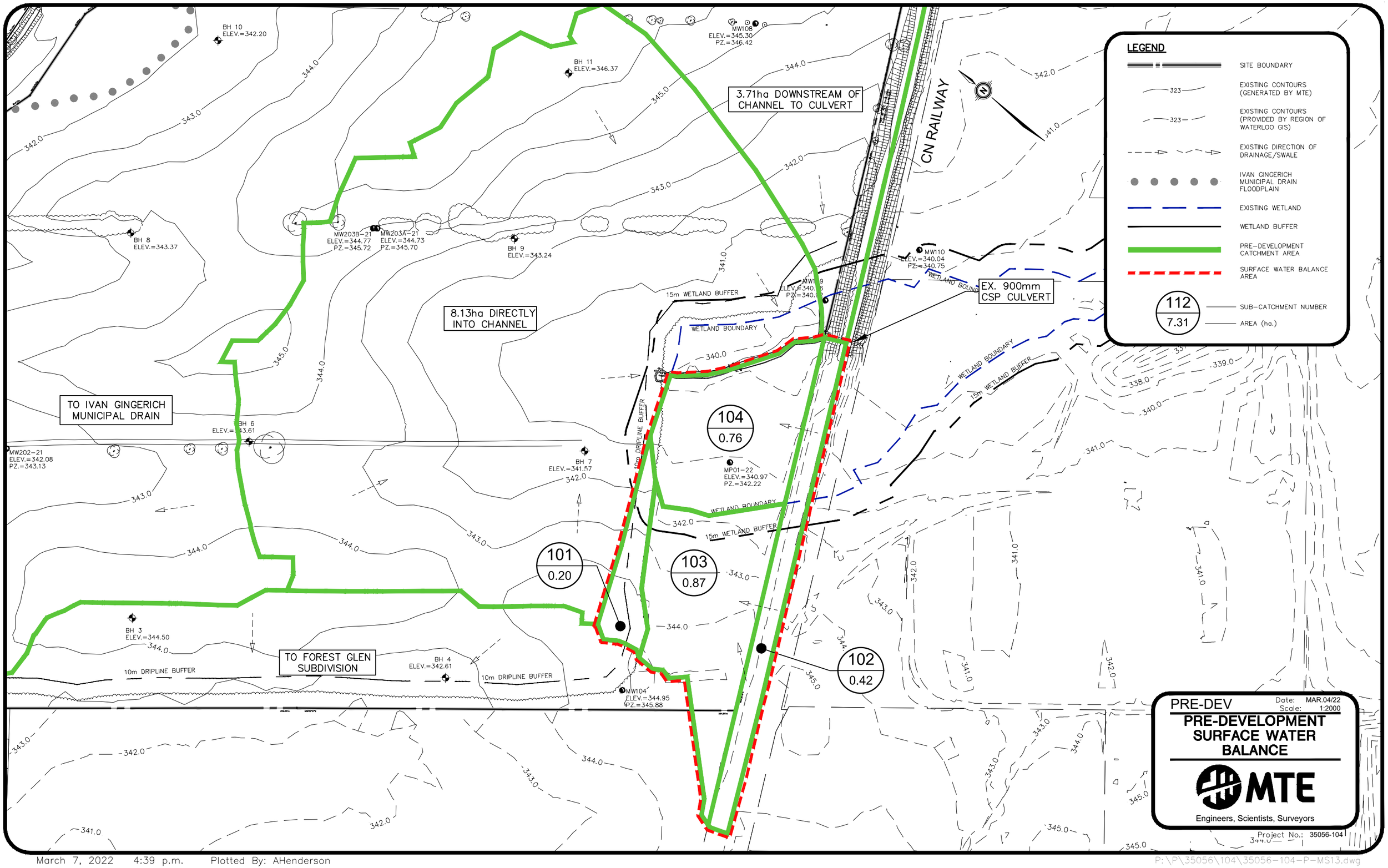
	Parameters				
	ET (mm/yr)	Surplus	Runoff	Infiltration	Infiltration Factor
Hilly, Mature Forests, C	593	365	182	182	0.50
Hilly, Urban Lawn, C	578	380	247	133	0.35
Rolling, Urban Lawn, C	578	380	209	171	0.45
Hilly, Pasture, C	589	369	203	166	0.45

Pre-Development Catchment	Pre Location (Landuse, Topo, Soil)	Pervious: Runoff to Wetland			Post-Development Catchment	Pervious: Runoff to Wetland		
		Area of Runoff to Wetland (ha)	Runoff Rate (mm/yr)	Runoff Volume (m^3/year)		Area of Runoff to Wetland (ha)	Runoff Rate (mm/yr)	Runoff Volume (m^3/year)
101 (Pasture and Buffer)	Hilly, Pasture, C	0.20	203	**406**	201 (Rolling, Urban lawn, C)	0.37	209	773
102 (Railway Corridor and Embankments)	Hilly, Urban Lawn, C	0.42	247	**1,037**	202 (Hilly, Urban Lawn, C)	0.42	247	**1,037**
103 (Wooded Area)	Hilly, Mature Forests, C	0.87	182	**1,586**	203 (Hilly, Mature Forests, C)	0.87	182	**1,586**
104 (Wetland)	Hilly Mature Forsts, C	0.76	182	**1,385**	204 (Hilly, Mature Forests, C)	0.76	182	**1,385**
		2.25	196	**4,414**		2.42	198	**4,781**
Pre-Development Runoff to Wetland				**4414**	**Post-Development Runoff to Wetland**			**4781**

NOTES:

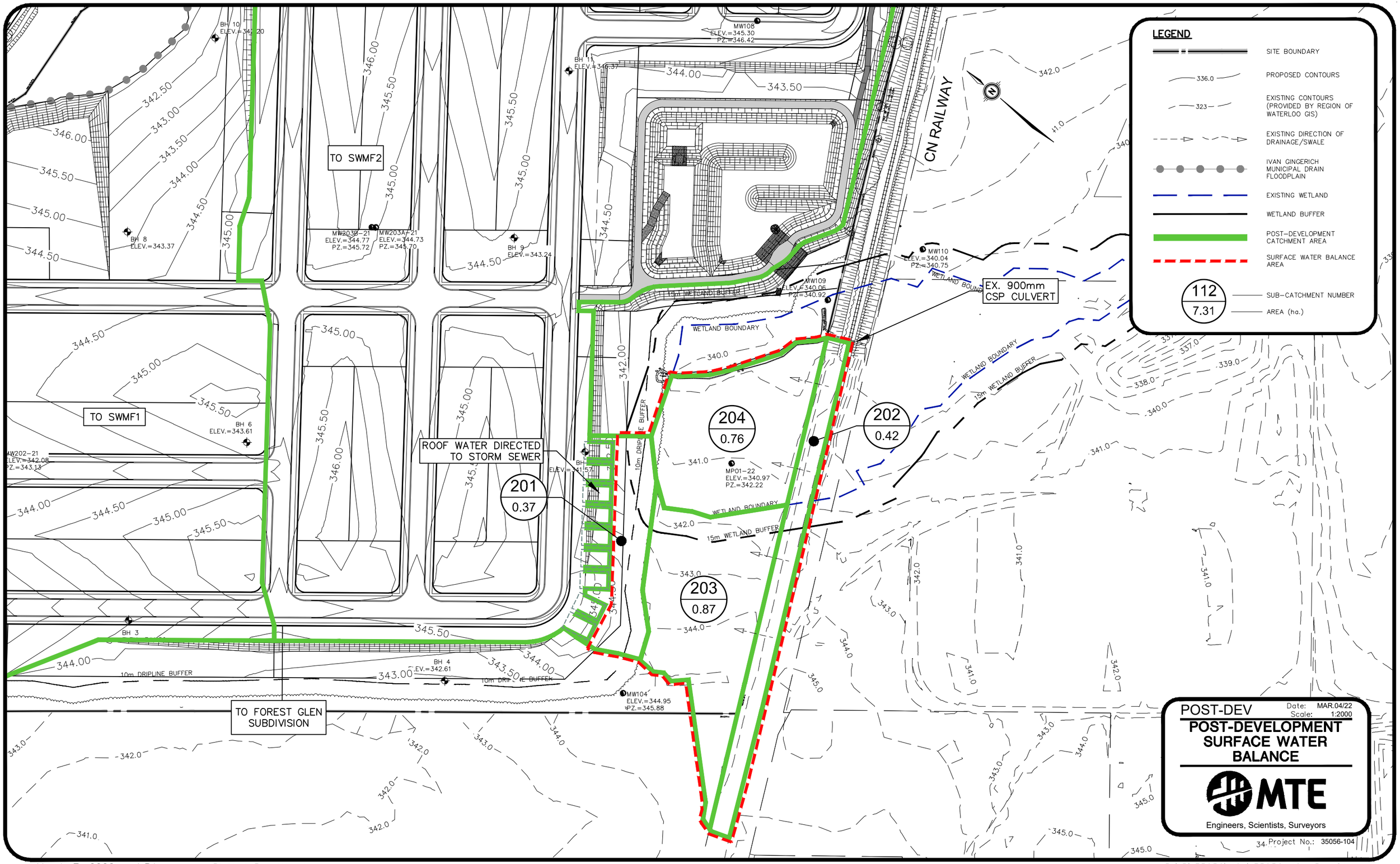
1. Soils based on the Geotechnical Investigation (Peto MacCallum Ltd., February 2022)
2. Annual precipitation taken from Preston Weather Station

Wetland	
Pre-Development Runoff (m3/yr)	**4,414**
Post-Development Runoff (m3/yr)	**4,781**
Net (m3/yr)	**367**
Net Surplus to Wetland	**8.31%**



March 7, 2022 4:39 p.m. Plotted By: AHenderson

P:\P\35056\104\35056-104-P-MS13.dwg

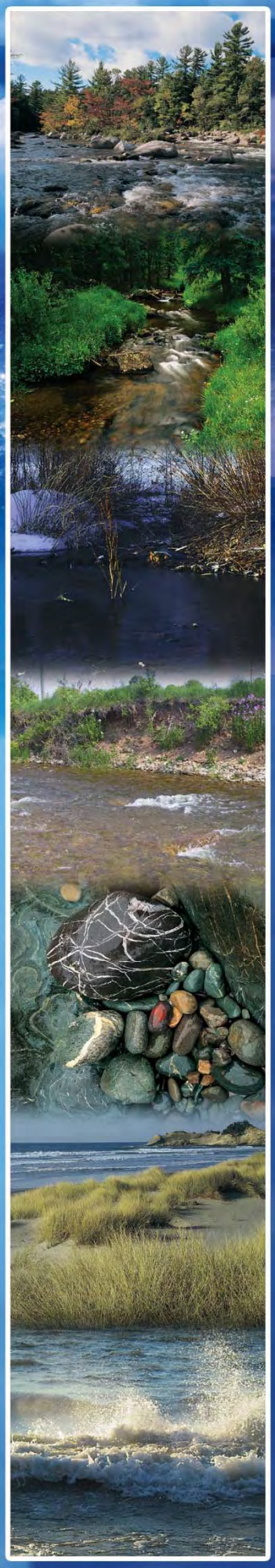


March 7, 2022 4:34 p.m. Plotted By: AHenderson

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Appendix H

Water's Edge Erosion Threshold Assessment









water's edge
ENVIRONMENTAL SOLUTIONS TEAM LTD.

Wilmot Woods
New Hamburg, ON

Fluvial Geomorphic & Erosion Threshold Assessment

February 15, 2022

File Number: 21005
February 15, 2022

Mr. Jason Cabral, C.E.T.
Project Manager
MTE Consultants Inc.
520 Bingemans Centre Drive
Kitchener, Ontario
N2B 3X9

Dear Mr. Cabral:

RE: Wilmot Woods, New Hamburg
Fluvial Geomorphological and Erosion Threshold Assessment

1. INTRODUCTION

Water's Edge was retained by MTE Consultants Inc. to complete an Erosion Threshold Analysis (ETA) for the Ivan Gingrich Drain and its tributaries in New Hamburg. This erosion threshold will be used to confirm the maximum velocity and allowable discharge from the proposed Stormwater Management Facility (SWMF) that supports the planned Wilmot Woods development.

The proposed SWMF will discharge to a tributary of the Ivan Gingrich Drain that is already receiving SWMF discharge from the existing development to the west. The tributary as well as the main channel for the Ivan Gingrich Drain were evaluated between the SWMF and the Grand River as part of the geomorphological investigation. The flowpath between the SWMF and the Grand River is about 930 m. Moderate localized erosion was observed in the study reaches, particularly the Ivan Gingrich Drain downstream of the confluence with the SWMF tributary and upstream of the forested area. **Figure 1** shows the general location of the proposed development, and **Figure 2** shows the location of the study reaches.

This report characterizes the existing watercourse and watershed conditions within the study area based on the desktop assessments and field investigations. The analyses used to approximate were done by utilizing industry-standard and published methods within fluvial geomorphology. Recommended measures to prevent or mitigate issues caused by erosion are discussed.

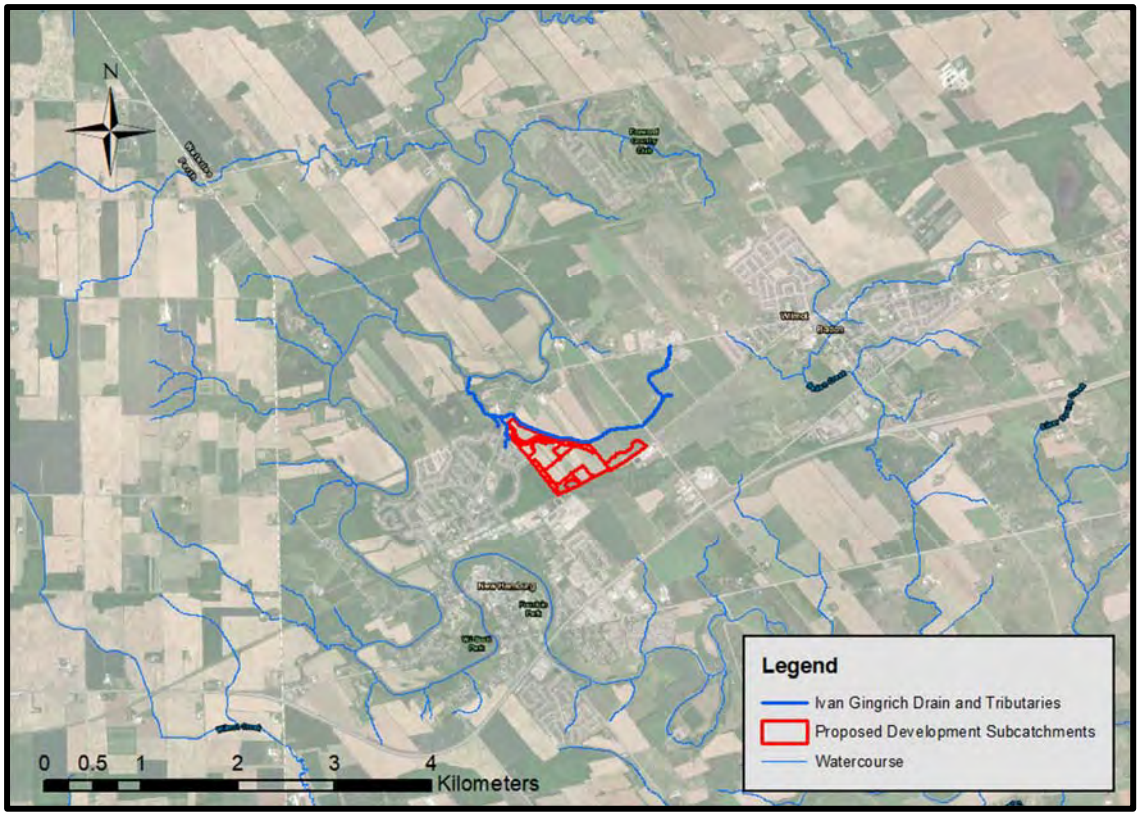


Figure 1: Location of the Study Area

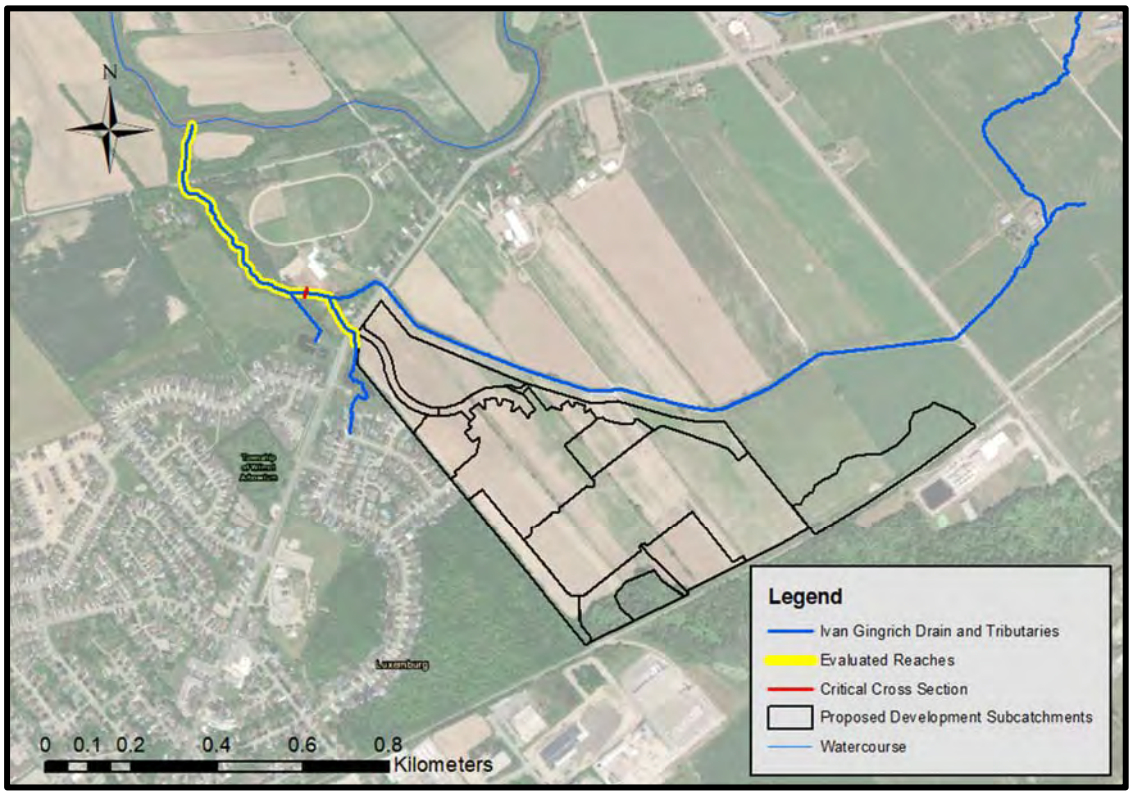


Figure 2: Identification of Study Area and Reaches

2. BACKGROUND INFORMATION

Our preliminary assessment of the Ivan Gingrich Drain for an ETA included a review of the following resources, terms of reference and background information:

- Engineering Drawings (November 2021) by MTE:
  - Post-Development Drainage Area Plan
  - Stage-Storage-Discharge Relationship – North SWMF
- Physiography of Southern Ontario by Chapman & Putnam (digital data from Ministry of Northern Development and Mines (MNDM));
- Ontario Flow Assessment Tool (OFAT);
- Ontario Base Mapping (OBM); and,
- Site Survey and Field Assessments (detailed further in Section 3).

2.1 Physiography and Surficial Geology

Understanding the surficial and underlying geology for the study area provides insight into the geological influence on channel geometry, expected rates of erosion, and helps define the quantity and type of sediment available for watercourses to transport and deposit. The northern half of the watershed is located in the Waterloo Hills physiographic region, while the southern half of the watershed including most of the study reach is located in the Stratford Till Plain.

3. FIELD INVESTIGATION & ASSESSMENT

Water's Edge visited the study site in March and November 2021 to collect field information and assess existing conditions to understand local trends and conduct rapid assessments. The rapid assessments provide general classifications of the stream stability and overall health. Erosion assessments aim to determine threshold values that define the initiation of sediment motion such as flows, depths, or velocities.

Critical locations or reaches were selected based on the proposed outfall location for the SWMF. Runoff from the proposed development will mostly flow into the SWMF before being discharged into the Ivan Gingrich Drain tributary. Critical reaches were specifically selected to assess potential impacts related to the increased runoff volume and attenuation from the proposed SWMF.

Surveying was used to collect topographic and cross-sectional information for the evaluated reaches. Signs of erosion, bankfull channel characteristics, channel alignment, as well as natural features were studied to characterize each reach. Pebble counts and sediment samples were collected for particle analysis to determine the average grainsize of the bed.

Appendix A contains a series of ground photography taken during the site visits. **Appendix B** contains figures of the longitudinal profiles and the cross sections.

3.1 Reach Delineation

Channel morphology and substrate characteristics can change along a watercourse. It is necessary to account for this variation by delineating lengths of a watercourse that exhibit representative planform, sediment substrate, land use, local geology, valley confinement, hydrology and gradient. Reaches are typically comprised of at least two meander bends and can range in length up to thousands of meters.

For this study, two reaches were considered. The Ivan Gingrich Drain tributary between the SWMF and the main channel was the first reach and the main branch of the Ivan Gingrich Drain between the tributary and the Grand River was the second reach.

3.2 Geomorphic Characteristics

Both reaches are single threaded channels with well-defined cross-sections and banks. The main channel reach is about 760 m long, while the tributary is about 170 m long. There is minimal riparian vegetation along the tributary, while the main channel has riparian areas on both sides through most of the reach except for the upstream end. The tributary is mostly lined with stone between the existing SWMF and Waterloo Street and is primarily exposed soil between Waterloo Street and the confluence with the main channel. Upstream of Waterloo Street, the channel is well-defined with a u-shaped cross-section, while between Waterloo Street and the confluence the cross-section is v-shaped with very low side slopes which allows flows to easily spill into the floodplains. In one portion of the tributary between Waterloo Street and the confluence, the channel had been excavated creating a narrow and deep cross-section that would reduce access to floodplains. Additionally, immediately upstream of the excavated area a large tree had been cut down which has dammed the channel and directs flows outside of the natural channel. Several small, informal culvert crossings were present

Downstream of the confluence, the main channel has very steep banks with minimal riparian vegetation and fine sediment, leading to instabilities. About 100 m downstream of the confluence, the riparian area is primarily forested, the channel has shallower banks, sediment sizes were more varied, and fewer signs of erosion were present. The representative geomorphic characteristics of the surveyed reaches surveyed are shown in **Table 1**.

Table 1: Summary of Study Area Geomorphic Parameters

Parameter	IGD Tributary	Ivan Gingrich Drain
Bankfull Width (m)	4.82	4.35
Bankfull Mean Depth (m)	0.15	0.5
Bankfull Max Depth (m)	0.31	0.88
Bankfull Area (m^2)	0.72	2.19
Wetted Perimeter (m)	4.88	4.85
Hydraulic Radius (m)	0.15	0.45
Width-Depth Ratio	32.13	8.7
Entrenchment Ratio	2.76	3.42
Bankfull Slope (m/m)	0.01	0.01
Channel Substrate D_{50} (mm)	5.84	1.1
Channel Substrate D_{84} (mm)	52.8	15.1
Rosgen Classification	C	E

3.3 Stream Assessment Scores

In addition to classification of a stream system, various techniques for geomorphic assessments are used to better understand general stream conditions (stability, habitat, erosion/degradation, riparian, etc.). Rapid field assessments provide an indication of the channel stability and ecological stream condition, while also identifying primary processes in action (e.g. widening). The Rapid Geomorphic Assessment (RGA) and the Rapid Stream Assessment Technique (RSAT) together provide a thorough description of the existing channel conditions. The field sheets of these assessments are provided in **Appendix C**.

The RGA assessment focuses entirely on the geomorphic component of a river system. The RGA method consists of four factors that summarize various components of channel adjustment. The RGA check sheet documents indicators of different modes of channel adjustment: widening, aggradation, degradation, and planform adjustment. These observations are quantified to produce

a value that indicates the state of channel stability: "In Regime/Stable" (<0.20), "Transitional/Stressed" (0.21-0.40), or "In Adjustment/Unstable" (>0.40).

Results for the RGA (**Table 2**) show that the study reach is in a state of adjustment which indicates that the channel morphology is not within the range of variance and evidence of instability is widespread. The primary indicators of geomorphic change were noted to be those of widening and degradation.

Table 2: RGA Results

Reach	Form of Adjustment				Stability Index	Condition
	Aggradation	Degradation	Widening	Planform Adjustment		
Ivan Gingrich Drain	0.43	0.4	0.3	0.14	0.32	Transitional / Stressed
Tributary	0	0	0.1	0.14	0.06	In Regime/Stable

The RSAT is a semi-quantitative approach to characterize stream conditions where 6 different criteria are scored and evaluated. Abiotic and biotic indicators which influence overall stream quality have been streamlined and weighted appropriately within each of the evaluation criteria.

The six criteria are:

1. Channel stability;
2. Channel scouring and sediment deposition;
3. Physical in-stream habitat;
4. Water quality;
5. Riparian habitat conditions; and
6. Biological conditions

River channel stability and cross-sectional characterization is a critical component of RSAT. The entire channel was inspected for signs of instability (such as bank sloughing, recently exposed non-woody tree roots, general absence of vegetation within the bottom third of the bank, recent tree falls, etc.) and channel degradation or downcutting (such as high banks in small headwater streams and erosion around man-made structures). Observations were noted and cross-section measurements were made.

A rapid assessment of soil conditions along the riverbanks was also conducted to determine soil texture and potential erodibility of the watercourse bank. Qualitative water quality measurements were also made (temperature, turbidity, colour and odour) along with an indication accumulation of sediment or substrate fouling. The RSAT typically involves a quantitative sampling or observation and evaluation of benthic organisms. As no benthic sampling was undertaken, the score was based on site conditions and general water quality observations. Each category is ranked against the maximum possible score. The sum of scores provides an indication of the watercourse's overall condition, stability and health. **Table 3** details the range of scores and rankings with a higher score suggesting a healthier system.

For the main channel of the Ivan Gingrich Drain, the score was 25.5 which corresponds to a "fair" condition. The scores were generally in the middle of the range for each category. For the tributary of the Ivan Gingrich Drain, the score was 31, which corresponds to a "good" condition. The tributary ranked highly in channel stability and channel scour and sediment deposition categories due to the rip rap lined channel as well as vegetation that stabilized the channel elsewhere. The tributary also ranked low in physical in-stream habitat, riparian habitat conditions and biological indicators. Most of these scores were related to the ephemeral nature of the tributary which was dry when it was evaluated.

Table 3: RSAT Summary Results

Category	Ivan Gingrich Drain	Tributary	Max Possible Score
Channel Stability	4.4	11	11
Channel Scour & Sediment Deposition	4.6	8	8
Physical In-Stream Habitat	3.75	3	8
Water Quality	5.25	8	8
Riparian Habitat Conditions	2.5	1	7
Biological Indicators	5	0	8
Total Score	**25.5**	**31**	**50**
Condition	**Fair**	**Good**	

4. EROSION THRESHOLD ASSESSMENT

An erosion threshold assessment is used to determine the critical flow rate at which sediment transport is initiated for a representative grain size.

4.1 General

A fluvial geomorphological survey was completed using GPS on November 16, 2021. For the purpose of an erosion threshold assessment, bankfull cross-sections were surveyed at select locations where signs of ongoing or historical erosion were present. Channel velocities and shear stresses on the bed are expected to be greatest through these sections therefore providing the best representation of critical values. The longitudinal profile was also surveyed to determine the channel slopes. Sediment samples were analyzed to determine the D_{50} and D_{84} particle sizes.

This detailed field data (cross-section, gradient, and particle distribution) is used to estimate the bankfull discharge, shear stress, and critical discharge values. Specifically, the critical discharge indicates the point at which sustained flows will tend to entrain and transport sediment. In this analysis, the D_{84} particle was used as index sizes.

Typically, to determine the critical shear stress for particle entrainment, the methods presented by Komar (1987) and Fischenich (2001) are used. These methods adapt and update the work of Shields (1936). The Komar method is most appropriate to gravel sized material, while Fischenich also incorporates finer material (sands). A modified Shields approach is also presented based on dimensionless Shields parameters presented in Julien's (1995) work. Based on the critical shear stress determined by each method, a critical depth is back-calculated and a critical discharge is determined. This critical discharge can then be applied as an erosion threshold target when controlling effluent input to the watercourse.

4.2 Erosion Threshold Considerations and Discussion

Specific cross-section locations were surveyed within the study reaches that will be impacted by the proposed SWMF. Critical threshold parameters were computed for those cross sections where bankfull indicators were considered to be reliable. Attempts were made to locate naturally formed riffles for cross-sectional surveys as these provide locations where flows are concentrated, and their composition is indicative of the type of material that becomes mobilized under frequent flow conditions below and up to the bankfull discharge.

Using the data collected during the field investigation and desktop analysis, bankfull characteristics for cross-sections were summarized. The bankfull energy gradient, bed materials, and channel classification are also summarized (**Table 1**). Related hydraulic parameters were determined; including stream power, unit stream power, and bed shear stress. These parameters were established at each cross-section and the results are summarized in **Table 4.**

Table 4: **Summary Hydraulics**

Parameter	Critical Cross-Section
Relative Roughness (m/m)	31.6
Shear Velocity (m/s)	0.14
Velocity based on FF/RR (m/s)	1.6
Bankfull Q (cms)	3.48
Froude #	0.72
Stream Power (W/m)	170.6
Unit Stream Power (W/m^2)	39.2
Bed Shear T_o (N/m^2)	19.9

Erosion threshold values for the critical reach using three different methods are shown in **Table 5**. Four cross-sections were surveyed to determine the erosion threshold, but only the cross-sections in the main channel produced reasonable values due to the stabilization and well-connected floodplains in the tributary. In the main channel, cross-sections were generally stable in the forested areas and were unstable close to the confluence with the tributary where riparian vegetation is minimal. Flows were modeled through each cross-section up to the critical depth until the representative particle size (D_{50}) is mobilized, then the critical discharge is calculated. These values generally vary with respect to the slope, roughness, and grain size. Influencing factors such as prevailing flows, land use, geology, human intervention, and in-channel structures will cause variation along the channel and need careful consideration when observing natural thresholds of erosion. As the substrate size increases, the critical flow also increases. A critical flow of 0.36 m^3/s was selected as the critical flow for erosion threshold as a conservative estimate and is based on critical shear stresses acting on the bed under bankfull conditions.

Table 5: Threshold Results

Method	Parameter	Critical Cross-Section
Komar (1987)	Critical Shear (N/m^2)	9.36
	Ratio of Bed Shear/Critical Shear	2.13
	Critical Radius (m)	0.19
	Critical Flow (m^3/s)	***0.38***
Fischenich (2001)	Critical Shear (N/m^2)	9.07
	Ratio of Bed Shear/Critical Shear	2.20
	Critical Radius (m)	0.18
	Critical Flow (m^3/s)	***0.36***
Modified Shields	Critical Shear (N/m^2)	9.15
	Ratio of Bed Shear/Critical Shear	2.18
	Critical Radius (m)	0.19
	Critical Flow (m^3/s)	***0.37***

4.3 Continuous Modelling

A continuous hydrologic model was developed using HEC-HMS 4.9 to evaluate the erosion under existing and proposed conditions. The LIDAR-based 2017 Lake Erie DTM data (Package S) was used for the terrain, Ontario Soil Survey data was used to define the hydrologic runoff conditions of the soil, and SOLRIS v3.0 was used to define the landuse in the existing conditions model. The SCS Curve Number Method was used to define runoff conditions based on the soil and landuse data. The Clark Unit Hydrograph was used to define the hydrograph transforms from the subcatchment headwaters to the outlet and is based on the physical characteristics of the subcatchment including the longest flowpath, channel length, slope, and roughness characteristics. The Muskingum-Cunge method was used for channel routing based on the slope, channel cross-section, and roughness for each reach.

Subcatchments were delineated based on the LiDAR surface using HEC-GeoHMS. Several subcatchments were manually divided so their outlets would match key locations from the SWM Report and facilitate adjustments to represent proposed conditions. The proposed conditions are based on the Stormwater Management Report from MTE from January 2022.

57 years of continuous daily precipitation data was obtained from 1959-2016 for the Stratford WWTP gauge, which is about 24 km from the site. The models were run for the entire period using 1-hour computation time-steps. The resulting hydrograph with hourly flow data was then analyzed to determine the number of erosion hours, cumulative effective shear stress, and cumulative effective work for existing and proposed conditions. The results of the analysis are shown in **Table 6**.

Table 6: Continuous Modelling Erosion Analysis Results

Parameter	Existing	Proposed	Percent Reduction
Erosion Hours	11,841	10,717	9.49
Cumulative Effective Shear Stress Index (Ns/m2)	1,052,792	1,026,652	2.48
Cumulative Effective Work Index (N/m)	833,104	801,599	3.78

The results show that all of the erosion indicators will be reduced under proposed conditions, particularly erosion hours. The erosion hours will be reduced by 9.49 % or 1,124 hours over 57 years. The erosion hours only consider the duration of erosion threshold exceedances, while the cumulative indices consider both the duration and magnitude of exceedances and are therefore more representative of the actual erosion potential of the critical reach. The cumulative indices show a smaller percent reduction than the erosion hours, which indicates that the duration of flows just above the erosion threshold will be reduced more, while erosion resulting from higher flows will be reduced less. This result indicates that no increase in erosion is expected in the receiving channel and that the SWM controls for the proposed site are adequate.

5. RECOMMENDATIONS AND MONITORING

During our site visit, we did note some ongoing erosion issues, particularly in the main channel of the Ivan Gingrich Drain upstream of the forested area to the confluence with the tributary receiving the proposed SWMF outflows. Monitoring of these sites is necessary to prevent degradation through the construction and post-construction phases.

The following monitoring program is recommended:

1. A monumented cross-section should be established at the critical cross-section location prior to construction of the proposed SWM facility and subdivision;
2. Erosion pins should be installed on degrading and relatively stable banks in order to compare rates and prior to construction of the proposed SWM facility and subdivision;
3. The site is to be inspected each Spring and Fall during the monitoring period;
4. During each Spring inspection, photos should be taken, erosion pins measured, and site conditions observed and noted;
5. During each Fall inspection, a survey should be conducted of the monumented cross-sections and the longitudinal profile of the reach in addition to photos, erosion pin measurements, and observation of site conditions;
6. Photos are to be taken from the same locations to facilitate comparison;
7. The monitoring be carried out on an annual basis through the construction of the SWM facility and build-out of the adjacent industrial buildings and for two (2) years following 90% catchment build-out; and,

8. Annual reports summarizing the field visits including erosion pin measurements, survey data, photos, observations, and recommendations for remedial work should be provided to the agencies.

6. CONCLUSIONS

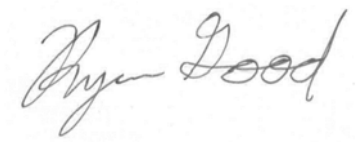
To carry out an erosion threshold assessment for the proposed development, a geomorphic survey was completed at the site, including pebble counts and sieve analyses to characterize channel materials. An erosion threshold flow rate was determined for the Ivan Gingrich Drain downstream of the proposed SWMF outfall. A monitoring program also proposed to mitigate erosion issues that may arise.

Based on our site investigations, assessments, and analyses, we conclude that:

1. Two cross-sections were identified in the study reach where erosion threshold parameters could be identified;
2. Several methods of computing erosion threshold parameters were used in the study to determine the critical flow at which incipient motion occurs;
3. The calculated erosion threshold is 0.36 m^3/s; and,
4. Continuous modelling over a 57-year period showed a reduction of Erosion Hours, Cumulative Effective Shear Stress Index, and Cumulative Effective Work Index under proposed conditions. This result indicates that additional erosion in the Ivan Gingrich Drain is unlikely and the proposed SWM controls are sufficient.

As such, we recommend that the proposed monitoring program be adopted to monitor the existing channel, ensure that post-development flows do not impact the channel and to ensure that any emerging issues are quickly identified and addressed.

Respectfully submitted,



Ryan Good, M.A.Sc., P.Eng.,
Water Resources Engineer

Water's Edge Environmental Solutions Team Ltd.

ATTACHMENTS

Appendix A: Photographs
Appendix B: Profile and Cross Sections
Appendix C: Stream Assessment Worksheet
Appendix D: HEC-HMS Summary Tables

ADDITIONAL REFERENCES & RESOURCES

Digital data from Ministry of Northern Development and Mines (MNDM)

Fischenich. 2001. Stability Thresholds for Stream Restoration Materials. EMRRP Technical Notes Collection (ERDC TN-EMRRP-SR-29), U.S. Army Engineer Research and Development Center, Vicksburg, M.S. www.wes.army.mil/e/emrrp

Julien, P. (1995). Erosion and Sedimentation. Cambridge: Cambridge University Press.

Komar, Paul D. 1987. Selective grain entrainment and the empirical evaluation of flow competence. Sedimentology, 34: 1165-1176.



APPENDIX A:

Site Photography



PHOTOGRAPH NO.: 1
FROM: Ivan Gingrich Drain Tributary at proposed SWMF outfall location
LOOKING: Upstream at Forest Glenn SWMF



PHOTOGRAPH NO.:2
FROM: Ivan Gingrich Drain Tributary at proposed SWMF outfall location
LOOKING: Downstream



PHOTOGRAPH NO.: 3
FROM: Ivan Gingrich Drain Tributary downstream of Waterloo Street
LOOKING: Upstream at box culvert crossing



PHOTOGRAPH NO.: 4
FROM: Ivan Gingrich Drain Tributary downstream of Waterloo Street
LOOKING: Upstream, typical bed material between Waterloo Street and Ivan Gingrich Drain



PHOTOGRAPH NO.: 5
FROM: Ivan Gingrich Drain Tributary downstream of Waterloo Street
LOOKING: Downstream at trees blocking channel



PHOTOGRAPH NO.: 6
FROM: Ivan Gingrich Drain Tributary downstream of Waterloo Street
LOOKING: Downstream at excavated channel



PHOTOGRAPH NO.: 7
FROM: Ivan Gingrich Drain Tributary downstream of Waterloo Street
LOOKING: Upstream at informal culvert crossings



PHOTOGRAPH NO.: 8
FROM: Ivan Gingrich Drain at confluence with tributary
LOOKING: Upstream



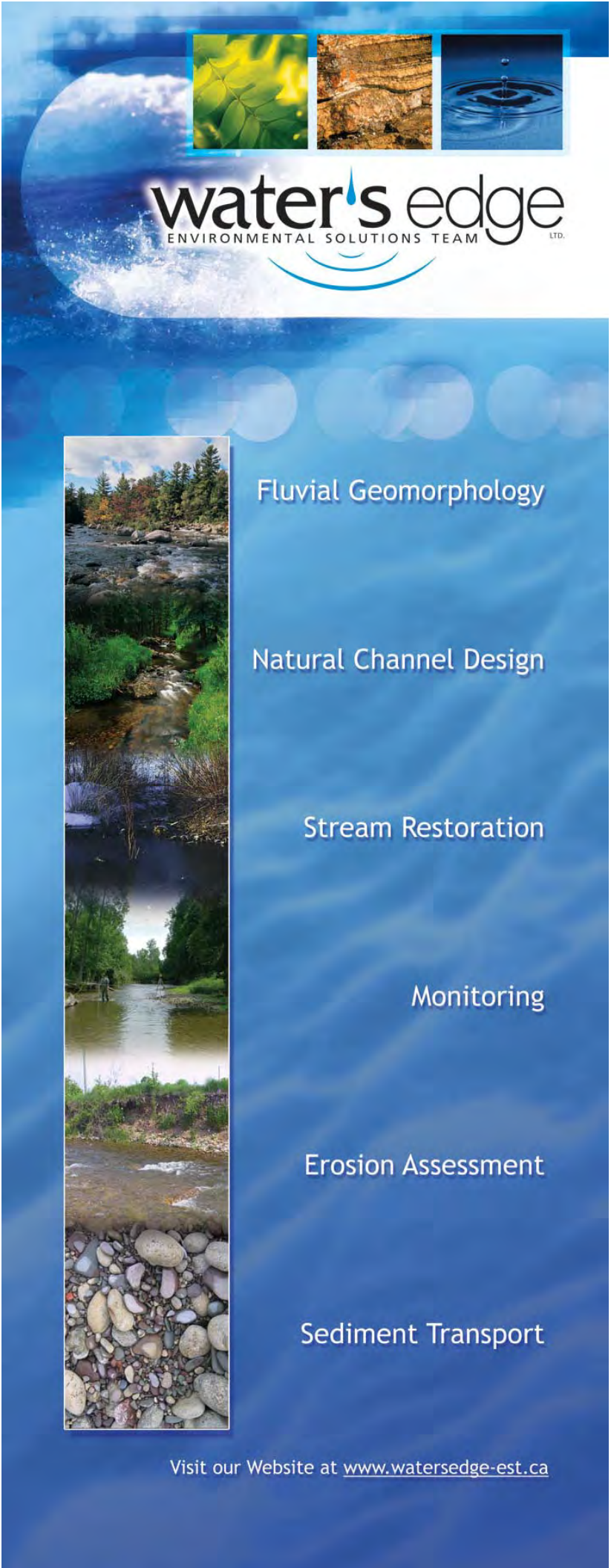
PHOTOGRAPH NO.: 9
FROM: Ivan Gingrich Drain
LOOKING: At critical cross-section location



PHOTOGRAPH NO.: 10
FROM: Ivan Gingrich Drain
LOOKING: Upstream from critical cross-section



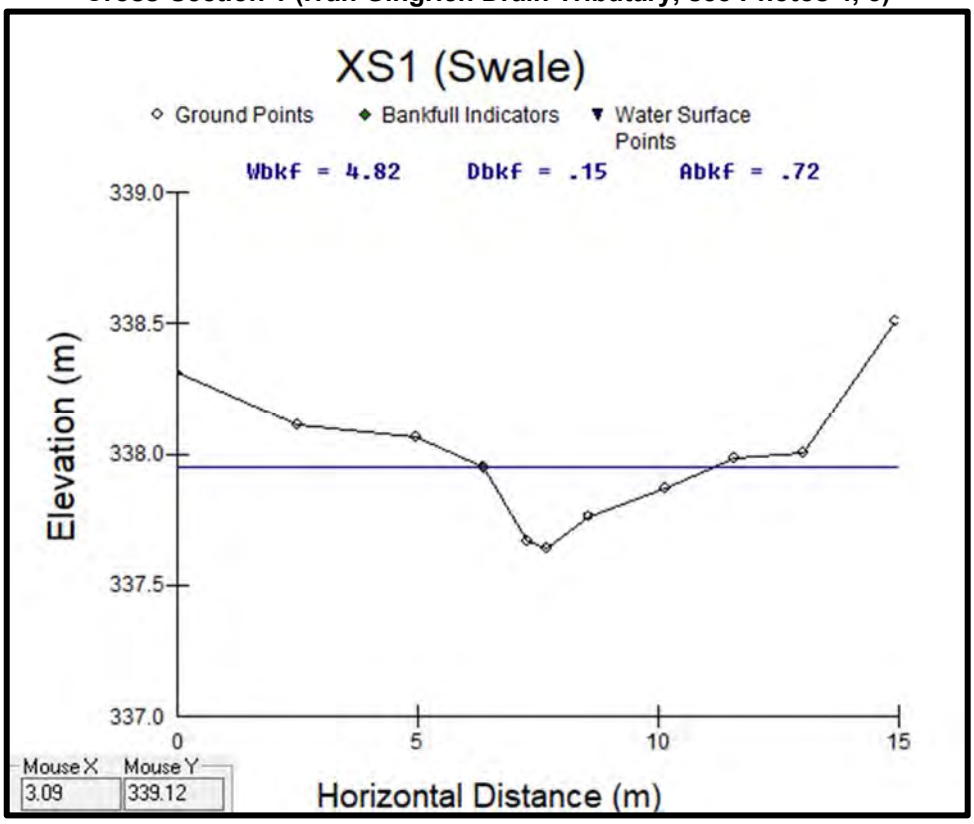
PHOTOGRAPH NO.: 11
FROM: Ivan Gingrich Drain
LOOKING: Downstream at critical cross-section



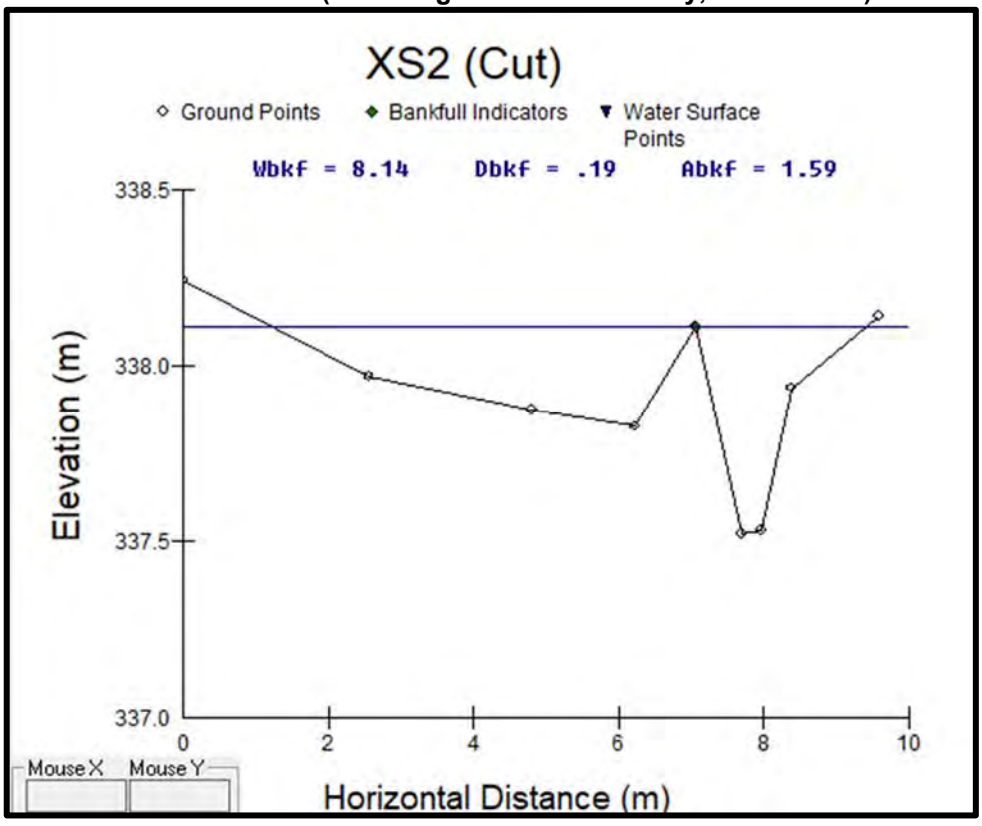
APPENDIX B:

Cross Sections

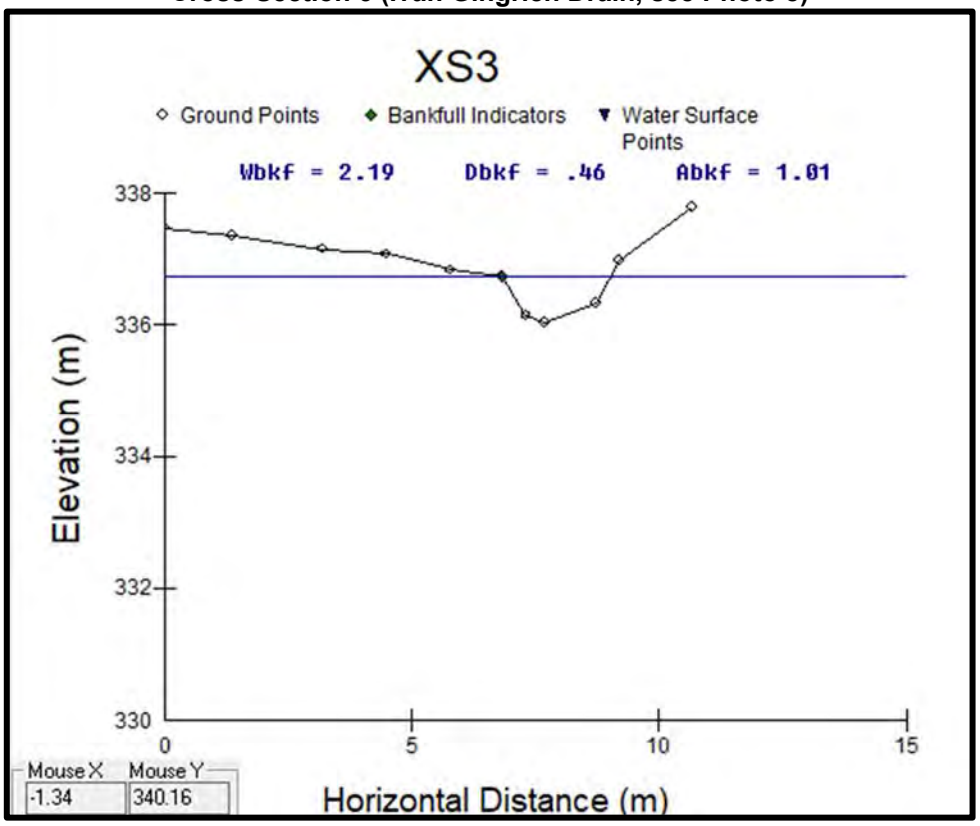
Cross-Section 1 (Ivan Gingrich Drain Tributary, see Photos 4, 5)



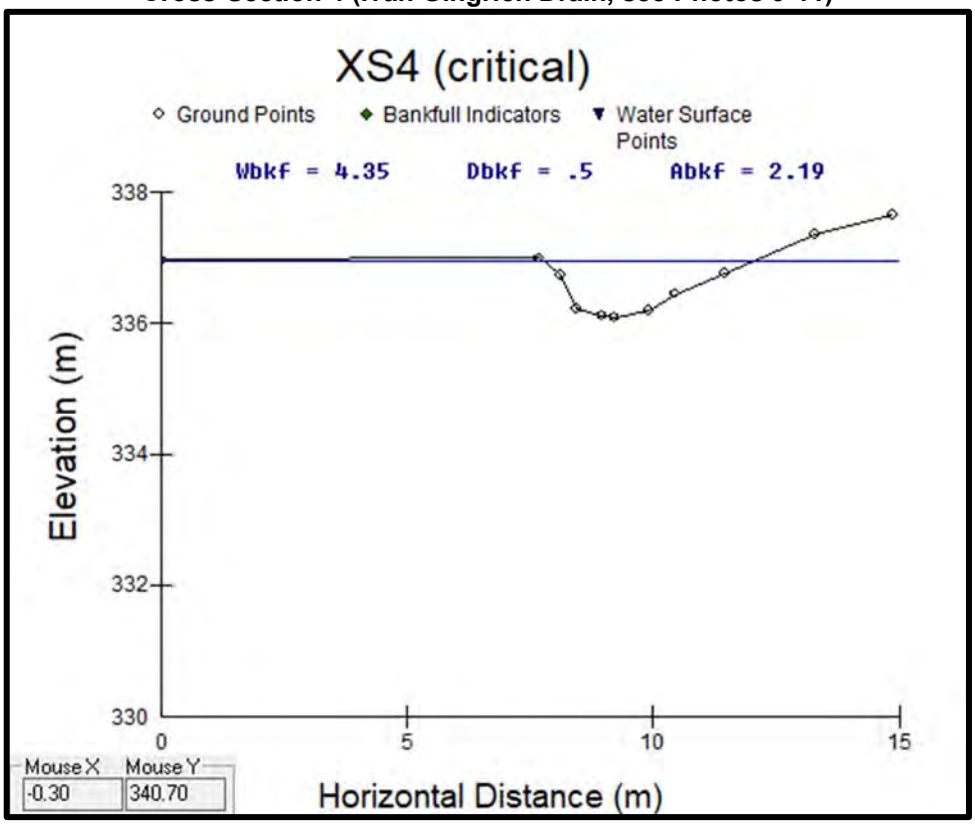
Cross-Section 2 (Ivan Gingrich Drain Tributary, see Photo 6)



Cross-Section 3 (Ivan Gingrich Drain, see Photo 8)



Cross-Section 4 (Ivan Gingrich Drain, see Photos 9-11)





APPENDIX C:

RGA and RSAT Assessment Sheets

Rapid Geomorphic Assessment

Date: 16-Nov-21
Evaluator: RG
Stream: Ivan Gingrich Drain Main Channel
Conditions: Overcast

Form / Process (1)	Geomorphic Indicator No (2)	Description (3)	Present No (4)	Present Yes (5)	Factor Value (6)
Evidence of Aggradation	1	Lobate bar	0	0	
	2	Coarse material in riffles embedded	0	0	
	3	Siltation in pools	0	1	
	4	Medial bars	0	1	
	5	Accretion on point bars	0	0	
	6	Poor longitudinal sorting of bed materials	0	1	
	7	Deposition in the overbank zone	0	0	
		Sum of Indices	0	3	0.43
Evidence of Degradation (DI)	1	Exposed bridge footing(s)	0	0	
	2	Exposed sanitary/storm sewer/pipeline/etc.	0	0	
	3	Elevated storm sewer outfall(s)	0	0	
	4	Undermined gabion baskets/concrete aprons/etc.	0	0	
	5	Scour pools d/s of culverts/storm sewer outlets	0	0	
	6	Cut face on bar forms	0	1	
	7	Head cutting due to knick point migration	0	1	
	8	Terrace cut through older bar material	0	1	
	9	Suspended armour layer visible in bank	0	1	
	10	Channel worn into undisturbed overburden/bedrock	0	0	
		Sum of Indices	0	4	0.40
Evidence of Widening (WI)	1	Fallen/leaning trees/fence posts/etc.	0	0	
	2	Occurrence of large organic debris	0	0	
	3	Exposed tree roots	0	1	
	4	Basal scour on inside meander bends	0	1	
	5	Basal scour on both sides of channel through riffle	0	1	
	6	Gabion baskets/concrete walls/etc. out flanked	0	0	
	7	Length of basal scour >50% through subject reach	0	0	
	8	Exposed length of previously buried pipe/cable/etc.	0	0	
	9	Fracture lines along top of bank	0	0	
	10	Exposed building foundation	0	0	
		Sum of Indices	0	3	0.30
Evidence of Planimetric Form Adjustment (PI)	1	Formation of cut (s)	0	0	
	2	Single thread channel to multiple channel	0	0	
	3	Evolution of pool-riffle form to low bed relief form	0	0	
	4	Cutoff channel(s)	0	0	
	5	Formation of island(s)	0	0	
	6	Thalweg alignment out of phase meander form	0	1	
	7	Bar forms poorly formed/reworked/removed	0	0	
		Sum of Indices	0	1	0.14
Stability Index (SI) = (AI + DI+ WI+ PI) /m					**0.32**
			Condition:	Transitional/Stressed	

General Comments:
"In Regime/Stable" (<0.20), "Transitional/Stressed" (0.21-0.40), or "In Adjustment/Unstable" (>0.40).

Rapid Geomorphic Assessment

Date: 16-Nov-21
Evaluator: RG
Stream: Ivan Gingrich Drain Tributary (SWMF Outflow Channel)
Conditions: Overcast

Form / Process (1)	Geomorphic Indicator No (2)	Description (3)	Present No (4)	Present Yes (5)	Factor Value (6)
Evidence of Aggradation	1	Lobate bar	0	0	
	2	Coarse material in riffles embedded	0	0	
	3	Siltation in pools	0	0	
	4	Medial bars	0	0	
	5	Accretion on point bars	0	0	
	6	Poor longitudinal sorting of bed materials	0	0	
	7	Deposition in the overbank zone	0	0	
		Sum of Indices	0	0	0.00
Evidence of Degradation (DI)	1	Exposed bridge footing(s)	0	0	
	2	Exposed sanitary/storm sewer/pipeline/etc.	0	0	
	3	Elevated storm sewer outfall(s)	0	0	
	4	Undermined gabion baskets/concrete aprons/etc.	0	0	
	5	Scour pools d/s of culverts/storm sewer outlets	0	0	
	6	Cut face on bar forms	0	0	
	7	Head cutting due to knick point migration	0	0	
	8	Terrace cut through older bar material	0	0	
	9	Suspended armour layer visible in bank	0	0	
	10	Channel worn into undisturbed overburden/bedrock	0	0	
		Sum of Indices	0	0	0.00
Evidence of Widening (WI)	1	Fallen/leaning trees/fence posts/etc.	0	0	
	2	Occurrence of large organic debris	0	0	
	3	Exposed tree roots	0	1	
	4	Basal scour on inside meander bends	0	0	
	5	Basal scour on both sides of channel through riffle	0	0	
	6	Gabion baskets/concrete walls/etc. out flanked	0	0	
	7	Length of basal scour >50% through subject reach	0	0	
	8	Exposed length of previously buried pipe/cable/etc.	0	0	
	9	Fracture lines along top of bank	0	0	
	10	Exposed building foundation	0	0	
		Sum of Indices	0	1	0.10
Evidence of Planimetric Form Adjustment (PI)	1	Formation of cut (s)	0	0	
	2	Single thread channel to multiple channel	0	0	
	3	Evolution of pool-riffle form to low bed relief form	0	0	
	4	Cutoff channel(s)	0	0	
	5	Formation of island(s)	0	0	
	6	Thalweg alignment out of phase meander form	0	1	
	7	Bar forms poorly formed/reworked/removed	0	0	
		Sum of Indices	0	1	0.14
Stability Index (SI) = (AI + DI+ WI+ PI) /m					**0.06**
			Condition:	IN REGIME / STABLE	

General Comments:
"In Regime/Stable" (<0.20), "Transitional/Stressed" (0.21-0.40), or "In Adjustment/Unstable" (>0.40).

RAPID STREAM ASSESSMENT TECHNIQUE (RSAT) Evaluation

Creek Name: Ivan Gingrich Drain
New Hamburg, ON

RSAT Section #: 3,4

Assessor: RG

Date: November 16, 2021

Coordinates:

Evaluation Category	Relative Significance	Criteria	Rating: Excellent	Good	Fair	Poor	Score
1 Channel Stability	Indicative of hydrologic/flow regime alteration and general condition of physical aquatic habitat. Provides insight into past, present and possible future changes in channel morphometry	Bank Stability	>80%	71-80 %	50-70 %	< 50 %	5
		Stream Bend Stability Outer bank height/bank overhang	<0.60 m / <0.60m	0.60 to 0.90 m / 0.60 to 0.75 m	0.90 to 1.20 m / 0.75 to 0.90 m	>1.20 m / >0.90 m	2
		Exposed roots and falls	old and large / 0-1	some young / 2-3	young common / 4-5	young abundant / >6	5
		Bottom 1/3 of Bank	resistant plant/soil	resistant plant/soil	highly erodable plant/soil	highly erodable plant/soil	6
		Cross-Section	V or U	V or U	Trapezoidal	Trapezoidal	4
		Typical Score:	**9 to 11**	**6 to 8**	**3 to 5**	**0 to 2**	**4.4**
NOTES:							
2 Channel Scour and Sediment Deposition	Relates to level of uncontrolled stormwater runoff, sediment load and transport and degradation of instream habitat.	Riffle Embeddedness	<25% sand & silt	25-50%	50-75%	>75%	4
		# of deep pools / substrate	high # / <30% fines	mod # / 30-60% fines	low-mod # / 60-80% fines	few # / >80 % fines	4
		Streak marks/sediment deposits absent	marks / dep absent	uncommon	common	common	4
		large sand deposits/fresh	rare / no fresh dep.	uncommon and small localized dep	common and small localized dep.	common and heavy dep along major portion	5
		Point bar/vege/sand	few / well vege / none	small/well vege/little	mod-large& unstable/high am't of sand common	mod-large& unstable/high am't of sand at most bends	6
		Typical Score:	**7 to 8**	**5 to 6**	**3 to 4**	**0 to 2**	**4.6**
NOTES:							
3 Physical In-stream Habitat	Relates to the ability of a stream to meet basic physical requirements necessary for the support of a well-balanced aquatic community (eg: depth of flow, water velocity, water temperature, substrate type and quality, etc).	Wetted Perimeter	> 85% of bottom width	61-85%	40 - 60 %	< 40 %	7
		Diversity of structure, velocity and depth of flow	All forms present, diverse vel. and depth of flow	Good mix of form, rel. diverse velocity and depth	Few pools, riffles and runs dominant, vel & depth gen shallow/slow	dominated by 1 type (usually runs) and 1 vel/depth (usually slow & shallow	5
		Riffle substrate	cobble, gravel, rubble, boulder mix with little sand & >50 % cobble	Good mix of gravel, cobble and rubble & 25-49% cobble	predominantly small cobble, gravel and sand & 5 - 24 % cobble	Predominantly gravel with high % sand & <5% cobble	2
		Riffle depth	>0.20 m	0.15 - 0.19 m	0.10 - 0.14 m	< 0.10 m	2
		Large Pool Depth	> 0.60 m	0.45 - 0.59 m	0.30 - 0.44 m	< 0.30 m	2
		Channel Process	No channel alteration of significant point bar formation or enlargement	Slight increase in point bar formation or slight amount of channel mod.	Mod. increase in point bars and / or channel mod.	extensive channel alteration or point bar formation / enlargement	5
		Riffle-Pool Ratio	0.9 - 1.1 to 1	0.7 - 0.89 to 1 or 1.11 - 1.3 to 1	0.5 - 0.69 to 1 or 1.31 - 1.5 to 1	< 0.49 to 1 or > 1.51 to 1	3
		Stream Temp. on a Summer Afternoon	< 20 ○ C	20 to 24 ○ C	24 to 26 ○ C	>27 ○ C	4
		Typical Score:	**7 to 8**	**5 to 6**	**3 to 4**	**0 to 2**	**3.75**
NOTES:							
4 Water Quality	Indicative of watershed perturbations / general level of human activity, point and non-point source loads, and aquatic habitat conditions.	Substrate Fouling (on rock underside)	None: 0 -10%	Light: 11-20%	Mod: 21 - 50 %	High >50%	3
		Total Dissolved Solids (TDS)	<50mg/L	50-100 mg/L	101-150 mg/L	>150 mg/L	5
		Clearness of Water	>0.90 m visibility	0.45 - 0.89 m	0.15 - 0.44 m	<0.15 m visible	5
		Odour	None	Slight organic odour	Slight - Moderate odour	Moderate to strong odour	8
		Typical Score:	**7 to 8**	**5 to 6**	**3 to 4**	**0 to 2**	**5.25**
NOTES:							
5 Riparian Habitat Conditions	Provides insight into change(s) in stream energetics, temperature regime, and both aquatic and terrestrial habitat conditions	Width of Riparian Buffer	Wide > 200' with mature forests on both sides	Forested buffer >100' along major portion	Predom. Wooded but major localized gaps	Mostly non-wooded vegetation, narrow width.	3
		Canopy coverage (Shading)	>80% shading	60-79% shading	50-60 % shading	<50 % shading	1
		Typical Score:	**6 to 7**	**4 to 5**	**2 to 3**	**0 to 1**	**2**
NOTES:							
6 Biological Indicators	Best overall indication of stream health and level of watershed perturbation	Diversity of macro-invert community	Diverse community present (mayflies, stoneflies, and cased caddisflies (few snails or leeches)	Mayflies and caddisflies (stoneflies absent)	Pollution-tolerant species; aquatic worms dominant	Poor diversity dominated by midgeflies, aquatic worms and snails.	5
		Number of Individuals	Mod to High #	Mod to High #	Low - Mod #	Low #	5
		Typical Score:	**7 to 8**	**5 to 6**	**3 to 4**	**0 to 2**	**5**
NOTES:							

TOTAL SCORE:	**25**
CONDITION:	**Fair**

RAPID STREAM ASSESSMENT TECHNIQUE (RSAT) Evaluation

Creek Name: Ivan Gingrich Drain Tributary
New Hamburg, ON

RSAT Section #: 1,2

Assessor: RG

Date: November 16, 2021

Coordinates:

Evaluation Category	Relative Significance	Criteria	Rating: Excellent	Good	Fair	Poor	Score
1 Channel Stability	Indicative of hydrologic/flow regime alteration and general condition of physical aquatic habitat. Provides insight into past, present and possible future changes in channel morphometry	Bank Stability	>80%	71-80 %	50-70 %	< 50 %	11
		Stream Bend Stability Outer bank height/bank overhang	<0.60 m / <0.60m	0.60 to 0.90 m / 0.60 to 0.75 m	0.90 to 1.20 m / 0.75 to 0.90 m	>1.20 m / >0.90 m	11
		Exposed roots and falls	old and large / 0-1	some young / 2-3	young common / 4-5	young abundant / >6	11
		Bottom 1/3 of Bank	resistant plant/soil	resistant plant/soil	highly erodable plant/soil	highly erodable plant/soil	11
		Cross-Section	V or U	V or U	Trapezoidal	Trapezoidal	11
		Typical Score:	**9 to 11**	**6 to 8**	**3 to 5**	**0 to 2**	**11**
	NOTES:						
2 Channel Scour and Sediment Deposition	Relates to level of uncontrolled stormwater runoff, sediment load and transport and degradation of instream habitat.	Riffle Embeddedness	<25% sand & silt	25-50%	50-75%	>75%	8
		# of deep pools / substrate	high # / <30% fines	mod # / 30-60% fines	low-mod # / 60-80% fines	few # / >80 % fines	8
		Streak marks/sediment deposits absent	marks / dep absent	uncommon	common	common	8
		large sand deposits/fresh	rare / no fresh dep.	uncommon and small localized dep	common and small localized dep.	common and heavy dep along major portion	8
		Point bar/vege/sand	few / well vege / none	small/well vege/little	mod-large& unstable/high am't of sand common	mod-large& unstable/high am't of sand at most bends	8
		Typical Score:	**7 to 8**	**5 to 6**	**3 to 4**	**0 to 2**	**8**
	NOTES:						
3 Physical In-stream Habitat	Relates to the ability of a stream to meet basic physical requirements necessary for the support of a well-balanced aquatic community (eg: depth of flow, water velocity, water temperature, substrate type and quality, etc).	Wetted Perimeter	> 85% of bottom width	61-85%	40 - 60 %	< 40 %	0
		Diversity of structure, velocity and depth of flow	All forms present, diverse vel. and depth of flow	Good mix of form, rel. diverse velocity and depth	Few pools, riffles and runs dominant, vel & depth gen shallow/slow	dominated by 1 type (usually runs) and 1 vel/depth (usually slow & shallow	0
		Riffle substrate	cobble, gravel, rubble, boulder mix with little sand & >50 % cobble	Good mix of gravel, cobble and rubble & 25-49% cobble	predominantly small cobble, gravel and sand & 5 - 24 % cobble	Predominantly gravel with high % sand & <5% cobble	8
		Riffle depth	>0.20 m	0.15 - 0.19 m	0.10 - 0.14 m	< 0.10 m	0
		Large Pool Depth	> 0.60 m	0.45 - 0.59 m	0.30 - 0.44 m	< 0.30 m	0
		Channel Process	No channel alteration of significant point bar formation or enlargement	Slight increase in point bar formation or slight amount of channel mod.	Mod. increase in point bars and / or channel mod.	extensive channel alteration or point bar formation / enlargement	8
		Riffle-Pool Ratio	0.9 - 1.1 to 1	0.7 - 0.89 to 1 or 1.11 - 1.3 to 1	0.5 - 0.69 to 1 or 1.31 - 1.5 to 1	< 0.49 to 1 or > 1.51 to 1	8
		Stream Temp. on a Summer Afternoon	< 20 ○ C	20 to 24 ○ C	24 to 26 ○ C	>27 ○ C	0
		Typical Score:	**7 to 8**	**5 to 6**	**3 to 4**	**0 to 2**	**3**
	NOTES:						
4 Water Quality	Indicative of watershed perturbations / general level of human activity, point and non-point source loads, and aquatic habitat conditions.	Substrate Fouling (on rock underside)	None: 0 -10%	Light: 11-20%	Mod: 21 - 50 %	High >50%	8
		Total Dissolved Solids (TDS)	<50mg/L	50-100 mg/L	101-150 mg/L	>150 mg/L	8
		Clearness of Water	>0.90 m visibility	0.45 - 0.89 m	0.15 - 0.44 m	<0.15 m visible	8
		Odour	None	Slight organic odour	Slight - Moderate odour	Moderate to strong odour	8
		Typical Score:	**7 to 8**	**5 to 6**	**3 to 4**	**0 to 2**	**8**
	NOTES:						
5 Riparian Habitat Conditions	Provides insight into change(s) in stream energetics, temperature regime, and both aquatic and terrestrial habitat conditions	Width of Riparian Buffer	Wide > 200' with mature forests on both sides	Forested buffer >100' along major portion	Predom. Wooded but major localized gaps	Mostly non-wooded vegetation, narrow width.	1
		Canopy coverage (Shading)	>80% shading	60-79% shading	50-60 % shading	<50 % shading	1
		Typical Score:	**6 to 7**	**4 to 5**	**2 to 3**	**0 to 1**	**1**
	NOTES:						
6 Biological Indicators	Best overall indication of stream health and level of watershed perturbation	Diversity of macro-invert community	Diverse community present (mayflies, stoneflies, and cased caddisflies (few snails or leeches)	Mayflies and caddisflies (stoneflies absent)	Pollution-tolerant species; aquatic worms dominant	Poor diversity dominated by midgeflies, aquatic worms and snails.	0
		Number of Individuals	Mod to High #	Mod to High #	Low - Mod #	Low #	0
		Typical Score:	**7 to 8**	**5 to 6**	**3 to 4**	**0 to 2**	**0**
	NOTES:						

TOTAL SCORE:	**31**
CONDITION:	**Good**



APPENDIX D:

HEC-HMS Summary Tables

Existing Conditions

Hydrologic Element	Drainage Area (km2)	Peak Discharge (m3/s)	Time of Peak	Volume (mm)
W180	0.11022	0.1753	28Jul.1983, 00:00	59003.39
Sugarlane Ridge SWMF	0.11022	0.1663	28Jul.1983, 00:00	58994
W230	0.29184	0.4641	28Jul.1983, 00:00	58975.46
Forest Glenn SWMF	0.29184	0.4852	27Jul.1983, 06:00	59078.21
R290	0.29184	0.483	27Jul.1983, 06:00	59075.7
W270	0.11923	0.1896	28Jul.1983, 00:00	58991.97
W280	0.001189	0.0019	28Jul.1983, 00:00	59014.89
UserPoint5	0.412259	0.6681	27Jul.1983, 06:00	59051.31
W320	0.21739	0.3457	28Jul.1983, 00:00	59029.26
W80	0.27084	0.4307	28Jul.1983, 00:00	59027.7
J109	0.564578	0.8981	27Jul.1983, 10:00	59027.92
W340	0.076348	0.1214	28Jul.1983, 00:00	59030.91
Adam Beck PS SWMF	0.076348	0.1219	27Jul.1983, 04:00	59041
R330	0.076348	0.1217	27Jul.1983, 04:00	59024.86
R440	0.564578	0.898	27Jul.1983, 10:00	59017.74
W430	0.41924	0.6667	28Jul.1983, 00:00	59025.29
UserPoint8	0.983818	1.5647	27Jul.1983, 10:00	59020.96
R500	0.983818	1.5646	27Jul.1983, 12:00	59022.28
W480	0.21461	0.3413	28Jul.1983, 00:00	59034.08
UserPoint9	1.198428	1.9059	27Jul.1983, 12:00	59024.4
R40	1.198428	1.9059	27Jul.1983, 12:00	59029.75
W470	0.46283	0.736	28Jul.1983, 00:00	59001.91
R50	0.412259	0.6605	27Jul.1983, 06:00	59046.23
J124	2.073517	3.2975	27Jul.1983, 12:00	59026.81
R150	2.073517	3.2975	27Jul.1983, 12:00	59027.23
R170	0.11022	0.1658	28Jul.1983, 00:00	58992.48
W160	0.005515	0.0088	28Jul.1983, 00:00	58964.11
W140	0.012927	0.0206	28Jul.1983, 00:00	58919.64
UserPoint2_x	2.202178	3.4926	28Jul.1983, 00:00	59024.7
R130	2.202178	3.4919	28Jul.1983, 00:00	59027.38
W120	0.35471	0.5641	28Jul.1983, 00:00	58953.07
Outlet1	2.556888	4.0559	28Jul.1983, 00:00	59017.07

Proposed Conditions

Hydrologic Element	Drainage Area (km2)	Peak Discharge (m3/s)	Time of Peak	Volume (mm)
W180	0.11022	0.1753	28Jul.1983, 00:00	59003.39
Sugarlane Ridge SWMF	0.11022	0.1663	28Jul.1983, 00:00	58994
W320	0.21739	0.3457	28Jul.1983, 00:00	59029.26
W80	0.27084	0.4307	28Jul.1983, 00:00	59027.7
J109	0.564578	0.8981	27Jul.1983, 10:00	59027.92
W340	0.076348	0.1214	28Jul.1983, 00:00	59030.91
Adam Beck PS SWMF	0.076348	0.1219	27Jul.1983, 04:00	59041
R330	0.076348	0.1217	27Jul.1983, 04:00	59024.86
R440	0.564578	0.898	27Jul.1983, 10:00	59017.74
W430	0.41924	0.6667	28Jul.1983, 00:00	59025.29
UserPoint8	0.983818	1.5647	27Jul.1983, 10:00	59020.96
R500	0.983818	1.5646	27Jul.1983, 12:00	59022.28
W480	0.21459	0.3413	28Jul.1983, 00:00	59034.08
UserPoint9	1.198408	1.9059	27Jul.1983, 12:00	59024.4
R40	1.198408	1.9058	27Jul.1983, 12:00	59029.75
W230	0.266069	0.4231	28Jul.1983, 00:00	58975.46
214	0.0176	0.028	28Jul.1983, 00:00	58985.14
W270c	0.01104	0.0176	28Jul.1983, 00:00	59044.4
Forest Glenn SWMF	0.294709	0.4768	27Jul.1983, 06:00	59082.4
R290	0.294709	0.4754	27Jul.1983, 06:00	59079.83
201	0.0685	0.1089	28Jul.1983, 00:00	59058.94
Junction-3	0.0685	0.1089	28Jul.1983, 00:00	59058.94
Reach-2	0.0685	0.1089	28Jul.1983, 00:00	59055.16
203	0.0139	0.0221	28Jul.1983, 00:00	59041.6
202	0.0071	0.0113	28Jul.1983, 00:00	59054.66
Junction-2	0.0895	0.1423	28Jul.1983, 00:00	59053.02
Proposed SWMF	0.0895	0.1423	28Jul.1983, 00:00	59050.15
Reach-1	0.0895	0.1423	28Jul.1983, 00:00	59049.6
207	0.0093	0.0148	28Jul.1983, 00:00	59019.8
205	0.0059	0.0094	28Jul.1983, 00:00	59054.66
Junction-1	0.1047	0.1665	28Jul.1983, 00:00	59047.23
W270b	0.00286	0.0045	28Jul.1983, 00:00	58985.14
W280	0.001555	0.0025	28Jul.1983, 00:00	59014.89
UserPoint5	0.403824	0.6421	28Jul.1983, 00:00	59070.46
R50	0.403824	0.6421	28Jul.1983, 00:00	59064.61
W470	0.345467	0.5494	28Jul.1983, 00:00	59001.91
208	0.0333	0.053	28Jul.1983, 00:00	59019.8
206	0.0185	0.0294	28Jul.1983, 00:00	59019.8
204	0.0147	0.0234	28Jul.1983, 00:00	58996.75
W270a	0.007317	0.0116	28Jul.1983, 00:00	58991.97
J124	2.021516	3.2147	28Jul.1983, 00:00	59031.32
R150	2.021516	3.2147	28Jul.1983, 00:00	59031.68
R170	0.11022	0.1658	28Jul.1983, 00:00	58992.48
W160	0.005515	0.0088	28Jul.1983, 00:00	58964.11
W140	0.012927	0.0206	28Jul.1983, 00:00	58919.64
UserPoint2_x	2.150177	3.4099	28Jul.1983, 00:00	59028.82
R130	2.150177	3.4091	28Jul.1983, 00:00	59031.95
W120	0.35471	0.5641	28Jul.1983, 00:00	58953.07
Outlet1	2.504887	3.9732	28Jul.1983, 00:00	59020.78

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March 15, 2022 - 10:00:05 AM - Plotted By: Alexander Henderson

LEGEND

- SITE BOUNDARY
- EXISTING DIRECTION OF DRAINAGE/SWALE
- EXISTING CONTOURS (GENERATED BY MTE)
- EXISTING CONTOURS (PROVIDED BY REGION OF WATERLOO GIS)
- EXISTING DRIPLINE
- EXISTING SANITARY SEWER (Ex. 300mmø SAN, Ex. SAN MH)
- EXISTING STORM SEWER (Ex. 600mmø STM, Ex. STM MH)
- EXISTING WATERMAIN (Ex. 200mmø WTM, Ex. HYD, SET)
- REGULATORY FLOODPLAIN (100 YR)
- EXISTING WETLAND
- WETLAND BUFFER
- DRIPLINE BUFFER
- PROPOSED RIGHT OF WAY
- EXISTING WATERCOURSE
- EXISTING RAILWAY
- EXISTING BOREHOLE (Ex. BH10, Elev=311.64)
- EXISTING MONITORING WELL (MW8, Ground Elev=313.50, Top of Casing=314.45)
- EXISTING TEST PIT (Test Pit#19, Elev=314.728)
- EXISTING BOREHOLE/ MONITORING WELL (BH/MW302-0, Ground Elev=313.50, Top of Casing=314.45)

IVAN GINGERICH DRAIN

CN RAILWAY

WATERLOO STREET

CHARLES YOUNG AVE

INGOLD AVE

WATER ST

EX. 1750mm CSP
SE. INV.=337.54
NW. INV.=337.48

PRESSURE TRANSDUCER
STAKE ELEV.=338.84
WATER LEVEL=337.56

EX. 2.4m x 1.2m
BOX CULVERT
SE. INV.=338.09
NW. INV.=338.04

EX. SWM FACILITY

EX. 900mmø CSP
CULVERT
N. INV.=339.503
S. INV.=339.304

MW101
ELEV.=339.20
PZ.=340.12

MW102
ELEV.=340.15
PZ.=341.11

MW105
ELEV.=341.08
PZ.=342.16

MW106
ELEV.=342.96
PZ.=344.13

MW107
ELEV.=347.01
PZ.=348.06

MW108
ELEV.=345.30
PZ.=346.42

MW109
ELEV.=340.06
PZ=340.92

MW110
ELEV.=340.04
PZ.=340.75

MW104
ELEV.=344.95
PZ.=345.88

MW201-21
ELEV.=343.52
PZ.=344.36

MW202-21
ELEV.=342.08
PZ.=343.13

MW203B-21
ELEV.=344.77
PZ.=345.72

MW2034-21
ELEV.=344.73
PZ.=345.70

MP01-22
ELEV.=340.97
PZ.=342.22

BH 1 ELEV.=339.37
BH 2 ELEV.=341.42
BH 3 ELEV.=344.50
BH 4 ELEV.=342.61
BH 5 ELEV.=341.78
BH 6 ELEV.=343.61
BH 7 ELEV.=341.57
BH 8 ELEV.=343.37
BH 9 ELEV.=343.24
BH 10 ELEV.=342.20
BH 11 ELEV.=346.37
BH 12 ELEV.=346.22

15m WETLAND BUFFER
WETLAND BOUNDARY
10m DRIPLINE BUFFER

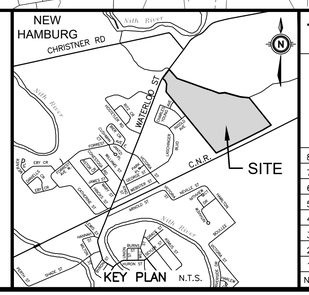
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TOWNSHIP OF WILMOT

No.	REVISION	BY	DATE
8.			
7.			
6.			
5.			
4.			
3.			
2.			
1.			

GEODETIC BM ELEV. = 342.487m
TABLET IS SET HORIZONTALLY IN SOUTH FACE OF CONCRETE FOUNDATION, BEING 62m NORTH OF CENTRELINE OF HIGHWAY; 2.26m EAST OF SOUTHWEST CORNER AND 24cm BELOW THE FIRST COURSE OF BRICKWORK.

SITE BENCHMARK ELEV. = 339.773m
CUT CROSS SOUTHWEST CORNER CONCRETE BOX CULVERT ON SOUTH SIDE OF WATERLOO STREET PNO 9059

OWNER
WILMOT WOODS DEVELOPMENTS INC.
310 FAIRWAY ROAD SOUTH KITCHENER

PROJECT
WILMOT WOODS
NEW HAMBURG

DRAWING
EXISTING CONDITIONS PLAN

MTE
Engineers, Scientists, Surveyors
(519) 743-6500 www.mte85.com

Project Manager: J.CABRAL	Project No.: 35056-104
Design By: AJC	Checked By: VAL
Drawn By: RXB	Checked By: AJC
Surveyed By: RLK/KPW	Drawing No.: EC1.1
Date: Jan.31/18	
Scale: 1:1500	Sheet of

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March 15, 2022 - 3:58:26 PM - Plotted By: Alex Cressman

IVAN GINGERICH DRAIN

CN RAILWAY

WATERLOO STREET

CHARLES YOUNG AVE

INGOLD AVE

EX. SWM FACILITY

Blk.20 Open Space 0.92 ha

Blk.19 Park 1.00 ha

Blk.17 Multiple Residential 0.98 ha

Blk.18 Multiple Residential 1.19 ha

Blk.21 Open Space 3.30 ha

Blk.22 Open Space 0.93 ha

Blk.23 SWM Facility 1.02 ha

Blk.34 Road Widening 0.03 ha

Blk. 7 Open Space 2.86 ha

WETLAND BOUNDARY

15m WETLAND BUFFER

10m DRIPLINE BUFFER

LEGEND

- SITE BOUNDARY
- EXISTING CONTOURS
- EXISTING EMBANKMENT (SLOPE AS NOTED)
- EXISTING DRIPLINE
- DRIPLINE BUFFER
- WETLAND BUFFER
- EXISTING WETLAND
- PROPOSED CONTOURS
- MAJOR OVERLAND FLOW ROUTE

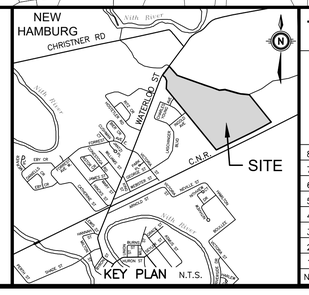
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TOWNSHIP OF WILMOT

No.	REVISION	BY	DATE
8.			
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1.			

GEODETIC BM ELEV. = 342.487m
TABLET IS SET HORIZONTALLY IN SOUTH FACE OF CONCRETE FOUNDATION, BEING 62m NORTH OF CENTRELINE OF HIGHWAY; 2.26m EAST OF SOUTHWEST CORNER AND 24cm BELOW THE FIRST COURSE OF BRICKWORK.

SITE BENCHMARK ELEV. = 339.773m
CUT CROSS SOUTHWEST CORNER CONCRETE BOX CULVERT ON SOUTH SIDE OF WATERLOO STREET PNO 9059

OWNER
WILMOT WOODS DEVELOPMENTS INC.
310 FAIRWAY ROAD SOUTH KITCHENER

PROJECT
WILMOT WOODS
NEW HAMBURG

DRAWING
FINISHED GRADE CONTOUR PLAN

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Engineers, Scientists, Surveyors
(519) 743-6500 www.mte85.com

Project Manager J.CABRAL	Project No. 35056-104
Design By AJC	Checked By VAL
Drawn By RXB	Checked By AJC
Surveyed By RLK/KPW	Drawing No. QU1.1
Date Nov.15/21	
Scale 1:1500	Sheet of

LEGEND

- SITE BOUNDARY
- EXISTING DIRECTION OF DRAINAGE/SWALE
- 323 — EXISTING CONTOURS
- 342.0 — HIGH GROUNDWATER CONTOURS
- EXISTING DRIPLINE
- Ex. BH10 Elev=311.64 — EXISTING BOREHOLE
- MW8 Ground Elev=313.50 Top of Casing=314.45 — EXISTING MONITORING WELL
- Test Pit#19 Elev=314.728 — EXISTING TEST PIT
- BH/MW302-D Ground Elev=313.50 Top of Casing=314.45 — EXISTING BOREHOLE/ MONITORING WELL
- 0.03 — GROUNDWATER SEPARATION CONTOUR, RED TICKS REPRESENT AREAS WHERE SEPARATION REQUIREMENT IS NOT MET
- 0.09 — GROUNDWATER SEPARATION CONTOUR, GREEN TICKS REPRESENT AREAS WHERE SEPARATION REQUIREMENT IS MET
- 0.00 — GROUNDWATER SEPARATION CONTOUR, CYAN TICKS REPRESENT AREAS WHERE SEPARATION FROM USF IS EXACTLY 0.60m
- IVAN GINGERICH MUNICIPAL DRAIN FLOODPLAIN
- EXISTING WETLAND
- WETLAND BUFFER
- DRIPLINE BUFFER

IVAN GINGERICH DRAIN

CN RAILWAY

WATERLOO STREET

INGOLD AVE

CHARLES YOUNG AVE

EX. SWM FACILITY

PRESSURE TRANSDUCER STAKE ELEV.=338.84 WATER LEVEL=337.56

MW101 ELEV.=339.20 PZ.=340.12

BH 1 ELEV.=339.37

BH 2 ELEV.=341.49

BH 5 ELEV.=341.78

MW102-21 ELEV.=342.08 PZ.=343.13

MW105 ELEV.=341.08 PZ.=342.16

BH 8 ELEV.=343.37

BH 10 ELEV.=342.20

MW106 ELEV.=342.96 PZ.=344.13

MW201-21 ELEV.=343.52 PZ.=344.88

MW202-21 ELEV.=344.77 PZ.=345.72

MW203A-21 ELEV.=344.73 PZ.=345.70

BH 9 ELEV.=343.64

BH 12 ELEV.=346.22

BH 11 ELEV.=347.30

MW108 ELEV.=345.30 PZ.=345.42

BH 6 ELEV.=343.61

BH 7 ELEV.=341.50

BH 3 ELEV.=344.50

BH 4 ELEV.=342.67

MW104 ELEV.=344.95 PZ.=345.88

MW107 ELEV.=340.01 PZ.=340.92

MW109 ELEV.=340.06 PZ.=340.92

MW110 ELEV.=340.04 PZ.=340.75

MP01-22 ELEV.=340.97 PZ.=342.22

WETLAND BOUNDARY

WETLAND BUFFER

10m DRIPLINE BUFFER

30m DRIPLINE BUFFER

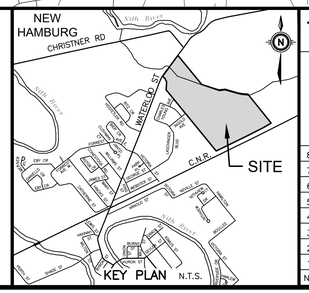
NOTE TO CONTRACTOR :

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.



TOWNSHIP OF WILMOT

No.	REVISION	BY	DATE
8.			
7.			
6.			
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4.			
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2.			
1.			

GEODETIC BM ELEV. = 342.487m
TABLET IS SET HORIZONTALLY IN SOUTH FACE OF CONCRETE FOUNDATION, BEING 62m NORTH OF CENTRELINE OF HIGHWAY; 2.26m EAST OF SOUTHWEST CORNER AND 24cm BELOW THE FIRST COURSE OF BRICKWORK.

SITE BENCHMARK ELEV. = 339.773m
CUT CROSS SOUTHWEST CORNER CONCRETE BOX CULVERT ON SOUTH SIDE OF WATERLOO STREET PNO 9059

OWNER
WILMOT WOODS DEVELOPMENTS INC.
310 FAIRWAY ROAD SOUTH KITCHENER

PROJECT
WILMOT WOODS
NEW HAMBURG

DRAWING
GROUNDWATER SEPARATION CONTOUR PLAN

MTE
Engineers, Scientists, Surveyors
(519) 743-6500 www.mte85.com

Project Manager J.CABRAL	Project No. 35056-104
Design By AJC	Checked By VAL
Drawn By AXH	Checked By AJC
Surveyed By RLK/KPW	Drawing No. QU2.1
Date Jan.21/22	
Scale 1:1500	Sheet of

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